RSP
RiverOak Strategic Partners

Manston Airport Air Freight Hub

Reviving strategic transport infrastructure to maximise Global Britain's trading potential

Applicant's response to Arup Assessor's Draft Report

Appendix 5

Project: Manston Airport Development Consent Order
Document Ref: TR020002/RED2/Arup/APP5
Redetermination Deadline Date: 3 December 2021

The Planning Inspectorate

Appeal Decision

Inquiry held over 30 days between 12 January 2021 and 12 March 2021

Site visits made on 17 December 2020 and 10 March 2021

by Michael Boniface MSc MRTPI, G D Jones BSc(Hons) DipTP MRTPI and Nick Palmer BA (Hons) BPl MRTPI

Panel of Inspectors appointed by the Secretary of State

Decision date: 26 May 2021

Appeal Ref: APP/C1570/W/20/3256619
London Stansted Airport, Essex

- The appeal is made under section 78 of the Town and Country Planning Act 1990 against a refusal to grant planning permission.
- The appeal is made by Stansted Airport Limited against the decision of Uttlesford District Council.
- The application Ref UTT/18/0460/FUL, dated 22 February 2018, was refused by notice dated 29 January 2020.
- The development proposed is airfield works comprising two new taxiway links to the existing runway (a Rapid Access Taxiway and a Rapid Exit Taxiway), six additional remote aircraft stands (adjacent Yankee taxiway); and three additional aircraft stands (extension of the Echo Apron) to enable combined airfield operations of 274,000 aircraft movements (of which not more than 16,000 movements would be Cargo Air Transport Movements) and a throughput of 43 million terminal passengers, in a 12-month calendar period.

Decision

1. The appeal is allowed and planning permission is granted for airfield works comprising two new taxiway links to the existing runway (a Rapid Access Taxiway and a Rapid Exit Taxiway), six additional remote aircraft stands (adjacent Yankee taxiway); and three additional aircraft stands (extension of the Echo Apron) to enable combined airfield operations of 274,000 aircraft movements (of which not more than 16,000 movements would be Cargo Air Transport Movements) and a throughput of 43 million terminal passengers, in a 12-month calendar period at London Stansted Airport, Essex in accordance with the terms of the application, Ref UTT/18/0460/FUL, dated 22 February 2018, subject to the conditions contained in the attached Schedule.

Application for Costs

2. At the Inquiry an application for costs was made by Stansted Airport Limited against Uttlesford District Council. This application is the subject of a separate Decision.

Preliminary Matters

3. The Inquiry was held as a wholly virtual event (using videoconferencing) in light of the ongoing pandemic. The Panel undertook an accompanied site visit to the airport on 10 March 2021 and an unaccompanied visit around the

surrounding area on the same day. An unaccompanied visit to the publicly accessible parts of the airport and surrounding area also took place on 17 December 2020.

4. On 18 May 2018, during the course of the planning application, the Council agreed to a request from the appellant to change the description of development to include a restriction on cargo air transport movements. This is the basis upon which the Council subsequently determined the application. The appeal has been considered on the same basis.

5. The Council resolved to grant planning permission for the development on 14 November 2018 but subsequently reconsidered its position before formally refusing planning permission. In light of the Council's reasons for refusal, its subsequent statement of case in this appeal and given the length of time that had passed since the application was made, an Environmental Statement Addendum (October 2020) (ESA) was produced to update the original Environmental Statement (February 2018) (ES). The Council consulted on the ESA so that all parties had an opportunity to consider its content. As such, the Panel is satisfied that no party is prejudiced by its submission at the appeal stage.

6. The ES and ESA were prepared in accordance with the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (EIA Regulations), including technical appendices and a non-technical summary. They cover a range of relevant topics, informed at the ES stage by a Scoping Opinion from the Council. The Panel is satisfied that the totality of the information provided is sufficient to meet the requirements of Schedule 4 of the EIA Regulations and this information has been taken into account in reaching a decision. Accordingly, while some of the evidence is critical of the ES and ESA, including in respect to their conclusions regarding carbon emissions, there is no significant contradictory evidence that causes the ES or the ESA to be called into question.

7. A local campaign group known as Stop Stansted Expansion (SSE) was granted Rule 6 status and participated as a main party to the Inquiry. However, shortly before the Inquiry opened it elected to rely on its written evidence for several topics so that a witness was not made available for cross-examination on those topics[1]. As such, this evidence was untested and has been considered by the Panel on this basis.

8. Rule 6 status was also granted jointly to Highways England and Essex County Council (the Highway Authorities) who initially opposed the proposal on highway grounds. However, these issues were resolved before the exchange of evidence and the Highway Authorities subsequently withdrew from the appeal proceedings, subject to appropriate planning obligations being secured.

9. The Council's fourth reason for refusing planning permission referred to the adequacy of infrastructure and mitigation measures needed to address the impacts of the development. This reason was partly addressed following agreement with the Highway Authorities about the scope of highways mitigation required, including at Junction 8 of the M11. The adequacy and need for other forms of mitigation are addressed in the body of this decision in

[1] Historical Background, Noise, Health and Well-Being, Air Quality, Surface Access (Rail)

relation to relevant topics and/or in relation to the discussion on conditions and planning obligations, such that this is not a main issue in the appeal.

10. Upon exchange of evidence between the parties, it became clear that the Council accepted that planning permission should be granted for the development, subject to conditions and obligations. However, there remained significant divergence between the parties as to the form and extent of any conditions and much time was spent discussing this matter over the course of the Inquiry.

11. On 20 April 2021, the Government announced that it would set a new climate change target to cut emissions by 78% by 2035 compared to 1990 levels and that the sixth Carbon Budget will incorporate the UK's share of international aviation and shipping emissions. The parties were invited to make comment and their responses have been taken into account in reaching a decision[2].

Main Issues

12. The main issues are the effect of the development on aircraft noise, air quality and carbon/climate change.

13. However, it is first necessary to consider national aviation policy and some introductory matters.

Reasons

National Aviation Policy and Introductory Matters

14. The Aviation Policy Framework (March 2013) (APF) sets out the Government's high-level objectives and policy for aviation. It recognises the benefits of aviation, particularly in economic terms, and seeks to ensure that the UK's air links continue to make it one of the best-connected countries in the world. A key priority is to make better use of existing runway capacity at all UK airports. Beyond 2020, it identifies that there will be a capacity challenge at all of the biggest airports in the South East of England.

15. There is also, however, an emphasis on the need to manage the environmental impacts associated with aviation and a recognition that the development of airports can have negative as well as positive local impacts. Climate change is identified as a global issue that requires action at a global level, and this is said to be the Government's focus for tackling international aviation emissions, albeit that national initiatives will also be pursued where necessary.

16. More recently, the Government published the ANPS[3] and MBU[4], on the same day, as early components of the forthcoming Aviation Strategy. The ANPS is primarily concerned with providing a policy basis for a third runway at Heathrow and is relevant in considering other development consent applications in the South East of England. It is of limited relevance to the current appeal as it is not a Nationally Significant Infrastructure Project (NSIP). Although the ANPS does refer to applications for planning permission, it notes the findings of the Airports Commission on the need for more intensive use of

[2] Having heard a significant amount of evidence on carbon and climate change during the Inquiry, the matters raised by the announcement did not necessitate reopening the Inquiry. Nor was it necessary for the ES to be further updated, as the announcement does not have a significant bearing on the likely effects of the development
[3] Airports National Policy Statement: new runway capacity and infrastructure at airports in the South East of England (June 2018)
[4] Beyond the horizon, The future of UK aviation, Making best use of existing runways (June 2018)

existing infrastructure and accepts that it may well be possible for existing airports to demonstrate sufficient need for their proposals, additional to (or different from) the need which is met by the provision of a Northwest Runway at Heathrow.

17. MBU builds upon the APF, again referencing work undertaken by the Airports Commission which recognised the need for an additional runway in the South East by 2030 but also noted that there would be a need for other airports to make more intensive use of their existing infrastructure. On this basis, MBU states that the Government is supportive of airports beyond Heathrow making best use of their existing runways[5]. There is no requirement flowing from national aviation policy for individual planning applications for development at MBU airports, such as Stansted, to demonstrate need[6] for their proposed development or for associated additional flights and passenger movements. This was not disputed by the Council and whilst SSE took a contrary view, even its witness accepted that there was a need for additional capacity within the London airport network, beyond any new runway at Heathrow[7].

18. The in-principle support for making best use of existing runways provided by MBU is a recent expression of policy by the Government. It is given in full knowledge of UK commitments to combat climate change, having been published long after the Climate Change Act 2008 (CCA) and after the international Paris Agreement. It thoroughly tests the potential implications of the policy in climate change terms, specifically carbon emissions. To ensure that Government policy is compatible with the UK's climate change commitments the Department for Transport (DfT) aviation model was used to look at the impact of allowing all MBU airports to make best use of their existing runway capacity[8]. This methodology appears to represent a robust approach to the modelling.

19. International aviation emissions are not currently included within UK carbon budgets and are instead accounted for through 'headroom' in the budgets, with a planning assumption for aviation emissions of 37.5Mt of CO_2. Whilst the Government has recently announced that international aviation will expressly form part of the sixth Carbon Budget, its budget value has not yet been defined.

20. Of course, the headroom approach of taking account of emissions from international aviation which has been used to date means that accounting for such carbon emissions as part of the Carbon Budget process is nothing new. What is set to change, however, is the process by which it is taken into account. As of yet, there has been no change to the headroom planning assumption. Nor has there been any indication from the Government that there will be a need to restrict airport growth to meet the forthcoming budget for international aviation, even if it differs from the current planning assumption. The specific carbon/climate change implications of this appeal are considered in more detail below.

[5] There is nothing in MBU which suggests that making best use proposals cannot involve operational development of the type proposed in this case
[6] Notwithstanding conclusions in relation to Manston Airport, which is not comparable to the current proposal (being a Development Consent Order scheme, involved an unused airfield and was a cargo-led proposal rather than passenger)
[7] Brian Ross in response to questions from the Inspector
[8] Emissions from UK airports not included in the model are unlikely to be significant as they are small and offer only short-range services

21. MBU sets out a range of scenarios for ensuring the existing planning assumption can be met, again primarily through international agreement and cooperation, considering carbon traded or carbon capped scenarios. It concludes that the MBU policy, even in the maximum uptake scenario tested, would not compromise the planning assumption.

22. Notwithstanding that conclusion, no examples of MBU-type airport development having gained approval since the publication of MBU were brought to the attention of the Inquiry[9] and whilst numerous other airports have plans to expand, none of those identified appear to have a prospect of receiving approval before this scheme. As such, it can be readily and reasonably concluded that this development would not put the planning assumption at risk.

23. Consistent with the APF, MBU differentiates between the role of local planning and the role of national policy, making it clear that the majority of environmental concerns, such as noise and air quality, are to be taken into account as part of existing local planning application processes. Nonetheless, it adds that some important environmental elements should be considered at a national level, such as carbon emissions, which is specifically considered by MBU. The Council apparently understood this distinction in resolving to grant planning permission in 2018. However, it subsequently changed its position, deciding that carbon is a concern for it as local planning authority despite MBU, and this led, at least in part, to the refusal of planning permission, as well as to its subsequent case as put at the Inquiry.

24. Since publication of MBU, UK statutory obligations under the CCA have been amended to bring all greenhouse gas emissions to net zero by 2050, compared to the previous target of at least 80% reduction from 1990 levels. In addition, the Government has indicated a new climate change target to cut emissions by 78% by 2035 compared to 1990 levels, effectively an interim target on the journey to net zero. Notwithstanding these changes, MBU has remained Government policy. There are any number of mechanisms that the Government might use to ensure that these new obligations are achieved which may or may not involve the planning system and may potentially extend to altering Government policy on aviation matters.

25. These are clearly issues for the Government to consider and address, having regard to all relevant matters (not restricted to aviation). The latest advice from the Committee on Climate Change (CCC) will be one such consideration for the Government but it cannot currently be fully known to what extent any recommendations will be adopted. The Government is clearly alive to such issues and will be well aware of UK obligations[10].

26. The ES and ESA contain detailed air traffic forecasts which seek to demonstrate the difference between a 'do minimum' scenario, where the airport makes use of its existing planning permission within its relevant restrictions, and the 'development case' scenario where the appeal development were to proceed. The forecasts are prepared in accordance with industry guidance and practise

[9] With the potential exception of the Southampton Airport scheme, which involved a runway extension to accommodate larger aircraft. No detailed evidence in relation to this scheme was provided by the parties, but it would not alter the Panel's conclusions on MBU support even if an increase in capacity resulted from the scheme
[10] Not least from the recent Supreme Court Judgement in respect of the ANPS - R (on the application of Friends of the Earth Ltd and others) v Heathrow Airport Ltd [2020] UKSC 52

by a professional in this field working as a Director in the aviation department for a global consulting service.

27. The Council, whilst highlighting the inherent uncertainty in forecasts and projections into the future, did not dispute the appellant's position on forecasting, concluding that the predictions were reasonable and sensible[11]. SSE made a series of criticisms of the inputs and assumptions used by the appellant, but these were largely based on assertion and often lacked a clear evidential basis. Different opinions about the likely number of passengers per air transport movement, fleet replacement projections, dominance of / reliance on a single airline at Stansted and cargo expectations were all rebutted by the appellant with justification for the inputs and assumptions used. The Panel was not persuaded that the conclusions in the ES and ESA were incorrect or unreliable. Indeed, they are to be preferred over the evidence of SSE on this matter, which was not prepared by a person qualified or experienced in air traffic forecasting. Accordingly, the forecasts contained within the ES and ESA are sufficiently robust and the best available in this case.

28. The appellant's forecasts do not align with those prepared by the Government in 2017 (DfT forecasts) which are used as the basis for conclusions in MBU, as referred to above. However, there is no reason why they should. The DfT makes clear that its forecasts are a long-term strategic look at UK aviation, primarily to inform longer term strategic policy. They do not provide detailed forecasts for each individual airport in the short-term and the DfT acknowledge that they may differ from local airport forecasts, which are prepared for different purposes and may be informed by specific commercial and local information not taken into account by the DfT. As such, the DfT states that its forecasts should not be viewed as a cap on the development of individual airports.

29. On this basis, the Panel does not accept that a divergence between the appellant's and the DfT's forecasts indicate any unreliability in the data contained in the ES and ESA. Nor is there any justification for applying a reduction to the appellant's forecasts[12]. Furthermore, SSE's forecasting witness recently challenged the validity and reliability of the DfT forecasts in the High Court while acting for SSE, thereby further calling into question the credibility of their now contradictory evidence to this Inquiry.

30. It remained unclear throughout the Inquiry, despite extensive evidence, why the speed of growth should matter in considering the appeal. If it ultimately takes the airport longer than expected to reach anticipated levels of growth, then the corresponding environmental effects would also take longer to materialise or may reduce due to advances in technology that might occur in the meantime. The likely worst-case scenario assessed in the ES and ESA, and upon which the appeal is being considered, remains just that. Conversely, securing planning permission now would bring benefits associated with providing airline operators, as well as to other prospective investors, with significantly greater certainty regarding their ability to grow at Stansted, secure long-term growth deals and expand route networks, potentially including long haul routes.

[11] Proof of Hugh Scanlon, UDC/4/1

[12] This is notwithstanding examples of previous air traffic forecasts for Stansted and other airports that have not be borne out for whatever reason. Any reduction to account for perceived optimism bias would be arbitrary and unlikely to assist the accuracy of the forecasts

31. SSE argued that the 'do minimum' case had been artificially inflated to minimise the difference from the 'development case'. However, there is no apparent good reason why the airport would not seek to operate to the maximum extent of its current planning restrictions if the appeal were to fail. Indeed, as a commercial operator, there is good reason to believe that it would. The fact that it does not operate in this way already does not mean it cannot or will not in future. In fact, the airport has seen significant growth in passenger numbers in recent years, since Manchester Airports Group took ownership, albeit that these have latterly been affected by the pandemic.

32. As such, there is no good reason to conclude that the air traffic forecasts contained within the ES and ESA are in any way inaccurate or unreliable. Of course, there is a level of uncertainty in any forecasting exercise but those provided are an entirely reasonable basis on which to assess the impacts of the proposed development. The Panel does not accept that there has been any failure to meet the requirements of the EIA Regulations, as concluded above.

Aircraft Noise

33. The overarching requirements of national policy, as set out in the National Planning Policy Framework (the Framework) and the Noise Policy Statement for England (NPSE), are that adverse impacts from noise from new development should be mitigated and reduced to a minimum and that significant adverse impacts on health and quality of life should be avoided. It is a requirement of the NPSE that, where possible, health and quality of life are improved through effective management and control of noise.

34. The APF states that the overall policy is to limit and, where possible, reduce the number of people significantly affected by aircraft noise. The APF expects the aviation industry to continue to reduce and mitigate noise as airport capacity grows and that as noise levels fall with technology improvements the benefits are shared between the industry and local communities.

35. While the APF states that the 57 dB LAeq 16 hour contour should be treated as the average level of daytime aircraft noise marking the approximate onset of significant community annoyance, the 2014 Survey of Noise Attitudes (SoNA) indicates that significant community annoyance is likely to occur at 54 dB $L_{Aeq\ 16\ hour}$. The latter metric has been used by the Civil Aviation Authority in its *Aviation Strategy: Noise Forecast and Analysis – CAP 1731.* It has also been used in the Government's consultation *Aviation 2050, The future of UK aviation.* The Council and the appellant agree that the 54 dB $L_{Aeq\ 16\ hour}$ contour should be the basis for future daytime noise restrictions in this case.

36. The NPSE describes the concepts of Lowest Observed Adverse Effect Level (LOAEL) and Significant Observed Adverse Effect Level (SOAEL). The LOAEL is set at 51 dB $L_{Aeq\ 16\ hour}$ in the DfT's Air Navigation Guidance and is the level above which adverse effects on health and quality of life can be detected. These levels apply to daytime hours. The corresponding levels at night are a LOAEL of 45 dB $L_{Aeq\ 8\ hour}$ and onset of significant annoyance at 48dB $L_{Aeq\ 8\ hour}$.

37. The World Health Organisation's (WHO) Environmental Noise Guidelines 2018 (ENG) recommend lower noise levels than those used in response to SoNA. The Government has stated in *Aviation 2050* that it agrees with the ambition to reduce noise and to minimise adverse health effects, but it wants

policy to be underpinned by the most robust evidence on these effects, including the total cost of action and recent UK specific evidence which the WHO did not assess. These factors limit the weight that can be given to the lower noise levels recommended in the ENG.

38. Aircraft modernisation is reducing aircraft noise over time. It has been demonstrated that the daytime 57 dB and 54 dB noise contours will decrease in extent over the period to 2032, both with and without the development, albeit that the 54 dB contour would be slightly larger in the development case (DC) compared to the do minimum (DM) scenario. The 51 dB LOAEL contour is however predicted to increase slightly in extent compared to the 2019 baseline.

39. The night-time 48 dB contour is also predicted to decrease in extent and this reduction would be greater in the DC than in the DM scenario. This is based upon there being a greater amount of fleet modernisation, including fewer of the noisier cargo flights.

40. The ESA compares the DC with the DM scenario at 2032, which is when the maximum passenger throughput is predicted to be reached, and at 2027 which is identified as the transition year. In 2032 there would be an increase in air noise levels during the daytime of between 0.4 and 0.6 dB which is assessed as a negligible effect. There would be a beneficial reduction in night-time noise of between 0.3 and 0.8 dB in the DC compared to DM, but this is also assessed as negligible.

41. Saved Policy ENV11 of the Uttlesford Local Plan 2005 (ULP) resists noise generating development if this would be liable to adversely affect the reasonable occupation of existing or proposed noise sensitive development nearby. The ESA demonstrates that this would not be the case.

42. It is necessary to ensure that the benefits in terms of the reduction in noise contours over time arising from fleet modernisation, and the reduction in night noise are secured in order that these are shared with the community in accordance with national policy in the APF. The Council's position is that the development is acceptable in terms of aircraft noise, subject to suitable mitigation measures. Condition 7 defines the maximum areas to be enclosed by 54 dB $L_{Aeq\ 16hour}$, and 48 dB $L_{Aeq\ 8\ hour}$ noise contours and requires that the area enclosed by each of those contours is reduced as passenger throughput is increased, in accordance with the findings of the ESA.

43. There is no control of the night-time noise contour under the existing permission. This is instead subject to control under the Government's night flight restrictions which impose a Quota Count. It is noted that the Secretaries of State in granting the last planning permission considered that there was no need for such a condition because of the existing controls.

44. However, the night flight restrictions do not cover the full 8 hour period used in the L_{Aeq} assessment. Consequently, if only the night flight restrictions were to be relied upon, there would be no control of aircraft noise between 23:00 and 23:30 hours and between 06:00 and 07:00 hours. The ESA has demonstrated that the reductions in night noise would be beneficial to health. For these reasons, inclusion of the $L_{Aeq\ 8hour}$ restriction in condition 7 would be necessary. In coming to this view, the Panel has taken into account the dual restrictions that would apply. However, the night noise contour requirement in condition 7

would be necessary to secure the benefit and it has not been demonstrated that the night noise restrictions would be sufficient in this respect.

45. The Panel has considered SSE's submissions concerning the methodology used in the ES and ESA. The use of L_{Aeq} levels in the assessment is in accordance with Government policy and reflects the conclusions of SoNA, but the ES and ESA also include assessments of the number of flights exceeding 60 and 65 dB(A) and maximum single event noise levels. The assessments of aircraft noise are comprehensive, and the methodology used is justified and widely accepted as best practice, including by the Government and industry. The Council considers that the methodology used is robust. The Panel has also considered the evidence on air traffic forecasts and, for the reasons given elsewhere in this decision, is satisfied that the assumptions regarding fleet replacements are robust.

46. SSE has referred to the number of complaints about noise increasing in recent years. However, it is also relevant to consider the number of complainants which has significantly decreased. These factors have been taken into account in the ES and ESA.

47. The existing sound insulation grant scheme (SIGS) provides for financial assistance to homeowners and other noise-sensitive occupiers, to be used to fund sound insulation measures. This uses a contour which is based on 63 dB $L_{Aeq\ 16\ hour}$ for daytime and the aggregate 90 dBA SEL footprint of the noisiest aircraft operating at night.

48. The submitted Unilateral Undertaking (UU) provides for an enhanced SIGS whereby a 57 dB daytime contour is used, thereby increasing its extent and the number of properties covered. This is consistent with the evolving perceptions of the level of significant adverse effects and exceeds the levels recommended for such measures as stated in the APF. The use of this contour together with the 90 dBA SEL footprint as qualifying criteria would provide mitigation against both daytime and night-time noise. The latter criterion recognises that sleep disturbance is more likely to arise from single events than average noise levels over the night-time period.

49. The UU also applies to specific identified noise-sensitive properties including schools, community and health facilities and places of worship. An assessment of these properties has been undertaken using the daytime 57 dB contour used for residential properties, the number of flights above 65 dB and the maximum sound levels of aircraft flying over properties. Inclusion of properties in the list in Schedule 2 Part 1 of the UU means that bespoke measures may be discussed between the property owner and the airport operator and that further noise surveys may be undertaken. Thaxted Primary School does not qualify for inclusion in the list under the criteria used. However, submissions were made to the Inquiry that the school should be included. It has provisionally been included in the list subject to the Panel's decision.

50. Thaxted Primary School is outside, but adjacent to the boundary identified for the SIGS. This is represented by the 57 dB $L_{Aeq\ 16\ hour}$ and 200 daily flights above 65 dB (N65 200). The school is well outside the 63 and 60 dB contours, the former being the level that Government policy recognises, in the APF, as requiring acoustic insulation to noise-sensitive buildings and the latter the level to which this may potentially be reduced.

51. Departing aircraft predominantly take off towards the south-west, away from the school. Those that do take off towards the north-east turn onto standard routes away from the school before reaching it. The school is, however exposed to noise from arriving aircraft.

52. Standards for internal noise levels in schools are set out in *Building Bulletin 93 – Acoustic design of schools: performance standards* (BB93). These use $L_{Aeq\ 30mins}$ as a metric because school pupils experience noise over limited periods and not over the full daytime period. No assessment has been undertaken using this metric. It is, however, possible to determine the effect of the proposal having regard to the maximum sound levels of aircraft flying over the property in question.

53. It has been demonstrated that the school would not be exposed to L_{Amax} flyover levels of 72 dB or more. The Council agrees that this maximum level would ensure that internal noise levels would not exceed 60 dB, with windows open. This provides a good degree of certainty that noise levels would be in accordance with BB93 which states that indoor ambient noise levels should not exceed 60 dB $L_{A1,\ 30\ mins}$.

54. No representations have been made either by the school or the education authority with regard to inclusion of Thaxted Primary School in the list. It has not been demonstrated that the school should be included in the list in terms of any specific need for mitigation. For these reasons the inclusion of Thaxted Primary School in the list of properties in Schedule 2 Part 1 of the UU would not be necessary and on this basis this provision would not meet the tests in the Community Infrastructure Levy Regulations 2010 (the CIL Regulations).

55. The noise assessments in the ES and ESA take into account ground noise from aircraft. The Council's reason for refusal concerns only aircraft noise and not noise from ground plant and equipment or surface access. The Panel has considered the evidence provided by SSE in respect of the latter, but these do not alter its conclusions on this main issue.

56. It has been demonstrated beyond doubt that the development would not result in unacceptable adverse aircraft noise and that, overall, the effect on noise would be beneficial. Subject to the mitigation provided by the UU and the restrictions imposed by condition 7, the development would accord with Policy ENV11 of the ULP and with the Framework.

Air Quality

57. Although air pollution levels around the airport are for the most part well within adopted air quality standards, an area around the Hockerill junction in Bishop's Stortford has nitrogen dioxide levels that are above those standards. This is designated an Air Quality Management Area (AQMA). The development would increase emissions from aircraft, other airport sources and from road vehicles, but this would be against a trend of reduction in air pollution as a result, amongst other things, of increasing control of vehicle emissions.

58. The pollutants which are assessed are oxides of nitrogen (NOx), particulate matter (PM_{10}) and fine particulate matter ($PM_{2.5}$). Ultrafine particulates (UFP) are recognised as forming a subset of $PM_{2.5}$ and they are likely to affect health. However, there is no recognised methodology for assessing UFP and the most that can be done is a qualitative, rather than quantitative assessment.

59. Policy ENV13 of the ULP resists development that would involve users being exposed on an extended long-term basis to poor air quality outdoors near ground level. The Policy identifies zones on either side of the M11 and the A120 as particular areas to which the Policy applies.

60. Paragraph 170 of the Framework states that development should, wherever possible, help to improve local environmental conditions such as air quality. Paragraph 181 states that planning decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of AQMAs and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified.

61. Emissions of NOx, PM_{10} and $PM_{2.5}$ would increase slightly in the DC compared to the DM scenario. They would also increase in comparison to the 2019 baseline. However, pollutant levels resulting from other sources, notably road traffic, are forecast to decline. The ES and ESA demonstrate that there would be no exceedance of air quality standards at human receptors and that air quality impacts would be negligible. The overall effect of the development in terms of air quality would be in accordance with the Framework and with the Clean Air Strategy, which refers to the need to achieve relevant air quality limit values. While the Framework seeks to improve air quality where possible, it recognises that it will not be possible for all development to improve air quality.

62. While the proposed development would not improve air quality, the UU secures a number of measures to encourage the use of public transport and to reduce private car use, including single occupancy car trips. The airport has a Sustainable Development Plan which, whilst not binding, commits to reducing air pollution. It has already achieved significant increases in use of public transport, thereby limiting emissions and these initiatives would be continued. The measures would have other objectives such as reducing carbon emissions, which would not necessarily benefit air quality but nonetheless the provisions of the UU would overall be likely to secure improvements in air quality.

63. Although it has raised a number of issues concerning the methodology used and the robustness of the assessments during the appeal process, the Council made no request for further information under the EIA Regulations.

64. SSE has commented on a number of aspects of the air quality assessments, including the transport data used, the receptors assessed and modelling. The appellant has provided clarification of the aspects that have been queried by SSE and has justified the approach taken and the assumptions made. The appellant's responses provide sufficient reassurance that the assessments are soundly based and that they are conservative.

65. The air quality assessment depends on the assessment of road traffic in terms of vehicle emissions. Surface access is dealt with elsewhere in this decision, but the transport modelling forms a robust assessment which has been accepted by the Highway Authorities. Consequently, this forms a sound basis for the air quality assessment.

66. The Clean Air Strategy includes a commitment to significantly tighten the current air quality objective for fine particulates, but no numerical standard has yet been set. The current objective for $PM_{2.5}$ is 25µg/m^3. The 2008 WHO guidelines recommend an ultimate goal for annual mean concentrations of

$PM_{2.5}$ of 10µg/m^3. The Clean Air Strategy commits to examine the action that would be necessary to meet this limit but no timescale for this has been set.

67. The ESA assesses the largest concentration of $PM_{2.5}$ in 2032 to be 11.6µg/m^3 in the DC. This is well below the current objective but slightly above the more ambitious WHO guideline. The great majority of the modelled concentrations would be below that guideline value. The assessment also shows that the effect of the development by comparison to the DM scenario would be negligible. The proposal would not unacceptably compromise the Clean Air Strategy in reducing concentrations of $PM_{2.5}$ and accords with the current objective.

68. The Bishop's Stortford AQMA is within East Hertfordshire District Council's (EHDC) administrative area. Policy EQ4 of the East Hertfordshire Local Plan 2018 requires minimisation of impacts on local air quality. That Policy also requires, as part of the assessment, a calculation of damage costs to determine mitigation measures. The ES and ESA demonstrate that there would be negligible effects for which the UU secures mitigation measures. EHDC has consequently raised no objection to the proposal.

69. The AQMA is centred around a traffic signal-controlled road junction which is enclosed by buildings on all sides. The A1250 is at a gradient on both sides of the junction. It is likely that the high monitored levels of pollutants here result from emissions from queuing traffic and the enclosing effect of the buildings. Nitrogen dioxide (NO_2) levels have been declining here in recent years, with a reduction in levels between 2012 and 2019. However, NO_2 levels remain above the air quality standard for 3 of the 4 locations monitored and significantly above the standard for 2 of those locations.

70. An adjustment factor has been used to compensate for the difference between modelled and measured concentrations of NO_2 in the AQMA. Uttlesford District Council is concerned that this factor is unusually high, but it has been undertaken in accordance with Defra's Local Air Quality Management Technical Guidance TG16 and on this basis, is not considered unreasonable. This guidance was used together with the Emission Factor Toolkit and Defra's background pollutant concentrations maps in predicting future improvements in air quality. Sensitivity tests using less optimistic assumptions regarding future improvements in air quality were incorporated in the ES and ESA. While there is acknowledged uncertainty in predicting future levels, a rigorous approach has been used in the assessment.

71. It is not disputed that airport activities contribute less than 1% to NOx concentrations in Bishop's Stortford. The appellant's transport modelling demonstrates that any increase in traffic along the A1250 and through the Hockerill junction would, at worst be 1.3% of current traffic flow in the DC compared to DM. This extra traffic would not necessarily be evenly distributed throughout the day. Queuing traffic would tend to increase emissions and the adjacent buildings would have an enclosing effect. Nonetheless, this level of additional traffic would be unlikely to appreciably affect pollution levels in the AQMA.

72. It is common ground that UFPs result from combustion sources including burning of aviation fuel, which contains higher levels of sulphur than fuel used for road vehicles. It is also agreed that there is no reliable methodology for assessing the quantity of UFPs that would result from the development. It is

the quantity of these particulates, rather than their mass, that is particularly relevant in terms of implications for human health.

73. Although the development would result in increases in $PM_{2.5}$, the ES and ESA demonstrate that those increases would be negligible compared to the DM scenario. It is also the case that ambient levels of $PM_{2.5}$ are predicted to reduce over time. The assessment considers the mass of $PM_{2.5}$. While assumptions can be made about the mass of UFPs as a subset of $PM_{2.5}$ reducing over time, it is not possible to conclude on the number of UFPs in the absence of any recognised assessment methodology. That said, the Health Impact Assessment considered epidemiological research, which includes the existing health effects of $PM_{2.5}$ and thus UFPs as a subset. This concluded that there would be no measurable adverse health outcomes per annum.

74. The Aviation 2050 Green Paper proposes improving the monitoring of air pollution, including UFP. While the significance of UFP as a contributor to the toxicity of airborne particulate matter is recognised, footnote 83 of the Green Paper notes that the magnitude of their contribution is currently unclear.

75. The Council, while raising concern over UFPs, is nonetheless content that permission could be granted subject to conditions requiring monitoring of air quality. The UU secures such monitoring, and condition 10 requires implementation of an air quality strategy, which is to be approved by the Council.

76. The nearby sites of Hatfield Forest and Elsenham Woods are Sites of Special Scientific Interest (SSSI). Policy ENV7 of the ULP seeks to protect designated habitats.

77. The ES and ESA assessments were undertaken in accordance with Environment Agency[13] and Institute of Air Quality Management (IAQM)[14] guidance. The ESA demonstrates that the development would result in long-term critical loads for NOx concentrations at the designated sites being increased by less than 1%.

78. Previous monitoring has shown that 24-hour mean NOx concentrations can greatly exceed annual mean concentrations. Condition 10 requires a strategy to minimise emissions from airport operations and surface access. A condition has also been suggested which would require assessment of 24-hour mean NOx concentrations at the designated sites and provision of any necessary mitigation. The IAQM guidance states that the annual mean concentration of NOx is most relevant for its impacts on vegetation as effects are additive. The 24-hour mean concentration is only relevant where there are elevated concentrations of sulphur dioxide and ozone which is not the case in this country. Natural England has accepted the assessment and has not requested use of the 24-hour mean concentration.

79. The UU includes obligations to monitor air quality, and to discuss with the Council the need for any measures to compensate for any adverse effect on vegetation within the designated sites. Because monitoring of air quality and necessary mitigation in respect of the SSSIs would be secured by the UU, the suggested condition to assess 24-hour mean NOx concentrations would not be necessary.

[13] Environment Agency H1 guidance
[14] Institute of Air Quality Management: Land-Use Planning & Development Control: Planning for Air Quality (2017)

80. The ES concluded that there would be no significant effect at ecological receptors. The Council considers that the development would be acceptable in air quality terms subject to imposition of suitable conditions to limit the air quality effects and to secure mitigation measures.

81. For the reasons given, it has been demonstrated that the development would not have an unacceptable effect on air quality and that it accords with Policies ENV7 and ENV13 of the ULP.

Carbon and Climate Change

82. There is broad agreement between the parties regarding the extremely serious risks associated with climate change. These risks are acknowledged and reflected in Government policy. Indeed, in this regard, the Framework states, amongst other things, that the environmental objective of sustainable development embraces *mitigating and adapting to climate change, including moving to a low carbon economy*. It adds that *the planning system should support the transition to a low carbon future in a changing climate* … and … *should help to shape places in ways that contribute to radical reductions in greenhouse gas emissions*.

83. Nonetheless, in spite of that general accord there remains much disagreement between the main parties to the Inquiry over how the effects of the development on climate change should be assessed, quantified, monitored and managed, including into the future.

84. The Government has recently made it clear that it will target a reduction in carbon emissions by 78% by 2035 compared to 1990 levels and that the sixth Carbon Budget, scheduled to be introduced before the end of June 2021, will directly incorporate international aviation emissions rather than by using the headroom / planning assumption approach of the previous budgets. The first of these measures will introduce a target for reducing emissions prior to the net zero target of 2050, acting as an intermediate target, and is set to be enshrined in law.

85. The latter measure will alter the way in which such emissions are accounted for. The Government intends to set the sixth Carbon Budget at the 965 MtCO2e level recommended by the CCC. As outlined above, carbon emissions from international aviation have always been accounted for in past carbon budgeting. There is no good reason to assume that the coming change in how they are accounted for will significantly alter Government policy in this regard or that the Government intends to move away from its MBU policy.

86. Indeed, the Government's press release expressly states, amongst other things, that *following the CCC's recommended budget level does not mean we are following their policy recommendations*. Moreover, it also says that *the Government will 'look to meet' this reduction through investing and capitalising on new green technologies and innovation, whilst maintaining people's freedom of choice, including on their diet. For that reason, the 6CB will be based on its own analysis, and 'does not follow each of the Climate Change Committee's specific policy recommendations.'*

87. As outlined in the *National Aviation Policy and Introductory Matters* subsection, there is in-principle Government policy support for making best use of existing runways at airports such as Stansted, and MBU thoroughly tests the potential

implications of the policy in terms of carbon emissions. International aviation carbon emissions are not currently included within UK carbon budgets, but rather are accounted for via an annual 'planning assumption' of 37.5MtCO_2. MBU policy establishes that, even in the maximum uptake scenario tested, this carbon emissions planning assumption figure would not be compromised.

88. The contents of the ES and ESA, which - unlike MBU - specifically assess the potential impacts of the appeal development, support the conclusions of MBU in this regard. Indeed, they indicate that the proposed development would take up only an extremely small proportion of the current 'planning assumption'. For instance, the ESA shows in 2050 that the additional annual carbon emissions from all flights resulting from the development are likely to be in the region of 0.09MtCO_2, which would equate to only 0.24% of the 37.5MtCO_2 planning assumption[15].

89. This assessment assumes that the airport would not seek to use its permitted total of 274,000 ATMs in the event that the appeal were to be dismissed. Yet, in practice, it seems more likely that it would, as a commercial operator, seek to maximise flights. Consequently, the relative increase in carbon emissions resulting from the development would be likely to be less than as predicted in the ESA compared to what might happen if the proposed development were not to proceed.

90. In light of the CCC's recommendations and the Government's 20 April 2021 announcement, the 37.5MtCO_2 planning assumption, as a component of the planned total 965 MtCO_2e budget, may well change. Even if it were to be reduced as low as 23MtCO_2, as is suggested might happen by the Council's carbon/climate change witness with reference to the advice of the CCC on the sixth Carbon Budget, an increase in emissions of 0.09MtCO_2 resulting from the appeal development in 2050 would be only some 0.39% of this potential, reduced figure.

91. Unsurprisingly, the carbon emission figures in the ESA vary across the years modelled to 2050 and over the three scenarios employed from 2032 ('Pessimistic', 'Central' and 'Best practice'). For instance, the predicted additional annual carbon emissions from flights increases steadily from the base-year of 2019 over the years to 2032 leading to a predicted increase of some 0.14MtCO_2 in 2032[16], which equates to 0.38% of the planning assumption. Notwithstanding these variations, in each case the annual values for all years and scenarios would, nonetheless, remain only a very small proportion of both the Government's established planning assumption and a potentially reduced assumption of 23MtCO_2.

92. Of course, these are annual emissions figures and, as such, they need to be summed in order to give the full, cumulative amount of predicted additional carbon emissions resulting from flights associated with the appeal development for any year on year period, such as the 2019 to 2050 period used in the ESA. Consequently, the cumulative additional emissions predicted in the ESA for the entire 2019-2050 period or for the 2032-2050 period are far greater than the 0.09MtCO_2 forecast for the year 2050. However, the Government's planning

[15] 0.09MtCO_2 is the difference between the 'Annual Development Case Central' and the 'Annual Do Minimal Central' scenarios of the ESA
[16] 0.14MtCO_2 is the difference between the 'Development Case Pessimistic' and the 'Do Minimum Pessimistic' scenarios of the ESA

assumption of 37.5MtCO_2 is also an annual figure, as is the figure of 23MtCO_2, such that the relative cumulative amounts of carbon emissions would remain proportionately small.

93. Notwithstanding reference to a range of planned airport development as part of the appeal process, the fact that no examples of MBU-type development having been approved since the publication of MBU were brought to the attention of the Inquiry lends further support to the conclusion that this development alone would not put the planning assumption at risk[17].

94. Although UK statutory obligations under the CCA have been amended since the publication of MBU to bring all greenhouse gas emissions to net zero by 2050, with an additional target of a 78% reduction in carbon emissions by 2035 set to be introduced, MBU remains Government policy. Given all of the foregoing and bearing in mind that there are a range of wider options that the Government might employ to meet these new obligations and that aviation is just one sector contributing to greenhouse gas emissions to be considered, there is also good reason to conclude that the proposed development would not jeopardise UK obligations to reach net zero by 2050 or to achieve the planned 2035 intermediate target. On this basis, given the very small additional emissions forecast in relative terms, there is also no reason to expect that the Council's climate emergency resolution should be significantly undermined.

95. The aviation emissions assessments of the ES and ESA are reported as CO_2 only rather than in the wider terms of carbon dioxide equivalent emissions (CO_2e), which also includes nitrous oxide (N_2O) and methane (CH_4), and which the Government has adopted for its sixth Carbon Budget. While it may have been beneficial to have used CO_2e in preference to CO_2 in the ES and ESA, this was not a matter raised by the Council during scoping, nor at any other stage prior to the exchange of evidence. The approach of the ES and ESA, in this regard, is also consistent with the DfT's 2017 Forecasts and with the MBU policy. Consequently, the approach adopted in the ES and ESA is not flawed or incorrect as such. In any event, the evidence indicates that were N_2O and CH_4 to have been included in the ES and ESA assessments, the results would not change significantly on the basis that N_2O and CH_4 account for in the region of only 0.8 to 1.0% of total international aviation CO_2e emissions.

96. In addition to carbon and carbon dioxide equivalent emissions, other non-carbon sources have the potential to effect climate change. Nonetheless, they are not yet fully understood, with significant uncertainties remaining over their effects and how they should be accounted for and mitigated. There is currently no specific Government policy regarding how they should be dealt with and uncertainty remains over what any future policy response might be. Moreover, no evidence was put to the Inquiry which clearly and reliably establishes the extent of any such effects.

97. The nature of non-carbon effects resulting from aviation has parallels with carbon effects in that they are complex and challenging, perhaps even more so than carbon effects given the associated greater uncertainties, and that they largely transcend national boundaries. Consequently, in the context of MBU development, it is reasonable to conclude that they are matters for national Government, rather than for individual local planning authorities, to address.

[17] Subject to footnote 9 above

It is also noteworthy that the current advice on this matter from the CCC to the Government appears largely unchanged compared to its previous advice.

98. In this context, therefore, the potential effects on climate change from non-carbon sources are not a reasonable basis to resist the proposed development, particularly bearing in mind the Government's established policy objective of making the best use of MBU airports. Moreover, if a precautionary approach were to be taken on this matter, it would be likely to have the effect of placing an embargo on all airport capacity-changing development, including at MBU airports, which seems far removed from the Government's intention.

99. The reason for refusal relating to carbon emissions and climate change refers only to the proposed development's effects resulting from additional emissions of international flights. Nonetheless, the evidence put forward as part of the appeal process also refers to wider potential effects on climate change, including carbon emissions from sources other than international flights.

100. Discussion and testing of the evidence during the Inquiry process revealed no good reasons to conclude that any such effects would have any significant bearing on climate change. Indeed, the Statement of Common Ground on Carbon between the appellant and Council states that *the emissions from all construction and ground operation effects (i.e. all sources of carbon other than flight emissions) are not significant.* It adds that *Stansted Airport has achieved Level 3+ (carbon neutrality) Airport Carbon Accreditation awarded by the Airport Council International*.

101. Given the conclusions outlined above regarding the potential effects of the appeal development arising from international flights, the evidence does not suggest that the combined climate change effects of the development would be contrary to planning policy on such matters, including the Framework, or that it would significantly affect the Government's statutory responsibilities in this regard. Furthermore, no breach of the development plan associated with carbon/climate change is cited in the relevant reason for refusal and none has been established as part of the appeal process.

102. Accordingly, for all of the foregoing reasons, having due regard to current national aviation policy and wider planning policy, including the development plan and the Framework, the proposed development would not have a significant or unacceptable effect on carbon/climate change.

Other Matters

103. Other topic areas considered during the Inquiry that are not expressly assessed above included Local Context, Health & Well Being, Ecology, Socio-Economic Impacts, and Surface Access (Road & Rail). Before assessing the planning balance, these are considered in turn, followed by any remaining matters raised by interested parties during both the planning application stage and the appeal process.

Local Context

104. The airport is located in a pleasant rural context. Hamlets, villages and small towns, many of which have conservation areas and listed buildings, are dispersed amongst countryside. Nonetheless, the operational development proposed in this case would all be well contained within the airport boundaries.

105. The only material effect apparent in the wider area would be from increased passenger flights over time. Other types of flight are not expected to increase to their current caps as a result, given that the overall limit on annual air transport movements would not change. The main consequences of this for local people are discussed above. Given the Panel's conclusions on these matters, it is not expected that the proposed development would alter the airport's rural context or affect nearby heritage assets in any way bearing in mind the current permitted use of the airport and its likely future use were the appeal to be dismissed.

Health & Well Being

106. The Health Impact Assessment (HIA) considers health impacts arising from noise and air quality both from airport operations and from surface access, and socio-economic factors. The ES and ESA conclude that health effects in terms of air quality would be negligible and that there would be a minor beneficial effect from a reduction in the number of people exposed to night-time air noise. The ES and ESA further conclude that the development would have a major beneficial effect on public health and wellbeing through generation of employment and training opportunities and provision for leisure travel.

107. Research underpinning the WHO ENG guidelines was considered as part of the HIA, and the ES and ESA have taken a more precautionary approach than those guidelines. Whilst criticisms are made by other parties, no alternative detailed assessment has been put forward that would cast doubt on the findings of the ES and ESA or indicate that the likely effects would differ from those assessed. The conclusions of the ES and ESA are considered reliable.

Ecology

108. Given the conclusions of the Air Quality sub-section, in light of the wider evidence, including the findings of the ES and ESA, and subject to the identified suite of mitigation to be secured via the UU and conditions, there is no good reason to believe that the appeal development would have any effects on biodiversity and ecology that would warrant the refusal of planning permission.

Socio-Economic Impacts

109. The ES and ESA demonstrate that the proposal would be of social and economic benefit by enabling increased business and leisure travel. Leisure travellers would benefit from increased accessibility to foreign destinations. Businesses would benefit through increased inward investment. The economy would benefit through increased levels of employment and expenditure. Associated with employment growth, training facilities would be supported. Representatives of business, including local and regional business organisations, transport operators, and the Stansted Airport College expressed their support for the proposal at the Inquiry. The social and economic benefits of the proposal are not disputed by the Council.

110. SSE and interested parties have questioned several of the assumptions made in the ES and ESA, including those regarding the level of job creation, the suitability of those jobs for local people and the effect of the proposal on the trade balance. The appellant has demonstrated, however, that the assumptions made in the ES and ESA are appropriate and robust. The evidence base that has been used and the modelling undertaken are also

questioned but these are sufficient to demonstrate the benefits. Furthermore, even if some of the assumptions made by SSE and interested parties proved to be correct, such as a lower level of job creation than expected, a considerable number of beneficial jobs would still be created.

111. It is likely that increased economic prosperity in the south-east and east of England would not be at the expense of growth elsewhere in the country but would rather assist the growth of the UK economy as a whole. There is no reason to believe that the development would divert investment from other parts of the country that need investment or prejudice the Government's 'levelling-up' agenda, particularly as the development seeks to meet an established need for airport expansion in the south-east of England.

Surface Access

112. As outlined above, both Highways England and Essex County Council withdrew from the appeal proceedings following the identification of a mechanism to secure the delivery of a suite of highways related mitigation. No objections have been made to the appeal scheme by Network Rail or by the rail operators that serve Stansted. Indeed, there is broad support from those quarters. There are, nonetheless, remaining concerns expressed by other parties, including SSE, regarding surface access.

113. Notwithstanding that criticism is made of the methodology, assumptions and evidence that has led the statutory highway authorities and rail operators to their respective current positions, they appear to be well founded, based on a good understanding of the operation of the airport and the surrounding surface access infrastructure, both rail and highway, including capacity and modal share. This includes in respect to dealing with two-way car trips and the likely effects of the development on the highway network through Stansted Mountfitchet and Takeley, which were the subject of considerable discussion at the Inquiry. No alternative traffic counts, surveys, modelling or comprehensive assessment of the potential effects of the development in respect to surface access have been put to the Panel.

114. The Framework states that development should only be prevented or refused on highway grounds if there would be an unacceptable impact on highway safety, or the residual cumulative impacts on the road network would be severe. The evidence put to the Inquiry falls far short of demonstrating that this would be the case.

115. Subject to securing and delivering the range of proposed mitigation, which includes improvements to Junction 8 of the M11 and the Prior Wood Junction, as well as to the local road network and to public transport, the development would have no significant effects in terms of surface access. Moreover, Stansted Airport is and would continue to be well served by the strategic highway network and wide ranging public transport services, including its integrated rail, bus and coach stations.

Other Considerations

116. There was much discussion during the Inquiry and in written evidence about previous expansion at the airport and the conclusions of decision makers at that time. The last planning permission to increase the capacity of the airport was granted in 2008. Putting aside that previous applications did not involve

the form of development sought here, planning policy and other considerations have changed significantly since that time and it is not possible to draw any meaningful parallels with the consideration of this appeal.

117. Public engagement occurred in advance of the planning application, as set out in the Statement of Community Involvement (February 2018), the results of which informed the development now under consideration. Further extensive consultation took place at both the planning application and appeal stages and a significant number of responses have been received, both supporting and opposing the scheme, covering a range of topics. The Panel is satisfied that all statutory requirements have been met in these regards and that interested parties have had good opportunity to comment and engage with the planning application and appeal processes.

118. The planning application and appeal have progressed in accordance with normal process and procedure and there is no evidence before the Inquiry that suggests otherwise. It was necessary to hold the Inquiry using a virtual format in accordance with the Planning Inspectorate's Interim Operating Model and in light of restrictions in place as a result of the pandemic. This allowed the appeal to progress in an efficient and expedient way, whilst upholding the opportunity for interested parties to engage with the process. Indeed, many local people and organisations spoke at the Inquiry over several days. It would not have been appropriate to unnecessarily delay the appeal pending potential changes in Government or local policy. Appeals must be determined in accordance with the circumstances at the time of the decision.

119. The respective Secretaries of State were asked several times to recover the appeal for their own determination but declined to do so, determining that the issues involved are of no more than local significance. There is no requirement for appeals to be recovered and the Panel has properly considered the proposals on behalf of the Secretary of State, having had regard to all the evidence, including the case made by the Council and comments from local people. There is a statutory right to appeal planning decisions which is vital to the operation of the planning system and the public costs involved are not a material consideration.

120. In addition to the foregoing matters, concern has been expressed by a range of interested parties, including by Parish Councils. These cover a range of topics, including: local infrastructure, services and facilities, and their potential cost to the public sector; vibration; malodour; rat-running; public safety and risk; water resources, sewerage and flooding; wider pollution issues, including littering and from light; effects on agriculture; parking, including 'fly parking' and the cost of drop-off at the airport; demand for more housing, including affordable housing; the combined effects of planned airport development elsewhere; the 'monopoly' held by the appellant at the airport; the local economy being said to be over-reliant on the airport; current and potential future flight paths; the effects of stacking aircraft; the physical works proposed are said not to be needed to support the proposed changes to flight and passenger numbers; the existing quality of the airport, including security, management and size; a new airport should be developed in the Thames Estuary instead of the appeal scheme; damage to the highway network, including erosion, and to property; stress for residents and businesses associated with uncertainty over development and activity at the airport; and alleged aviation fuel dumping.

121. These matters are largely identified and considered within the Council officer's reports on the appeal development. They were also before the Council when it prepared its evidence and when it submitted its case at the Inquiry and are largely addressed in its evidence and in the various statements of common ground. The Council did not conclude that they would amount to reasons to justify withholding planning permission. The Panel has been provided with no substantiated evidence which would prompt us to disagree with the Council's conclusions in these respects subject to the UU and the imposition of planning conditions.

122. Some of the submissions from interested parties refer to potential interference with human rights. Given the foregoing conclusions, particularly in terms of the appeal process and the main issues, any interference with human rights that might result from the appeal being allowed would not be sufficient to give rise to a violation of rights under Article 1 of the First Protocol to the Convention, as incorporated by the Human Rights Act 1998.

123. Interested parties have also referred to a number of matters which are either not planning matters or not relevant to the appeal. These include property values, compensation claims, and the conduct and motives of the appellant and of Council members and officers. Any potential future development or further increase in capacity at the airport would require a further planning application which would be subject to the Council's consideration. The lawfulness or otherwise of past development at the airport is a matter for the Council, as local planning authority.

Planning Obligations

124. Planning obligations made under S106 of the Town and Country Planning Act 1990 as a Unilateral Undertaking, dated 26 March 2021 (the UU), were completed after the Inquiry closed in line with an agreed timetable. In the event that planning permission were to be granted and implemented it would be subject to the obligations of the UU, which would include the securing of:

- Noise Mitigation - a new enhanced sound insulation grant scheme for a defined area in the vicinity of the airport to replace existing measures. This would include a greater number of properties than the existing scheme through use of a lower noise contour;
- Transport
  - Mechanisms and funding to secure improvements to Junction 8 of the M11 and to the Priory Wood Junction, local road network improvements and monitoring, and local bus service improvements;
  - The airport operator shall join the Smarter Travel for Essex Network;
  - Expanded Sustainable Transport Levy (to replace the existing Public Transport Levy) to be used to promote the use of sustainable transport by passengers and airport staff;
  - Enhanced rail users discount scheme, with higher rate of discount and revised eligibility;
  - Revised targets for mode share (applying 'reasonable endeavours' to achieve those targets) – non-transfer passenger mode share of 50% by public transport, of 20% (by 39mppa) and 12% (by 43mppa) by 'kiss and fly', and 55% (by 39mppa) of staff access by single occupancy private car; updated working arrangements for the airport's Transport Forum,

Airport Surface Access Strategy and Travel Plan; and a study of and pursuant improvements to the on-site bus and coach station;

- Skills, education and employment – continuance of the Stansted Airport Employment Forum and Combined Local Benefits, including the on-site education centre for local children and schools, the on-site airport Employment Academy, Stansted Airport College, and local supply chain support;
- Community - a new, replacement Community Trust Fund to help mitigate any adverse health and / or quality of life effects arising from the development as a result of increased noise levels and a reduction in the amenity of local green spaces;
- Air Quality and Ecology – protection and enhancement of environmentally sensitive sites, including air quality and ecological monitoring at the airport, Eastend Wood and Hatfield Forest, and pursuant compensation;
- Water quality – retention of the requirement to monitor local watercourses; and
- Monitoring – payments to support the Council's costs associated with monitoring the UU's planning obligations.

125. The Council has submitted detailed statements (the CIL Statements), which address the application of statutory requirements to the planning obligations within the UU and also set out the relevant planning policy support / justification. Having considered the UU in light of Regulation 122 of the CIL Regulations and Government policy and guidance on the use of planning obligations, we are satisfied that most of the obligations therein would be required by and accord with the policies set out in the CIL Statements.

126. The exception to this is the inclusion of Thaxted Primary School within the SIGS in Schedule 2 Part 1 of the UU, for the reasons outlined in the *Noise* section above. For those reasons, its inclusion is not necessary and as such does not accord with the CIL Regulations. Subject to this exception, the SIGS is necessary to ensure the development accords with national and local policy requirements to minimise and mitigate adverse noise impact and to avoid significant adverse impact.

127. Subject to the above noted exception, the Panel is satisfied that the remainder of the obligations are directly related to the proposed development, fairly and reasonably related to it and necessary to make it acceptable in planning terms. Furthermore, the UU and its terminology are sufficiently precise and enforceable.

Conditions

128. Conditions were suggested by all three main parties to the appeal in the event that planning permission were to be granted, and these have been taken into account in formulating the conditions imposed.

129. A five year period for the commencement of development has been imposed rather than the standard three year period promoted by the Council, to allow greater flexibility in light of the anticipated impact of the pandemic on the airport and wider aviation industry. Although not suggested by any party, it is

also considered necessary in the interests of certainty to specify the plans approved and with which the development must accord.

130. A scheme of water resource efficiency measures is secured to minimise water consumption in accordance with Policy GEN2 of the ULP. It is also considered necessary to secure a surface water drainage scheme in order to avoid flooding as a result of the development.

131. A Construction Environmental Management Plan is needed to minimise the impact of the works on neighbouring occupants and to ensure that acceptable living conditions are maintained in accordance with Policy GEN4 of the ULP.

132. A Biodiversity Management Strategy is necessary in light of findings contained within the submitted ecological surveys. There is a need to conserve and enhance protected and priority species in accordance with statutory obligations and Policy GEN7 of the ULP.

133. For the same reason, the mitigation and enhancement measures and/or works identified in the Preliminary Ecological Appraisal (Feb 2018), Preliminary Ecological Appraisal Update (October 2020) and Ecology Mitigation Strategy (February 2018), are necessary. The Preliminary Ecological Appraisal Update is referenced as the most up to date appraisal, which includes measures beyond those contained in the Ecological Mitigation Strategy, in particular, provisions for the protection of ground nesting birds. A licence will also be required from Natural England, who do not object to the appeal proposal, for the translocation of protected species.

134. Condition 7 restricts noise emanating from aircraft in line with that permissible under the extant planning permission up to 35 million passengers per annum. After that, a progressive improvement in noise conditions is secured over time in line with the ES/ESA predictions to protect the living conditions of neighbouring occupants in accordance with Policy ENV11 of the ULP, and consistent with the APF's objective to share the benefit of improvements to technology with local communities.

135. There are currently no noise restrictions imposed by planning condition for night flights and Stansted, as a designated airport, is controlled by separate night flight operating restrictions imposed by the DfT. These operate on a Quota Count system over a 6.5 hour night-time period, meaning that there is a 1.5 hour period that remains uncontrolled, beyond the 16 hour daytime period imposed by condition 7. In order to ensure certainty that the noise impacts of the development will be as anticipated in the ES/ESA, and to avoid harm to the living conditions of local residents, it is considered necessary to impose a night-time restriction by condition in this case, alongside the daytime restrictions and notwithstanding some existing DfT control.

136. In order to clarify the terms of the planning permission and to ensure that the development and associated effects do not exceed those assessed, conditions are attached which restrict the total number of aircraft movements, the number of cargo air transport movements and passenger throughput during any 12 month period.

137. There is dispute between the parties regarding whether and to what extent it is necessary to control the effects of noise, air quality and carbon arising from the development.

138. Condition 7, discussed above, satisfactorily secures a betterment in noise conditions over time so as to make the development acceptable, such that there is no need or justification for imposing further measures in respect to noise.

139. The effect of the development on local air quality is expected to be very small and would not put nationally prescribed air quality standards or limits at risk in the area. Nevertheless, the appellant proposes a condition to secure an Airport Air Quality Strategy that would be updated over time in a continued effort to minimise emissions and contribute to compliance with relevant limit values or national objectives for pollutants. The provision of electric vehicle charging points can also be secured by separate condition as a measure necessary to minimise air pollution associated with the development. This is considered sufficient to make the development acceptable in planning terms, in accordance with Policy ENV13 of the ULP and the objectives of the Framework.

140. International aviation emissions are not currently directly included in UK carbon budgets and Government policy is clear that there is sufficient headroom for MBU development at all airports, including Stansted. Carbon emissions associated with the development from sources other than international aviation are expected to be relatively small and would not themselves materially impact upon carbon budgets, including the planned sixth Carbon Budget which will directly include international aviation emissions, or otherwise conflict with the objectives of the Framework. As such, a condition limiting carbon is not necessary.

141. The appeal proposal accords with current policy and guidance and there is no evidence that it would compromise the ability of future generations to meet their own needs. The conditions discussed above are sufficient to make the development acceptable in planning terms.

142. The Council proposes alternative conditions to deal with noise, air quality and carbon. Its primary case involves a condition, referred to during the Inquiry as 'condition 15', which would impose restrictions based upon the impacts assessed in the ES/ESA, along with future more stringent restrictions (using some interpolated data from the ES/ESA) and a process that would require the Council's reassessment and approval periodically as the airport grows under the planning permission, allowing for a reconsideration against new, as yet unknown, policy and guidance. In light of the Panel's conclusions on these matters, there is no policy basis for seeking to reassess noise, air quality or carbon emissions in light of any potential change of policy that might occur in the future. Furthermore, it would be likely to seriously undermine the certainty that a planning permission should provide that the development could be fully implemented. This appeal must be determined now on the basis of current circumstances and the proposed 'condition 15' is not necessary or reasonable.

143. As an alternative to 'condition 15', two other conditions (dealing with air quality and carbon) are suggested by the Council. These would also impose future restrictions defined by the Council. Again, it follows from our conclusions on the main issues that these are not necessary to make the development acceptable in planning terms, so these have not been imposed.

144. It is also unnecessary to require an assessment of impacts of the full proposed airport expansion on 24-hour mean NOx concentrations at Elsenham

Woods SSSI and Hatfield Forest SSSI given that this has not been requested by Natural England and the ES/ESA indicates that the development would not be significant in ecology terms.

145. SSE suggested a separate set of conditions, though many were broadly in line with those agreed between the Council and the appellant as considered above. No additional trigger for the commencement of development is needed as this permission must necessarily have been implemented for passenger numbers to exceed 35 million in any 12-month period. Noise restrictions beyond that imposed by condition 7 are suggested by SSE but these seek arbitrary limits with no certainty that they would be achievable. They are not necessary or reasonable in light of the Panel's findings as outlined above. Similarly, no evidence was put to the Inquiry which would justify imposing specific restrictions on helicopter movements. Publication of passenger throughput figures on the airport's website is not necessary to make the development acceptable, as conceded by SSE during the Inquiry.

146. SSE also sought a requirement for the provision of a taxi holding area close to the terminal to minimise unnecessary empty running, whereby taxis drop off at the airport but do not pick-up a return fare. A taxi company is already based at the airport and the appellant explained that it has recently provided a holding area within the mid-stay car park that might assist with such concerns. Regardless, extensive sustainable transport measures are secured by planning obligations so that a specific requirement of this type is unnecessary.

147. Additional air quality and carbon requirements to those sought by the Council were suggested by SSE but given the Panel's conclusions on these matters, these are not reasonable or necessary. Finally, SSE sought restrictions on future applications for development at the airport in terms of passenger numbers or a second runway, though recognised the difficulties of complying with the tests for conditions. Such restrictions are not relevant to the development being sought and would not be necessary or reasonable.

148. The wording of conditions has been amended as necessary to improve their precision and otherwise ensure compliance with the tests for conditions contained in the Framework. So far as the conditions require the submission of information prior to the commencement of development, the appellant has provided written confirmation that they are content with the wording and reasons for being pre-commencement requirements.

Planning Balance

149. The development plan, so far as it is relevant to this appeal, is the ULP. Although dated, it contains a number of policies[18] relevant to this proposal which are not materially inconsistent with the objectives of the Framework and continue to provide a reasonable basis upon which to determine the appeal, alongside other material considerations.

150. Policy S4 of the ULP provides for development directly related to or associated with Stansted Airport to be located within the boundaries of the airport.

151. Policy ENV11 of the ULP seeks to avoid harm to noise sensitive uses. The evidence indicates that the overall effect of the proposal on aircraft noise would

[18] Relevant ULP policies were reviewed by the Council and the appellant for the purposes of the appeal

be beneficial. Even at their peak, noise levels would not exceed that permissible under the existing planning permission. After that, it is expected that noise would reduce as a result of factors such as fleet mix and advances in technology. This improvement in noise conditions over time can be secured by condition in line with Government policy to share the benefits of airport expansion with local communities. As such, there would be no conflict with Policy ENV11 or the similar objectives of the Framework to protect living conditions.

152. Not all development can have the effect of improving air quality and by its very nature, there would inevitably be some additional air pollution from the proposed development which must weigh against the proposal. However, the ES/ESA assesses the impacts as being negligible at all human receptors and no exceedances of the air quality standards are predicted for any of the pollutants at human receptors in the study area. NOx concentrations at all ecological receptors are predicted to be below the critical level/air quality standard of 30µg/m^3 for all scenarios tested. The predicted changes in nitrogen deposition at the Hatfield Forest SSSI and NNR and Elsenham Woods SSSI remain less than 1% of the sites' lower critical loads. Ongoing monitoring of air quality within the SSSIs is provided for within the submitted Unilateral Undertaking. Overall, there would be no material change in air quality as a result of the development. As such, there would be no conflict with Policy ENV13 of the ULP, which seeks to avoid people being exposed on an extended long-term basis to poor air quality; or the similar objectives of the Framework.

153. Carbon emissions are predominantly a matter for national Government and the effects of airport expansion have been considered, tested and found to be acceptable in MBU. It is clear that UK climate change obligations would not be put at risk by the development, including in light of the Government's 20 April 2021 announcement. Carbon emissions from other sources associated with the development, such as the operation of airport infrastructure, on site ground based vehicles and from people travelling to and from the site are relatively small and would be subject to extensive sustainable transport measures secured by conditions and obligations that would minimise impacts as far as possible. Therefore, this matter weighs against the proposal only to a limited extent and could not be said to compromise the ability of future generations to meet their needs, or otherwise conflict with the objectives of the Framework taken as a whole.

154. The Highway Authorities are satisfied that the development would not unacceptably affect highway safety or capacity and the Panel agrees. All infrastructure and mitigation measures required to make the development acceptable in planning terms can be secured by conditions or planning obligations. On this basis, there would be no conflict with ULP Policies GEN1, GEN6, GEN7, ENV7, ENV11 or ENV13 so far as they require infrastructure delivery or mitigation.

155. The Council and the appellant agree that the proposed development accords with the development plan, taken as a whole. It is further agreed that the Framework's presumption in favour of sustainable development should apply as a result of the proposals' accordance with an up-to-date development plan[19].

[19] Framework paragraph 11(c)

In these circumstances the Framework states that development should be approved without delay.

156. In addition, the scheme receives very strong support from national aviation policy. Taken together, these factors weigh very strongly in favour of the grant of planning permission. Furthermore, the development would deliver significant additional employment and economic benefits, as well as some improvement in overall noise and health conditions.

157. The Council has recently withdrawn its emerging Local Plan such that it has no prospect of becoming part of the development plan and attracts no weight in the determination of this appeal. There are a number of made Neighbourhood Plans in the local area, but none contain policies that have a bearing on the outcome of the appeal.

158. Overall, the balance falls overwhelmingly in favour of the grant of planning permission. Whilst there would be a limited degree of harm arising in respect of air quality and carbon emissions, these matters are far outweighed by the benefits of the proposal and do not come close to indicating a decision other than in accordance with the development plan. No other material considerations have been identified that would materially alter this balance.

Conclusion

159. In light of the above, the appeal is allowed.

Michael Boniface	*G D Jones*	*Nick Palmer*
INSPECTOR	INSPECTOR	INSPECTOR

APPEARANCES

FOR THE LOCAL PLANNING AUTHORITY:

Philip Coppel, of Queens Counsel and Asitha Ranatunga, of Counsel	Instructed by Elizabeth Smith, Interim Legal services Manager, Uttlesford District Council
They called	
James Trow BSc(Hons) MIOA MIEnvSc	Managing Director, Noise Consultants Ltd
Dr Mark Broomfield BA DPhil	Associate Director, Ricardo Energy and Environment Ltd
Dr Mark Hinnells BA(Hons) MA MSc PhD	Senior Consultant, Ricardo Energy and Environment Ltd
Hugh Scanlon BA(Hons) MPhil MRTPI	Senior Director, Lichfields

FOR THE APPELLANT:

Thomas Hill, of Queens Counsel and Philippa Jackson, of Counsel	Instructed by Alistair Andrew, Head of Planning Services, Manchester Airport Group (MAG)
They called	
Tim Hawkins BSc MSc	Chief of Staff, MAG
Dan Galpin BSc(Hons)	Director, ICF
David Thomson BSc MSc	Senior Director, RPS
Vernon Cole BSc(Hons) MSME MBA CEng MIOA FIMechE IIAV	Acoustic Consultant, Cole Jarman Ltd
Dr Michael Bull BSc PhD CEng CSci CEnv IAQM MIEnvSc IChemE	Director, Ove Arup & Partners Ltd
Dr Andrew Buroni BSc(Hons) MSc PhD RSM RSPH	Director, RPS
Mike Barker BSc(Hons) MSc CIEEM	Director of Ecology, RPS
Neil Robinson BSc MSc MBA	CSR & Future Airspace Director, MAG
George Vergoulas BSc(Hons) MSc CEnv MIEnvSc MIEMA	Associate, Ove Arup & Partners Ltd
Philip Rust CEng MICE CIHT	Director, Steer Group
Edith McDowall BA(Hons) MPhil	Director, Optimal Economics
Louise Congdon BA(SocSci) MA	Managing Partner, York Aviation

Alistair Andrew BA(Hons) DipTP (UC) MRTPI	Head of Planning Services, MAG

FOR STOP STANSTED EXPANSION:

Paul Stinchcombe and Richard Wald, both of Queens Counsel	Instructed by Brian Ross, Deputy Chairman of Stop Stansted Expansion (SSE)
They called[20]	
Ken McDonald FCA	Founder, Secretary and Trustee of The Hundred Parishes Society and SSE Executive Committee Member
Brian Ross[21] BCom(Hons) MBA FRSA MSPE	Deputy Chairman of SSE
Peter Lockley MA	Barrister
Michael Young BA(Hons) FCA	SSE Executive Committee Member
Bruce Bamber BSc MA MSc MCIHT	Director of Railton TPC Ltd

INTERESTED PERSONS:

Derek Connell	The Three Horseshoes Public House, Duton Hill
Vere Isham	Broxted Parish Council
Dr Graham Mott	Elsenham Parish Council
Cllr Jenny Jewell	Great Canfield Parish Council
Neville Nicholson	Helions Bumpstead Parish Council
Dr Zoe Rutterford	Henham Parish Council & Chickney Parish Meeting
Cllr Neil Reeve	High Easter Parish Council
Julia Milovanovic	Moreton Bobbingworth & The Lavers Parish Council
Peter Jones	Stansted Mountfitchet Parish Council
Cllr Barrett	Stebbing Parish Council
Cllr Geoff Bagnell	Takeley Parish Council
Cllr Duncan McDonald	Much Hadham Parish Council
Richard Haynes JLL	Thaxted Parish Council
John Devoti	Howe Green and Great Hallingbury Residents Chairman of East Hertfordshire Green Party
Alex Daar	The Aviation Environment Federation
Tim Johnson	New Economics Foundation
Alex Chapman	Local Resident
Jonathan Fox	Local Resident
Michael Belcher	Local Resident

[20] Although other proofs of evidence were submitted in support of SSE's case, including those of Peter Sanders CBE MA DPhil, Prof Jangu Banatvala CBE MA MD(Cantab) FRCP FRCPath FMedSci DPH, Martin Peachey MA(Cantab), John Rhodes MA(Oxon), Dr Claire Holman and Colin Arnott BA MPhil MRTPI, only the five witnesses listed were called to give evidence at the Inquiry

[21] Mr Ross gave evidence in respect to the Inquiry topics of 'air traffic forecasting and predictions', 'socio-economic impacts' and 'planning matters'. For the latter of these topics he adopted the proof of evidence of Mr Arnott

Maggie Sutton	Local Resident
Simon Havers	Local Resident
Irene Jones	Local Resident
Mark Johnson	Uttlesford Green Party
Edward Gildea	Local Resident
Raymond Woodcock	Local Resident
Cliff Evans	Local Resident
George Marriage	Local Resident
Quintus Benziger	Local Resident
Jonathan Richards	Local Resident
Vincent Thompson	Local Resident
Peter Franklin	Local Resident
Roger Clark	Local Resident
Martin Berkeley	Local Resident
Suzanne Walker David Burch	Director of Policy, Essex Chamber of Commerce
Andy Walker	Director of Policy, Suffolk Chamber of Commerce CBI East
Freddie Hopkinson	Chair, Cambridge Ahead
Harriet Fear MBE	Executive Director, Visit East of England
Pete Waters	UK VP Strategy, AstraZeneca
Dr Andy Williams	UK Director, World Duty Free
Martyn Scarf	Managing Director, National Express
Chris Hardy	Director of Corporate Affairs, Greater Anglia
Jonathan Denby	Principal, Stansted Airport College
Karen Spencer MBE	The Easter and Rodings Action Group
Robert Beer	

SCHEDULE OF CONDITIONS FOR APPEAL REF APP/C1570/W/20/3256619:

1. The development hereby permitted shall be begun before the expiration of 5 years from the date of this decision.

2. Prior to reaching 35mppa, a scheme for the provision and implementation of water resource efficiency measures during the operational phases of the development shall be submitted to and approved in writing by the local planning authority. The scheme shall include the identification of locations for sufficient additional water meters to inform and identify specific measures in the strategy. The locations shall reflect the passenger, commercial and operational patterns of water use across the airport. The scheme shall also include a clear timetable for the implementation of the measures in relation to the operation of the development. The approved scheme shall be implemented, and the measures provided and made available for use in accordance with the approved timetable.

3. Prior to the commencement of construction works, a Construction Environmental Management Plan (CEMP) shall be submitted to and approved in writing by the local planning authority. The construction works shall subsequently be carried out strictly in accordance with the approved CEMP, unless otherwise approved in writing by the local planning authority.

   The CEMP shall incorporate the findings and recommendations of the Environmental Statement and shall incorporate the following plans and programmes:

   (a) External Communications Plan
      (i) External communications programme
      (ii) External complaints procedure

   (b) Pollution Incident Prevention and Control Plan
      (i) Identification of potential pollution source, pathway and receptors
      (ii) Control measures to prevent pollution release to water, ground and air (including details of the surface/ground water management plan)
      (iii) Control measures for encountering contaminated land
      (iv) Monitoring regime
      (v) Emergency environmental incident response plan
      (vi) Incident investigation and reporting
      (vii) Review/change management and stakeholder consultation

   (c) Site Waste Management Plan
      (i) Management of excavated materials and other waste arising
      (ii) Waste minimisation
      (iii) Material re-use

   (d) Nuisance Management Plan (Noise, Dust, Air Pollution, Lighting)
      (i) Roles and responsibilities
      (ii) Specific risk assessment – identification of sensitive receptors and predicted impacts
      (iii) Standards and codes of practice
      (iv) Specific control and mitigation measures
      (v) Monitoring regime for noise

(e) Management of Construction Vehicles
  (i) Parking of vehicles of site operatives
  (ii) Routes for construction traffic

The CEMP shall include as a minimum all measures identified as "Highly Recommended" or "Desirable" in IAQM "Guidance on the assessment of dust from demolition and construction," Version 1.1 2014 commensurate with the level of risk evaluated in accordance with the IAQM guidance, for construction activities which are within the relevant distance criteria from sensitive locations set out in Box 1 and Tables 2, 3 and 4 of the IAQM guidance.

The CEMP shall provide for all heavy goods vehicles used in the construction programme to be compliant with EURO VI emissions standards, and for all Non Road Mobile Machinery to be compliant with Stage V emissions controls as specified in EU Regulation 2016/1628, where such heavy goods vehicles and Non Road Mobile Machinery are reasonably available. Where such vehicles or machinery are not available, the highest available standard of alternative vehicles and machinery shall be used.

4. Prior to commencement of the development, a detailed surface water drainage scheme for the airfield works hereby approved based on the calculated required attenuation volume of 256m^3, shall be submitted to and approved in writing by the local planning authority. The approved scheme shall be fully implemented before any of the aircraft stands and taxiway links hereby approved are brought into use. The scheme shall be implemented in accordance with the approved details as part of the development, and shall include but not be limited to:
   - Detailed engineering drawings of the new or altered components of the drainage scheme;
   - A final drainage plan, which details exceedance and conveyance routes, and the location and sizing of any drainage features; and
   - A written report summarising the scheme as built and highlighting any minor changes to the approved strategy.

5. A Biodiversity Management Strategy (BMS) in respect of the translocation site at Monks Farm shall be submitted to, and approved in writing by, the local planning authority prior to the commencement of construction works. The BMS shall include:

   - Description and evaluation of features to be managed;
   - Ecological trends and constraints on site that might influence management;
   - Aims and objectives of management;
   - Appropriate management options for achieving aims and objectives;
   - Prescriptions for management actions;
   - Preparation of a work schedule (including an annual work plan capable of being rolled forward over a five year period);
   - Details of the body or organisation responsible for implementation of the Strategy; and
   - Ongoing monitoring and remedial measures.

   The Strategy shall also set out (where the results from monitoring show that conservation aims and objectives of the BMS are not being met) how

contingencies and/or remedial action shall be identified, approved by the local planning authority and implemented so that the development still delivers the fully functioning biodiversity objectives of the originally approved scheme. The BMS shall be implemented in accordance with the approved details.

6. All ecological mitigation and enhancement measures and/or works shall be carried out in accordance with the details contained in the Stansted – Ecology Mitigation Strategy (RPS, February 2018) forming part of Appendix 16.1 and 16.2 of the Environmental Statement and in the Conclusions and Recommendations of the Preliminary Ecological Appraisal Update (RPS, 5 October 2020), Appendix 16.A of the Environmental Statement Addendum.

7. The area enclosed by the 57dB(a) Leq, 16h (0700-2300) contour shall not exceed 33.9 sq km for daytime noise.

   By the end of the first calendar year that annual passenger throughput exceeds 35million, the area enclosed by the following contours shall not exceed the limits in Table 1:

Table 1

54 dB $L_{Aeq, 16hr}$	57.4 km^2
48 dB $L_{Aeq, 8hr}$	74.0 km^2

   By the end of 2032 or by the end of the first calendar year that annual passenger throughput reaches 43million (whichever is sooner), Stansted Airport Limited, or any successor or airport operator, shall reduce the areas enclosed by the noise contours as set out in Table 2. Thereafter the areas enclosed by the contours as set out in Table 2, shall not be exceeded.

Table 2

54 dB $L_{Aeq, 16hr}$	51.9 km^2
48 dB $L_{Aeq, 8hr}$	73.6 km^2

   For the purposes of this condition, the noise contour shall be calculated by the Civil Aviation Authority's Environmental Research and Consultancy Department (ERCD) Aircraft Noise Contour model (current version 2.4), (or as may be updated or amended) or, following approval by the local planning authority, any other noise calculation tool such as the Federal Aviation Administration Aviation Environmental Design Tool (current version 3.0c) providing that the calculations comply with European Civil Aviation Conference Doc 29 4th Edition (or as may be updated or amended) and that the modelling is undertaken in line with the requirements of CAA publication CAP2091 (CAA Policy on Minimum Standards for Noise Modelling). All noise contours shall be produced using the standardised average mode.

   To allow for the monitoring of aircraft noise, the airport operator shall make noise contour mapping available to the local planning authority annually as part of demonstrating compliance with this condition. Contours should be provided in 3dB increments from 51 dB $L_{Aeq,16hr}$ and 45 dB $L_{Aeq, 8hr}$.

8. The passenger throughput at Stansted Airport shall not exceed 43 million passengers in any 12 calendar month period. From the date of this permission, the airport operator shall report the monthly and moving annual total numbers of passengers in writing to the local planning authority no later than 28 days after the end of the calendar month to which the data relate.

9. There shall be a limit on the number of occasions on which aircraft may take-off or land at the site of 274,000 Aircraft Movements during any 12 calendar month period, of which no more than 16,000 shall be Cargo Air Transport Movements (CATMs). From the date of the granting of planning permission, the developer shall report the monthly and moving annual total numbers of Aircraft Movements, Passenger Air Transport Movements and CATMs in writing to the local planning authority no later than 28 days after the end of the calendar month to which the data relate.

   The limit shall not apply to aircraft taking off or landing in any of the following circumstances:

   a) The aircraft is required to land at the airport because of an emergency, a divert or any other circumstance beyond the control of the operator and commander of the aircraft; or

   b) The aircraft is engaged on the Head of State's flight, or on a flight operated primarily for the purposes of the transport of Government Ministers or visiting Heads of State or dignitaries from abroad.

10. Prior to the airport first handling 35mppa, an Airport Air Quality Strategy (AAQS) shall be submitted to and approved in writing by the local planning authority. The AAQS shall set out how the airport operator shall take proportionate action to contribute to compliance with relevant limit values or national objectives for pollutants through:

    a) Measures to minimise emissions to air from its own operational sources;

    b) Measures to influence actions to be undertaken to improve air quality from third party operational sources; and

    c) Measures that reduce emissions through the Airport Surface Access Strategy (ASAS), the Sustainable Transport Levy and the Local Bus Network Development Fund.

    Thereafter, the AAQS shall be reviewed at the same time as the ASAS reviews (at least every 5 years or when a new or revised air quality standard is placed into legislation) and submitted to and be approved in writing by the local planning authority. At all times the AAQS shall be implemented as approved, unless otherwise approved in writing by the local planning authority.

11. Within 6 months of the date of this planning permission a scheme for the installation of rapid electric vehicle charging points at the airport shall be submitted to and approved in writing by the local planning authority. The scheme shall indicate the number and locations of the charging points and timetable for their installation. The approved scheme shall be fully implemented in accordance with the approved timetable and retained thereafter.

12. The development hereby permitted shall be carried out in accordance with the following approved plans: Location Plan: NK017817 – SK309; Site Plan: 001-001 Rev 01; Mike Romeo RET: 001-002 Rev 01; Yankee Remote Stands: 001-003 Rev 01; Runway Tango: 001-004 Rev 01 and Echo Stands: 001-005 Rev 01.



PRIMED & POSITIONED

STRATEGIC MOVES BY AMAZON AIR | WINTER 2021

Chaddick Policy Brief | February 16, 2021
By Joseph P. Schwieterman, Jacob Walls, Borja González & Crystal Bell

Our analysis of Amazon Air's recent activities indicates that the carrier has:

- Successfully launched an intra-Europe network using planes registered to Amazon
- Expanded flights by 15% since August and positioned itself for another growth spurt this spring
- Set into motion plans to fly numerous airplanes it owns rather than leases, primarily 767s
- Invested heavily in Cincinnati & Wilmington, OH, giving it new options to handle third-party shipping
- Boosted its presence at major passenger-oriented airports in the country's largest cities

Amazon Air has taken decisive steps to implement an international strategy

and is positioned for sustained growth in the next six months. Retail giant Amazon's fully owned Air subsidiary now has a significant presence on two continents.[1]

This independently produced brief offers an overview of Amazon Air's evolving orientation between September 2020 and February 2021.[2] The analysis draws upon publicly available data from a variety of informational sources including:

- Data from flightaware.com and flightradar24 on 1,700 Amazon Air plane takeoffs and landings in early 2021 and an equal number from 2020
- Information on fleet registration from various published sources, including planespotters.net
- Assessment of the company's strategic direction from investment analysts

The results of our latest analysis build upon our September 2020 Amazon Air Brief. That brief described Amazon's "summer surge" that occurred May - September 2020, including new hub development and the company's broadening geographic reach. Our May 2020 Brief explains why we expect its fleet to grow, possibly reaching 200 planes by 2028.

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PHOTO CREDIT (ABOVE): BOEING 737-800 AT MADRID, BY ADRIAN NOWAKOWSKI .

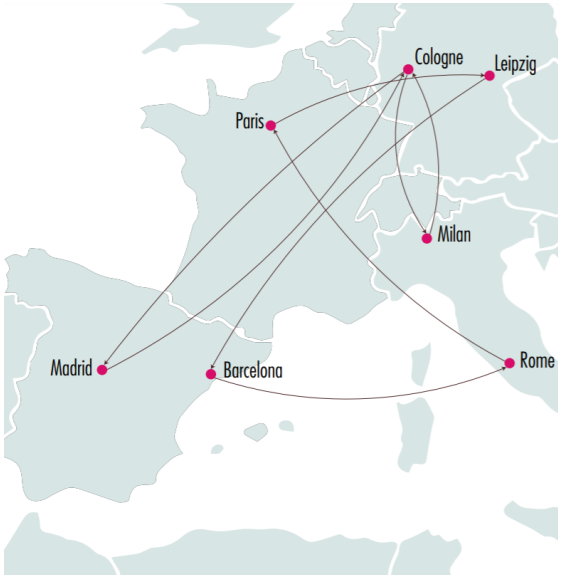
SEVEN FINDINGS FROM OUR ANALYSIS:

FINDING 1. Amazon Air's intra-Europe network, operated using planes registered to the company since late last year, is a conduit for growth throughout Europe. The network is served using a pair of Boeing 737s leased to ASL Ireland Airlines, and a third plane will likely enter service soon. The Irish carrier generally operates eight daily flights on medium-distance routes such as Leipzig – Barcelona and Cologne – Madrid.

Among Amazon Air's most significant developments of the past year is the emergence of intra-Europe operation serving four countries, using planes registered under the Amazon Air name. Almost immediately after leasing a pair of planes in October and November to ASL Ireland Airlines, the contractor deployed them on major routes within Western Europe. ASL is a familiar player in the cargo scene, providing services for both DHL and FedEx.

Previously, Amazon Air had been reportedly working with carriers using non-Amazon planes to meet its European needs. The Boeing 737-800s are intensively used, each generally completing four flight segments daily—a higher number than most of its U.S.-based airplanes. These planes fly from the wee hours to late evening between seven cities. One plane regularly makes a morning Cologne, DE – Milan, IT roundtrip followed by a Cologne – Madrid, ES roundtrip that same day. The other is often dispatched on Leipzig, DE – Barcelona, ES – Rome, IT – Paris, FR –Leipzig trips (Figure 1).

FIGURE 1: Amazon Air's Intra-Europe Network



Amazon Air's intra-Europe network, launched in November, primarily serves seven cities using Boeing 737 freighters.

Amazon Air's budding intra-Europe network, like its North American network, has a decentralized orientation and involves widely dispersed airports. No airport having regular flights is within 300 miles (483 kilometers) of another. Amazon Air has reportedly begun handling its own planes at Leipzig/Halle Airport and is reported to be planning to develop its own hub at that strategic spot.[3] However, Amazon generally has four daily flights serving Cologne, compared to just two daily at Leipzig and its five other European airports.

The new network is skeletal, confined entirely to Germany, Italy, France, and Spain. The network does not overlap with Amazon's semi-regular transatlantic service between the U.S. and Amsterdam and, significantly, does not yet encompass the Benelux countries, the United Kingdom, and the Republic of Ireland. Although the Leipzig flights give Amazon access to the Visegrad Group states, such as the Czech

Republic and Poland, Amazon will need to expand if the network is to come close to matching the broad geographic coverage of the U.S. network.

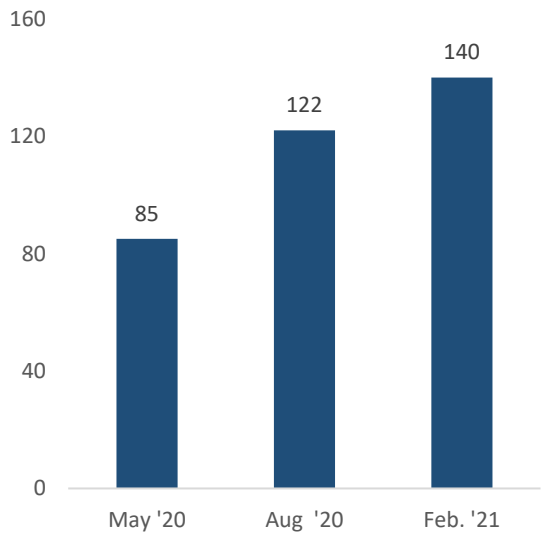
We expect that both Cologne, a hub for United Parcel Service (UPS) and Leipzig, a hub for DHL, will emerge as bona-fide hubs for Amazon Air, with the latter seeming poised for more rapid development, over the next year. A third plane leased to ASL will likely take to the skies soon, and we expect the network's growth to be an important development over the next year.

FINDING 2. Amazon Air's flight activity grew by 15% between August 2020 and February 2021, despite the slowdown in retail shipments that typically occurs after the start of the new year. The airline now regularly makes an average of 140 flights daily, and we expect that number to grow to more than 160 by June 2021.

Daily flight activity on planes registered to Amazon Air grew from an average of 122 to 140 between August 2020 and February 2021, which constitutes 15% growth over a roughly six-month period (Figure 2). These estimates are derived from comparisons of the average number of flights over six-day periods in August 2020 and our more recent sample taken in late January/early February 2021 (see Appendix for details on our sampling process).

The *North American* portion of Amazon Air grew 8% between August 2020 and February 2021. When Amazon's intra-Europe flights are excluded, the share of its flights touching down or taking off at one or more of its three largest hubs, Cincinnati-Northern Kentucky International (CVG), Ontario International (ONT), and Chicago Rockford International (RFD), inched upward from 19.3% to 19.4% (see Appendix).

FIGURE 2: Growth in Daily Flight Activity

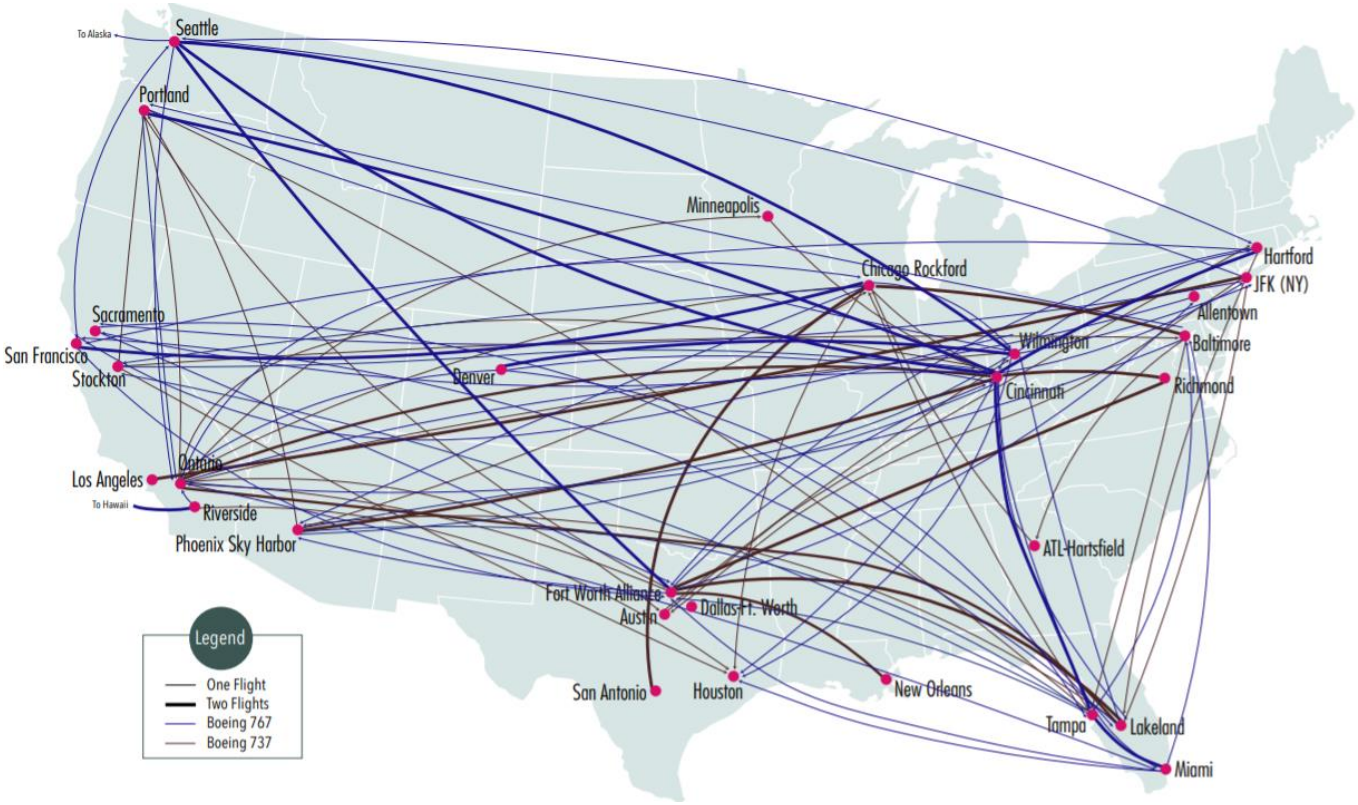


The number of flights on planes registered on Amazon grew from an average of 122 in late August 2020 to 140 in early February 2021, growth of 15%

Boeing 767s are the carrier's workhorses, accounting for about 80 daily flights, compared to about 60 flights using 737s. Almost three quarters (70%) of departures occur between 6 a.m. and 10 p.m., giving Amazon Air a less nocturnal orientation than FedEx Express or UPS. As new airplanes are added to the fleet (see discussion on next page), we anticipate the number of flights will grow to 160+ by June 2021. If it reaches this milestone, Amazon Air will have approximately doubled in size in the 13 months between May 2020 and June 2021.

Impressive as this is, Amazon Air's domestic operations will remain small compared to FedEx Express and UPS. Amazon's domestic network would still be only about 15% as large as UPS's. On international routes, the difference in size is much greater. Nevertheless, the airline's rapid growth rate sets it apart from nearly all other established cargo airlines.

FIGURE 3: Amazon Air North American Flight Network



Amazon Air's network, shown above on Thursday, January 21, 2021, remains highly decentralized, with point-to-point service between numerous non-hub cities. Kentucky's Cincinnati/Northern Kentucky International (CVG), California's Ontario International (ONT), and Illinois' Chicago Rockford International (RFD) remain its most heavily served points.

FINDING 3. Amazon Air is poised for another expansionary wave this spring. The airline has at least 10 planes registered to it that are not presently flying (some undergoing conversion to freighters) and another four slated to join its fleet soon. This growth will be undergirded by eleven Boeing 767 passenger models acquired from Delta Air Lines and WestJet.

Amazon has continuously expanded its fleet, registering planes every month since our September 2020 report. Among the highlights of its fleet development are the four WestJet and seven Delta Air Lines Boeing 767 passenger models Amazon recently announced it was in the process of acquiring. These planes, which will be owned outright by the carrier rather than leased, will reportedly be operated by its established contractors. Each requires modifications (or has already undergone modifications) for conversion to freighter service. Much of that work, a process typically taking about four months, is apparently being done in Mexico City, MX and Tel Aviv, IL (Israel). Some of these 11 planes, it has been reported, may not join its fleet until 2022.[4]

As we emphasized in past reports, a precise measure of the size of Amazon Air's fleet is hindered by the lack of publicly disclosed details about all its contractual arrangements. Investment analysts have noted that a significant amount of cargo may move on planes not registered to Amazon Air, particularly on

routes operating to points outside the U.S. According to a recent media report, Amazon Air reportedly described its fleet (presumably both planes registered to it and those registered to others) as being 81 planes in mid-January, whereas the public sources we evaluated showed the number of planes registered to it as somewhat less.[5]

These measurement issues aside, we feel strongly that monitoring *publicly available* data about planes registered by Amazon is an effective way to measure the carrier's changing scale and geographic orientation. **Based on public sources, between early September 2020 and February 2021, Amazon Air**:

- Expanded the **in-service** fleet of planes registered to it from **52 to 59**, a **13.5% increase**
- Expanded the **total fleet** of planes registered to it, including parked planes and those undergoing transformation to freighters, from **56 to 68**, for a **21.4% increase.** Nine off these planes are not presently in revenue service
- Has four planes that **are slated to be added to its fleet soon**. This does not include several of the Delta planes in the recently announced purchase

We anticipate that seven or eight planes registered to Amazon will likely begin service by June 2021, pushing the fleet of *active* planes under its registry to 66 or 67, which, together with more intensive utilization of existing planes, sets the stage for another growth spurt, like that occurring last summer.

FINDING 4. Expanding hubs at Cincinnati-Northern Kentucky International (CVG) and Ohio's Wilmington Air Park (ILN) position Amazon to move assertively into third-party delivery at the time of its choosing. The growing density of flight operations and warehouses around these airports, and the investments being made by other retailers and logistic providers in this area, give Amazon newfound capacity to provide expedited business-to-consumer deliveries for purchases not made on the Amazon platform. Flights from CVG and ILN already connect Amazon to most of the US population, and much more expansion appears imminent.

Between August 2020 and February 2021, activity at CVG has grown from 25.7 to 27.8 flights per day and Wilmington Air Park (just 69 miles northeast of CVG) grew from 13.7 to 14.8 daily flights (Figure 4). Cumulatively, these airports account for about 30% of the airline's flights. CVG and Wilmington are almost ideally situated for domestic package movements due to the centrality of their location, each within a 10-hour truck trip of much of the country's population. We expect both airports to remain focal points, as both have Amazon fulfillment centers near them and enjoy synergy with the DHL international hub at CVG, UPS Worldport in Louisville, KY, and Ohio's Columbus Rickenbacker International Airport (a major hub for international apparel shipments).

In November 2020, Morgan Stanley publicized its expectation that Amazon will launch a third-party delivery service in the United States, possibly as soon as this year.[6] **This service would include delivery of packages involving purchases not made on the Amazon platform, a move that could change the landscape of a sector long dominated by FedEx, UPS, and the U.S. Postal Service**. As the investment firm noted in May 2020, Amazon rolled out a "logistics as a service" offering in the United Kingdom, and a similar offering could be launched in the U.S. once the pandemic eases.[7] We concur, while acknowledging that Amazon has revealed little about its plans. In our view, however, Amazon's entry into this business will

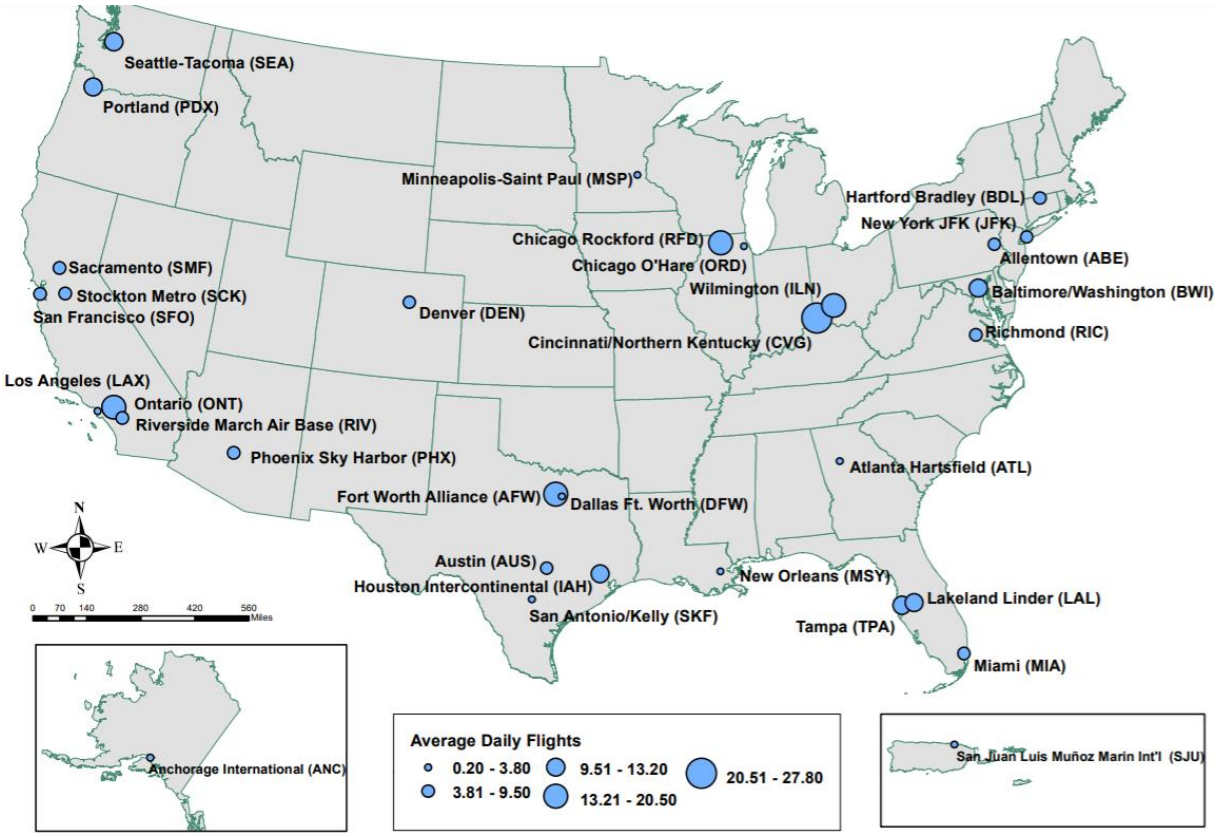


Amazon's massive terminal facility at CVG, shown here on February 14, 2021, is designed to allow sorting on seven levels and projected to open this year.

likely occur in the next 18 months, and when it occurs, Amazon Air—and the CVG/Wilmington hubs in particular—will be critical (Figure 4).

Amazon would likely focus on retailer-to-consumer shipments (e.g., moving packages from retailer warehouses to consumers) without trying to replicate the comprehensive services offered by FedEx and UPS, which have vast

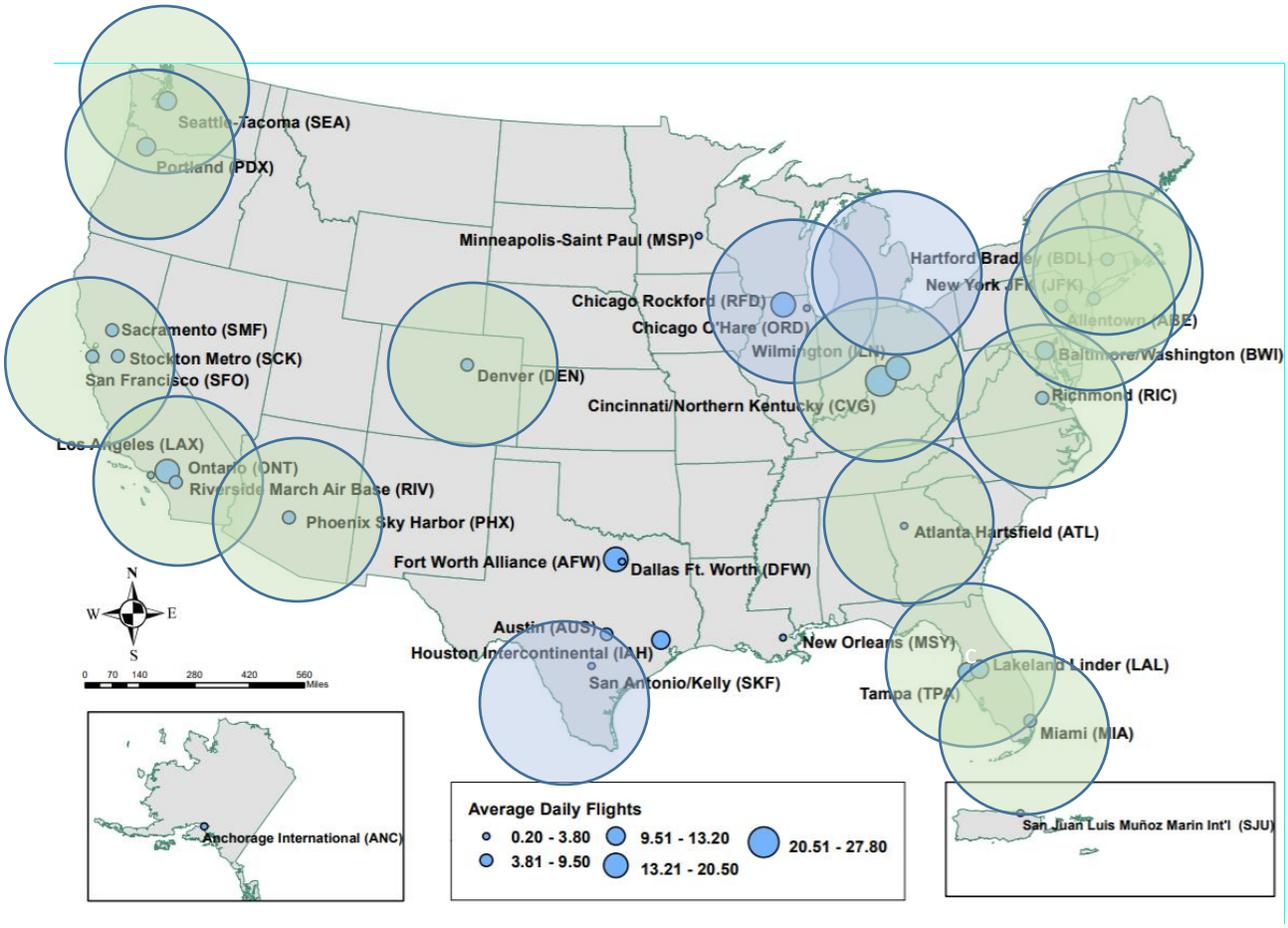
FIGURE 4: Distribution and Size of Amazon Air Airports in United States, excluding Hawaii



This map shows the average number of Amazon arrivals and departures at its North American airports, except Hawaii, in a six-day sample ending in early February 2021. The combined scale of its Ohio Valley hubs at CVG and Wilmington are evident, as is the airline's tendency to serve multiple airports in the same metropolitan region.

FIGURE 5: Points within 250 miles of an airport with nonstop Amazon Air service from CVG and Wilmington, OH

Amazon Air destinations in green; additional DHL destinations in blue



Area within 250 miles of an airport with nonstop Amazon Air flights from CVG

Area within 250 miles of an airport with nonstop DHL flights from CVG

Amazon Air's flight network at CVG and nearby Wilmington, Ohio already allows for the rapid shipment of inventory and packages to points within a four- or five-hour truck drive of the vast majority of the U.S. population, with additional routes operated by DHL. Some of the notable gaps will likely be filled during Amazon's anticipated CVG expansion later this year. UPS's Worldport in Louisville, KY is just 90 minutes away by truck.

door-to-door networks. CVG can be expected to dwarf Wilmington in size after the former's new ground facilities are fully operational, which is expected either in the summer or fall of 2021. CVG's facilities will reportedly have the capacity to support up to 200 flights per day (see our May 2020 Brief). A new interchange is being built on Interstate 275 west of CVG, and a pair of interchanges on Interstate 75 is being expanded.[8] We expect Amazon to gradually knit together its vast facilities throughout this part of the Ohio Valley while continuing to rely on both airports.

As shown on Figure 5, Amazon Air's flights from CVG or Wilmington already reach airports within 250 miles (about a five-hour truck drive) of the vast majority of the country's population. The network reaches virtually the entirety of the East and West Coasts and much of the Sunbelt, Colorado, and the Southwest, with some of the notable gaps filled by DHL's nonstop flights from CVG. This diverse array of flights makes next-day delivery of packages originating in the Ohio Valley a workable option, assuming appropriate ground-travel infrastructure is in place. With additional expansion at CVG, and possibly Wilmington as well, Amazon is in position to have a next-day shipping network centering on the Ohio Valley that reaches 95% of the population of the contiguous United States. Such a network would be valuable to both Amazon and third-party retailers selling on different platforms.

Dividing operations between two airports poses several disadvantages, including lessened plane-to-plane schedule connectivity and reduced package-sorting efficiency on airport grounds. However, trucks handle the preponderance of Amazon's package shipments and most sorting and dispatching will likely occur away from these airports. The two-airport system allows Amazon to avoid concentrating so much activity at higher-cost locations around CVG and leverages Wilmington's role as the home to Air Transport Services Group (ATSG), one of its major airline contractors. Amazon has a robust relationship with ATSG and has a five-year lease at Wilmington, which apparently extends through at least 2023. Moreover:

- Extensive development is underway around both CVG and Wilmington, initiated by both Amazon and other retailers' interest in being near its expanding Ohio Valley operations
- A staggering 18 million square feet of newly completed industrial development (heavily oriented toward warehouse space) has come online both north and south of the Cincinnati area since 2017, much of it due to Cincinnati's expanding role as a logistics hub[9]
- A 755,000-square-foot project for Bed Bath & Beyond in Monroe, OH, is proceeding roughly midway between the two airports.[10] Wayfair already has a major presence at CVG
- Amazon tends to use several airports in the same region, as is evident in the Chicago, Southern California, Northern California, and West-Central Florida regions

By this September, much more will be known about Amazon's trajectory at CVG and Wilmington–and how its Ohio Valley operations are positioned for third-party delivery. More of the 100,000 electric vans the company has ordered from Rivian, an electric-vehicle company located near Detroit, MI, will be on the road as well, providing clues about its interest in third-party delivery.[11]

FINDING 5. Amazon Air is putting more emphasis on major commercial airports having extensive passenger traffic than in the past. The airline has markedly expanded at Portland International, Phoenix Sky Harbor International, San Francisco International, Seattle-Tacoma International, and Tampa International airports in recent months.

The airline's recent expansion has put greater emphasis on major commercial airports within large metropolitan areas that have continuously been busy passenger hubs. In our May 2020 Amazon Brief we anticipated that growth would remain concentrated at cargo-focused airports with little passenger traffic.

TABLE 1: Busiest Amazon Air Airports in North America (except Hawaii)

RANK	AIRPORT	FLIGHTS April 24, 2020	6-DAY AVG August, 2020	6-DAY AVG February, 2021
1	Cincinnati-Northern Kentucky Int'l (CVG)	24	25.7	27.8
2	Ontario Int'l (ONT)	13	21.5	20.5
3	Fort Worth Alliance (AFW)	8	16.7	17.2
4	Chicago Rockford Int'l (RFD)	15	16.5	15.8
5	Wilmington Air Park (ILN)	13	13.7	14.8
6	Tampa Int'l (TPA)	16	11.3	13.2
7	Lakeland Linder Int'l (LAL)	0	11.5	11.5
8	Seattle-Tacoma Int'l (SEA)	9	9.3	11.2
9	Baltimore-Washington Int'l Thurgood Marshall (BWI)	6	9.0	10.5
10	Portland Int'l (PDX)	6	8.2	10.5
11	Houston Bush Int'l (IAH)	9	10.2	10.0
12	Phoenix Sky Harbor Int'l (PHX)	4	6.5	9.5
13	New York John F. Kennedy Int'l (JFK)	0	8.0	8.8
14	Windsor Locks (Hartford) Bradley Int'l (BDL)	2	6.8	8.0
15	San Francisco Int'l (SFO)	2	2.8	7.0
16	Miami Int'l (MIA)	6	7.3	6.7
17	Riverside March Air Reserve Base (RIV)	4	5.7	6.5
18	Stockton Metropolitan (SCK)	4	4.0	6.2
19	Sacramento Int'l (SMF)	4	6.2	4.5
20	Allentown Lehigh Valley Int'l (ABE)	6	5.0	4.3

To some extent, this has happened. In autumn of 2021, Amazon expanded at Florida's Lakeland Linder International, California's Riverside March Air Reserve Base, and Ohio's Wilmington, none of which have any significant passenger traffic, as well as California's Stockton Metropolitan Airport, which has little. We also expect operations to commence this year at San Bernardino International Airport, another cargo-oriented airport that we expect to become a focal point of Amazon's Southern California operations. Nearby Riverside March Air Base, another cargo airport, is a focal point for Hawaii traffic.

At the same time, Amazon's recent expansion in Portland, Phoenix, San Francisco, and Seattle, and its continuing presence at busy passenger-oriented airports in Atlanta, Dallas, Denver, New York, and Tampa, suggests that it is increasingly willing to deepen its services at airports with massive passenger traffic (Table 1). In turn, several cargo-oriented airports have seen modest *reductions* in flight activity since August 2020, including Allentown, Chicago Rockford, and San Antonio Kelly.

Our results also show that Amazon is now only judiciously adding cities to its U.S. networks. Our February 2021 sample showed new regular flights only to Louis Armstrong New Orleans International Airport (MSY), which had lacked such service in August 2020. Even so, we expect Amazon to use its new planes to fill gaps in its North American network, which could include airport additions in the Carolinas, Michigan, Utah, and Upstate New York, where many cities are 300+ miles from an Amazon-served airport.

FINDING 6. Amazon now has a balanced network of airports in the Northeast that places more emphasis on Connecticut's Hartford Bradley International and New York's John F. Kennedy International airports and less on Pennsylvania's Allentown Lehigh Valley International Airport. Amazon is also making a concerted push at Virginia's Richmond International Airport, which relieves pressure on Baltimore-Washington International Airport and positions the company to better serve the Mid-Atlantic region.



Boeing 737-8CN at California's Ontario International Airport on December 17, 2020. Ontario has seen steady growth since our first report in June 2020 (Peiwen Chen)

Hartford Bradley has emerged as a stellar performer, growing from a mere two flights in May 2020 to six in August 2020 and eight this month. Allentown has gradually diminished, reduced to 4.3 flights per day. Activity at New York's JFK Airport has remained stable at about 8.8 flights per day. This triad offers a well-balanced system that puts the enormous population between Philadelphia and southern Maine within three hours of an Amazon airport.

On the southern half of the

Northeastern Corridor, growth at Richmond International is providing added connectivity to the Mid-Atlantic region and eastern Tennessee. This airport had no Amazon flights last May but now averages four daily. Activity at Baltimore-Washington International, long an Amazon stronghold, has also inched up, from averaging 9.5 to eleven flights.

FINDING 7. Amazon Air has reduced transpacific flights and appears to be relying almost entirely on charters and other contractual arrangements to support its supply chain across the Pacific. Offseason transoceanic international flying has been largely reduced to a semi-regular roundtrip between Amsterdam and Chicago.

Amazon Air's shift from transoceanic flights on international routes appears to reflect the company's desire to use its fleet for shorter-hop flights supporting inventory and packaging movements between warehouses on the same continent. In August of 2020, planes registered to Amazon Air made semi-regular trips across both the North Atlantic and Pacific. Among those flights were periodic Shanghai, China to U.S. trips as well as periodic service from Incheon, Korea. In the new sample, only Amsterdam – Chicago O'Hare flights, operated on roughly half the days observed, took to the skies.

This shift may be attributable to Amazon's increased leverage when negotiating rates with cargo airlines amid the slump in general air cargo shipments reported last autumn. Alternatively, it may reflect the tendency for January and February to be perennially soft times for online retail purchases, making transoceanic flights less imperative this time of year. We expect that a small number of transoceanic flights will return come peak season, but that this will remain a niche operation.

Our conversations with analysts suggest that there is a broad consensus that the "value-added" benefit of Amazon Air's fleet is greatest on flights making trips *within* Europe and North America, particularly on routes supporting rapid inventory and package movement among its many warehouses and fulfillment centers. The need for such flight connections is growing as Amazon pushes for more next-day delivery. For shipments across the oceans linking manufacturers to its warehouses, conventional cargo airlines using larger airplanes appear better suited for the task.

SHORT-TERM OUTLOOK AND PREDICTIONS

The remainder of 2021 promises to bring more strategic moves by Amazon Air and likely a gradual "densification" of its network as well. Such initiatives will advance its push to expand overnight package delivery options. We anticipate several general moves by late May 2021:

- Amazon will push daily flight operations upward another 15% over the next five months so that it regularly tops 160 daily flights by late June 2021. Such growth will be critical to Amazon's expansion of next-day delivery options. This growth will likely take the form of perhaps 7 – 8 more planes added to its fleet
- Amazon Air's expanding operations will allow for significant expansion in next-day delivery of packages throughout the United States, a process abetted by new 767 freighters coming online
- Amazon will grow the intra-Europe network significantly, starting with the addition of a third plane operated under contract by ASL. This will likely continue with more 737s and the addition of new

routes beyond the existing countries served, possibly in the Republic of Ireland, the United Kingdom, the Benelux countries, and Eastern Europe

- Amazon Air will increasingly position itself to support the delivery requirements of third parties, who need to ship packages and parcels for goods not purchased on the Amazon platform. The CVG hub, together with nearby Wilmington, will allow Amazon to increasingly handle third-party business-to-consumer shipments. Amazon's interest in, and timetable for, third-party delivery is unclear, although we expect it will make a move within 18 months.

We anticipate activities at particular airports to include:

- Growth at Cincinnati CVG that will push its activity from fewer than 30 flights per day today to around 50 flights per day by year's end, made possible by the opening of its massive new facilities anticipated for this autumn
- The introduction of significant flight operations at Southern California's San Bernardino International Airport, with some activity possibly shifting from Ontario International, within the next few months
- Expansion at both Cologne and Leipzig, Germany, as it lays the groundwork for significant expansion in Europe, that will include the addition of new airports in countries not yet served
- Expansion to airports that fill gaps in its coverage, such as possible service to Upstate New York, the Carolinas, and Salt Lake City, which will give it improved coverage in areas where travel times from its airports are presently six hours or more.

SEE OUR SEPTEMBER 2020 REPORT FOR AN ASSESSMENT OF THE JUXTAPOSITION OF FLIGHTS AND WAREHOUSES



Boeing 737-8AS at Madrid, Spain on January 17, 2021 by Adrian Nowakowski

APPENDIX: Takeoffs & Landings at Airports Served by Amazon Air

Airport	Thursday April 23	Six Day August '20 Average	Thursday January 21	Monday January 25	Tuesday January 26	Wednesday February 3	Friday February 4	Saturday, February 5	Six day Feb '21 Average	Net Change Aug '20-Feb '21
Allentown Lehigh Valley Int'l (ABE)	6	**5.0**	5	2	4	4	7	4	4.3	**-0.7**
Amsterdam Airport Schipol (AMS)	0	**0.7**	0	0	0	1	2	2	0.8	**0.2**
Anchorage Ted Stevens Int'l (ANC)	4	**2.0**	2	2	2	2	2	2	2.0	**0.0**
Atlanta Hartsfield-Jackson International (ATL)	0	**2.0**	4	2	3	2	2	2	2.5	**0.5**
Austin-Bergstrom International (AUS)	0	**4.0**	4	4	4	4	5	4	4.2	**0.2**
Baltimore-Washington Marshall Int'l (BWI)	6	**9.0**	10	10	12	10	11	10	10.5	**1.5**
Chicago O'Hare International (ORD)	0	**2.7**	4	2	2	4	5	4	3.5	**0.8**
Chicago Rockford International (RFD)	15	**16.5**	17	15	15	16	16	16	15.8	**-0.7**
Cincinnati/Northern Kentucky Int'l (CVG)	24	**25.7**	28	27	30	28	26	28	27.8	**2.2**
Dallas-Ft. Worth International (DFW)	0	**0.0**	1	0	0	0	0	0	0.2	**0.2**
Denver International (DEN)	4	**3.7**	4	5	4	4	4	4	4.2	**0.5**
Fort Worth Alliance (AFW)	8	**16.7**	19	20	18	15	15	16	17.2	**0.5**
Honolulu Daniel K. Inouye International (HNL)	4	**4.3**	3	4	4	4	4	4	3.8	**-0.5**
Houston George Bush Intercontinental (IAH)	9	**10.2**	11	10	9	10	10	10	10.0	**-0.2**
Incheon International, Korea (ICN)	1	**0.0**	0	0	0	0	0	0	0.0	**0.0**
Kahului (OGG)	2	**2.2**	2	2	1	2	2	2	1.8	**-0.3**
Kailua-Kona/Kona International (KOA)	0	**1.7**	1	2	3	2	2	2	2.0	**0.3**
Lakeland Linder International (LAL)	0	**11.5**	10	12	11	12	12	12	11.5	**0.0**
Miami International (MIA)	6	**7.3**	6	8	6	7	7	6	6.7	**-0.7**
Los Angeles International (LAX)	0	**0.0**	2	2	2	2	2	2	2.0	**2.0**
Minneapolis-Saint Paul International (MSP)	2	**3.7**	2	2	2	2	2	2	2.0	**-1.7**
New Orleans, Louis Armstrong Int'l (MSY)	0	**0.0**	2	2	2	2	2	2	2.0	**2.0**
New York John F. Kennedy Int'l (JFK)	0	**8.0**	10	9	8	8	10	8	8.8	**0.8**
Ontario International (ONT)	13	**21.5**	19	22	21	20	19	22	20.5	**-1.0**
Osaka Kansai International Japan (KIX)	0	**0.2**	0	0	0	0	0	0	0.0	**-0.2**
Phoenix Sky Harbor International (PHX)	4	**6.5**	9	10	10	8	10	10	9.5	**3.0**
Portland International (PDX)	6	**8.2**	10	12	11	10	10	10	10.5	**2.3**
Richmond International (RIC)	0	**5.0**	4	4	4	4	4	4	4.0	**-1.0**
Riverside March Air Reserve Base (RIV)	4	**5.7**	5	7	7	6	6	8	6.5	**0.8**
Sacramento International (SMF)	4	**6.2**	5	4	4	6	4	4	4.5	**-1.7**
San Antonio/Kelly Field (SKF)	2	**3.2**	2	2	2	2	2	2	2.0	**-1.2**
San Francisco International (SFO)	2	**2.8**	10	7	6	8	6	5	7.0	**4.2**
San Juan Luis Muñoz Marin Int'l (SJU)	0	**2.7**	2	2	2	2	2	2	2.0	**-0.7**
Seattle-Tacoma International (SEA)	9	**9.3**	13	12	11	12	8	11	11.2	**1.8**
Shangai Pudong Int'l China (PVG)	0	**0.5**	0	0	0	0	0	0	0.0	**-0.5**
Stockton Metropolitan (SCK)	4	**4.0**	6	7	6	6	6	6	6.2	**2.2**
Tampa International (TPA)	16	**11.3**	13	15	14	11	14	12	13.2	**1.8**
Wilmington Air Park (ILN)	13	**13.7**	15	15	16	14	15	14	14.8	**1.2**
Windsor Locks Bradley Int'l (Hartford) (BDL)	2	**6.8**	10	8	8	8	8	6	8.0	**1.2**
Western Europe -- Intra-Europe Network	0	0	16	16	16	16	16	16	16.0	**16.0**
Total takeoffs & landings	**170**	**244.2**	**286**	**285**	**280**	**274**	**278**	**274**	**279.5**	
Total flights	**85**	**122.1**	**143**	**143**	**140**	**137**	**139**	**137**	**139.8**	
Percent of takeoff and landings										
At Cincinnati CVG	14.1%	**10.5%**	9.8%	9.5%	10.7%	10.2%	9.4%	10.2%	**10.0%**	
At CVG, excluding Intra-Europe network	14.1%	**10.5%**	10.4%	10.0%	11.4%	10.9%	9.9%	10.9%	**10.6%**	
At 3 largest hubs	21.8%	**26.1%**	22.4%	22.5%	23.6%	23.4%	21.9%	24.1%	**23.0%**	
At 3 largest hubs exclud. Intra-Europe network	21.8%	**19.3%**	17.8%	18.2%	19.3%	18.6%	17.2%	19.4%	**18.4%**	
At airports not on U.S. Mainland	6.5%	**5.8%**	9.1%	9.8%	10.0%	10.6%	10.8%	10.9%	**10.2%**	

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[1] Amazon Air is not to be confused with the retailer's experimental drone unit, Amazon Prime Air.
[2] This brief is prepared as an extension of Chaddick Institute's mission to promote public understanding of the evolution of transportation systems. The findings are based entirely on Chaddick Institute's independent analysis of publically available data. Any opinions expressed are those of the authors.
[3] For a discussion of the Leipzig hub, see this *Breakbulk News* article, dated September 26, 2018:
[4] Amazon reported in a press release that these jets will be part of its active fleet "by 2022." To see the press release, visit
[5] The 81-plane total was reported in this *Business Insider* article, dated January 3, 2020:
Planespotters.net indicated the carrier had 58 planes at the time, with another four planned.
[6] For a discussion of the Morgan Stanley predictions, see this *DC Velocity* article, dated November 2, 2020:
[7] For a discussion, see this *DC Velocity* article, dated November 2, 2020:
[8] For a discussion of growth in the Cincinnati areas, see this *Supply Chain Dive* article, dated November 17, 2020:
[9] For a discussion, see this *Supply Chain Dive* article, dated November 17, 2020:
[10] *Ibid.*
[11]For a discussion, see this *CNET* article, dated February 3, 2020:

05/10/2021

Amazon Air Fleet Grows with E-Commerce Market Boom

Amazon's Prime Air operation commenced flights in 2016 when it secured the use of a single Boeing 767-200BDSF.

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Over the next five years Amazon's fleet grew to total 69 aircraft, inclusive of four different aircraft types: the

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Author



Jon Whaley
Senior Aviation Analyst

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[redacted]

[redacted]

Amazon, it has taken more of a backseat in recent times, with only four examples having been in operation since 2017. Amazon began introducing it's first narrowbody, the Boeing 737-800BCF, into its ranks in the second quarter of 2019. Amazon has since gone on to expand those operations and become the largest operator of the Boeing 737-800BCF. The most recent addition to the Amazon fleet is the ATR72-500, to be utilised on these

Job Title

Company *

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With the COVID-19 pandemic having expedited the growth of the e-commerce market, Amazon's fleet growth is unlikely to slow any time soon. According to data from IBA's aviation intelligence platform **InsightIQ**, there are currently at least a further eleven Boeing 767-300ER aircraft (which are yet to be converted) destined for Amazon. It is expected that the Boeing 767-300ER Passenger to Freighter (P2F) conversion programs will be in their end stage by 2024. Post 2024, IBA anticipates that the Airbus A330-200 and A330-300 will be the predominant P2F choice for express operators. Amazon may attempt to source the remaining Boeing 767-300ER aircraft feedstocks, though at some point a transition will have to be made into a new widebody type if the operator wants to expand consistently.

Aviation Intelligence - DHL Express orders 12 Electric Alice Aircraft

Articles



DHL Express has placed an order for 12 electric Eviation Alice aircraft, with delivery anticipated in 2024. The order represents the freight operator's first foray into electric aircraft.

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expected to follow. The Alia-250 would allow for carbon-zero operations on a regional basis, given the type has a limited range of 250 miles. As Amazon is yet to commit any orders, there is still uncertainty as to what role a type such as the Alia-250 could play within Amazon's operation. IBA suspects that Amazon will place an order for an eVTOL at some point, with the Alia-250 likely to be the type selected. This potential for



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The role of digital transformation in accelerating the UK's rebound from Covid-19

Part Two – Changing how Britain works

A report for Virgin Media Business

August 2021

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Executive Summary



- In 2020, GDP contracted by almost 10%, marking the largest recorded annual fall in UK GDP.
- Whilst Cebr's macro models predicts GDP to return to current level in 2022 and get back to a fully recovered growth trajectory by 2025, the evolution of Covid-19 pandemic and of the associated restrictions imposed by governments are largely unknown.
- Covid-19 also led to a significant acceleration in digital technology adoption across organisations, estimated by organisations' decision-makers to be of approximately 3 years.
- **Cebr's Covid-accelerated Digital Transformation (CADT) model shows that the digital transformation driven by Covid-19 can accelerate the UK's rebound from Covid-19, driving up to a £76bn boost to the UK economy throughout the recovery period 2021-2025 and up to £236bn boost by 2040.**
- Drawing on primary research data, this study finds that key digital transformations implemented during Covid-19 - working policies, digital delivery of services and use of big data - are set to shape the future of UK organisations.
- Whilst some barriers to their full implementation still exist, the associated potential benefits are found to be large.
- **The benefits of remote working, as the digital transformation that mostly affected organisations in the UK, are large and varied.** This study finds that flexible working can:
    - Be a socially inclusive policy, supporting employment opportunities for otherwise 'locked out' individuals;
    - Help the UK addressing the "productivity puzzle";
    - Drive significant environmental benefits;
    - Improve individuals' health with important implications for the UK public health system;
    - Contribute to the UK's levelling up agenda, by supporting regional economies; and
    - Enable individuals to do activities the public sector would otherwise bear the cost of.

Overview of the study



- The Centre for Economics and Business Research (Cebr) is pleased to present this report to Virgin Media Business (VMB), in which we look at **the role of digital transformation in accelerating the UK's rebound from Covid-19 and in creating a wide variety of benefits for organisations, employees and the wider society.**
- This report follows 'The role of digital transformation on the UK economy' Cebr report presented to VMB in January 2021, which estimated the economic impact of digital acceleration in the UK through Cebr's CADT model.
- This report builds on the previous study, investigating the economic impact of digital transformation using more robust and up-to-date information collected through primary research - specifically:
    - An **'organisations' decision-makers survey'**, which sought to understand recent patterns in digital transformation in terms of working policies, digital delivery of services and use of big data, drawing on responses from individuals with decision-making responsibility within their organisation.
    - An **'employee & society survey'**, which sought to understand how employees' personal and professional life is affected by flexible working.
- A more comprehensive description of the two surveys is outlined in the Appendix.

Overview of the study



- The report is broken down into four different modules:
  1) Module 1 – The Economy, which assesses the impact of digital transformation on the UK-wide economy and six sectors of interest through Cebr's CADT model. The model was updated replacing the assumptions with more robust and up-to-date information directly drawn on the 'organisations' decision-makers survey'.
  2) Module 2 - Organisations, which summarizes the primary data collected through the 'organisations' decision-makers survey' into a set of insightful findings.
  3) Module 3 - Employees, which summarises the primary data collected through the 'employee & society survey' into a set of insightful findings.
  4) Module 4 – Society, which uses the insights from the 'employee & society survey' to assess the societal benefits that could be unlocked through a wide-spread adoption of flexible working policies.

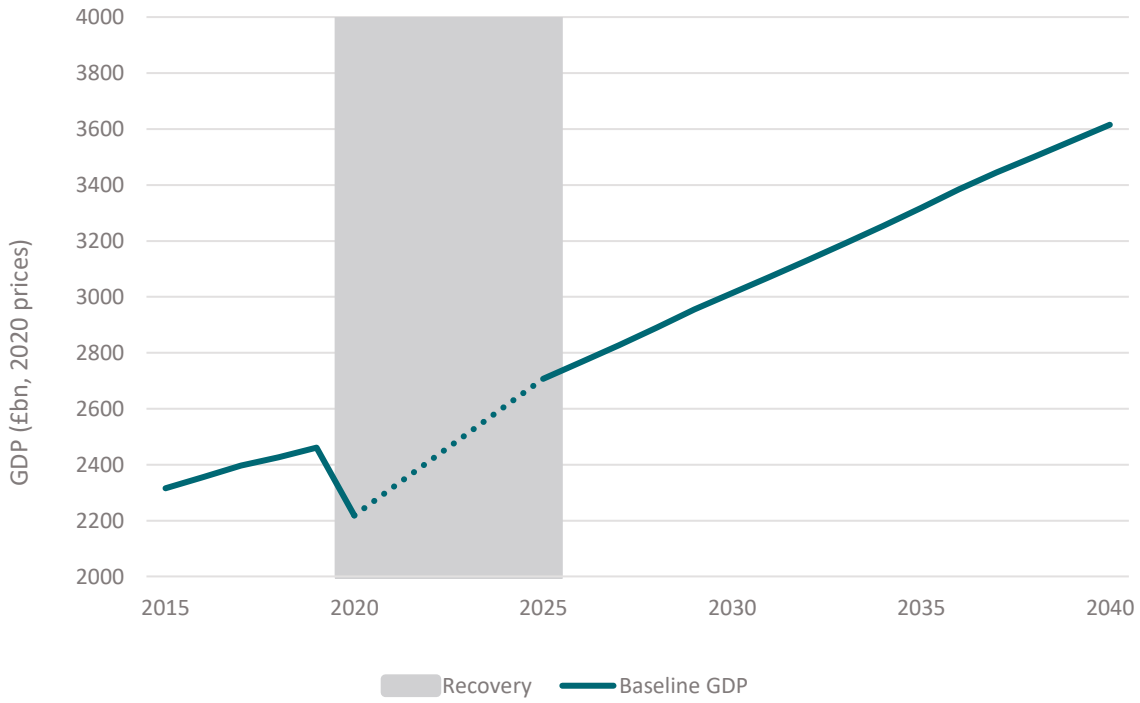
Module 1:
The Economy

2021

In 2020, GDP contracted by almost 10%, marking the largest recorded annual fall in UK GDP

- The UK economy is facing a significant economic downturn, as a consequence of the imposed restrictions to fight the spread of Covid-19 pandemic.
- In 2020, GDP contracted by almost 10%, marking the largest recorded annual fall in UK GDP.
- Cebr's in-house macro model (as of June 2021) produces a long term forecast of UK GDP. **Cebr's macro models predicts GDP to return to current level in 2022 and get back to a fully recovered growth trajectory by 2025.**
- Under this baseline scenario, UK GDP is estimated to be approximately £2,707bn by 2025. By 2030, GDP is expected to grow to approximately £3,014bn and by 2040 it is estimated to be approximately £3,615bn.
- Whilst the model was updated in June 2021 using the most up-to-date assumptions, uncertainty around the shape of UK recovery exists as the pandemic and the related government responses are largely unpredictable.

UK GDP, 2015-2040.



Source: ONS, Cebr analysis

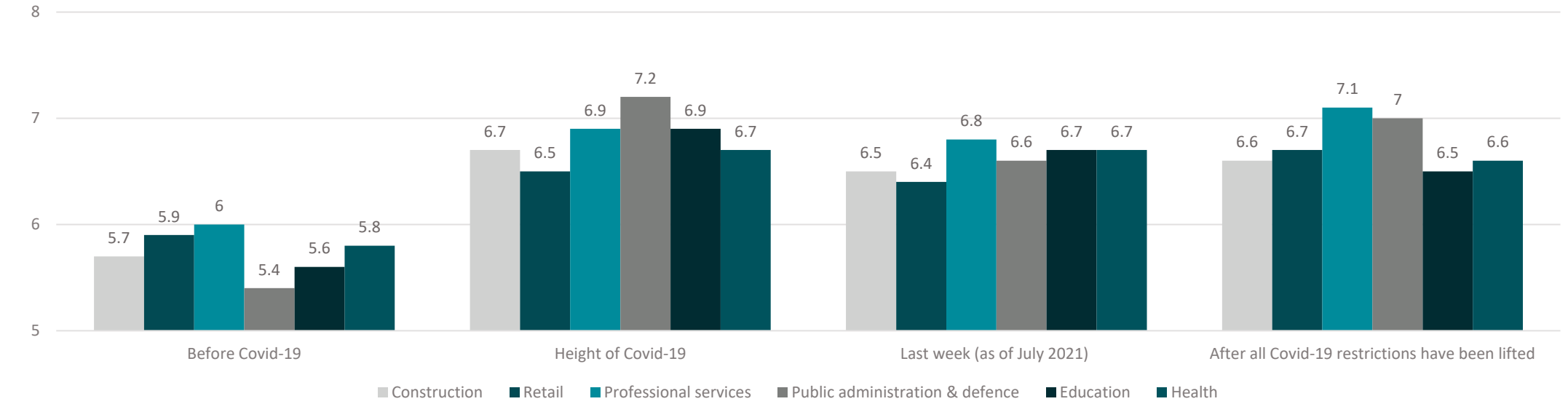
Covid-19 led to an unprecedented shift in the use of digital technologies across the world

- Whilst many economies, including the UK, are experiencing an ongoing global economic recession in direct result of the pandemic, Covid-19 also led to an unprecedented shift in the use of digital technologies across the world.
- In a previous report for VMB 'The role of digital transformation on the UK economy', **Cebr estimated a potential £232bn boost across the UK economy by 2040 driven by increased investment in digital transformation.** The following three business transformations were identified as key drivers:
    - Flexible working;
    - Digital delivery of services; and
    - The creation of larger and richer training sets for machine learning (or use of big data).
- In this report, **Cebr revises the assumptions that shaped the previous research, drawing on the most up-to-date information** about UK organisations' decisions in relation to technology adoption. The research draws on a survey of 502 business decision-makers across the UK economy, which offers an accurate 'on the ground' picture concerning digital transformation across different organisations, roles, sectors and regions. Updated modelling assumptions include:
    - Organisations' increased level of investments in technology; and
    - The rate of technology adoption acceleration across UK organisations, as driven by the need for up-to date technology.
- Using a more recent macro model forecast (June 2021) adds a further degree of robustness to the research findings in relation to shorter term predictions.
- In addition to UK-wide estimations, the analysis focuses on six sectors of interest: construction, education, health, professional services, public administration & defence, retail.

Covid-19 has intensified the need for up-to-date technology

- Decision-makers across UK organisations believe that adopting the most up-to-date technology was more than “quite important” before Covid-19.
- Nevertheless, it became increasingly important throughout the pandemic and is set to keep this higher prominence in the future.
- Decision-makers working for public administration & defence organisations experience the biggest change, reporting a 30% increase in the importance of technology adoption.

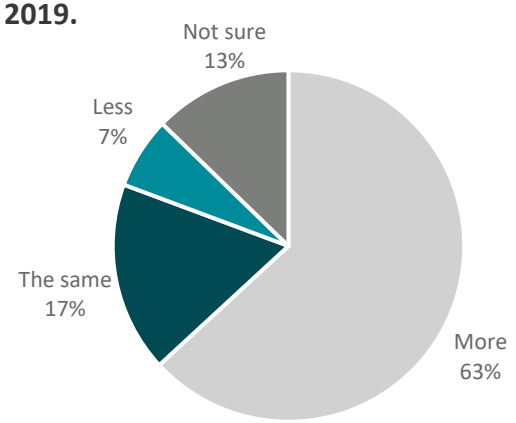
Importance of adopting the most up-to-date technology on a scale from 0 to 10.



Source: Opinium survey, Cebr analysis

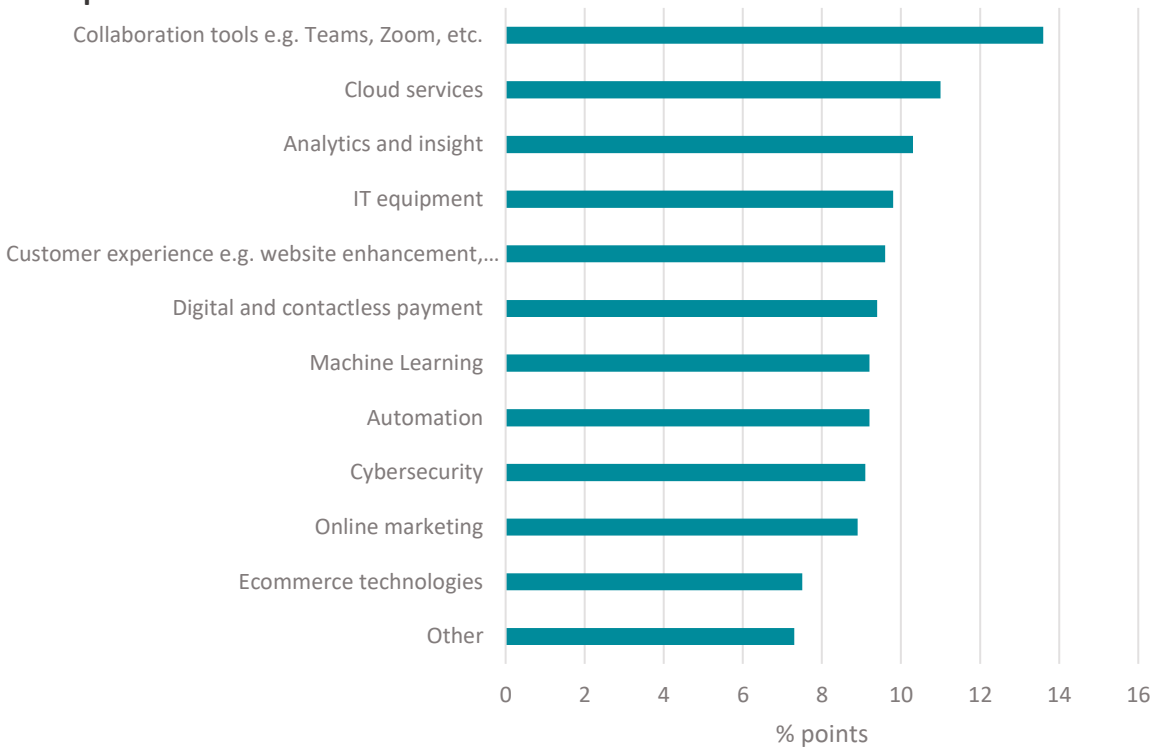
Organisations have reacted to new needs by increasing their technology / digital / IT spend in 2020/2021

Organisations' spending on technology / digital /IT in 2020/2021, compared to 2019.



Source: Opinium survey, Cebr analysis

Percentage increase in organisations' spending on specific technologies in 2020/21, compared to 2019.



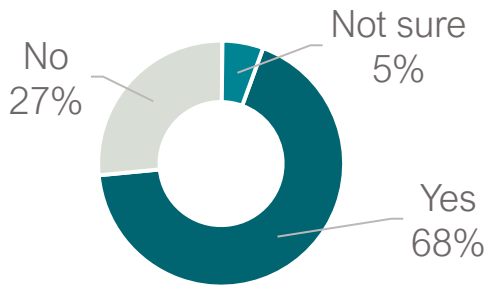
Source: Opinium survey, Cebr analysis

- Decision-makers think that their organisations will increase technology / digital / IT spend in 2020/2021 by an average of 18%, compared to 2019.
- Focusing on specific technologies, decision-makers report collaboration tools as the biggest additional investment. Arguably, this result is driven by the need to enable individuals to efficiently work more flexibly.

There is a large consensus amongst decision-makers that Covid-19 has accelerated the use of technology

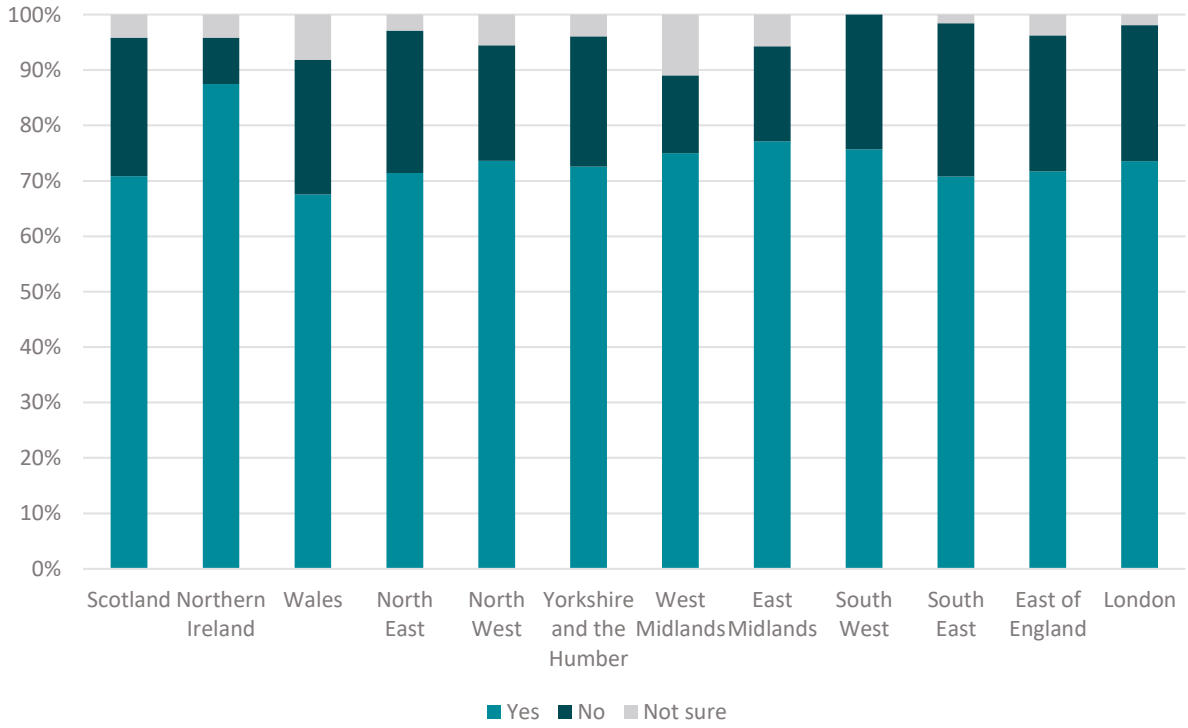
- More than two third (68%) of decision-makers state that Covid-19 has accelerated the use of technology across their organisations. This statistics is significantly higher for companies located in Northern Ireland (88%).
- In the next slide, we note that technology adoption acceleration is faster for :
  - Bigger organisations, which arguably have more resources to implement changes. Some of the change areas analysed require investment with high fixed costs, which is more feasible and efficient in larger firms.
  - Sectors at the forefront of the pandemic e.g. health and public administration & defence.

Has Covid accelerated the use of technology across organisations?



Source: Opinium survey, Cebr analysis

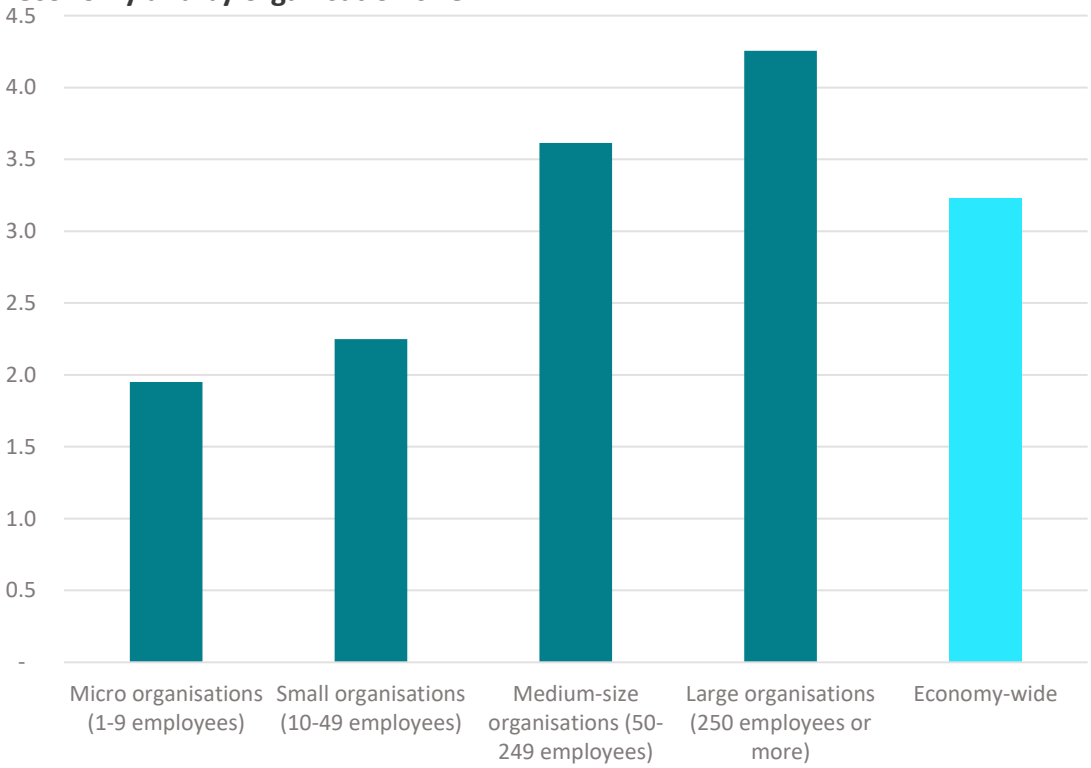
Has Covid accelerated the use of technology across organisations? Results reported by location of organisation's sites/offices.



Source: Opinium survey, Cebr analysis

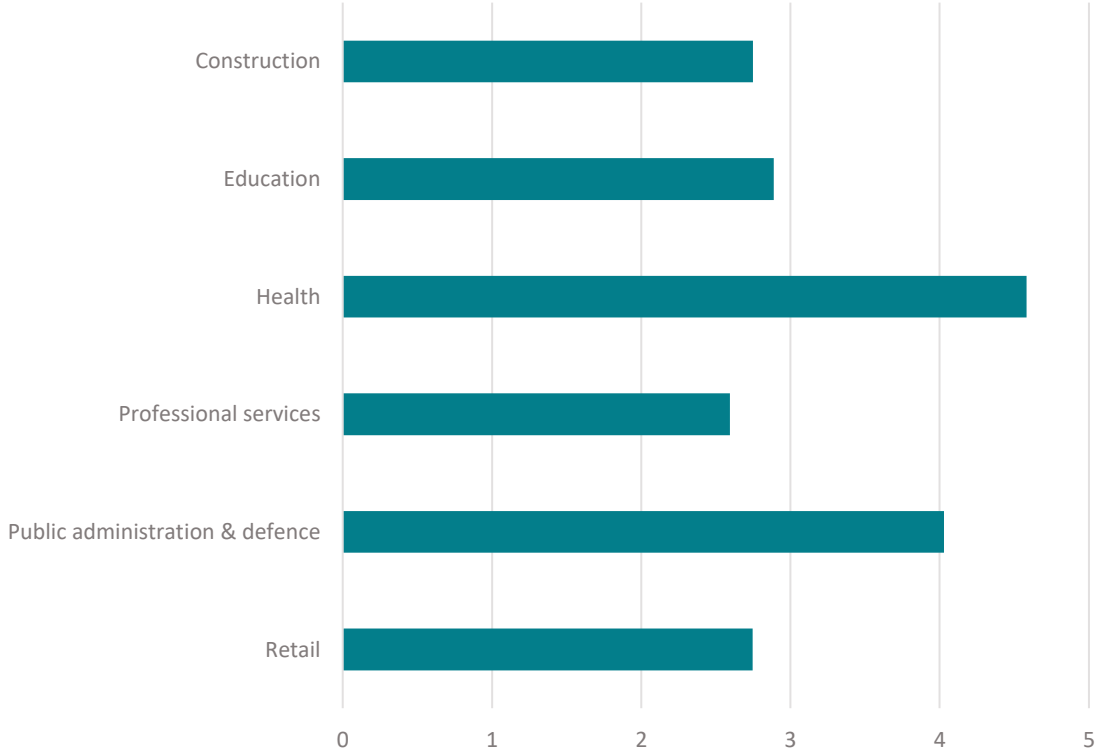
On average, Covid-19 has accelerated the use of technology across organisations by 3 years

Average number of years of technology adoption acceleration, for the UK economy and by organisation size.



Source: Opinium survey, Cebr analysis

Average number of years of technology adoption acceleration, by sector of interest.



Source: Opinium survey, Cebr analysis

Digital transformation is set to accelerate UK's rebound from Covid-19 and drive up to a £236bn boost by 2040

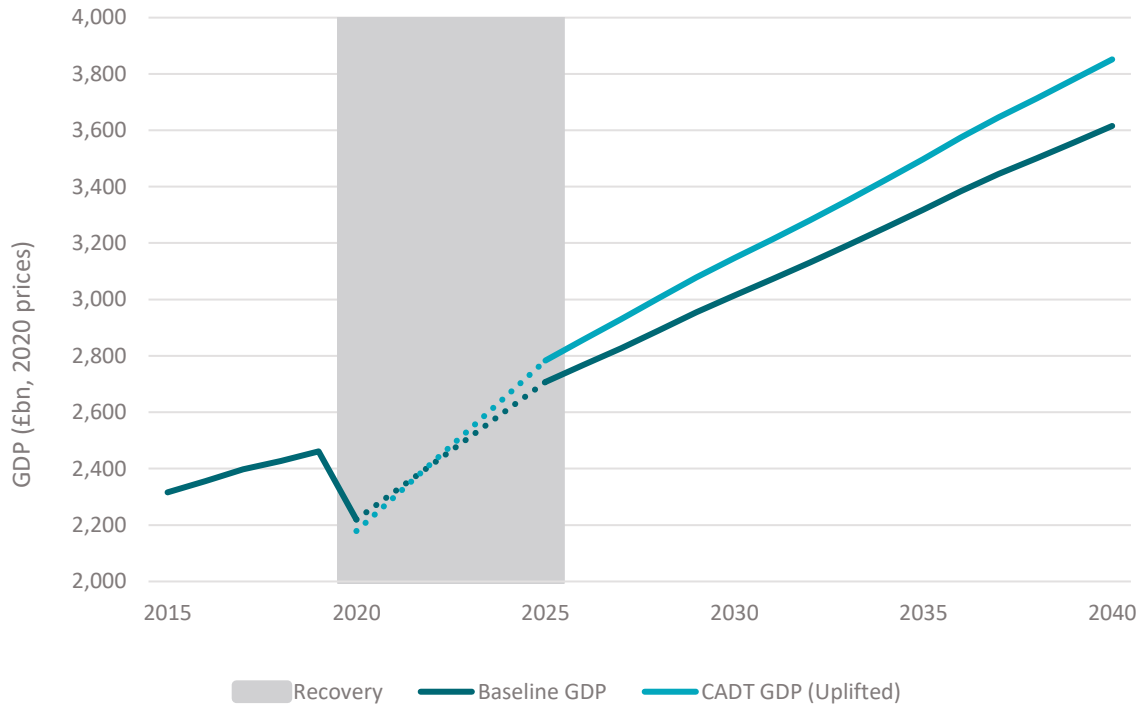
- Drawing on more robust and up-to-date assumptions, Cebr's CADT model shows that **digital transformation can accelerate the UK's rebound from Covid-19, driving up to a £76bn boost to the UK economy throughout the recovery period 2021-2025 and up to £236bn boost by 2040.** These figures compare with £74bn and £232bn respectively, found in our previous report.
- Cebr's in-house macro model (as of June 2021) is used as baseline scenario, against which the Digital Transformation uplift is calculated.
- The CADT model assumes an increased investment in technology, leading to an **acceleration in technology adoption of 3 years across all UK organisations**. Modelling assumptions were taken from the 'organisations' decision-makers survey'.
- Some of the associated economic uplift will be realised as a result of investment increasing the capital available to workers and allowing them to work more productively.

Digital transformation uplift to UK GDP.

	2025	2030	2040
UK economy, real £bn (2020 prices)	76	133	236
UK economy, %	2.8	4.4	6.5

Source: Cebr analysis

UK GDP, 2015-2040.



Source: ONS, Cebr analysis

Digital transformation can drive up to a £4bn boost to the UK construction sector by 2040

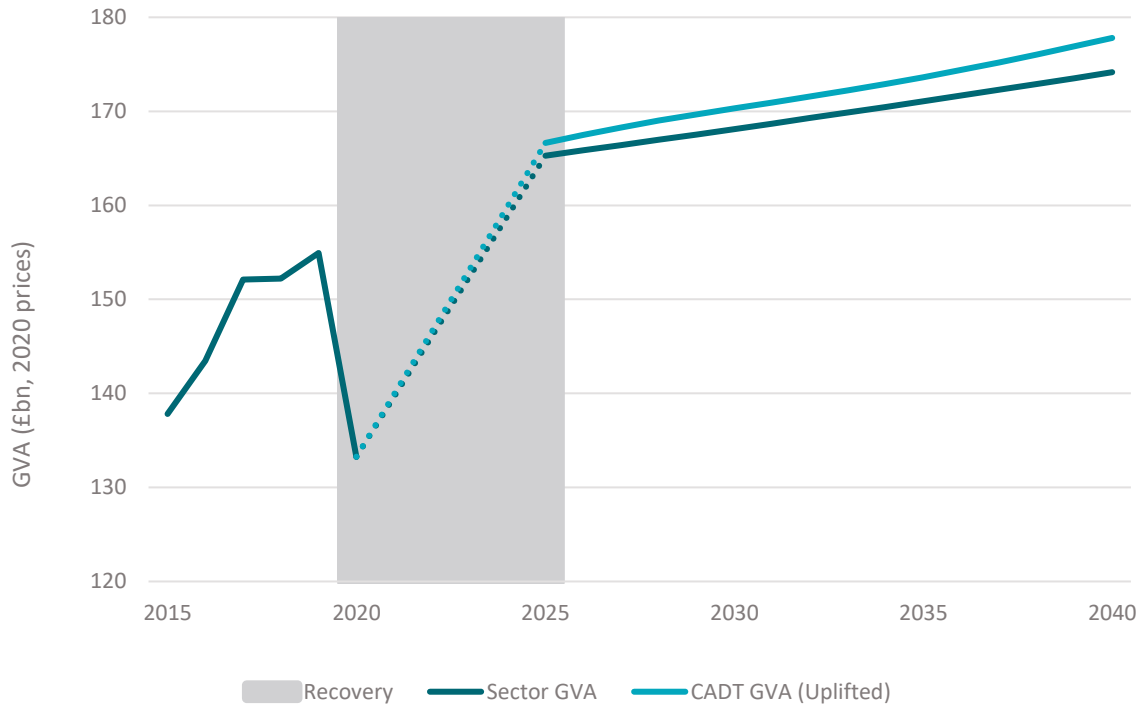
- The CADT model shows that digital transformation can drive up to a £4bn boost to the UK construction sector by 2040. **We estimate the size of the construction sector to be approximately £178bn in 2040, or a modest 2.1% higher than the counterfactual baseline.**
- Decision-makers working in this sector stated that their organisations:
  - Will spend on average 14% more on technology / digital / IT in 2020/2021 as compared to 2019; and
  - Have accelerated technology adoption by 2.6 years on average during Covid-19.
- Amongst the sectors of interest, construction was found to have the lowest rate of technology acceleration during Covid-19. This confirms our findings from the literature review, which outline the construction sector as a slow adopter of digital transformation.

Digital transformation uplift to construction sector GVA.

	2025	2030	2040
UK construction sector, real £bn (2020 prices)	1.3	2.2	3.7
UK construction sector, %	0.8	1.3	2.1

Source: Cebr analysis

UK construction sector GVA, 2015-2040.



Source: ONS, Cebr analysis

Digital transformation can drive up to a £10bn boost to the UK education sector by 2040

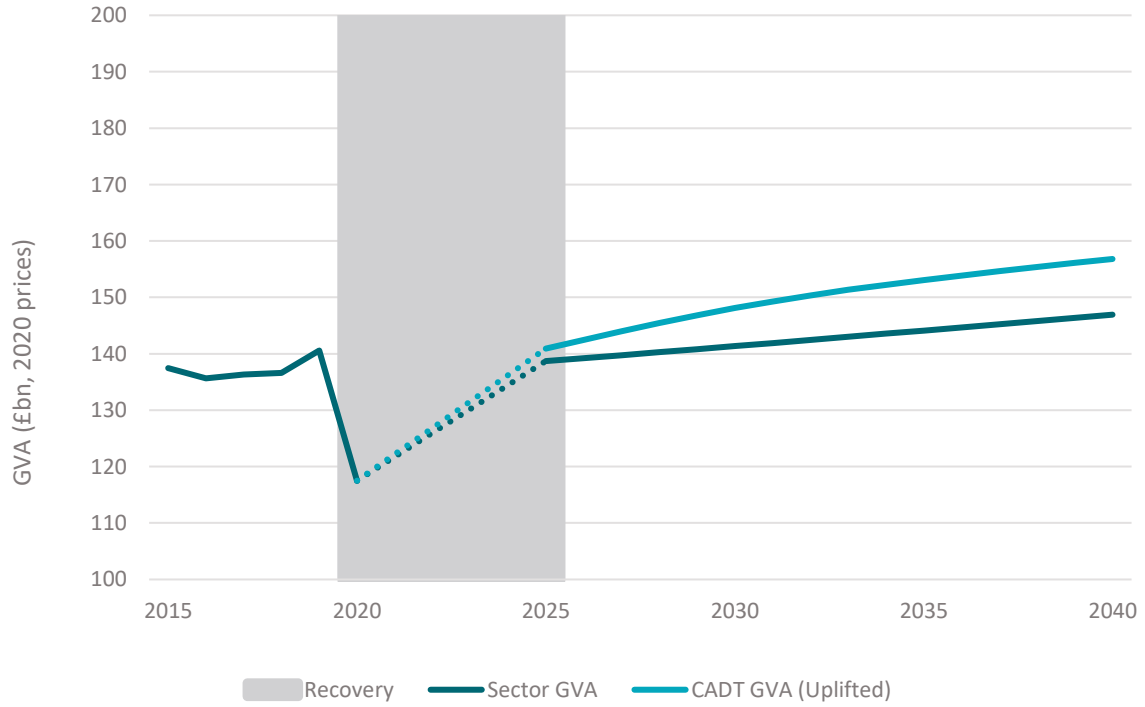
- The CADT model shows that digital transformation can drive up to a £10bn boost to the UK education sector by 2040. **We estimate the size of the education sector to be approximately £157bn in 2040, or 7% higher than the counterfactual baseline.**
- Decision-makers working in this sector stated that their organisations:
  - Will spend on average 24% more on technology / digital / IT in 2020/2021 as compared to 2019; and
  - Have accelerated technology adoption by 2.9 years on average during Covid-19.
- Whilst in the past education was not the fastest technology adopter, the sector is expected to experience faster and more radical digital transformations going forward. This is demonstrated by the significant increase in digital spend by organisations in this sector and the changes that the sector underwent during Covid-19, e.g. online education due to schools forced to close.

Digital transformation uplift to education sector GVA.

	2025	2030	2040
UK education sector, real £bn (2020 prices)	2.2	6.7	9.9
UK education sector, %	1.6	4.8	6.8

Source: Cebr analysis

UK education sector GVA, 2015-2040.



Source: ONS, Cebr analysis

Digital transformation can drive up to a £53bn boost to the UK health sector by 2040

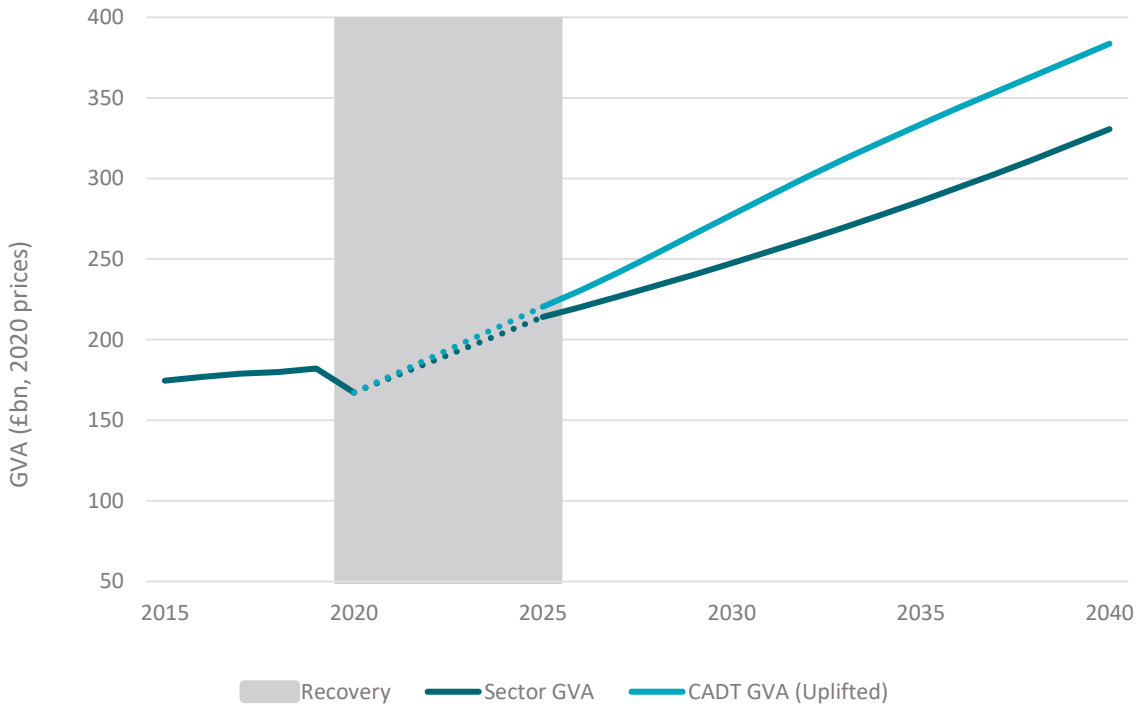
- The CADT model shows that digital transformation can drive up to a £53bn boost to the UK health sector by 2040. **We estimate the size of the health sector to be approximately £384bn in 2040, or a significant 16% higher than the counterfactual baseline.**
- Decision-makers working in this sector stated that their organisations:
  - Will spend on average 17% more on technology / digital / IT in 2020/2021 as compared to 2019; and
  - Have accelerated technology adoption by 4.6 years on average during Covid-19.
- The pace of technology transformation was the fastest in the health sector during Covid-19. For a sector that more than any one else is at the forefront of the pandemic, digital transformation has been critical in meeting the public health needs driven by the global health crisis.

Digital transformation uplift to health sector GVA.

	2025	2030	2040
UK health sector, real £bn (2020 prices)	6.4	30.1	53.0
UK health sector, %	3.0	12.2	16.0

Source: Cebr analysis

UK health sector GVA, 2015-2040.



Source: ONS, Cebr analysis

Digital transformation can drive up to a £19bn boost to the UK professional services sector by 2040

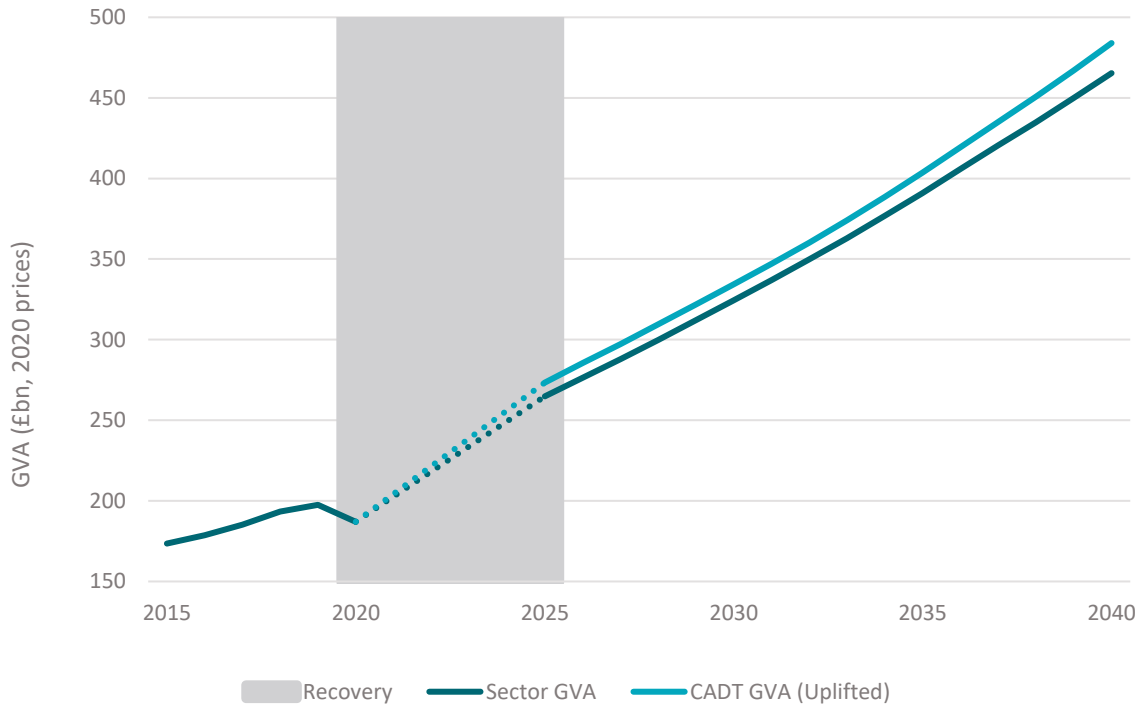
- The CADT model shows that digital transformation can drive up to a £19bn boost to the UK professional services sector by 2040. We estimate the size of the professional services sector to be approximately £482bn in 2040, or 4% higher than the counterfactual baseline.
- Decision-makers working in this sector stated that their organisations:
  - Will spend on average 17% more on technology / digital / IT in 2020/2021 as compared to 2019; and
  - Have accelerated technology adoption by on average 2.6 years during Covid-19.
- The professional services sector has a 'high' current level of digital transformation adoption. Due to the shape of technology adoption curve, sectors with higher level of current adoption gets a lower impact from further technological transformation.

Digital transformation uplift to professional services sector GVA.

	2025	2030	2040
UK professional services sector, real £bn (2020 prices)	8.5	9.8	18.7
UK professional services sector, %	3.2	3.0	4.0

Source: Cebr analysis

UK professional services sector GVA, 2015-2040.



Source: ONS, Cebr analysis

Digital transformation can drive up to a £37bn boost to the UK public administration & defence sector by 2040

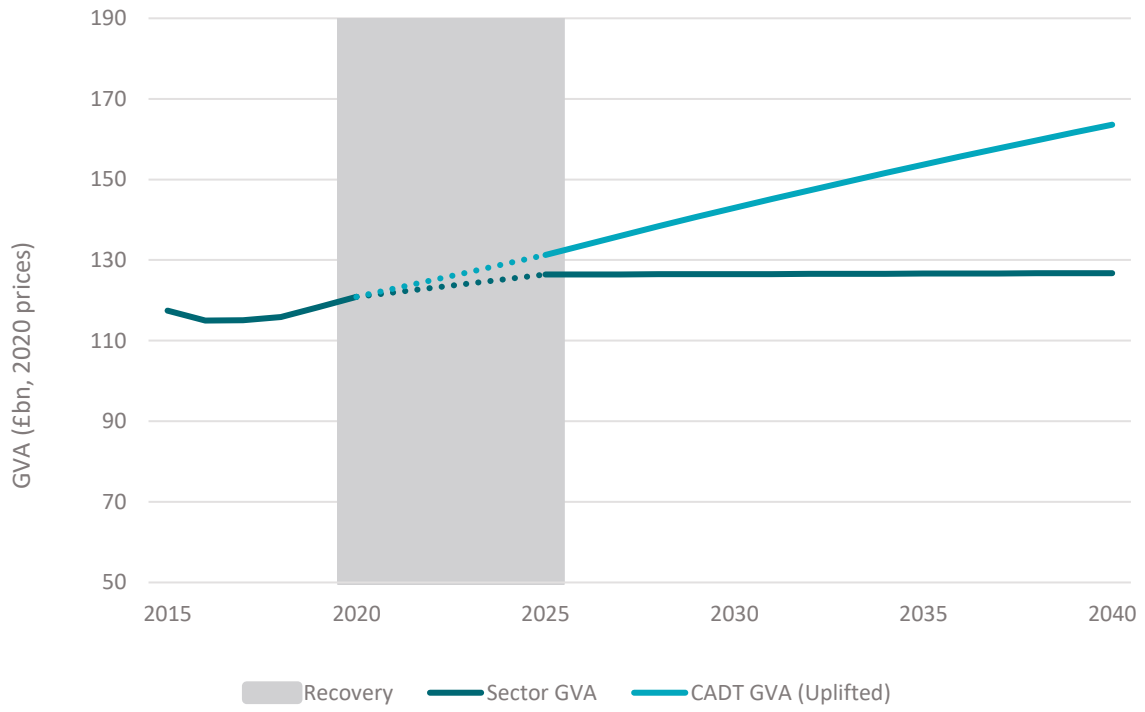
- The CADT model shows that digital transformation can drive up to a £37bn boost to the UK public administration & defence sector by 2040. **We estimate the size of the public administration & defence sector to be approximately £164bn in 2040, or a significant 29% higher than the counterfactual baseline.**
- Decision-makers working in this sector stated that their organisations:
  - Will spend on average 22% more on technology / digital / IT in 2020/2021 as compared to 2019; and
  - Have accelerated technology adoption by on average 4 years during Covid-19.
- Above the average rate of technology transformation is set to enable the public sector to meet demand for digital government services, driving significant benefits for the economy.

Digital transformation uplift to public administration and defence sector GVA.

	2025	2030	2040
UK public administration & defence, real £bn (2020 prices)	4.8	16.4	36.9
UK public administration & defence, %	3.8	13.0	29.1

Source: Cebr analysis

UK public administration and defence sector GVA, 2015-2040.



Source: ONS, Cebr analysis

Digital transformation can drive up to a £21bn boost to the UK retail sector by 2040

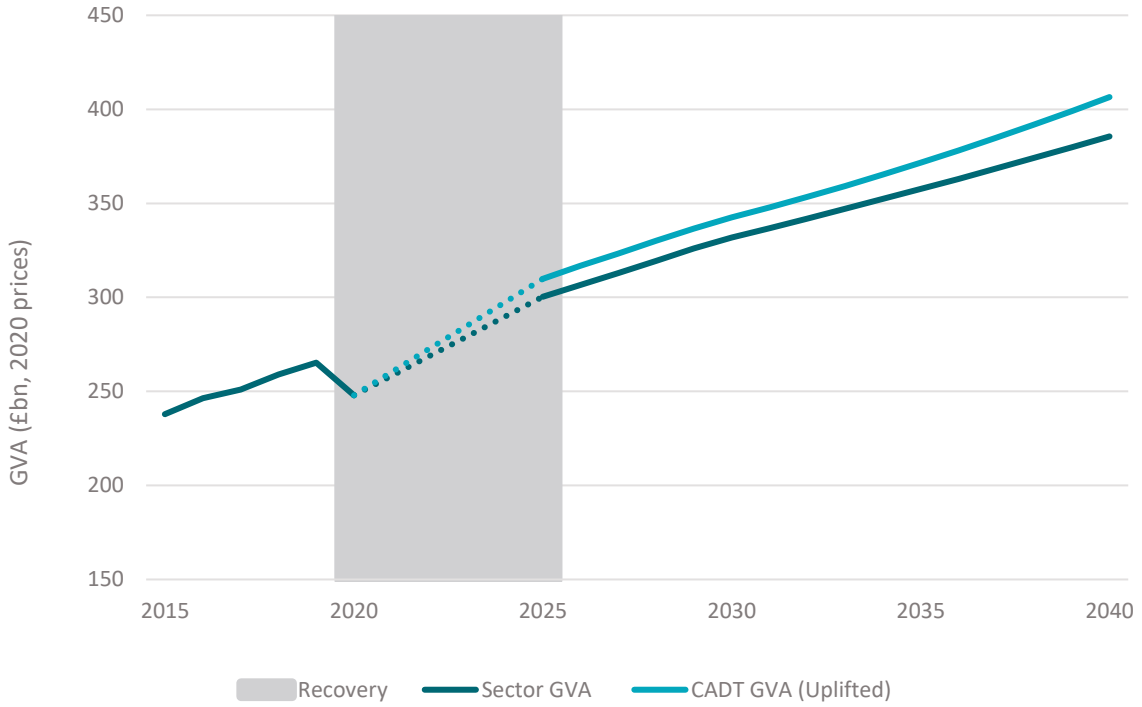
- The CADT model shows that digital transformation can drive up to a £21bn boost to the UK retail sector by 2040. **We estimate the size of the retail sector to be approximately £406bn in 2040, or 5% higher than the counterfactual baseline.**
- Decision-makers working in this sector stated that their organisations:
  - Will spend on average 13% more on technology / digital / IT in 2020/2021 as compared to 2019; and
  - Have accelerated technology adoption by on average 2.7 years during Covid-19.
- As professional services, the retail sector was found to have a 'high' current level of digital transformation adoption. As such, it is expected to get a relatively lower impact from further technological transformation.

Digital transformation uplift to retail sector GVA.

	2025	2030	2040
UK retail sector, real £bn (2020 prices)	9.6	10.8	20.9
UK retail sector, %	3.2	3.3	5.4

Source: Cebr analysis

UK retail sector GVA, 2015-2040.



Source: ONS, Cebr analysis

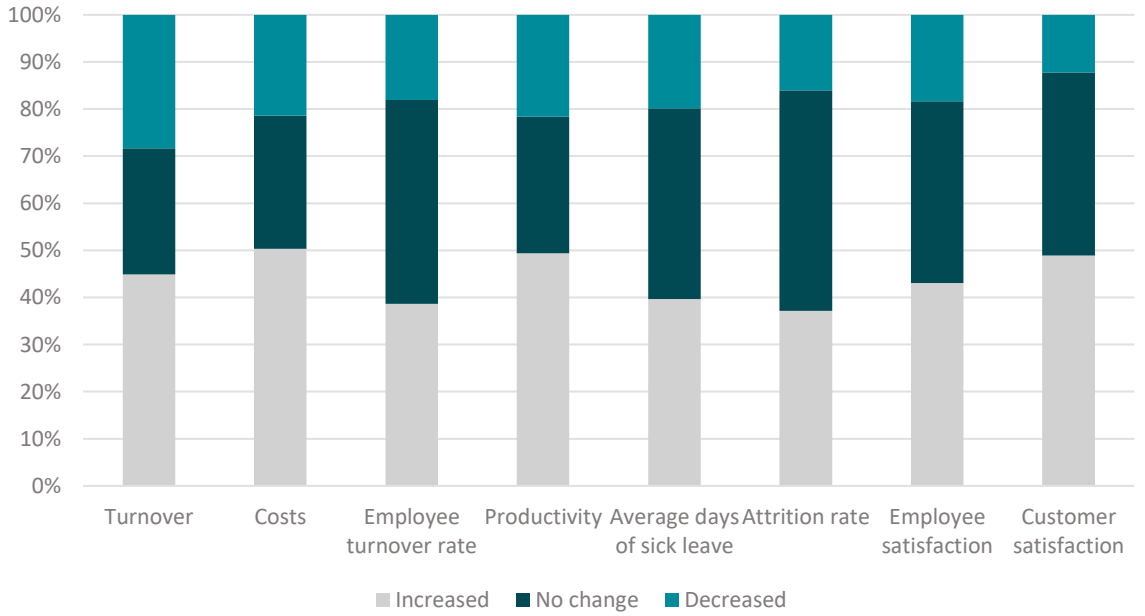
Module 2: Organisations

2021

Organisations across the survey sample have not been negatively impacted by Covid-19

- Decision-makers report that key organisations' metrics have not been negatively impacted by Covid-19. Note that these are the results from our entire sample, with greater weight therefore placed on the key sectors of interest and less weight placed on sectors more severely hit by the crisis e.g. hospitality. As such, **these results are fully representative of the UK economy, which as we previously noted is experiencing a significant economic downturn.**
- Interviewees think that **customer satisfaction is the metric that improved the most**, increasing by 5% on average across organisations. This result is driven by public administration & defence and health sectors, which registered an improvement of 6% and 7% respectively. Arguably, digital delivery of public and medical services underpins this result.
- Improvement in employee metrics, such as satisfaction and productivity, could be a result of a more wide-spread flexible working culture.
- In order to draw a more accurate picture of the relationship between flexible working and employees' performance and personal/professional well-being, we have covered these topics in our 'consumer & society survey'.
- Greater costs could be represented by additional investments in new technologies, outlined in Module 1 of this report.

Key organisations' metrics in 2020/2021 compared to 2019 across organisations.



Average increase, %.

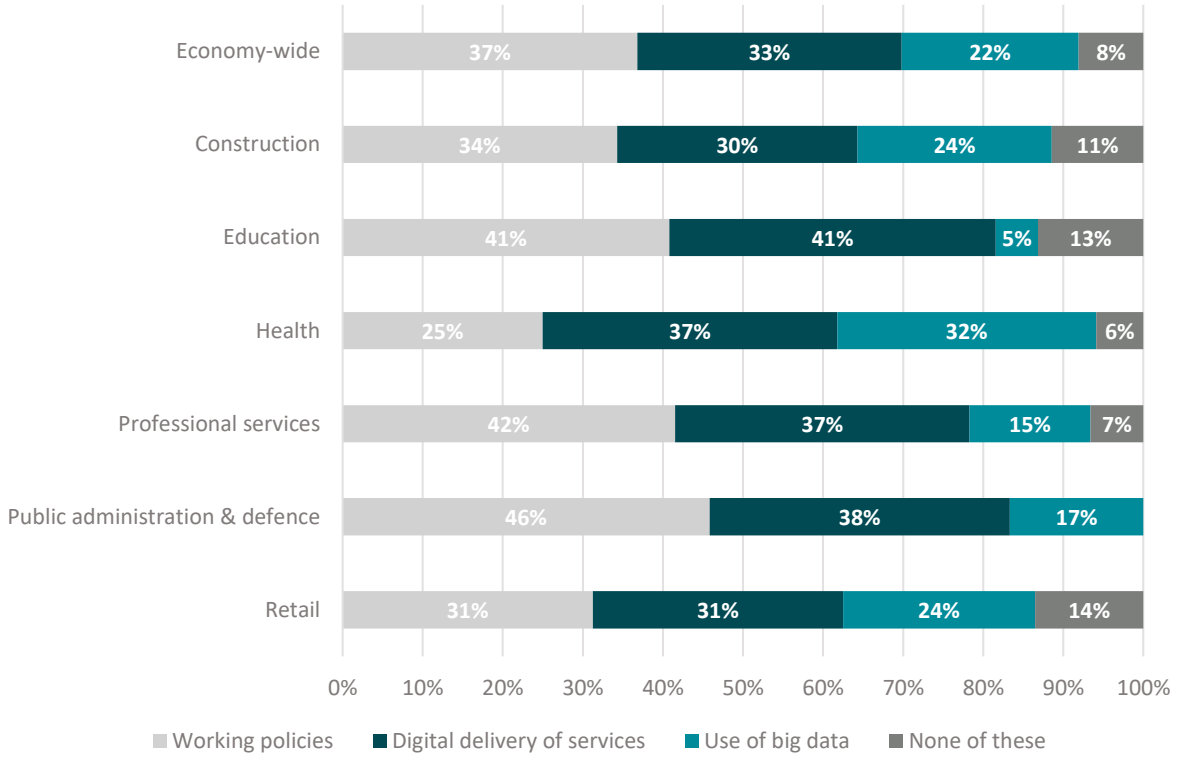
Turnover	Costs	Employee turnover	Productivity	Attrition rate	Employee satisfaction	Customer satisfaction
2.2	3.5	2.8	3.4	3	3.6	4.9

Source: Opinium survey, Cebr analysis

Technology-related changes in working policies were largely implemented by UK organisations

- We interrogated decision-makers about which areas between working policies, digital delivery of services and use of big data, experienced technology-related changes.
- Focusing on the six sectors of interest:
  - Construction and Retail experience a balanced evolution in the three key areas of changes;
  - Changes in working policies and digital delivery of services are predominant in the Education sector. Closure of schools and imposition of online education forced fast transformations in these areas;
  - Amongst the six sectors, Health experience one of the biggest changes in the digital delivery of services. Online/telephone GP appointments or digital medical prescriptions are examples of that;
  - Public administration & Defence is the sector most interested by changes in working policies. Arguably, public sector is an office jobs intensive sector and, as such, a large proportion of employees could switch to remote working at the height of Covid-19.

Areas that experienced a change during Covid-19 across the UK economy and the six sectors of interest.

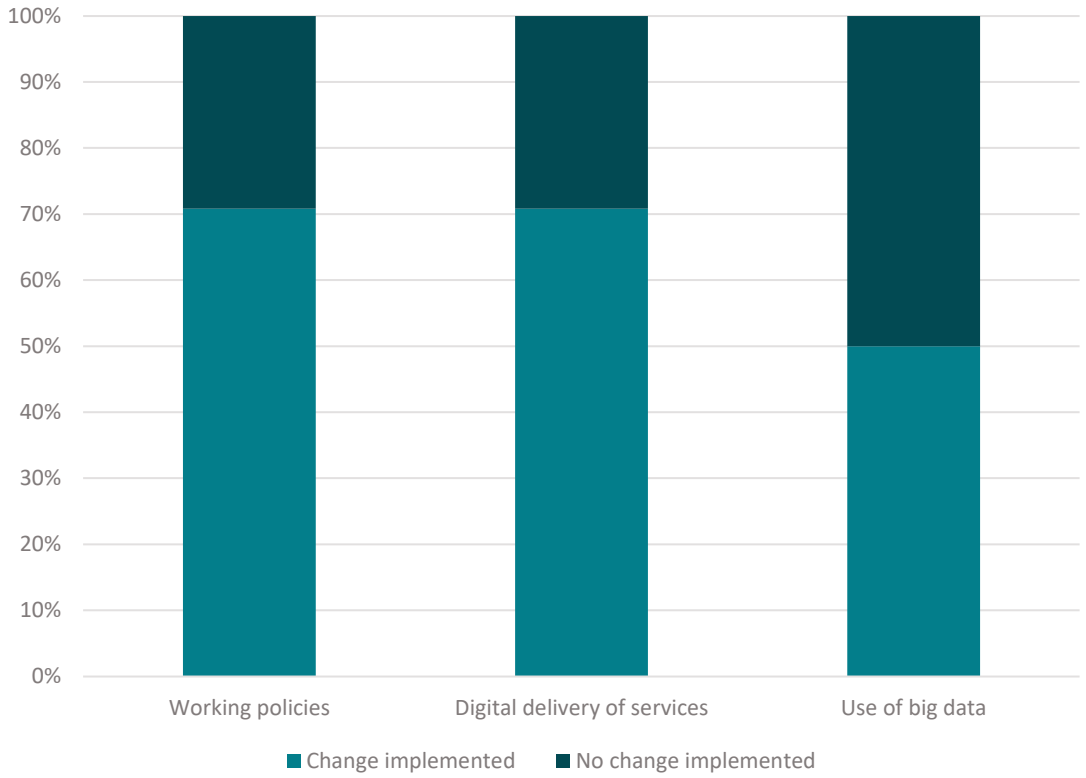


Source: Opinium survey, Cebr analysis

Organisations in our sample with offices/sites in NI are more prone to adopt changes, relative to those across the rest of the UK

- Northern Ireland (NI) is the region were technology acceleration was most wide-spread according to interviewed decision-makers.
  - 71% of organisations implemented some changes in working policies compared to 55% of companies across the UK / 71% across UK large organisations.
  - 71% implemented changes in the digital delivery of services compared with 50% of companies across the UK / 63% across UK large organisations.
  - 50% implemented changes in the use of big data compared with 33% across the UK / 44% across UK large organisations.

Percentage of organisations in NI that implemented technology-related changes.

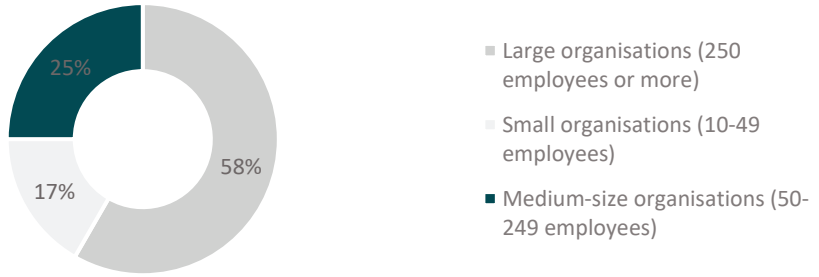


Source: Opinium survey, Cebr analysis

In Northern Ireland, large firms were overrepresented within our survey sample, but this alone cannot explain the findings

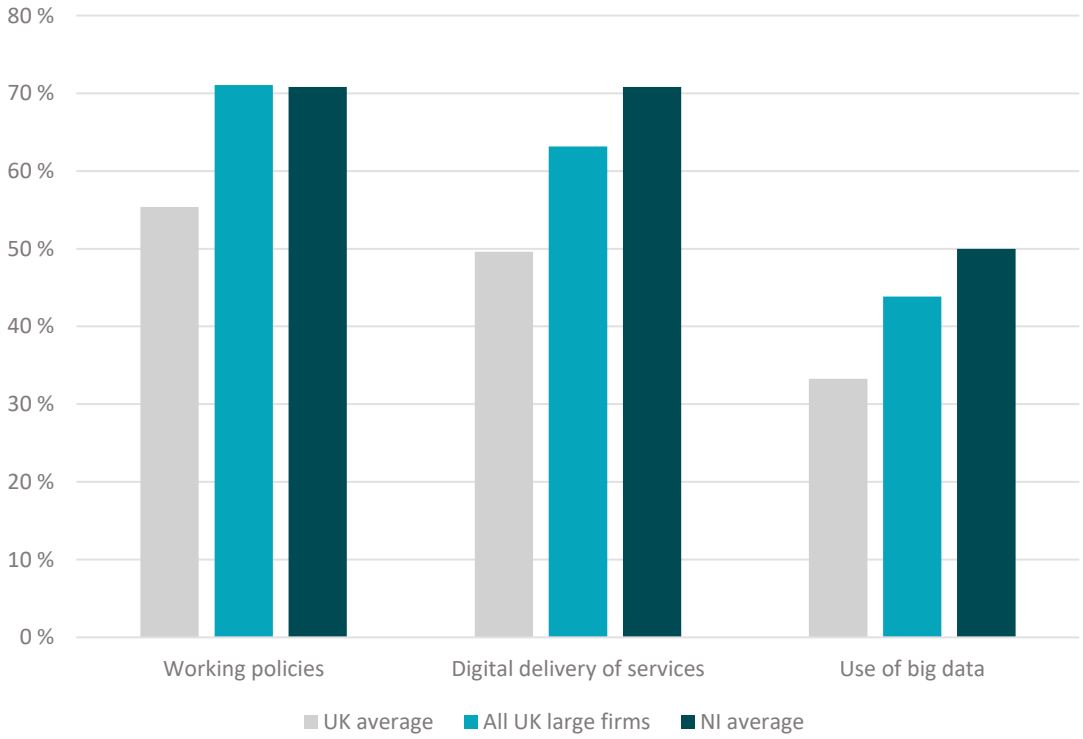
- This result is (at least explained by the high proportion of large organisations in our NI sub-sample (58% vs UK average 23%). As previously noted, larger organisations have been more active in implementing changes.
- However even when adjusting for the potential overweighting of large organisation within the Northern Irish sample, the implementation of technology-related changes is still greater than the UK average. Northern Irish firms across our sample have implemented changes in working policies at the same rate as the average for large firms across the UK, and have implemented the digital delivery of services and the use of big data at a higher rate.

Organisations with offices in Northern Ireland by size in survey sample



Source: Opinium survey, Cebr analysis

Percentage of organisations in NI that implemented technology-related changes, relative to UK average and average for large firms.

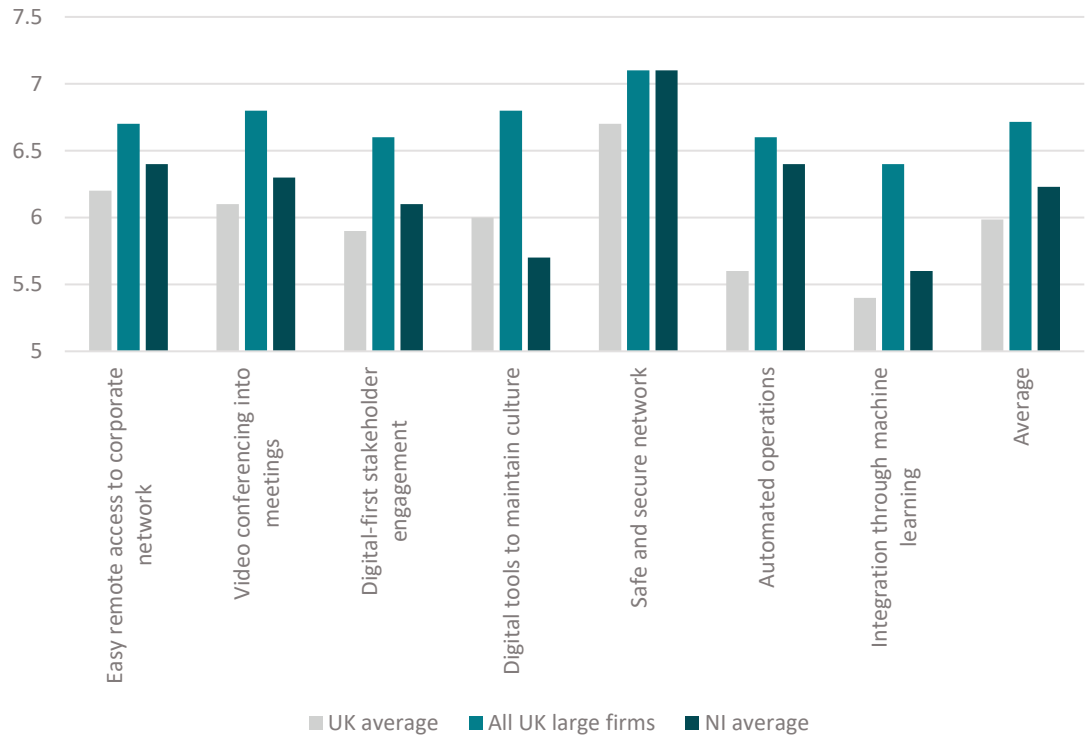


Source: Opinium survey, Cebr analysis

The evidence suggests Northern Irish firms may have started with a slightly lower baseline level of technology than in the UK

- One potential explanation for the stronger rate of digital adoption in Northern Ireland, is that firms were starting from a lower pre-Covid baseline.
- To test this hypothesis, we compare the pre-Covid level of technological development across a range of metrics for Northern Ireland, the UK and the average for all UK large firms.
- Given the general overweighting of large Northern Irish firms within our Northern Irish sample, if there were similar levels of technological development pre-Covid, we would expect the Northern Irish results to be closer to those for the average for all UK large firms.
- Instead, average levels of technological development are closer to the average for the UK. **Across all metrics, Northern Irish firms report an average level of pre-Covid development of 6.2 – closer to the UK average (6.0) than that for solely large firms (6.7).**
- While the evidence is not strong and further research would be ideal, this does provide support for the hypothesis and would also offer an intuitive explanation for the greater Northern Irish level of technology-related changes over the Covid period.

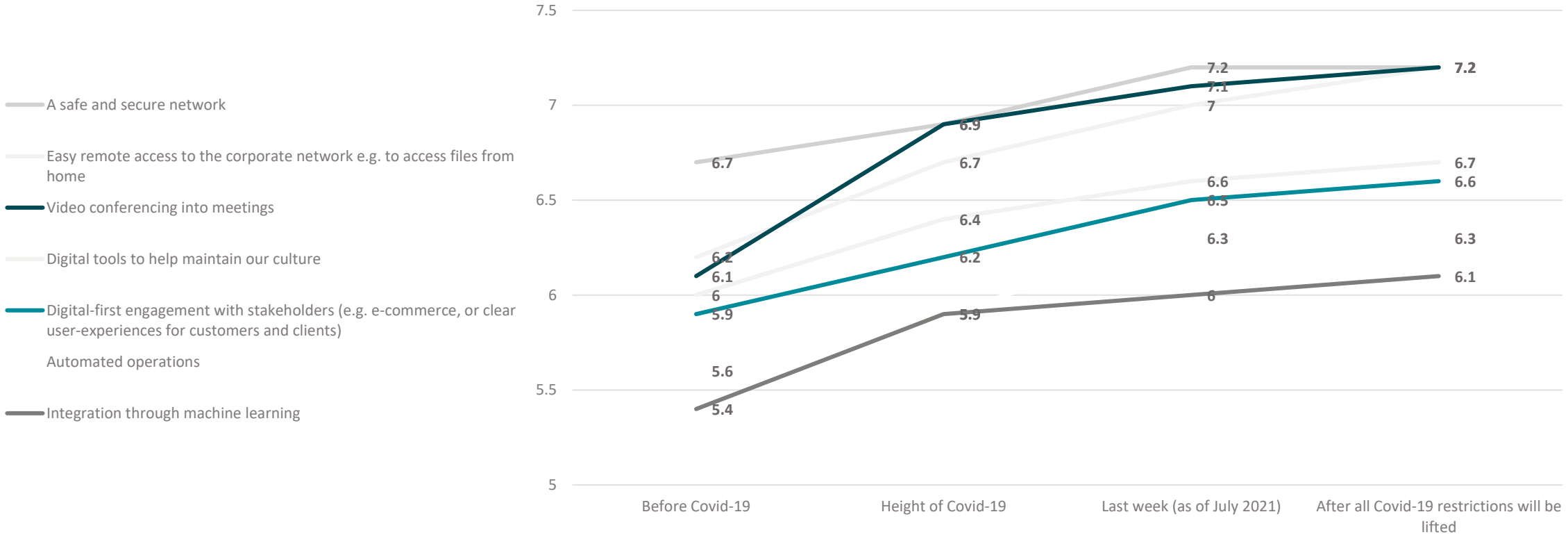
Percentage of organisations in NI that implemented technology-related changes.



Source: Opinium survey, Cebr analysis

Adoption of specific technologies and/or policies related to ways of working has particularly increased throughout Covid-19

How well developed were/are these technologies/or policies across organisations.



Source: Opinium survey, Cebr analysis

Changes in working policies are set to stay in the majority of organisations

- Changes in working policies are the most popular across organisations.
- On whether these changes will be made permanent:
  - A large majority of decision-makers (69%) believe that changes in working policies will be made permanent by their organisation;
  - Only 12% of respondents do not think that changes will be made permanent; and
  - 19% of respondents are unsure about the evolution of working policies in their organisation.
- Employees' demand because of improved work/life balance of employees is the first reason to be mentioned by decision-makers. Results from the 'consumer & society survey' confirm this statement, as shown in Module 3 of this report.
- 12% of respondents who do not think that changes will be made permanent mention need of in-person collaboration and no improvements from changes as key reasons.

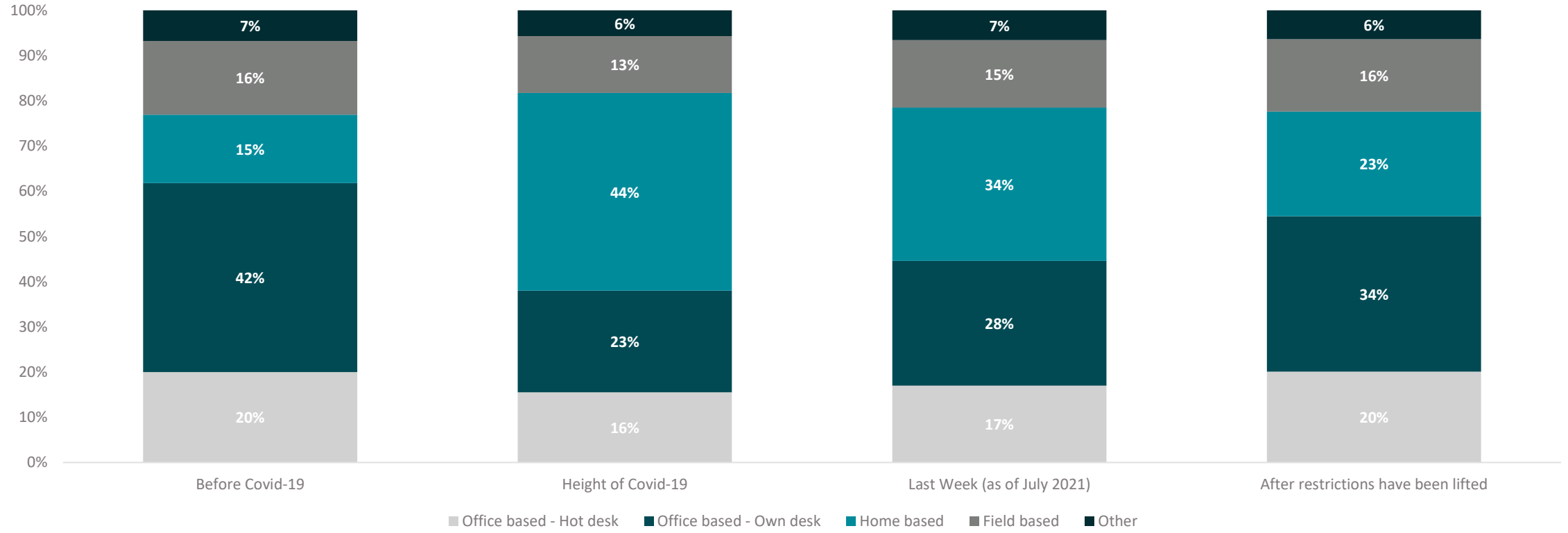
Key reasons for making the change in working policies permanent across organisations.



Source: Opinium survey, Cebr analysis

Whilst remote working is expected to be more common than pre-Covid, office-based work is set to remain predominant

Office usage policies across organisations before Covid-19, at the height of Covid-19, last week (as of July 2021) and after that all Covid-19 related restrictions will be lifted.

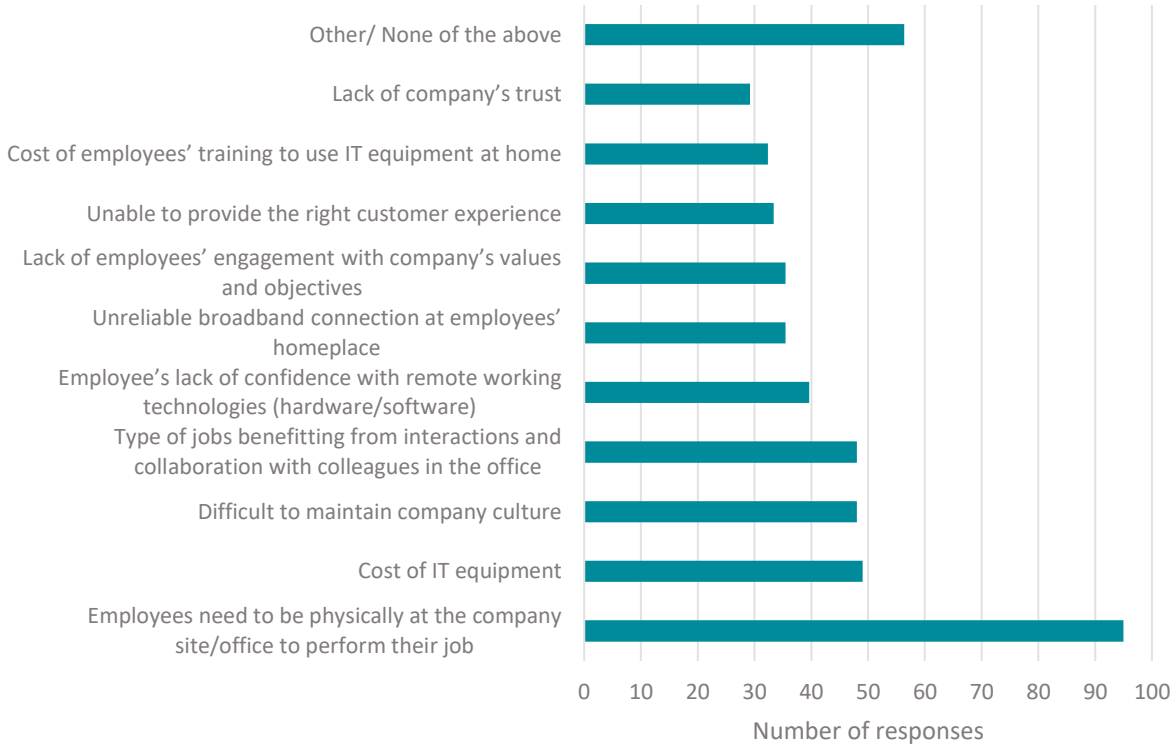


Source: Opinium survey, Cebr analysis

The need for employees to be physically at the company site/office continues to be partially present

- According to the survey results, about half (53%) of UK organisations had a flexible working policy in 2019. This has increased during the past 18 months, as the introduction of remote working was forced by the imposition of restrictions to fight the pandemic.
- The average number of days workforce works remotely passed from an average of 1.4 to 3.3 at the height of Covid-19. **Going forward, decision-makers expect employees to work remotely about half of the week (2.3 days).**
- The need for employees to be physically at the company site/office continues to be overly present across organisations (19% of the total 502 respondents). Construction and education are the sectors that more experience this barrier, with 35% and 28% of responses respectively.
- Also additional cost and hampered company culture are mentioned amongst the most important barriers. Decision-makers in retail stressed the difficulty to maintain the company culture (18% of responses).
- However as the previous slide demonstrated, these barriers are unlikely to be sufficient for firms to fully return to the pre-Covid status quo. Instead, **a hybrid approach, representing something between the peak-Covid level of remote working and the pre-Covid level is expected.**

Barriers to introduce flexible working policy across organisations.

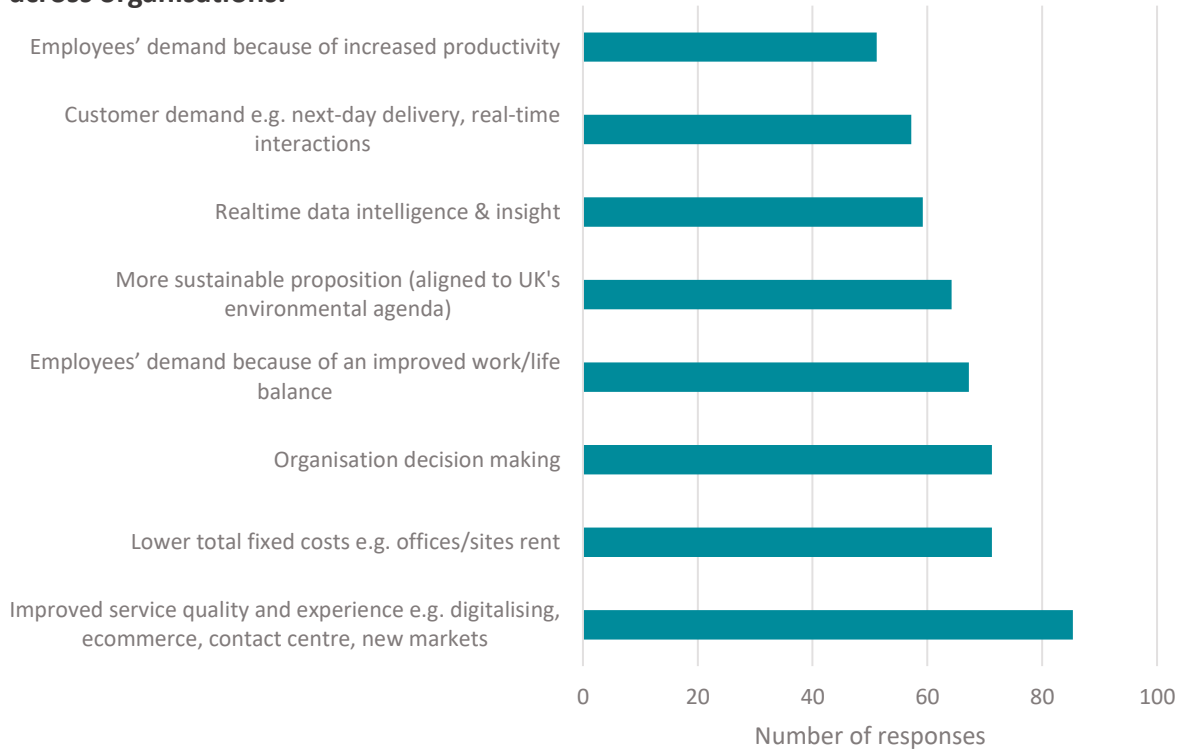


Source: Opinium survey, Cebr analysis

Improvement in service quality and experience is decisive for organisations to keep changes in digital delivery

- Digital delivery of services was the second most mentioned area of technological transformation by organisations.
- On whether these changes will be made permanent:
  - A large majority (77%) of decision-makers believe that changes in digital delivery of services will be made permanent by their organisation.
  - Only 8% of respondents do not think that changes will be made permanent.
  - 15% of respondents are unsure about the evolution of digital delivery of services in their organisation.
- The first most reported reason for making these changes permanent is the improvement in service quality and experience through digitalisation, ecommerce, contact centre and access to new markets.
- Whilst digital delivery of services enables organisations to reach new customers irrespective of their location, the need of in-person collaboration might prevent some organisations from making the changes permanent.

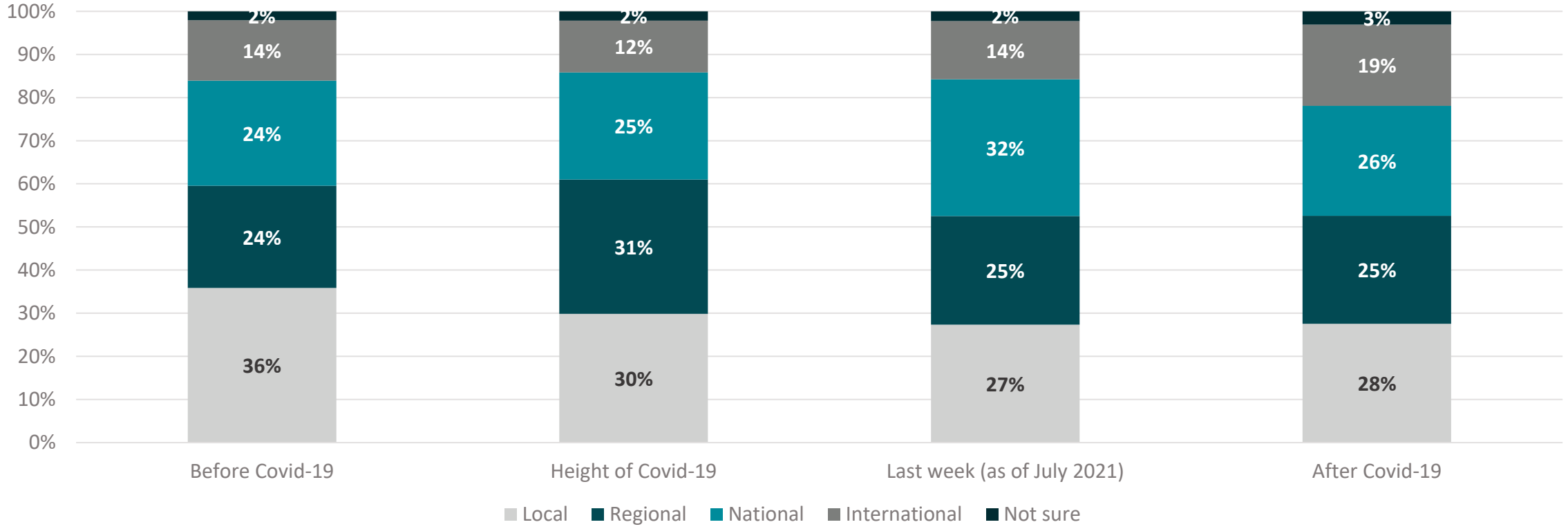
Key reasons for making the change in digital delivery of services permanent across organisations.



Source: Opinium survey, Cebr analysis

Digitalisation has helped organisations to reach a wider spectrum of customers

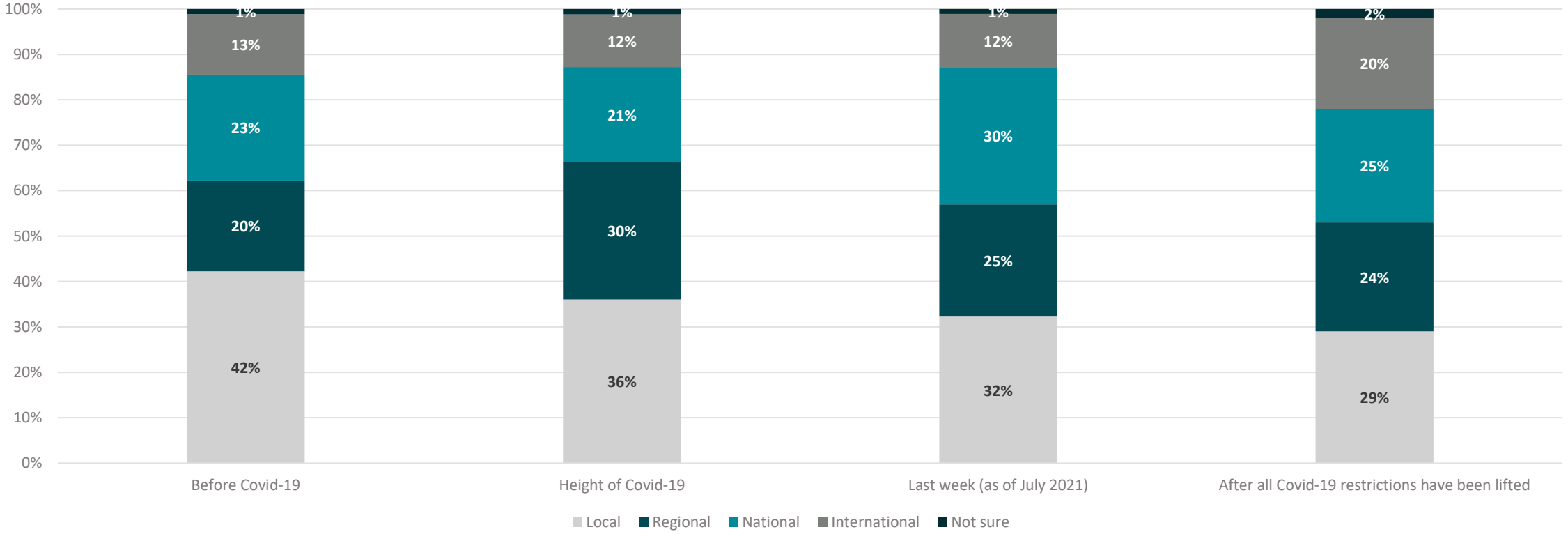
Customers' location before Covid-19, at the height of Covid-19, last week (as of July 2021) and after all Covid-19 related restrictions have been lifted.



Source: Opinium survey, Cebr analysis

The retail sector expects to have a more balanced customers mix after all Covid-19 restrictions have been lifted

Retail sector customers' location before Covid-19, at the height of Covid-19, last week (as of July 2021) and after all Covid-19 related restrictions have been lifted.

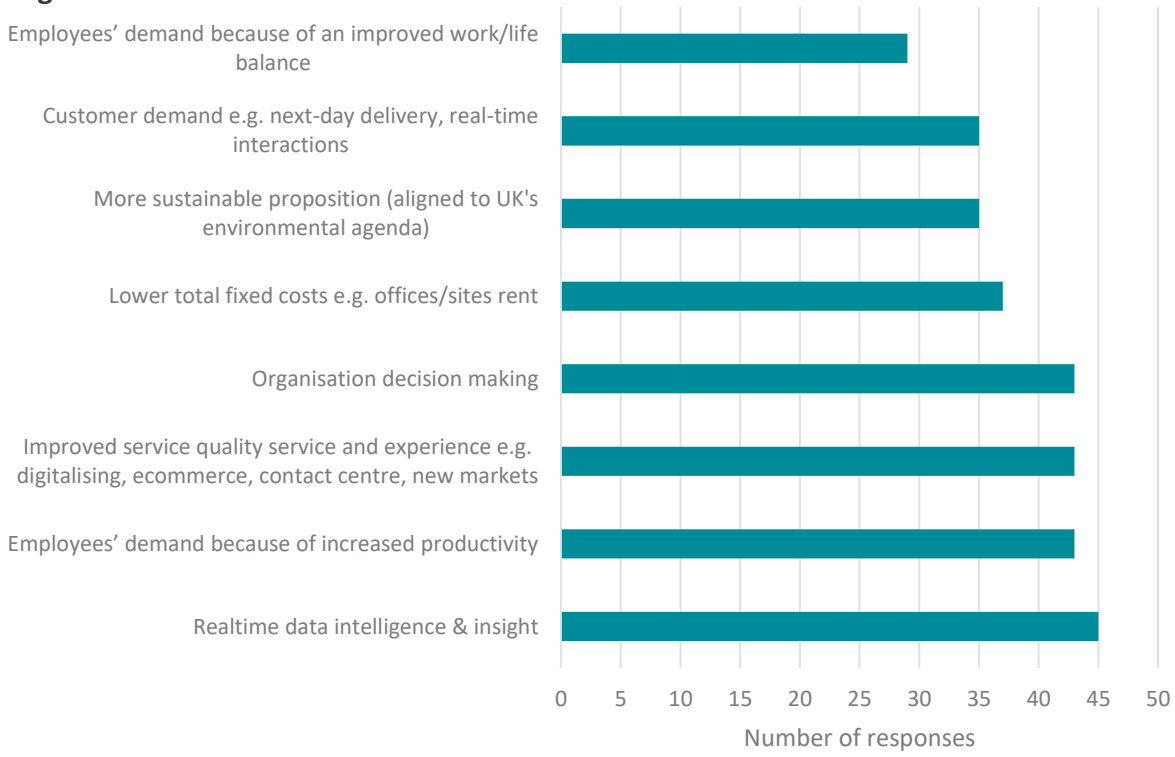


Source: Opinium survey, Cebr analysis

Whilst the use of big data has the potential to offer significant benefits to organisations, it requires staff training and buy-in

- Although to a lesser extent than other technological transformations, the use of big data has evolved across organisations.
- Of those organisations that report a change in this area:
  - A large majority (72%) of decision-makers believe that changes in the use of big data will be made permanent by their organisation;
  - 14% of respondents do not think that changes will be made permanent; and
  - 13% of respondents are unsure about the evolution of the use of big data in their organisation.
- Reasons for making these changes permanent are relatively spread out. As additional interpretation, changes in this area are complex and costly to implement. Once they have been successfully adopted, an organisation has a strong incentive to keep them in place.
- Staff preference for older practices and the required learning curve to a meaningful utilisation of big data might induce some organisations to remove changes in this area.

Key reasons for making the change in the use of big data permanent across organisations.

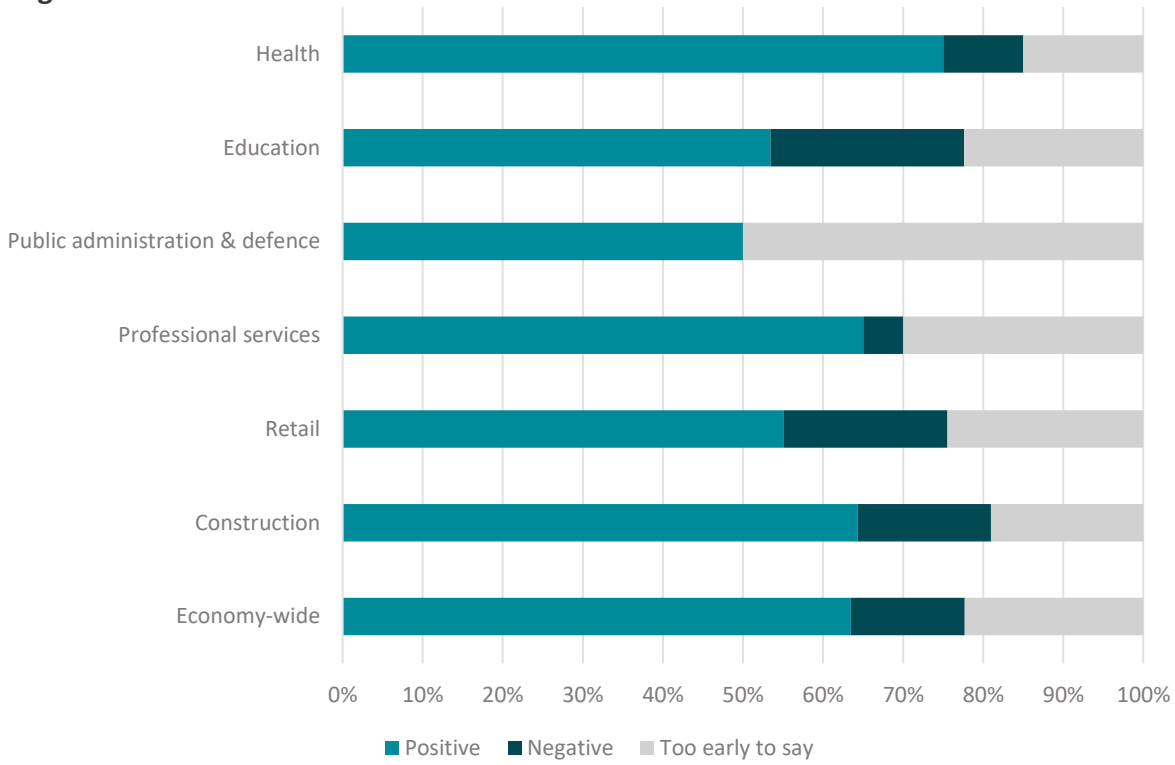


Source: Opinium survey, Cebr analysis

Looking forward, organisations believe that the technological transformation brought in by Covid-19 will have a positive impact

- Covid-19 has accelerated technological adoption across UK organisations and this will have an impact on the future. In addition to the economic benefits estimated through Cebr's CADT model, we are interested in decision-makers' views.
- Looking into a 2 years horizon, decision-makers think that Covid-19 will have significantly changed the way their organisation works (on average 6.5 on a scale 0-10).
- Amongst the sectors of interest, those foreseeing a biggest change are health and education. The health sector is also the most confident about the positive impact of these changes.
- Overall, the impact of changes brought by Covid-19 in the way organisations work is found to be positive across the whole economy, as reported by 63% of respondents.
- Public administration & defence, followed by retail and education, are slightly less confident.

How positive/negative the impact of changes brought by Covid-19 in the way organisations work are.



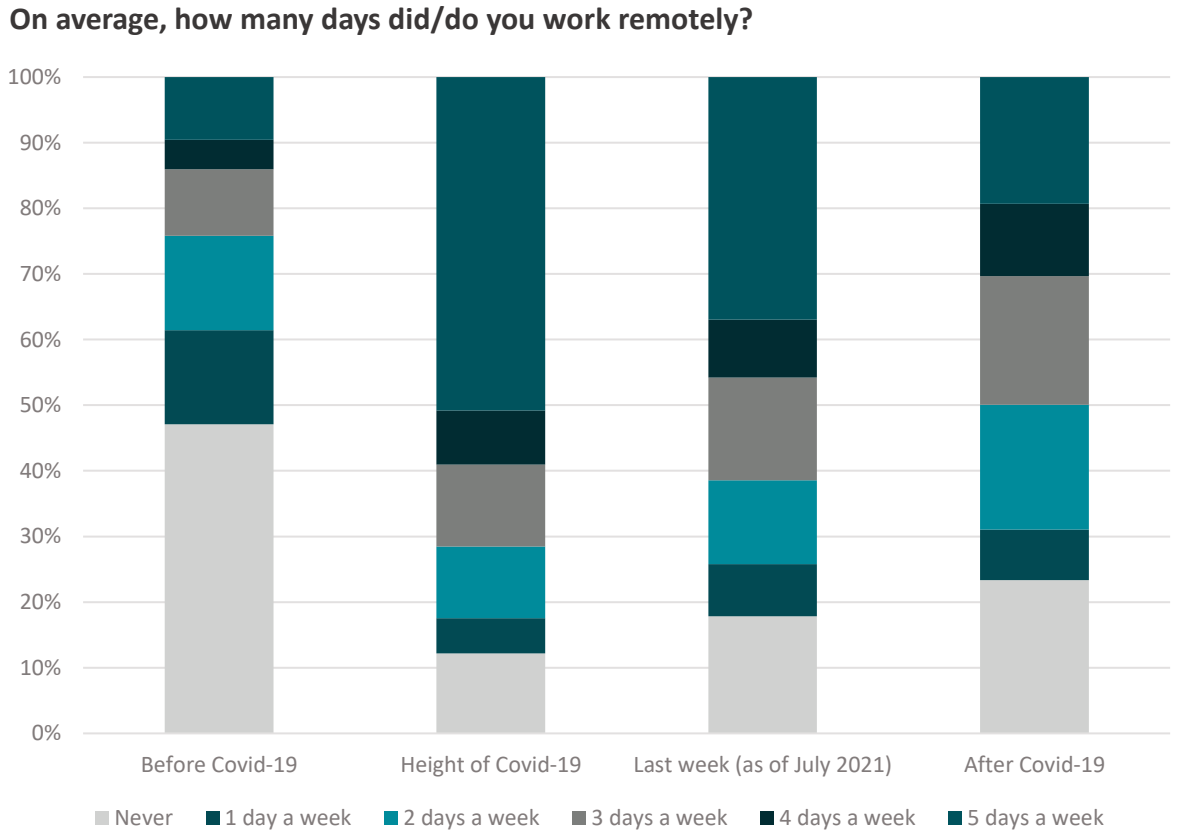
Source: Opinium survey, Cebr analysis

Module 3: Employees

2021

Employees who can do their job remotely would like to work remotely an average of 3 days a week

- Before Covid-19, almost 50% of employees were never working remotely, while only 10% were always working remotely
- The situation was reversed **during Covid, when only 12% were never working remotely and 51% were working from home everyday.**
- Employees believe that working remotely will be more accessible in the future and after Covid-19 only 23% of people think they will never work remotely; approximately half of what it was pre-Covid-19. Going forward, employees expect to work remotely 2.5 days per week.
- **Employees were separately asked how often they would work remotely if they had the choice. They report an average of 2.8 days/week.** However as seen in Module 2, decision-makers expect employees to work remotely about half of the week (2.3 days).
- **Employees working in professional services experienced the most substantial change** moving from 1 day of remote working before Covid-19 to almost full remote working at the height of Covid-19. Going forward, they expect to be the sector where remote working is more common, with 3 days/week worked remotely.
- While there is still a small disparity in employer/employee expectations for the extent of future remote working, these are relatively closely aligned and suggest a future arrangement very different to pre-Covid.
- **A future where the proportion of time spent working remotely aligns better with employees' preference could lead to increased employees' satisfaction and engagement with their organisations, improving morale without likely affecting hours worked.**

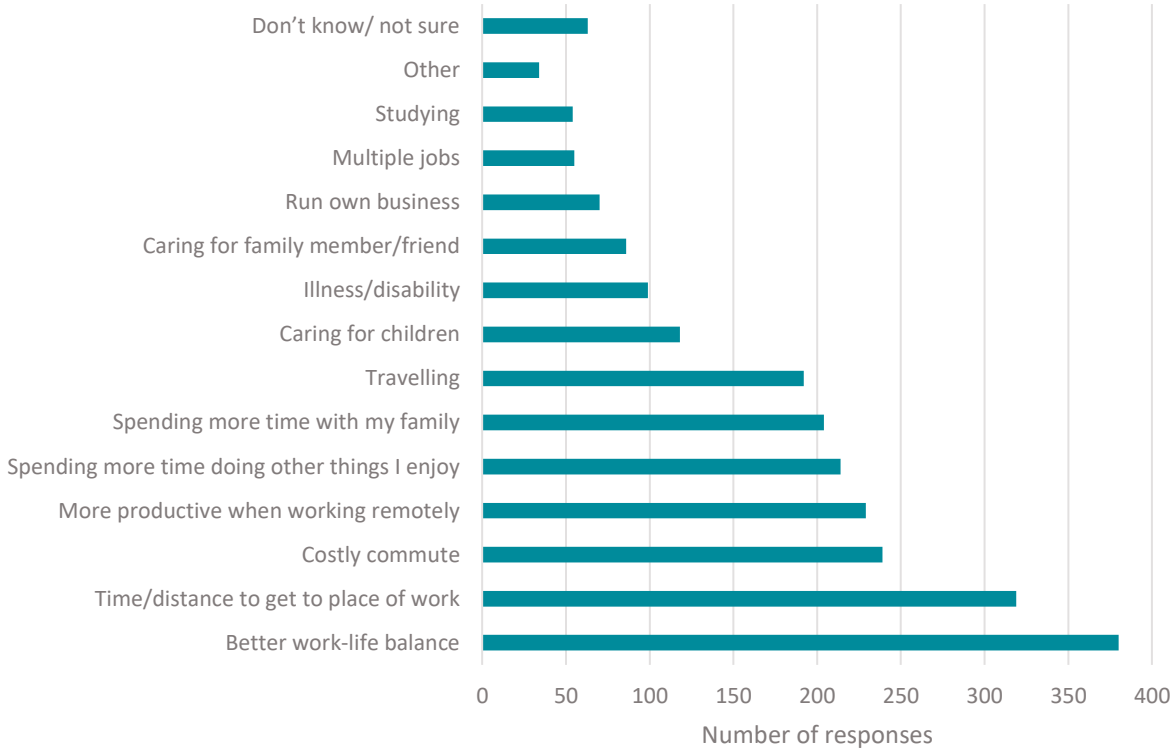


Source: Opinium survey, Cebr analysis

Remote working improves employees' work-life balance

- The cost of commuting, in terms of monetary value and time, is the most frequently mentioned reason for wanting to work remotely, followed by improved work-life balance
- Employees feel that working remotely offer them several advantages in both the professional and the personal sphere.
- **Just below one third (29%) of employees feel more productive when working remotely.** This could be explained by a variety of factors, such as lesser distractions, more independence and lack of commute.
- **27% feel that working remotely offers them greater opportunities to spend time doing the activities that they prefer**, including relaxing, caring for others and exercising.
- Finally, remote working plays an important role as inclusive policy for employees with different needs, and in particular for people with disabilities, parents with dependent children and people with caring responsibilities. More detailed analysis on the economic benefits associated with the inclusiveness of remote working are presented in the next slides.

Main reasons for employees to wanting to work remotely.

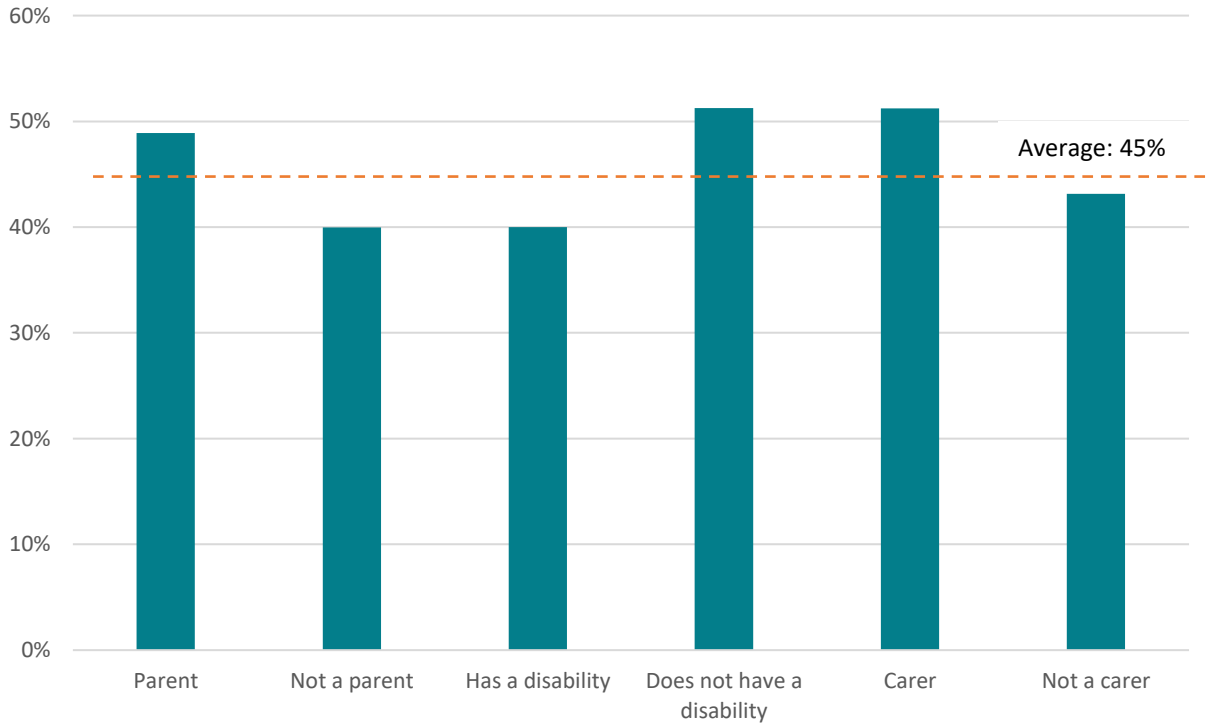


Source: Opinium survey, Cebr analysis

Flexible working can be a socially inclusive policy, supporting employment opportunities for otherwise 'locked out' individuals

- Across our entire sample, 45% of respondents who are currently out of a job, indicated that they would be more inclined to take a job with remote working.
- Within this, we further focus on three groups, for whom it is hypothesised that remote working may have disproportionate benefits, in terms of labour market access. These are parents, those with disabilities and carers. For differing reasons, each may find it difficult to commute to work, or spend an entire day away from home.
- Our survey results show that **for parents and carers, flexible working can bring greater than average labour market opportunities**, although this is not the case for those with disabilities.
- Across the UK, these results imply that flexible working could lead **3.8 million currently out of work individuals to be more inclined to take a job with remote working.**[1]
- **1.2 million of these are parents, 1.5 million have a disability and 0.5 million are carers.**

Share of currently out of work respondents who would be more inclined to take a job with remote working.



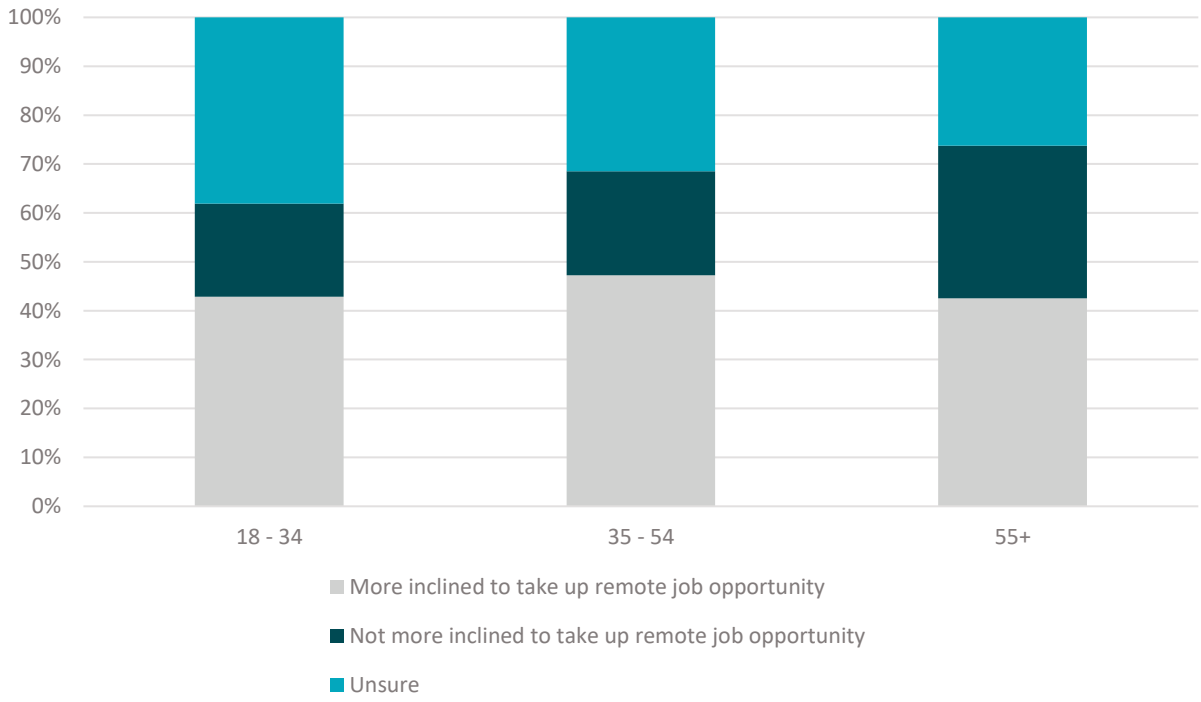
Source: Opinium survey, Cebr analysis

[1] Note that this does not automatically imply that all 3.8 million would find a job – only that these individuals would be more inclined to take one if offered. Other factors may also be behind why these individuals are currently out of work, including a lack of employment opportunities, or a mismatch of employee skills/employer requirements.

By age, those between 35 and 54 are most likely to benefit

- Of those who are out of work, **individuals between the ages of 35 and 54 are most inclined to take up a job with remote remoting.** 47% of those in this age bracket are more inclined to take up a job offering remote working, compared to 43% for both the 18-34 and 55+ age brackets.
- Considering also the previous slide, this is likely driven by the concentration of parents in this age bracket for whom remote working is advantageous.
- 18-34 year-olds who are out of work are most unsure about their views. As will be seen, this may well be driven by concerns about career development, in the absence of in-person interactions.
- **Across all age brackets, the most selected answer is that out of work individuals are more inclined to take up a remote opportunity.**

People not in employment more inclined to take up a job offering remote working, by age group.

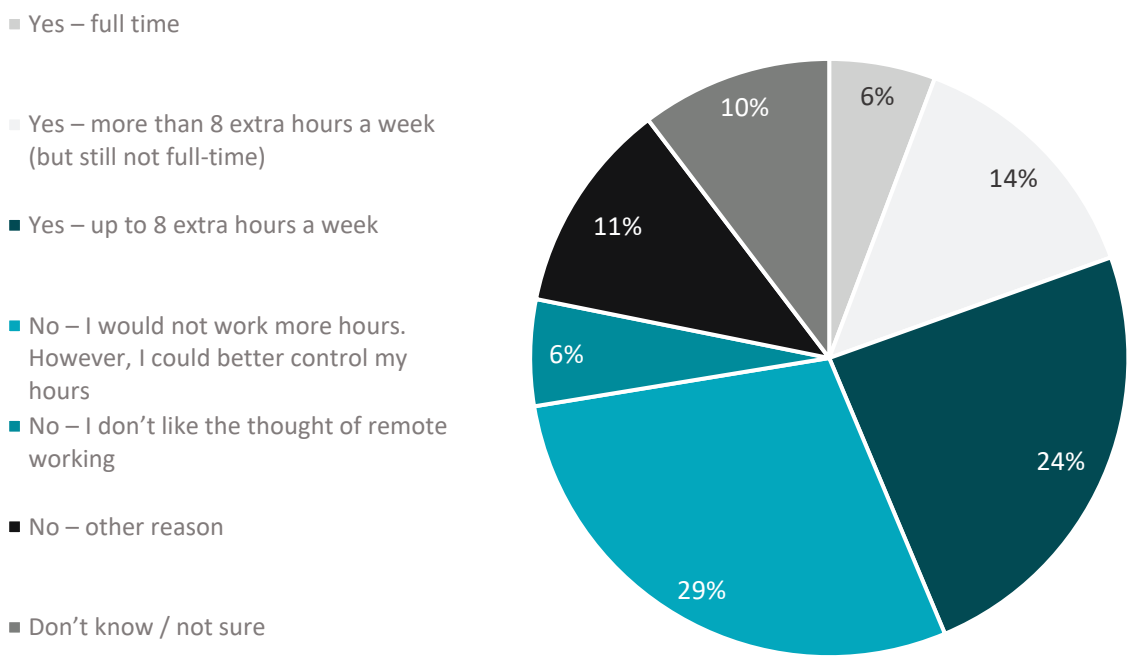


Source: Opinium survey, Cebr analysis

Nearly half of the UK's 8.6 million part-time workers would increase their hours if they could primarily work remotely

- Of the UK's total workforce, just over a quarter (26%, or 8.6 million total employees) work part-time.
- Of these, our survey responses indicate that 43% would choose to increase their hours, if they could work remotely.
- Based on the average increase in hours worked implied by the figure on the right, **on average part-time workers would choose to increase their hours by 5.1 hours per week.**
- For parents, this figure is 5.3 hours, those with a disability 5.0 hours and carers 6.8 hours.
- Considering also the share of employees who can feasibly work remotely, this could lead to an increase in hours worked of 1.27 billion hours annually. This is **equivalent to an extra 631,000 full-time employees entering the workforce.**

Preferences of part-time employees to change their hours, if presented with a flexible working alternative.

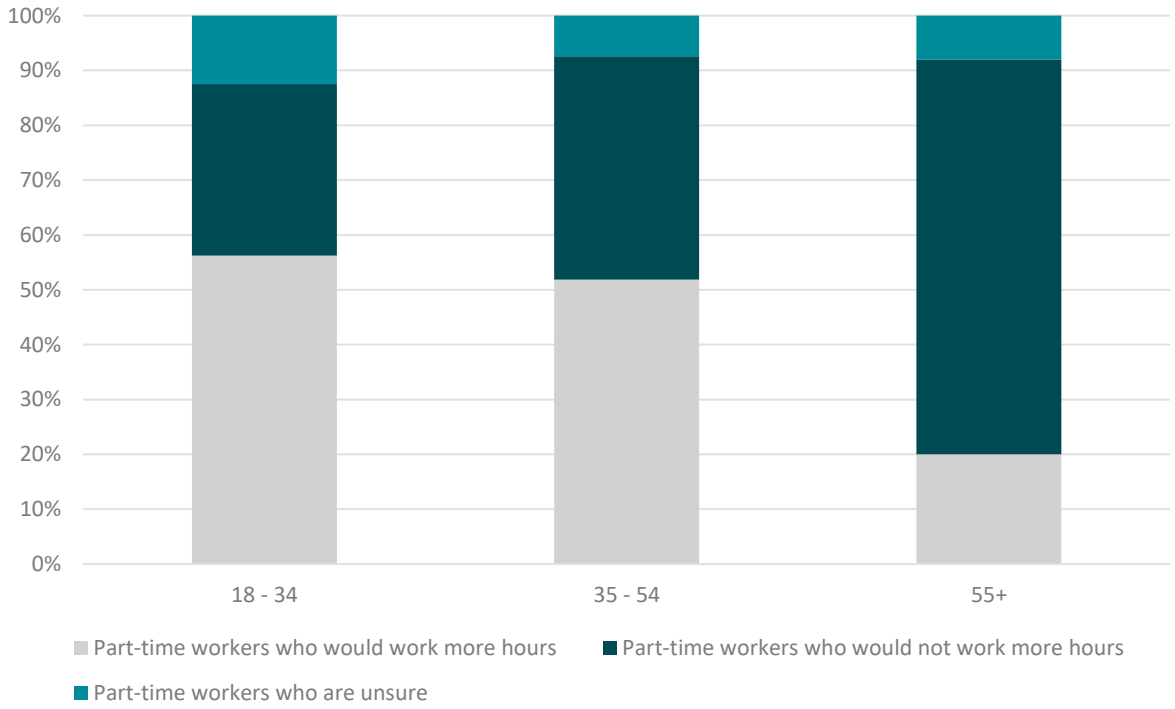


Source: Opinium survey, Cebr analysis

By age group, younger part-time workers are significantly more inclined to work more hours if working partly remotely

- When breaking down the part-time worker survey respondents by age, the sample sizes do get smaller. However given the very clear trend present in our findings, **it is clear that younger part-time workers have a greater preference to increase their hours if presented with a flexible working alternative.**
- Of those aged between 18 and 34, 56% of respondents stated they would increase their hours if presented with a flexible alternative. This falls slightly to 52% for the 35-54 age bracket and significantly for those over 55 (20%).
- Considering this, and the prior slide presenting similar analysis for out of work individuals, the evidence suggests that **flexible working is more beneficial for unemployed, or underemployed, younger and middle-aged employees.**

Preferences of part-time employees to work more hours if presented with a flexible working alternative, by age group.

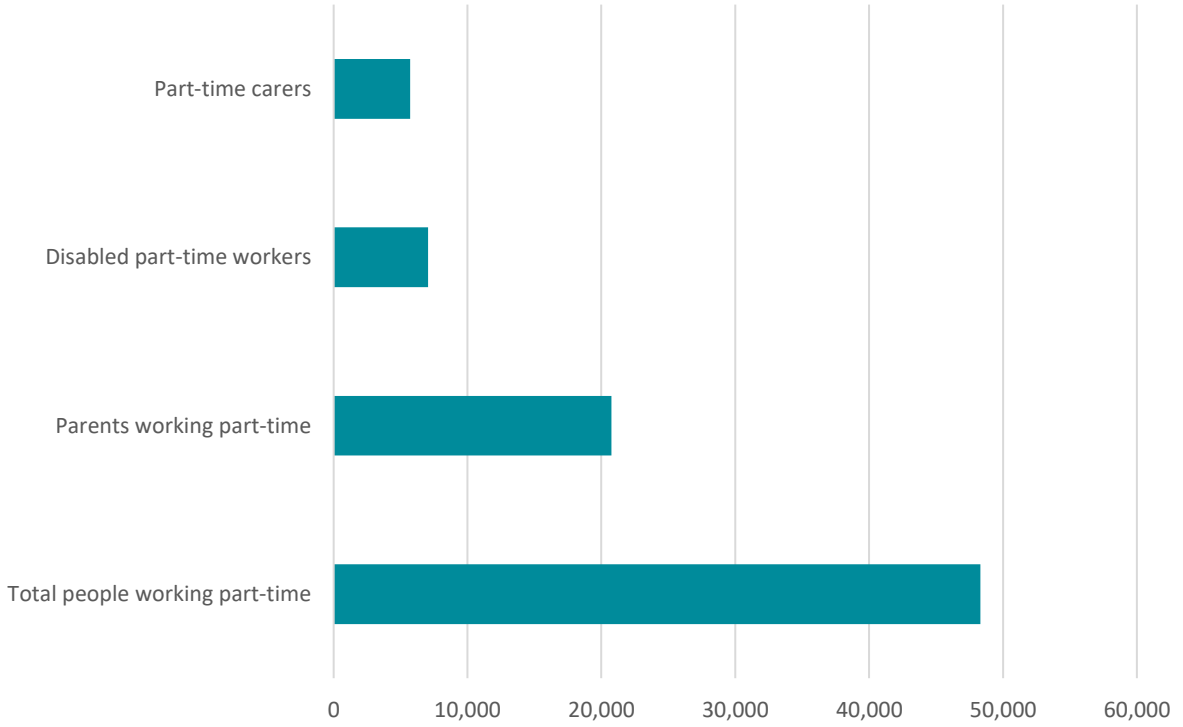


Source: Opinium survey, Cebr analysis

This increased part-time work could boost UK GDP by 2.4%

- Considering the potential increase in hours worked by part-time workers if offered a remote working solution, alongside average output per hour worked across the economy[1], we can estimate the additional GVA supported as a result of this increase.
- Across the economy, a potential annual boost to GDP of £48.3 bn is possible – equivalent to 2.4% of 2019 GDP.
- Of this, 43% (20.8bn) is estimated to be possible from part-time parents increasing their hours, 15% (£7.1bn) from disabled workers and 12% (£5.7bn) from part-time carers.

Increase in GVA attributable to increased hours worked by part-time workers, £m, 2019 prices.



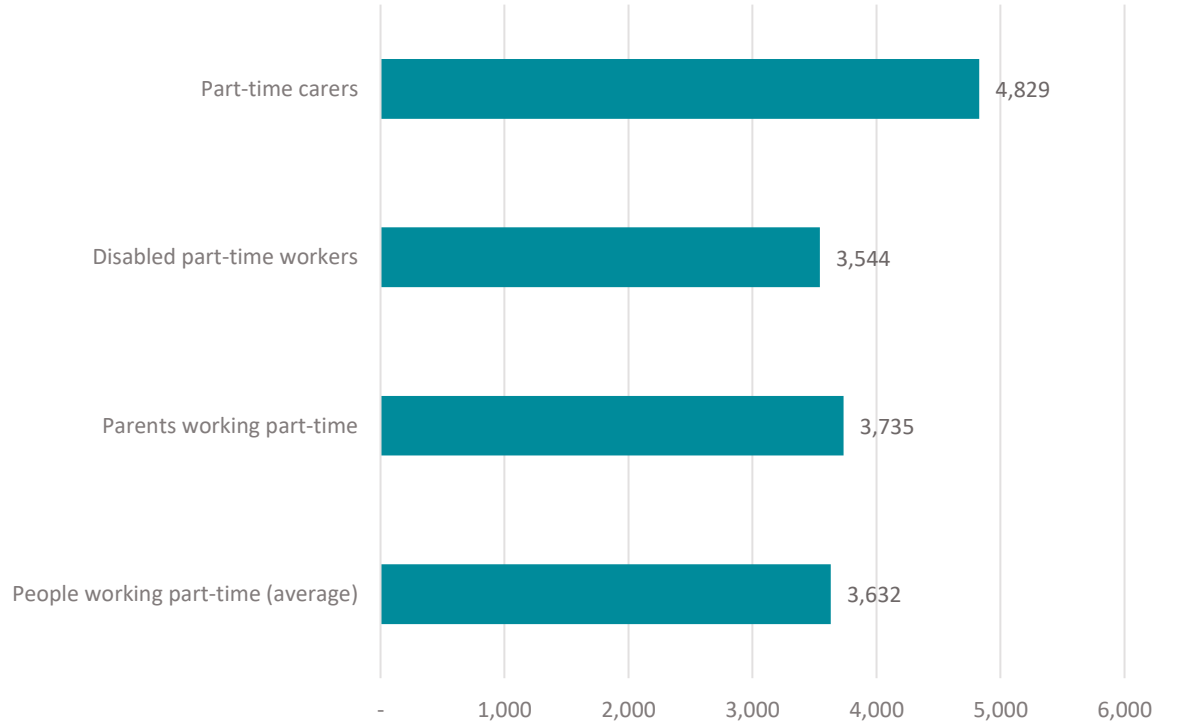
Source: Opinium survey, ONS, Cebr analysis

[1] Here, we considered whether it was more appropriate to use the average output per worker for solely part-time workers, or the average across the economy. While part-time workers do disproportionately work in lower productivity sectors such as retail and hospitality, it is unlikely to be these employees who can feasibly work remotely. We have therefore assumed that the part-time workers who can feasibly work remotely are more likely to be in industries more representative of the wider economy, than solely those in which part-time workers as a collective work.

Flexible working could enable part-time workers to earn £3.6k/year of extra-income

- Considering the potential increase in hours worked by part-time workers if offered a remote working solution, alongside median hourly earning, we can estimate the extra income that part-time workers could earn.
- **Part-time workers that are informal carers would benefit the most from a remote working solution** as they could work up to 7 additional hours per week and earn an additional £4.8k per year.

Increase in part-time workers' income enabled by flexible working, £, 2019 prices.

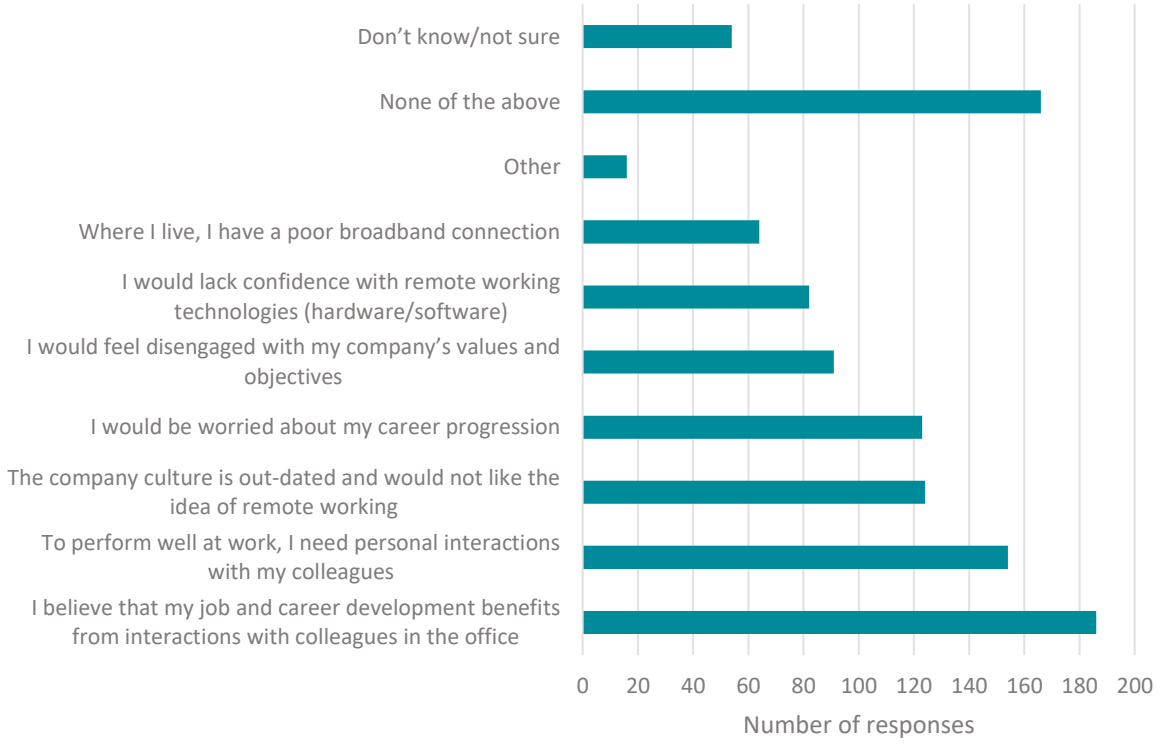


Source: Opinium survey, ONS, Cebr analysis

Professional and personal benefits of in-person interactions at work is the biggest barrier to remote working

- We asked all employees who could possibly work remotely to select up to three barriers to working from home.
- Individuals benefitting from in-person interactions with colleagues (i.e. better knowledge sharing and ability to work in team) is the most popular answer amongst respondents (27%). **Personal interactions not only improve team efficiencies and spread of information, they also foster individual performance for some people.**
- Importantly, 24% of workers do not see any barriers amongst those identified in the survey.

Barriers to remote working perceived by employees.

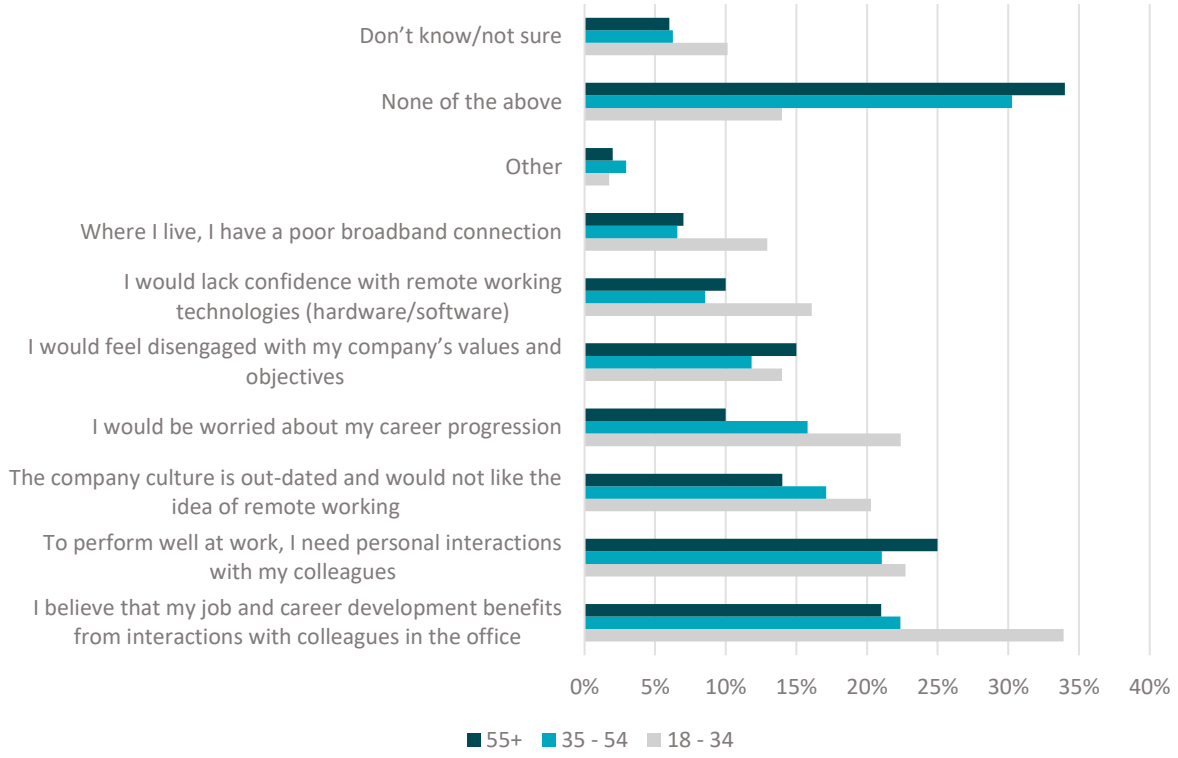


Source: Opinium survey, Cebr analysis

Younger people tend to perceive more barriers to remote working, with career development the most significant

- While we previously presented evidence that younger part-time workers would likely benefit from a shift to more remote working, collectively **those in the 18-34 age bracket report the most significant perceived barriers.**
- Only 14% of young remote workers report no perceived barriers, compared to 30% and 34% for 35-54 and 55+ respectively. The most significant perceived barrier in within the 18-34 bracket is job and career development suffering from a lack of in-person interactions.
- Significantly more younger workers also report concerns over career progression, relative to the two older groups. Intuitively this makes sense, with **younger workers having the most future career development still at stake.** Alleviating this concern and ensuring this perceived barrier does not become a reality, will be key for employers moving forwards.
- While it may be hypothesised that older non-digital native workers may disproportionately struggle with increased technological utilisation, this is interestingly not borne out in our data. Just 10% of 55+ employees report this as a potential barrier, compared to 16% of 18-34 employees and an average of 12% across the entire sample.

Barriers to remote working perceived by employees, by age group.



Source: Opinium survey, Cebr analysis

The impacts of remote working are considered largely positive by employees

- Overall, the impact of remote working is considered largely positive by workers, as **both professional and personal performances are expected to benefit from this working policy.**
- Amongst the different metrics, **work-life balance and personal finances are the most positively impacted by remote working.** The lack of commute leads to significant benefits, contributing to improved personal finances and work-life balance.
- Whilst people's professional and personal life is benefitting from remote working, almost 30% of employees fear a negative impact on professional development. Employers understanding this concern and considering solutions will be important in the future attractiveness of remote working.

Share of people with at least partial access to remote working, reporting positive/negative impacts on various metrics.

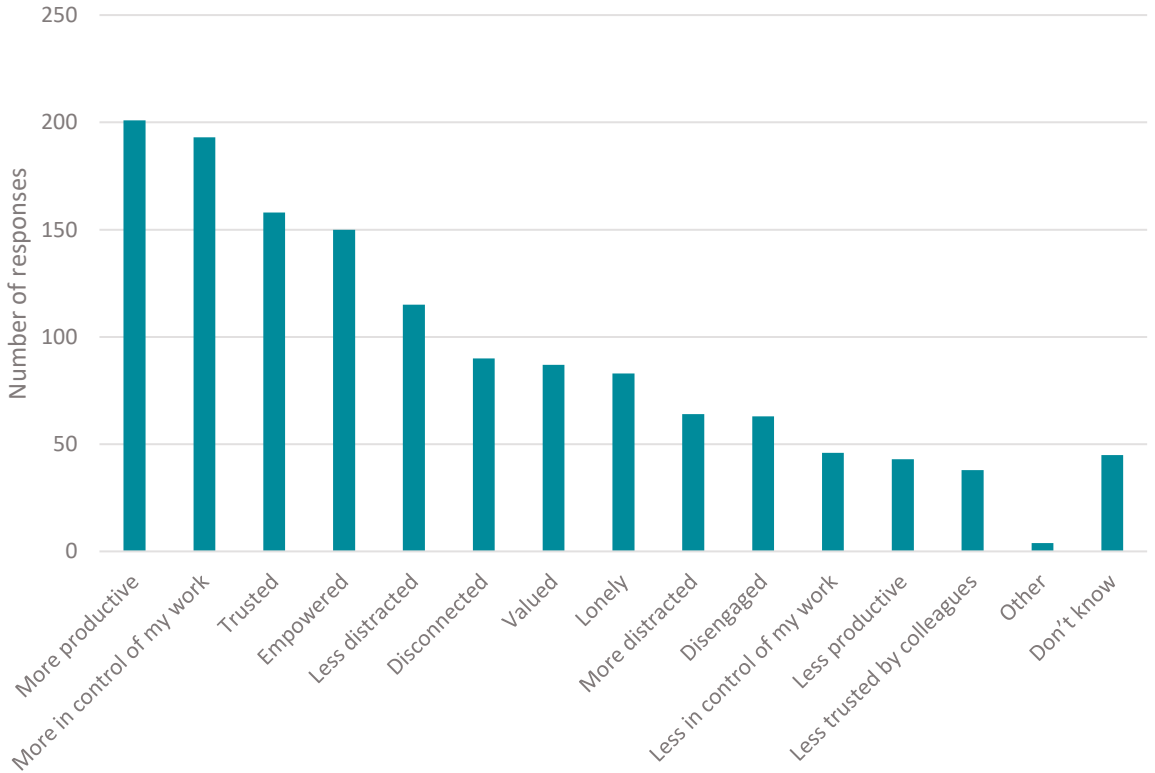


Source: Opinium survey, Cebr analysis

Employees' feelings towards remote working are largely positive

- Workers with at least partial access to remote working were asked how they feel about remote working, presenting them with a list of adjectives. **Positive feelings largely outweigh negative feelings.**
- Of the most significant results:
  - 36% of employees feel more productive whilst only 7% fell less so.
  - 34% of employees feel more in control compared to 8% feeling less in control.
  - 26% and 27% of employees feel more trusted and empowered respectively.
  - Employees feel more focused at home on the whole with 20% feeling less distracted and 11% feeling more distracted.
  - The most negative feeling towards working from home is feeling disconnected and lonely with 16% and 15% responding feeling this way respectively.

Employees' feelings towards remote working.

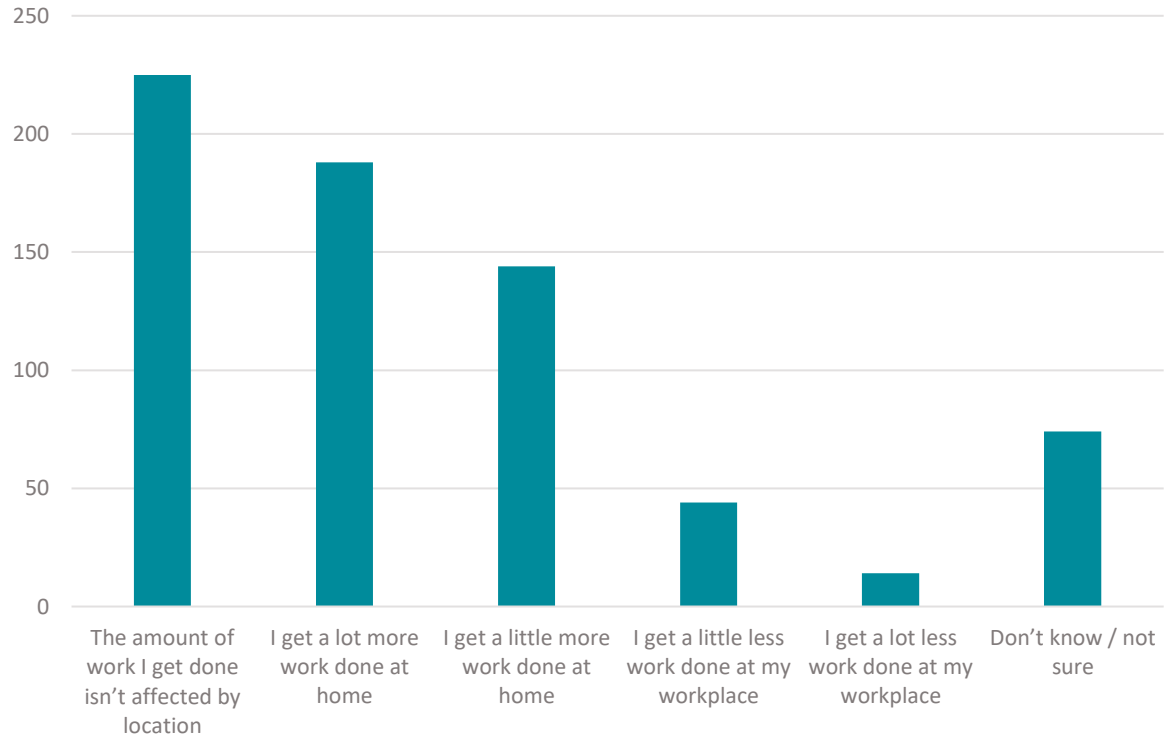


Source: Opinium survey, Cebr analysis

Remote working policies could play a significant role in addressing UK's subdued productivity

- As increased productivity is a popular theme when discussing the benefits of remote working, employees were asked to quantify the amount of additional work done, if any, in a day where they work remotely as compared to a day in the office.
- Just under half (47%) of employees who could feasibly do their job remotely think that they can get some or a lot more done when working remotely. These employees do on average 2 hours of additional work per day.
- Whilst these results need to be interpreted cautiously as they are self-reported by employees and, as such, could embed an element of optimism bias, evidence points out to large potential gains from remote working.
- Economic benefits from increased productivity driven by flexible working are captured by the CADT model. While we would certainly expect labour productivity (output/worker) to increase, quantifying the extent to which increases in output are a function of an increased labour stock or more productive workers is challenging.
- Classical economic theory suggests that at least some share of the increased output will be supported by increased productivity, but the exact value is as much as function of broader social policies (e.g. retirement ages and net migration).
- This is a particularly important issue given broader macroeconomic contexts. Unlike both their own productivity pre-financial crisis and the experience of other major developed economies since, the UK's productivity (as measured by output per worker) has been relatively flat since 2008. Policies which 'unlock' productivity growth are therefore of particular value.

Do you believe that you get more work done than you would at your workplace or your home?



Source: Opinium survey, Cebr analysis

Respondents resoundingly confirm the large and wide benefits of remote working

- Workers with at least partial access to remote working were asked whether they agree or not with a series of statements outlining the benefits of remote working.
- Respondents resoundingly agree with all the statements, confirming the large and wide benefits of remote working already outlined in this report.
- Employees confirm that lower costs and better work-life balance are at the forefront of the benefits generated by remote working.
- Another benefits strongly supported by respondents is the work flexibility created by remote working. Individuals feel enabled to work to the timeframe and pace that best suit them, enabling them to have space for personal commitments.
- The least supported statement is about remote working as enabler of collaboration with colleagues and customers. The need of interactions comes out again as a barrier to remote working.

Statements about remote working.

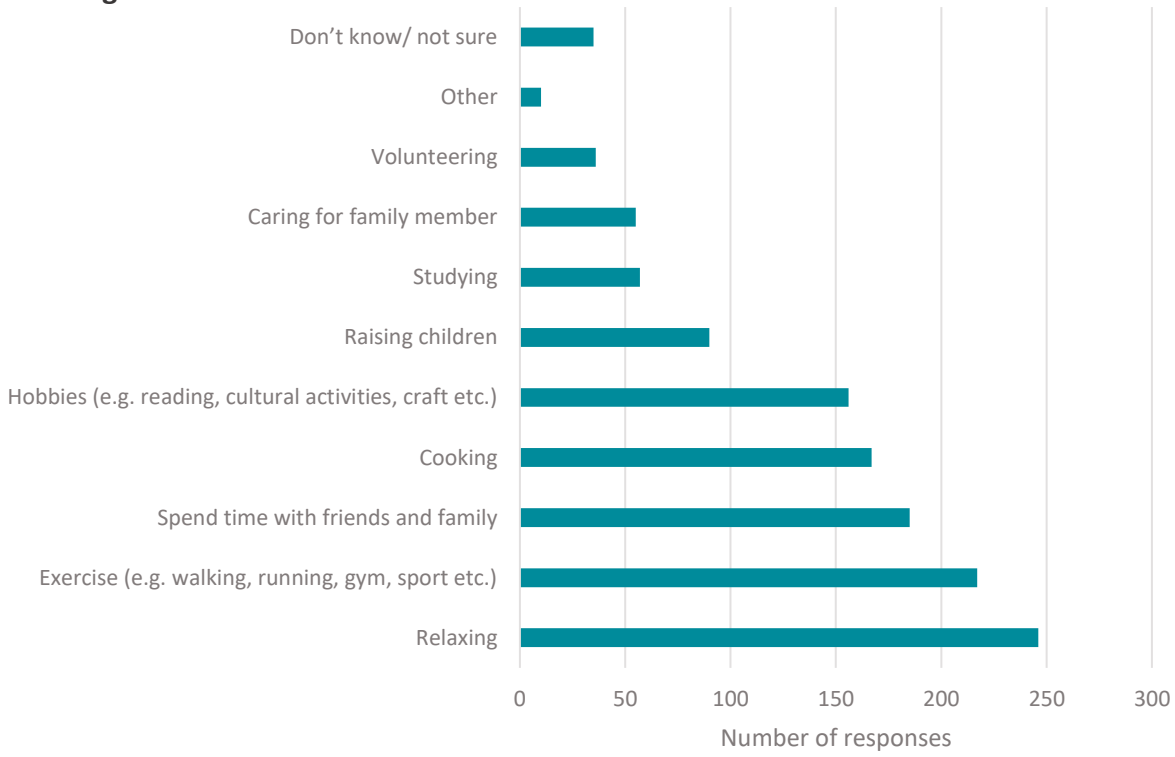


Source: Opinium survey, Cebr analysis

Workers would get an average of 2 hours a day of additional leisure time thanks to the possibility to work remotely

- The additional available time to do the things that people enjoy, such as staying with family and travelling, came out as one of the main reasons for wanting to work remotely.
- On average, **by working remotely workers save an additional 2 hours per day.** This can be interpreted as a combination of being more productive, time saved through not travelling into work and less distractions.
- On how employees use or would use this additional time:
  - Relaxing (46%), which is the most common answer, can drive significant mental and physical health benefits to individuals;
  - Exercising is the next most popular choice with 41% of responses. The potential impact of more time dedicated to exercising on individual physical health and on the UK public health system are assessed in Module 4.
  - Spending time with family, pursuing hobbies and cooking are other preferred leisure activities.

Number of respondents reporting they would choose particular activities if remote working allows more leisure time.

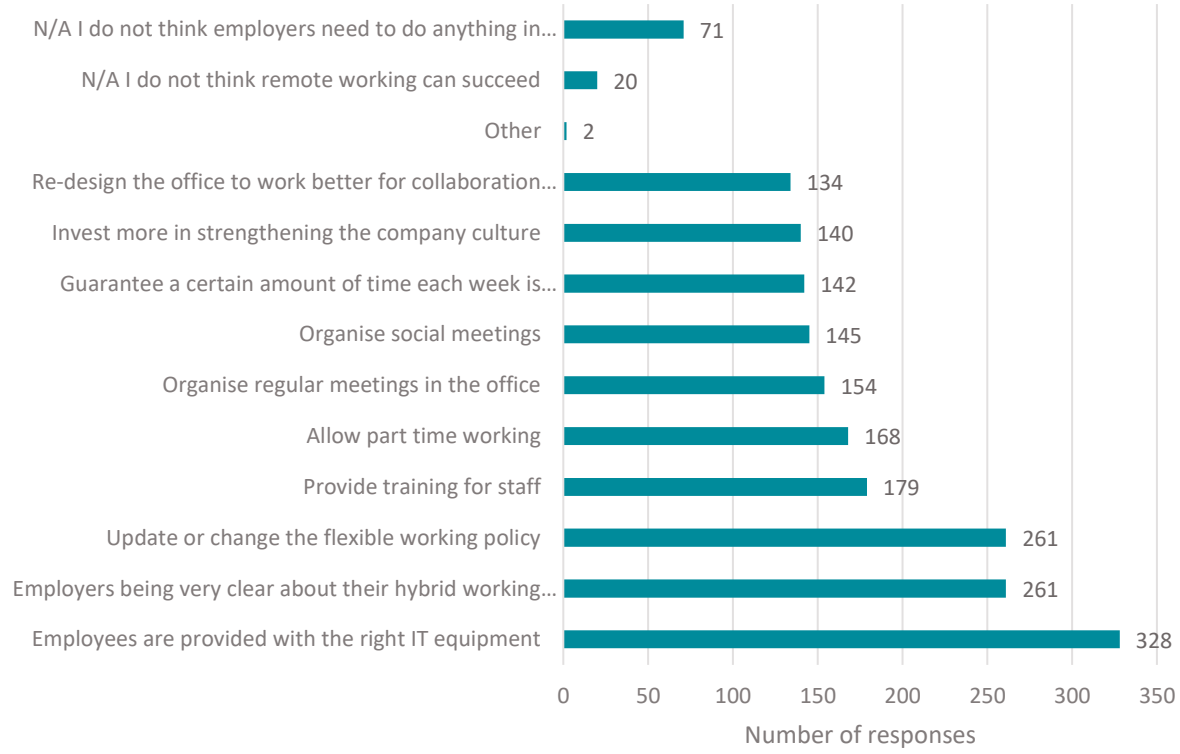


Source: Opinium survey, Cebr analysis

Long-term success of flexible working much depends on employers investing in IT equipment and making policies clear

- All those capable of working remotely were asked what employers should do to make flexible working a sustainable long-term option for organisations.
- **The most popular response (46%) is for organisations to provide staff with the right IT equipment to work from home.** As observed in Module 2, decision-makers mention the cost of equipment as a significant barrier for organisations to introduce flexible working policies.
- An effort towards more clear and up-to-date flexible working policies across organisation is also recommended by employees.
- To conclude, employees are more satisfied working remotely. **The success of remote working is based on employers providing the right IT equipment (allowing the realisation of potential productivity gains) and clearly outlining the organisations' attitude towards flexible working.**
- It is notable that the cost of IT equipment is also expressed as a significant barrier to remote working for employers. Present in both the decision-makers' and employees' survey, this represents a significant risk factor, which could undermine the realisation of the wide-ranging benefits assessed throughout this report.

What employers should do to ensure flexible working can succeed permanently.



Source: Opinium survey, Cebr analysis

Module 4: Society

2021

Reduced commuting could support significant environmental benefits

- With **65% of commuting trips taking place by car or** taxi in 2019, travelling an **estimated 56 billion miles**, commuting has significant environmental costs. Only 15% of trips take place by transport modes with no environmental footprint (walking or cycling).
- However **61% of employees believe their job could at least partially be done remotely**. This is equivalent to almost 20 million people across the UK.
- If these individuals worked even one extra day per week remotely, this would save over 1.2 billion car/taxi trips annually, and 382 million combined bus and rail/light rail trips.
- Considering the net effect across all transport modes, this would **reduce emission by 3.1 million tonnes of CO2e**. This would be equivalent to a 0.7% reduction on the UK's total greenhouse gas emissions in 2019.
- Valued using recommended carbon values from the DfT's transport analysis guidance (TAG), **this reduction in emissions would be worth £219m per annum.** These values reflect the costs required to limit global temperature increases to 2 degrees centigrade above pre-industrial levels

Environmental impact of reduced commuting, if potential remote workers worked one additional day per week from home.

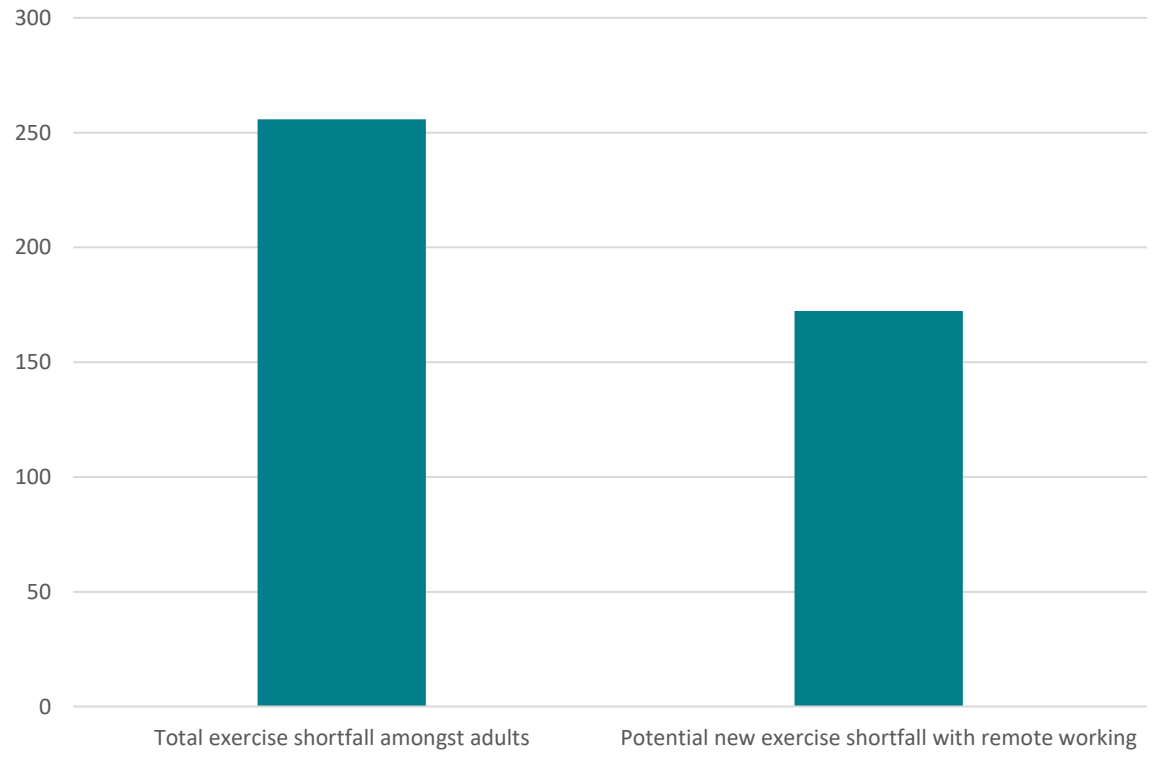
	Reduction in commuting trips (million)	Reduction in distance travelled (million miles)	Reduction in emissions (million tCO2e)	Value of reduced emissions (£m)
Car	1,211	10,424	2.60	181
Taxi	16	79	0.02	1
Motorcycle	17	136	0.02	3
Bus	153	1,007	0.17	12
Rail/Light rail	229	5,329	0.30	21
Walk	211	143	0.00	0
Cycle	68	223	0.00	0
Total	1,905	17,340	3.11	219

Source: Opinium survey, DfT, BEIS, ORR, Cebr analysis

With flexible working, 41% of people would use additional leisure time for exercise, reducing national physical inactivity levels

- The UK government advises that adults do at least 150 minutes of physical activity, but as of 2018/19, 37% (nearly 20 million people) do not meet this target. This creates an 'exercise shortfall' of 256 million hours,
- However with flexible working, **41% of people estimate that they would use some of their additional time on exercise.**
- Considering the other activities that were also chosen and therefore the likely share of time on exercise, **flexible working could lead to 21 more net minutes of exercise per day**, for the 19.8 million people who can do at least part of their job remotely. This considers the increase in physical activity supported by additional leisure time, netted off against the reduction in active travel while commuting.
- If these individuals worked even one day per week remotely more, assuming that the additional exercise is distributed evenly amongst those who currently do and do not exercise sufficiently[1],this **would reduce the UK's level of adult physical inactivity by 84 million hours** (33%).

Annual physical activity shortfall amongst UK adults, million hours, 2019.



Source: Opinium survey, Sport England, ONS, Cebr analysis

[1] Ideally, we would have data on current exercise levels, to ascertain the extent to which those who say they would exercise more, are those who do not currently exercise sufficiently. It is possible that those who already are keen exercisers are disproportionately captured, within the 41% who say they would exercise more if working remotely. Alternatively, it may be the case that those who do not exercise sufficiently have a greater incentive to exercise more and are more likely to choose to undertake additional exercise. This would be an interesting area for future exploration

This reduction in physical inactivity can bring significant health benefits

- Physical inactivity is one of the most severe risk factors to people's health and wellbeing. It is associated with several of the most severe non-communicable diseases (including CHD, Type II diabetes, breast cancer and colorectal cancer) and via these, in 2015 was estimated to cost the European economy over €80 billion per year.
- A potential 33% reduction in physical inactivity, can have significant impacts on health, preventing 79,000 cases of CHD, 192,000 of Type II diabetes, and a combined 20,000 of breast and colorectal cancer.
- Based on estimated 2019 NHS treatment costs, this would save the NHS a combined £1.0 billion per annum.

Benefits associated with a reduction in physical inactivity, 2019.

	Coronary Heart Disease	Type II diabetes	Breast cancer	Colorectal cancer	All-cause mortality
Cases	2,300,000	4,527,555	208,944	127,675	529,553
Cases attributable to inactivity	241,500	588,582	37,401	23,875	89,494
Estimated reduction in cases through a 33% reduction in inactivity	78,852	192,178	12,212	7,796	29,221
NHS current spend on ailment (£ million)	12,994	8,538	1,831	1,588	0
Savings to NHS given 33% reduction in inactivity (£ million)	445	362	107	97	0

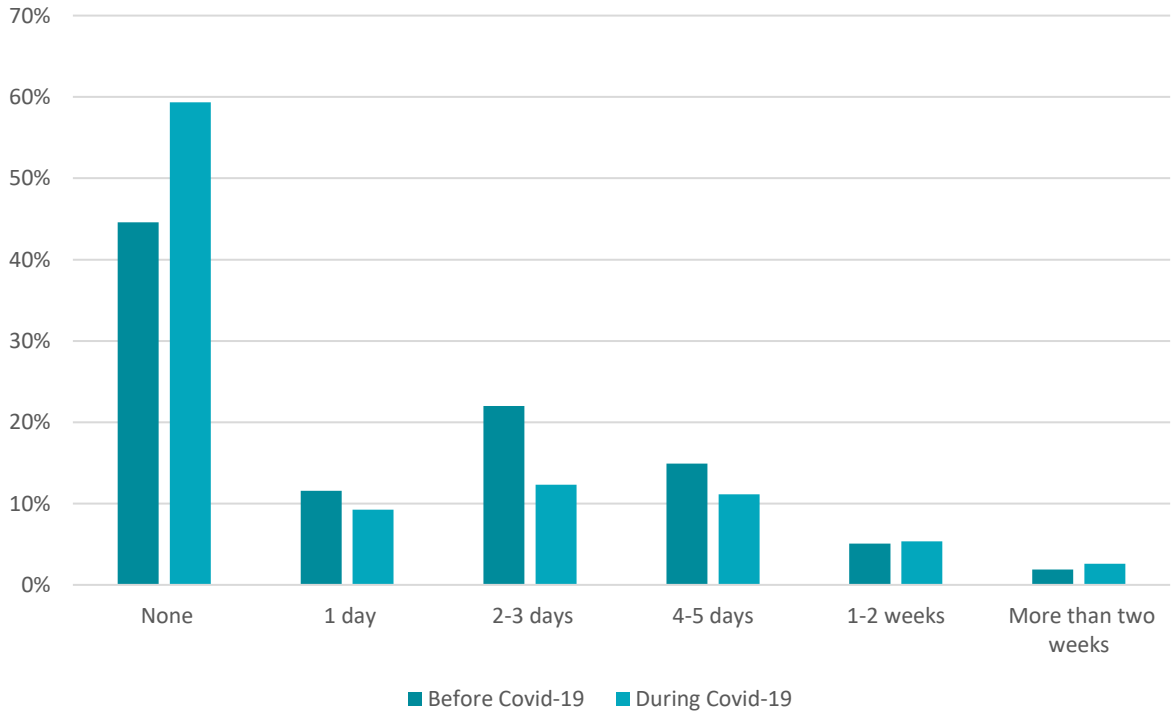
Source: Opinium survey, Sport England, ONS, Diabetes UK, British Heart Foundation, European Commission, NCBI, Cebr analysis

[1] ISCA/Cebr. (2015). 'The economic cost of physical inactivity in Europe'.'

Supporting this, people report taking less sick leave during the pandemic

- On average, the number of self-reported sick days taken fell during the Covid-19 pandemic from 2.2 to 1.9.
- This fall especially notable, as it occurred during a pandemic, when general sickness levels may have been expected to increase.
- We would caution against treating these values solely at face value – in absolute terms the ONS' survey of sickness absence rates in the workplace reports higher levels of illness.[1] However the trend of a fall in 2020 is consistent with our Opinium survey results.
- It would be wrong to attribute this decline solely to remote working supporting healthier lifestyles. During national lockdowns less person-to-person contact occurs, naturally reducing the chances of any disease transmission. Nevertheless, this is more positive supporting evidence

Self-reported number of days of sick leave taken pre-Covid and during the pandemic as share of total sample.



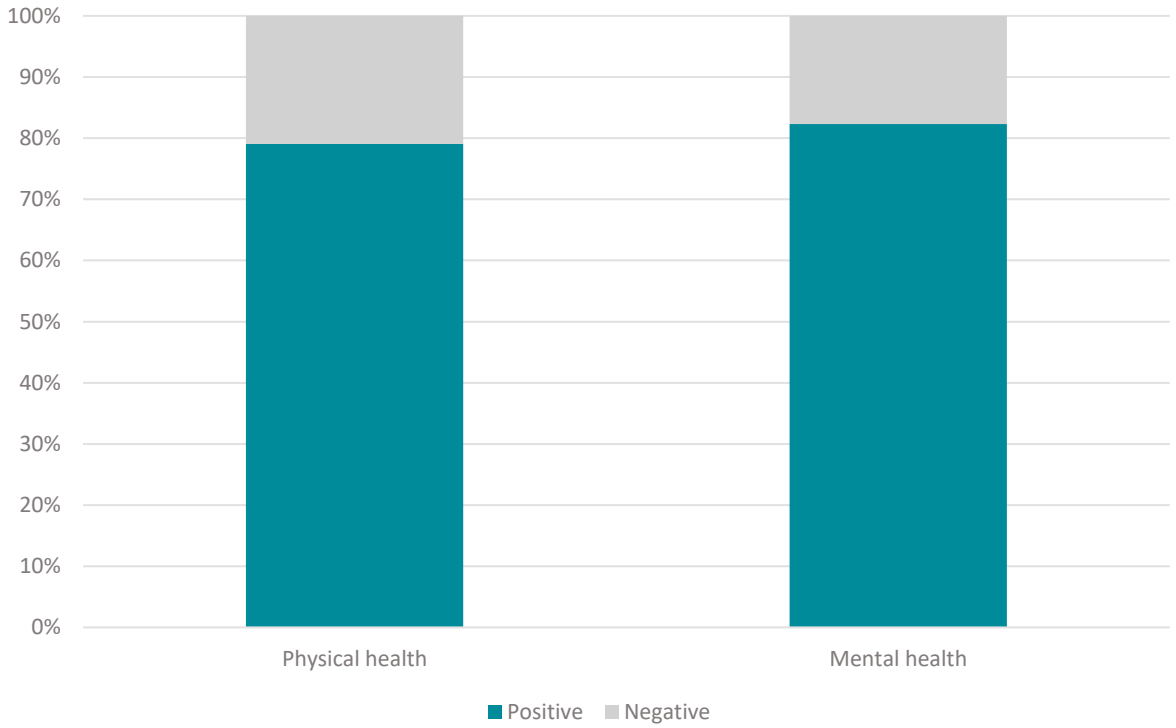
Source: Opinium survey, Cebr analysis

[1] [redacted]

While a significant majority report that remote working has positive impacts on their physical and mental health

- By a wide variety of metrics, remote working is viewed favourably by employees.
- Of those who answered either positively or negatively, 79% report positive impacts on their physical health and 82% positive impacts on their mental health.
- Note that those who replied that remote working had neither positive nor negative impacts, or they did not know the impact, have been excluded from this analysis.

Share of people reporting positive/negative impacts of remote working on health metrics.



Source: Opinium survey, Cebr analysis

Remote working could unlock more than 200 million hours of care, potentially saving the NHS £3.1bn per annum

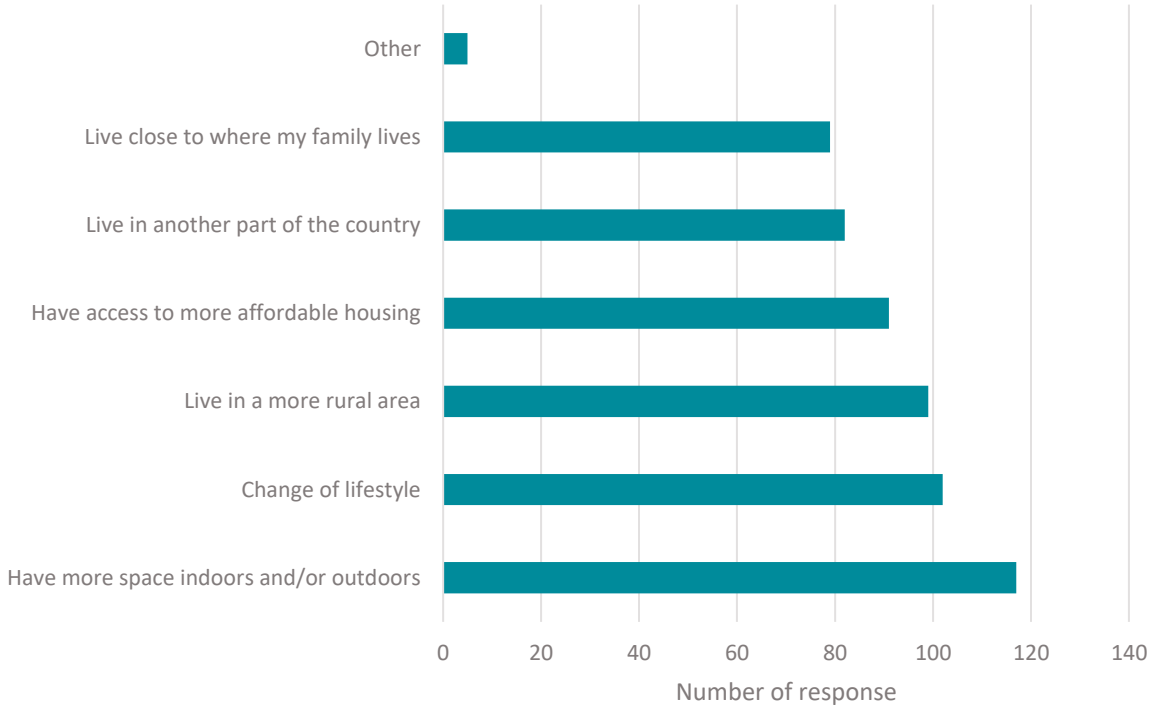
- As shown in Module 2, on average employees get 2 hours a day of additional leisure time thanks to the possibility to work remotely.
- Survey respondents self-report that they would spend part of this leisure time doing activities the public sector would otherwise bear the cost of e.g. offering unpaid care to family and friends.
- Looking at the average time that non-parents[1] would dedicate to caring for family members, we estimate that approximately 211 million hours of care could be unlocked by remote working.
- **Assuming the 'unlocked hours of care' would replace formal health support, flexible working could save the NHS £3.1bn per annum.**
- This figure does not include the additional hours of volunteering (282 millions), which arguably could replace hours of public sector work but have not been included to avoid overestimations.

[1] Parents with dependent children report a much higher percentage of time that they would spend caring for family members, as arguably they would spend most of this time with their own children. Using the figure self-reported by non-parents, we avoid to overestimate the "unlocked hours of care".

Remote working could enable people to have more freedom on where to live

- Of the people in employment working remotely all or most of the time, 36% have moved / will be moving or have considered moving house due to the freedom allowed by their work. Of those who are not currently working remotely, 43% would consider moving house if they had the possibility to work remotely.
- Workers mentioned the willingness to have more space, followed by change in lifestyle and living in a more rural areas as main reason for moving or wanting to move house.
- These reasons suggest a likely movement from high-density and generally more expensive urban areas to more decentralised areas of the country.
- Movements from urban to rural areas could contribute to a reallocation of human and capital resources across the UK, creating significant benefits to local economies.

Reasons why employees would consider moving house.



Source: Opinium survey, Cebr analysis

Regional movements enabled by remote working could significantly contribute to the UK's levelling-up agenda

- By asking employees where they would want to move, we were able to compute potential net movements across the UK.
- As shown by the chart,
  - London and the South East would be the regions losing more residents; while
  - Wales and Scotland are the preferred destinations for workers wanting to move.
  - Norther Ireland could also see significant net migration, with a potential net movement of 70,000 employees.
- We would caution against placing too much weight on these results in absolute terms – it is much easier to declare an *interest* in moving region than actually committing to this. The modelling is based on declared interests in moving region, without a fixed timeframe in place and changes are likely to be more long-term.

Potential net movements of employees across UK regions, people (thousands).

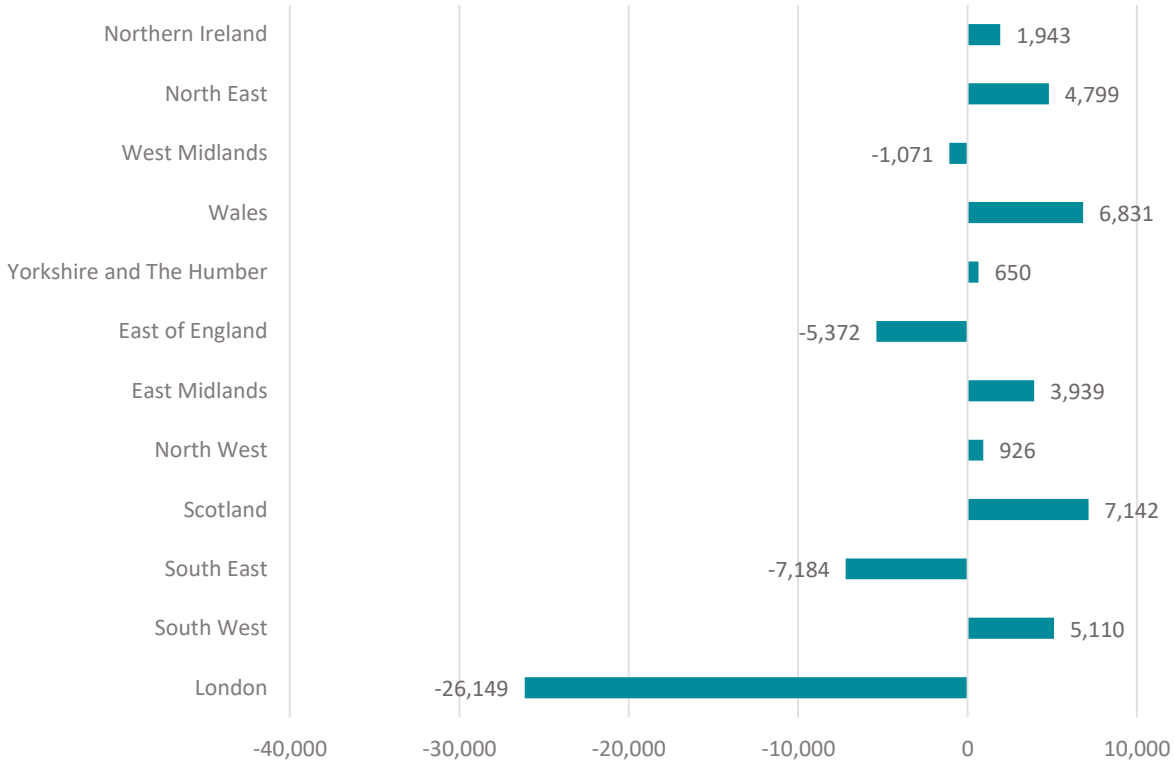


Source: Opinium survey, BRES, Cebr analysis

Regional movements enabled by remote working could significantly contribute to the UK's levelling-up agenda

- Assuming workers moving outside London and the South East would keep their current job with the same salary, **a remote working revolution could boost regional economies by as much as £33.3bn in earnings available for local consumption.** As outlined in the previous slide, the modelling is based on declared interests in moving region, without a fixed timeframe in place and changes are likely to be more long-term.
- Notably, the nations of Scotland, Wales and Northern Ireland would be expected to benefit, at the expense of England.
- Whilst local spending is set to rebalance regional economies, the redistribution of workers across the country could further support regional economies by fostering living standards and local salaries.
- Regional movements enabled by remote working could result in a talent and skills boost for regional economies, **significantly contributing to the UK's levelling-up agenda.**

Potential net movements of earnings across UK regions, million £ (2020 prices).



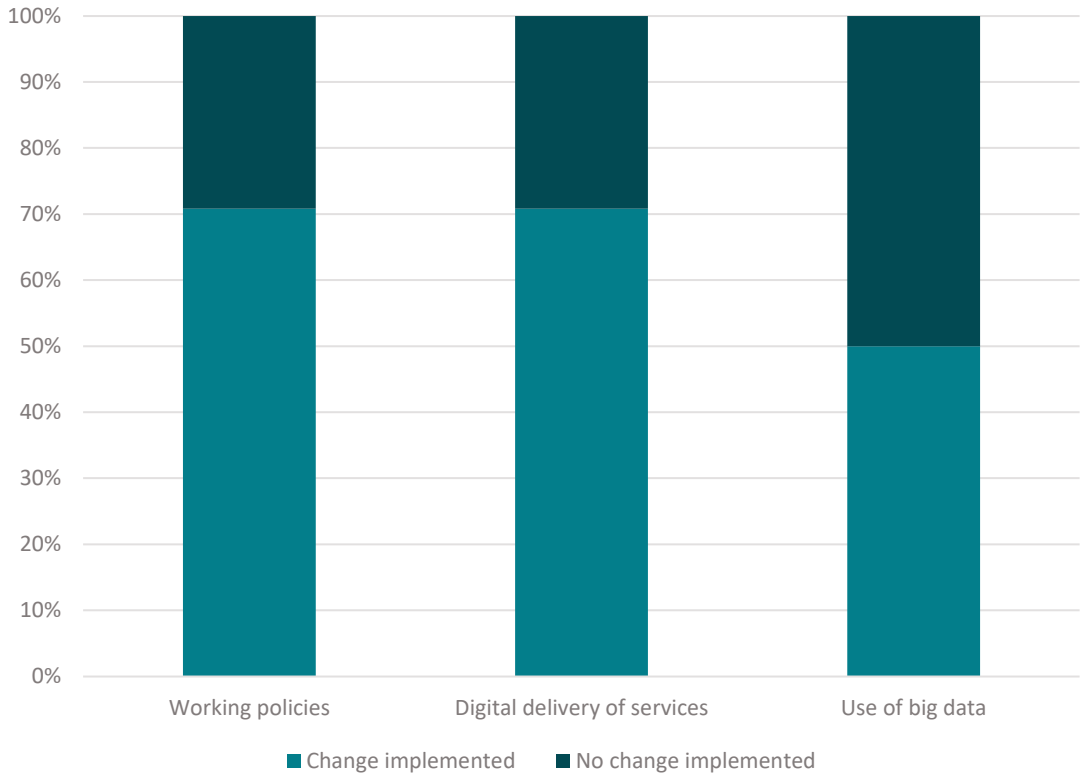
Source: Opinium survey, BRES, Cebr analysis

Summary findings for key areas of interest

Organisations in our sample with offices/sites in NI are more prone to adopt changes, relative to those across the rest of the UK

- Northern Ireland (NI) is the region were technology acceleration was most wide-spread according to interviewed decision-makers.
  - 71% of organisations implemented some changes in working policies compared to 55% of companies across the UK / 71% across UK large organisations.
  - 71% implemented changes in the digital delivery of services compared with 50% of companies across the UK / 63% across UK large organisations.
  - 50% implemented changes in the use of big data compared with 33% across the UK / 44% across UK large organisations.
- Larger organisations have been more active in implementing changes, and this result is partially explained by the high proportion of large organisations in our NI sub-sample (58% vs UK average 23%). However this alone cannot provide a full explanation.
- Northern Irish firms in our sub-sample (including all large and SME organisations) have implemented changes in working policies at the same rate as the average for large firms across the UK, and have implemented the digital delivery of services and the use of big data at a higher rate.
- There is some evidence that Northern Irish firms may have started with a lower pre-Covid level of technological readiness, which may partially have necessitated a stronger level of adoption over the last year and a half.

Percentage of organisations that implemented technology-related changes.

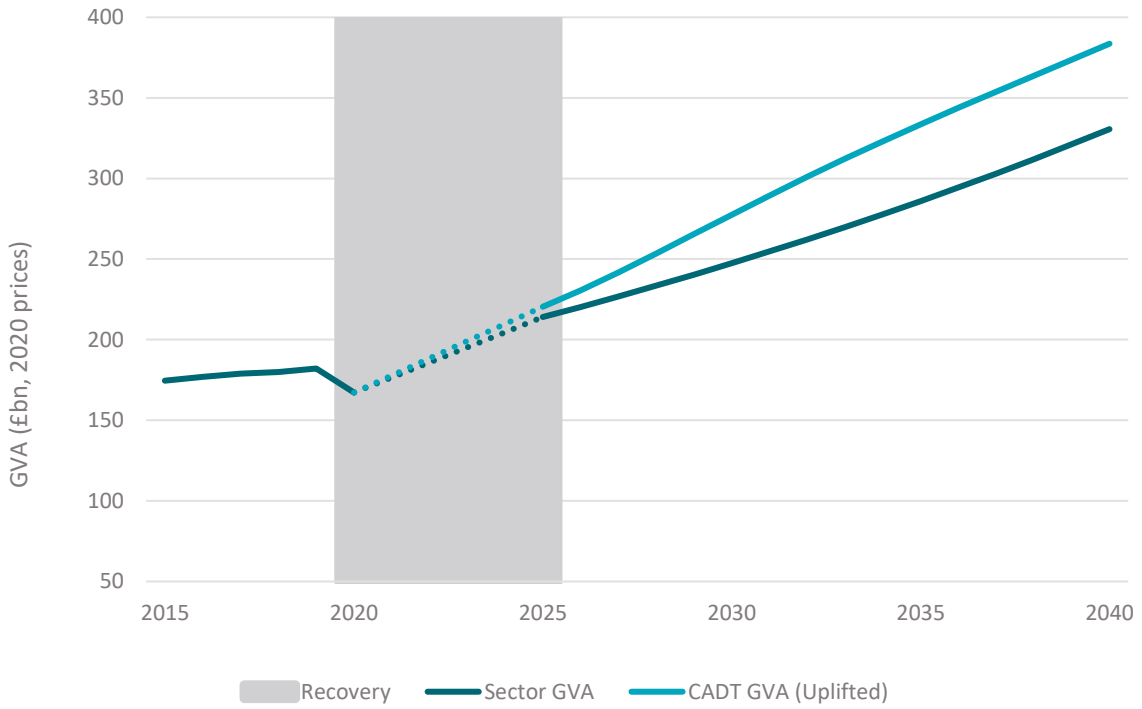


Source: Opinium survey, Cebr analysis

Covid-19 has accelerated technological adoption the most in the health sector

- The health sector experienced one of the biggest changes in the digital delivery of service. Key examples include online/telephone GP appointments and digital medical prescriptions.
- These changes are viewed positively by both organisations and customers:
  - 75% of respondents replied that the impact of changes in the way organisations work are positive.
  - As reported by our survey, customer satisfaction increased by 7%.
- Decision-makers working in the health sector stated that their organisations:
  - Will spend on average 17% more on technology / digital / IT in 2020/2021 as compared to 2019; and
  - Have accelerated technology adoption by 4.6 years on average during Covid-19. This is the most out of the six considered sectors – unsurprising perhaps for a sector more than any other directly impacted by changing public health needs.
- Our CADT model shows that digital transformation can drive up to a £53bn boost to the UK health sector by 2040. We estimate the size of the health sector to be approximately £384bn in 2040, or a significant 16% higher than the counterfactual baseline.

UK health sector GVA, 2015-2040.

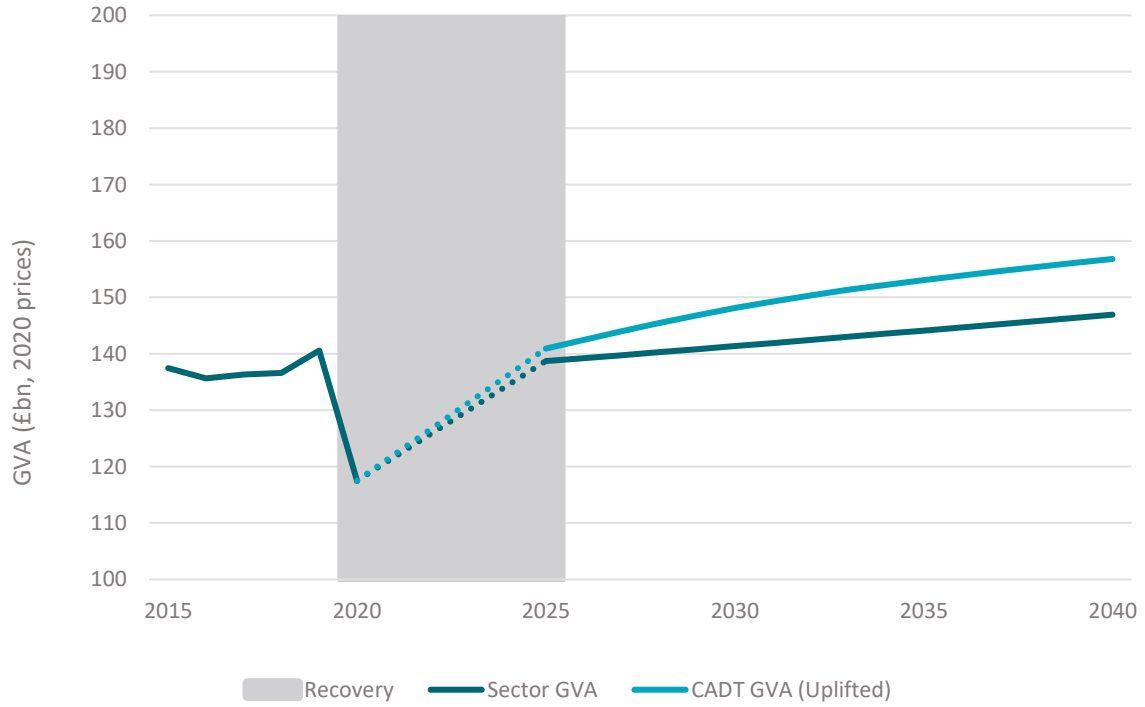


Source: ONS, Cebr analysis

Digital transformation could provide a £10bn boost to the UK education sector by 2040

- Closure of schools and imposition of online education forced fast transformations in these areas. In particular, **changing working policies and the digital delivery of services are reported as the most significant areas of change.**
- Whilst in the past education was not the fastest technology adopter, the sector is expected to experience faster and more radical digital transformations going forward. This is demonstrated by the significant increase in digital spend by organisations in this sector and the accelerated digital investment (on average by just under 3 years).
- The CADT model shows that digital transformation can drive up to a £10bn boost to the UK education sector by 2040. **We estimate the size of the education sector to be approximately £157bn in 2040, or 7% higher than the counterfactual baseline.**
- Decision-makers working in this sector stated that their organisations:
  - Will spend on average 24% more on technology / digital / IT in 2020/2021 as compared to 2019; and
  - Have accelerated technology adoption by 2.9 years on average during Covid-19.
- The need for employees to be physically at workplaces continues to act as barrier to remote working, with 28% of respondents in the sector reporting this as a barrier.

UK education sector GVA, 2015-2040.

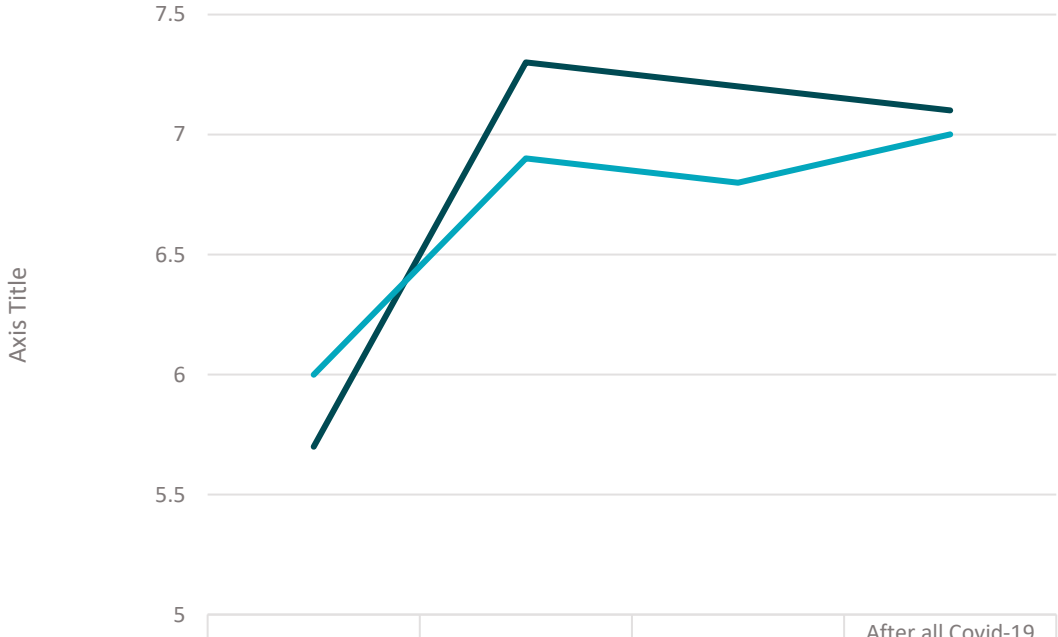


Source: ONS, Cebr analysis

Government organisations have accelerated their adoption of technology more rapidly than the private sector

- As reported by government decision-makers in our survey, the importance of adopting the most up-to-date technology increased by more than the UK average (albeit from a lower baseline), during the Covid-19 pandemic.
- This is likely due to the necessity of immediately ensuring essential services continued to run, however the rate of reported increased adoption is notable. **Government is often considered less efficient at adapting to changes than the private sector, however in this case the evidence suggests that the importance of rapid digital adoption means that has not been the case.**
- Supporting this, **78% of government decision-makers report that Covid-19 has accelerated their adoption of technology, compared to an average of 68%** across the UK. The average years of acceleration in technological adoption (4) is also slightly greater than average.
- Considering which of these are expected to have the greatest potential to improve the industry, flexible working policies, an improved online presence and stronger digital customer engagement were all frequent answers.

Importance of adopting the most up-to-date technology (0 to 10 scale).



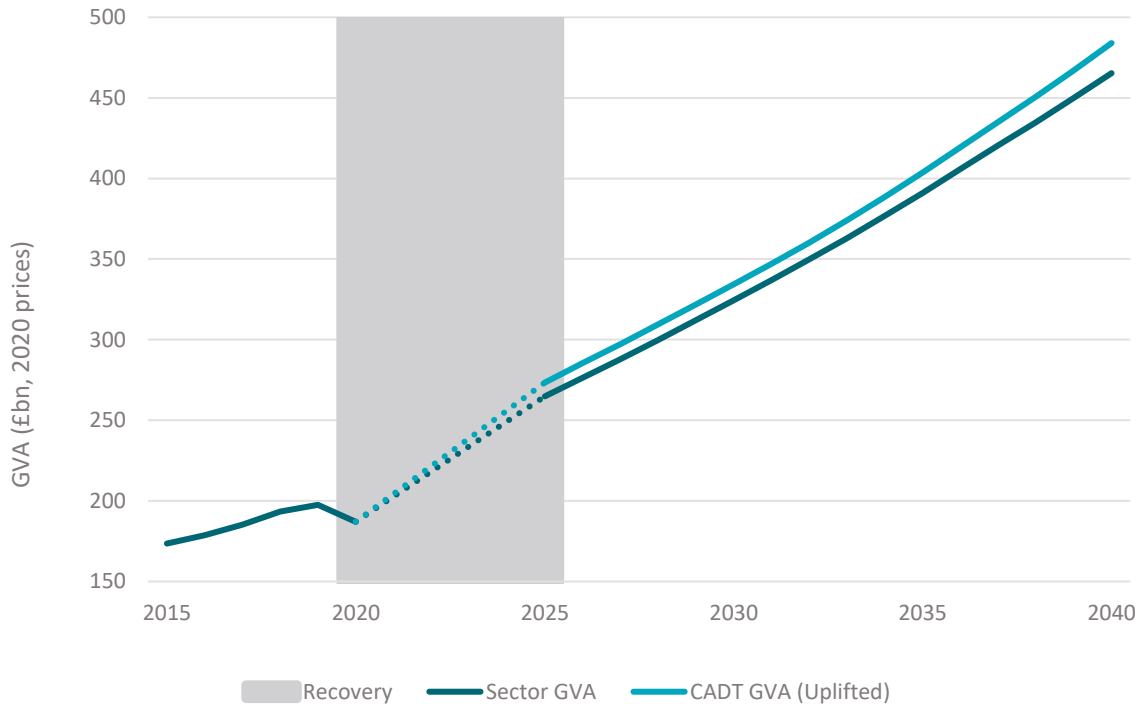
	Before Covid-19	Height of Covid-19	Last week (as of July 2021)	After all Covid-19 restrictions have been lifted
Government	5.7	7.3	7.2	7.1
Average	6	6.9	6.8	7

Source: Opinium survey, Cebr analysis

Professional services have high current levels of technological adoption, but moderate further gains are anticipated

- The professional services sector has a 'high' current level of digital transformation adoption. Due to the shape of technology adoption curve, sectors with higher level of current adoption gets a lower impact from further technological transformation.
- Despite this, **76% of respondents stated that Covid-19 had accelerated the use of technology.**
- As with the education sector, changing working policies and the digital delivery of services are reported as the most significant areas of change.
- The CADT model shows that digital transformation can drive up to a £19bn boost to the UK professional services sector by 2040. **We estimate the size of the professional services sector to be approximately £482bn in 2040, or 4% higher than the counterfactual baseline.**
- Decision-makers working in this sector stated that their organisations:
  - Will spend on average 17% more on technology / digital / IT in 2020/2021 as compared to 2019; and
  - Have accelerated technology adoption by on average 2.6 years during Covid-19.

UK professional services sector GVA, 2015-2040.



Source: ONS, Cebr analysis

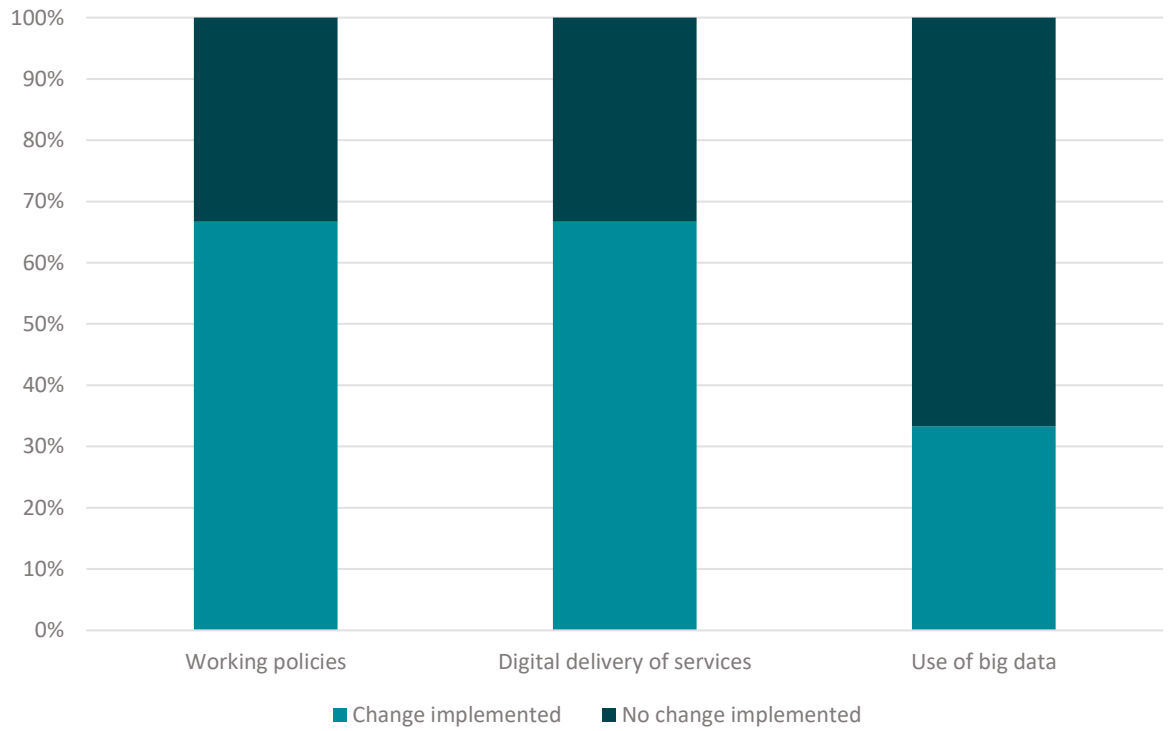
Specific analysis in the justice sector is difficult, however we estimate significant gains are likely

- The CADT model shows that digital transformation can drive up to a £37bn boost to the UK public administration & defence sector by 2040, equivalent to growth of 29% relative to the counterfactual baseline.
- As defined by VMB, the justice sub-sector falls within the public administration and defence sector. It covers all organisations within the 'Justice and judicial activities' SIC code, alongside additional organisations with "POLICE","CONSTABULARY","MINISTRY OF JUSTICE", "JUSTICE", "PROBATION", "PRISON" within their organisation name.
- Our survey data does not have organisation names, so a formal matching process is not feasible. However by considering the subsectors within which organisations with these names would likely fall, we can create a smaller sample of potential justice organisations (although we cannot know for certain whether these fit the justice definition above). Of these organisations:
  - A 17% increase in the importance of adopting the most up-to-date technology is reported, compared to 29% for the wider public administration sector and 17% for the broader economy.
  - 67% of firms report that Covid has accelerated their use of technology, compared to 71% for the wider public administration & defence sector and 68% for the broader economy.
  - Of those potential justice sector firms who reported an accelerated rate of technological adoption, the average increase was 5.3 years – greater than that of either the public administration and defence sector or the wider economy.
- Given the small sample sizes and the imperfect matching, we would caution against placing too much weight on these results. However on the balance of evidence, it seems likely that the growth in the justice sector as a result of digital transformation by 2040, is likely between the 7% for the UK economy and the 29% for public administration and defence.

Changes in working policies and digital delivery of services were implemented by 67% of organisations in the justice sector

- Focusing on the Justice sector (as a sub-sector of public administration and defence):
  - 67% of organisations implemented some changes in working policies compared to 55% of companies across the UK.
  - 67% implemented changes in the digital delivery of services compared with 50% of companies across the UK.
  - 33% implemented changes in the use of big data compared with 33% across the UK.
- Due to the small sample size, we present these results as purely indicative and advise against using them as conclusive.

Percentage of organisations in the Justice sector that implemented technology-related changes.



Source: Opinium survey, Cebr analysis

Annex 1:
Primary research

2021

Primary research

- This research was informed by primary research, which was designed by Cebr in collaboration with VMB and undertook by Opinium.
- The '**organisations' decision-makers survey**' was conducted between the 1st of July 2021 and the 10th of July 2021. A description of the sample is set out below.
  - 502 business decisionmakers who work for micro, small, medium and large sized organisations;
  - Of which 301 in the Education, Health, Public admin and defence, Professional Services, Retail or Construction sectors; and
  - 201 in other sectors.
- The '**employee & society survey**' was conducted between the 13th of July 2021 and the 17th of July 2021. The sample is made up of 2000 consumers weighted to be nationally representative

Annex 2:
Additional data cuts requested by VMB

Importance of adopting the most up-to-date technology on a scale from 0 to 10

Importance of adopting the most up-to-date technology on a scale from 0 to 10. Results are reported by organisations' sector of activity.

	Before Covid-19	Height of Covid-19	Last week (as of July 2021)	After all Covid-19 restrictions have been lifted
Construction	5.7	6.7	6.5	6.6
Retail	5.9	6.5	6.4	6.7
Professional services	6	6.9	6.8	7.1
Public administration & defence	5.4	7.2	6.6	7
Education	5.6	6.9	6.7	6.5
Health	5.8	6.7	6.7	6.6

Source: Opinium survey, Cebr analysis

Has Covid accelerated the use of technology across organisations? Results reported by location of organisation's sites/offices

Has Covid accelerated the use of technology across organisations? Results reported by location of organisation's sites/offices.

	Scotland	Northern Ireland	Wales	North East	North West	Yorkshire and the Humber	West Midlands	East Midlands	South West	South East	East of England	London	International
Yes	71%	88%	68%	71%	74%	73%	75%	77%	76%	71%	72%	74%	75%
No	25%	8%	24%	26%	21%	24%	14%	17%	24%	28%	25%	25%	19%
Not sure	4%	4%	8%	3%	6%	4%	11%	6%	0%	2%	4%	2%	6%

Source: Opinium survey, Cebr analysis

Average number of days workforce works remotely by sector

Average number of days workforce works remotely by sector, as reported by decision-makers across the six sectors of interest.

	Before Covid-19	Height of Covid-19	Last week (as of July 2021)	After all Covid-19 restrictions have been lifted
Construction	1.7	3.3	2.7	2.5
Retail	1.1	2.9	2.4	1.8
Professional services	1.5	4	3.2	2.5
Public administration & defence	1.4	3.1	2.7	1.7
Education	0.9	2.8	1.5	1.3
Health	1.3	2.9	2.4	2.7

Source: Opinium survey, Cebr analysis

Customer mix across the six sectors of interest

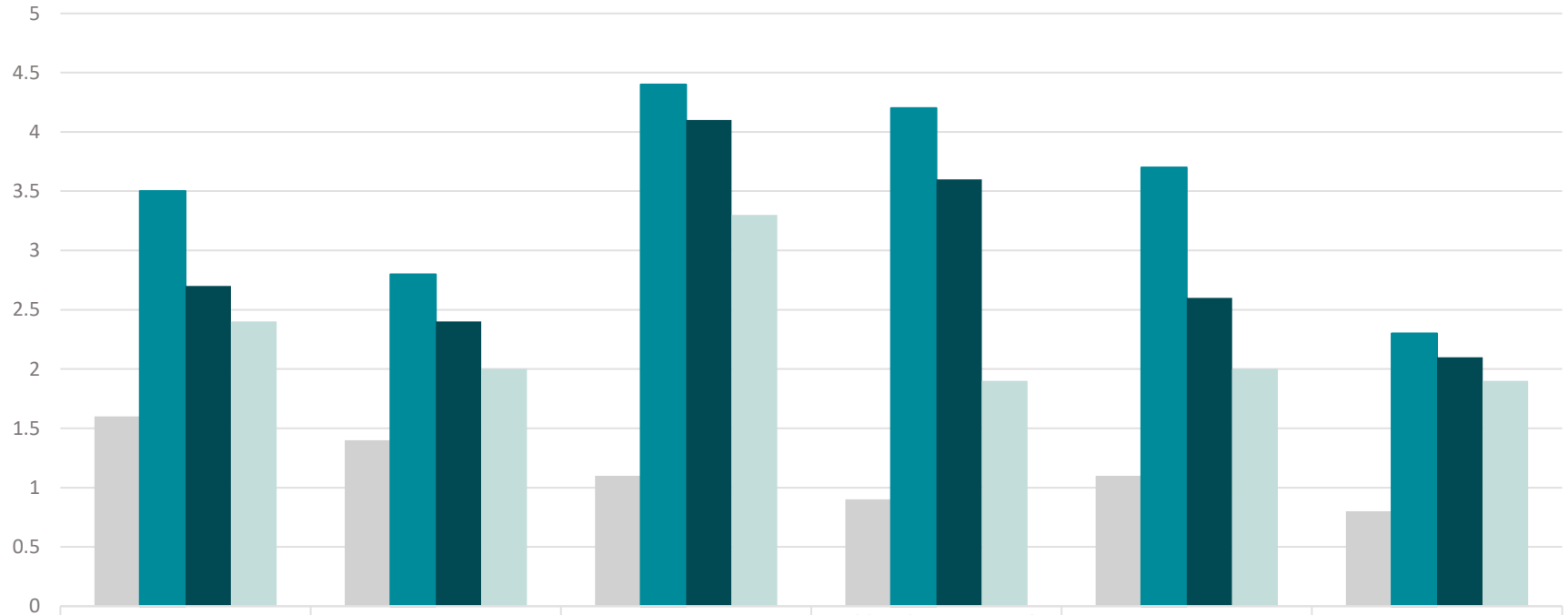
Customers' location before Covid-19, at the height of Covid-19, last week (as of July 2021) and after all Covid-19 related restrictions have been lifted. Results are reported by sector of activity.

	Customer mix	Before Covid-19	Height of Covid-19	Last week (as of July 2021)	After all Covid-19 restrictions have been lifted
Construction	Local	31%	12%	28%	22%
	Regional	36%	22%	30%	30%
	National	20%	16%	18%	21%
	International	3%	8%	3%	6%
	Not sure	2%	0%	2%	3%
Retail	Local	42%	36%	32%	29%
	Regional	20%	30%	25%	24%
	National	23%	21%	30%	25%
	International	13%	12%	12%	20%
	Not sure	1%	1%	1%	2%
Professional services	Local	32%	29%	26%	24%
	Regional	28%	28%	26%	22%
	National	37%	37%	39%	32%
	International	26%	24%	24%	29%
	Not sure	3%	2%	3%	5%
Public administration & defence	Local	9%	7%	6%	8%
	Regional	3%	6%	3%	4%
	National	4%	5%	4%	3%
	International	1%	0%	3%	2%
	Not sure	1%	1%	1%	1%
Education	Local	49%	41%	34%	41%
	Regional	20%	28%	24%	16%
	National	13%	17%	20%	15%
	International	10%	8%	9%	10%
	Not sure	2%	2%	2%	2%
Health	Local	31%	20%	15%	17%
	Regional	10%	23%	10%	13%
	National	10%	12%	24%	10%
	International	4%	5%	5%	11%
	Not sure	3%	3%	3%	3%

Source: Opinium survey, Cebr analysis

People working in professional services expect to work from home 3 times more than before Covid-19

On average, how many days did/do you work remotely? Responses are presented by sector of activity.



	Construction	Retail	Professional services	Public administration & defence	Education	Health
Before Covid-19	1.6	1.4	1.1	0.9	1.1	0.8
Height of Covid-19	3.5	2.8	4.4	4.2	3.7	2.3
Last week	2.7	2.4	4.1	3.6	2.6	2.1
After all Covid-19 restrictions have been lifted	2.4	2	3.3	1.9	2	1.9

Source: Opinium survey, Cebr analysis

Barriers to remote working perceived by employees (by age group)

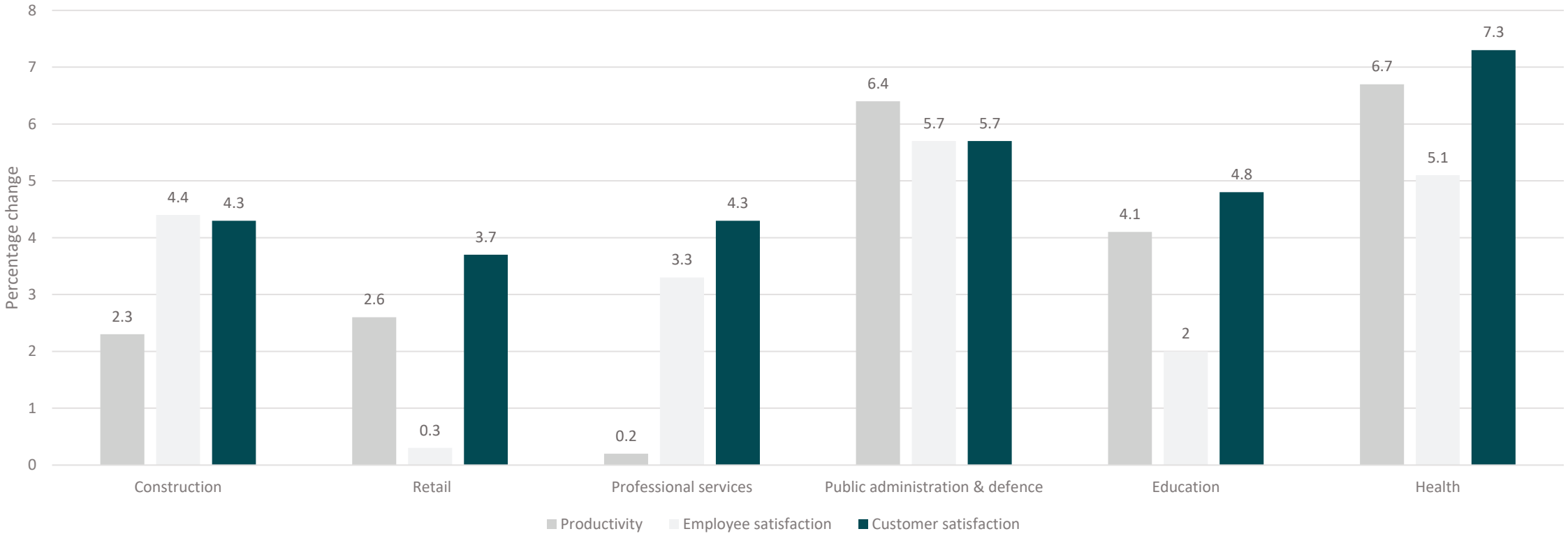
Barriers to remote working perceived by employees. Results are reported by age group.

	18 - 34	35 - 54	55+
I believe that my job and career development benefits from interactions with colleagues in the office	34%	22%	21%
To perform well at work, I need personal interactions with my colleagues	23%	21%	25%
The company culture is out-dated and would not like the idea of remote working	20%	17%	14%
I would be worried about my career progression	22%	16%	10%
I would feel disengaged with my company's values and objectives	14%	12%	15%
I would lack confidence with remote working technologies (hardware/software)	16%	9%	10%
Where I live, I have a poor broadband connection	13%	7%	7%
Other	2%	3%	2%
None of the above	14%	30%	34%
Don't know/not sure	10%	6%	6%

Source: Opinium survey, Cebr analysis

Increase in productivity, employee satisfaction and customer satisfaction by sector

Key organisations' metrics in 2020/2021 compared to 2019. Results are reported by organisations' sector of activity.



Source: Opinium survey, Cebr analysis

The majority of decision-makers across the six sectors of interest believe that the impact of changes brought by Covid-19 is positive

How positive/negative the impact of changes brought by Covid-19 in the way organisations work are. Results are reported by organisations' sector of activity.

	Positive	Negative	Too early to say
Construction	64%	17%	19%
Retail	55%	20%	24%
Professional services	65%	5%	30%
Public administration & defence	50%	0%	50%
Education	53%	24%	22%
Health	75%	10%	15%

Source: Opinium survey, Cebr analysis

Percentage increase/decrease in spending on specific technologies by sector

Percentage increase/decrease in organisations' spending on specific technologies in 2020/21, compared to 2019. Results are reported by organisations' sector of activity.

	Construction	Retail	Professional services	Public administration & defence	Education	Health
Analytics and insight	5.9	9.4	13	-5.4	8.1	12.8
Automation	3.9	6.3	8.5	4.6	5.7	15.6
Cloud services	9.4	5.9	13.9	4.7	7.8	13.3
Collaboration tools e.g. Teams, Zoom, etc.	10	8.1	18.1	19.7	10.5	14.7
Customer experience e.g. website enhancement, customer management technologies	3.4	9.6	7.4	10	7.6	13.3
Cybersecurity	4.6	6.6	10.3	2.9	6.1	7.2
Digital and contactless payment	3.2	6	7.7	3.1	6.5	15.6
Ecommerce technologies	2.9	7.3	4.3	1.7	4.9	10.6
IT equipment	6.5	5.7	8.7	6.2	9.3	14.3
Machine Learning	3	7.4	7.1	22.4	4.9	10.7
Online marketing	7.3	6.9	3.5	-4.5	9.2	6.8

Source: Opinium survey, Cebr analysis

Key reasons for making the change in working policies permanent by sector

Key reasons for making the change in digital delivery of services permanent. Results are presented by organisations' sector of activity.

	Construction	Retail	Professional services	Public administration & defence	Education	Health
Top three reasons for making the change in working policies permanent	• Organisation decision making • Employees' demand because of an improved work/life balance • Improved service quality service and experience e.g. digitalising, ecommerce, contact centre, new markets • Lower total fixed costs e.g. offices/sites rent	• Organisation decision making • Improved service quality service and experience e.g. digitalising, ecommerce, contact centre, new markets • More sustainable proposition (aligned to UK's environmental agenda)	• Improved service quality service and experience e.g. digitalising, ecommerce, contact centre, new markets • Employees' demand because of an improved work/life balance • Lower total fixed costs e.g. offices/sites rent	• Lower total fixed costs e.g. offices/sites rent • Employees' demand because of an improved work/life balance • Organisation decision making	• Employees' demand because of an improved work/life balance • Organisation decision making • Employees' demand because of increased productivity	• Employees' demand because of an improved work/life balance • Improved service quality service and experience e.g. digitalising, ecommerce, contact centre, new markets • Employees' demand because of increased productivity

Note: In some instances, more than three reasons have been included. This is due to options in the top three positions scoring the same number of responses.

Source: Opinium survey, Cebr analysis

Key reasons for making the change in digital delivery of services permanent by sector

Key reasons for making the change in digital delivery of services permanent. Results are presented by organisations' sector of activity.

	Construction	Retail	Professional services	Public administration & defence	Education	Health
Top three reasons for making the change in digital delivery of services permanent	• Organisation decision making • More sustainable proposition (aligned to UK's environmental agenda) • Employees' demand because of increased productivity	• More sustainable proposition (aligned to UK's environmental agenda) • Improved service quality service and experience e.g. digitalising, ecommerce, contact centre, new markets • Organisation decision making • Employees' demand because of an improved work/life balance • Customer demand e.g. next-day delivery, real-time interactions • Realtime data intelligence & insight	• Improved service quality service and experience e.g. digitalising, ecommerce, contact centre, new markets. • Organisation decision making • Lower total fixed costs e.g. offices/sites rent	• Lower total fixed costs e.g. offices/sites rent • Organisation decision making • Employees' demand because of an improved work/life balance	• Improved service quality service and experience e.g. digitalising, ecommerce, contact centre, new markets • Customer demand e.g. next-day delivery, real-time interactions • More sustainable proposition (aligned to UK's environmental agenda)	• Organisation decision making • Improved service quality service and experience e.g. digitalising, ecommerce, contact centre, new markets • Realtime data intelligence & insight

Note: In some instances, more than three reasons have been included. This is due to options in the top three positions scoring the same number of responses.

Source: Opinium survey, Cebr analysis

Key reasons for making the change in the use of big data permanent by sector

Key reasons for making the change in the use of big data permanent. Results are presented by organisations' sector of activity.

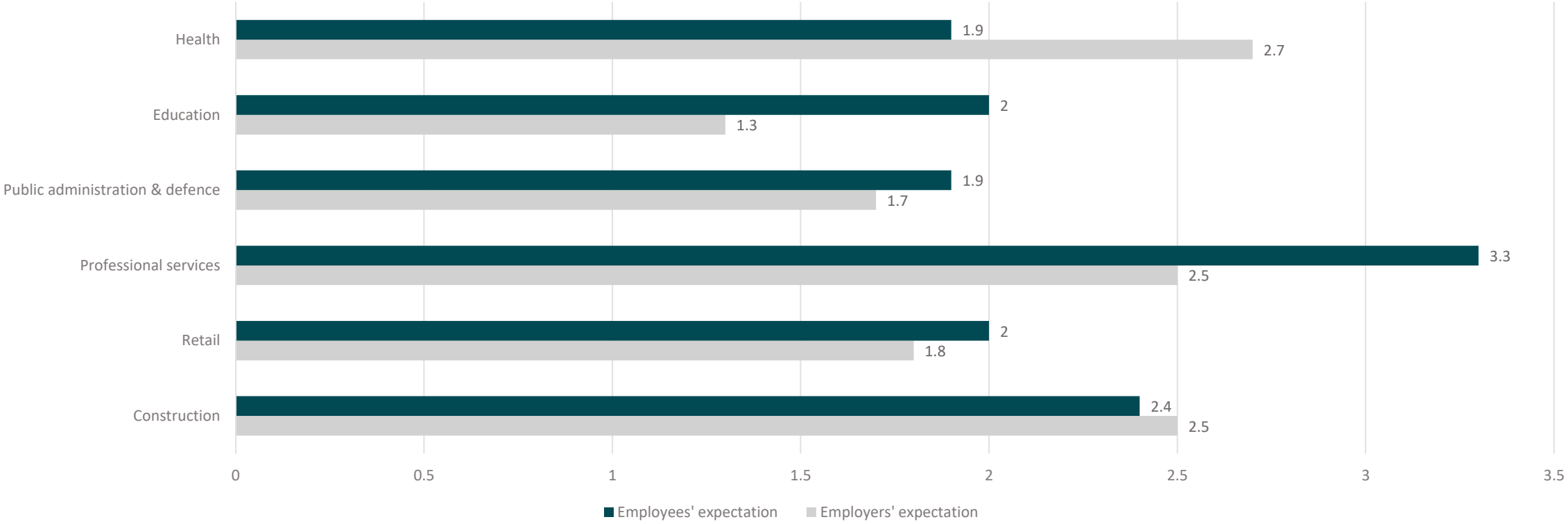
	Construction	Retail	Professional services	Public administration & defence	Education	Health
Top three reasons for making the change in the use of big data permanent	• Employees' demand because of increased productivity • Realtime data intelligence & insight • Organisation decision making • More sustainable proposition (aligned to UK's environmental agenda) • Employees' demand because of an improved work/life balance	• Realtime data intelligence & insight • Organisation decision making • More sustainable proposition (aligned to UK's environmental agenda) • Improved service quality service and experience e.g. digitalising, ecommerce, contact centre, new markets • Lower total fixed costs e.g. offices/sites rent	• Realtime data intelligence & insight • Improved service quality service and experience e.g. digitalising, ecommerce, contact centre, new markets • Organisation decision making	• Realtime data intelligence & insight • Improved service quality service and experience e.g. digitalising, ecommerce, contact centre, new markets • Employees' demand because of increased productivity	• Organisation decision making • Customer demand e.g. next-day delivery, real-time interactions • More sustainable proposition (aligned to UK's environmental agenda)	• Improved service quality service and experience e.g. digitalising, ecommerce, contact centre, new markets • Employees' demand because of increased productivity • Lower total fixed costs e.g. offices/sites rent

Note: In some instances, more than three reasons have been included. This is due to options in the top three positions scoring the same number of responses.

Source: Opinium survey, Cebr analysis

Difference in employers and employees' expectation of days working from home after all Covid-19 restrictions have been lifted

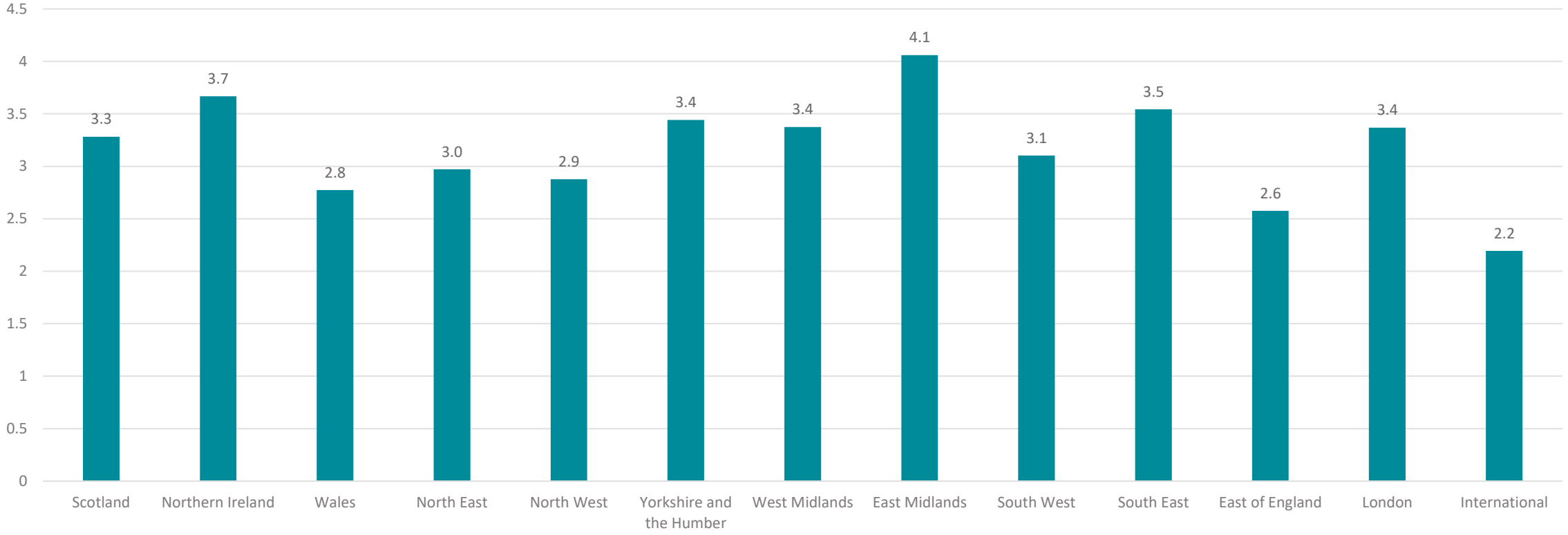
Difference in employers and employees' expectations of days working from home after all Covid-19 restrictions have been lifted. Results are reported by sector.



Source: Opinium survey, Cebr analysis

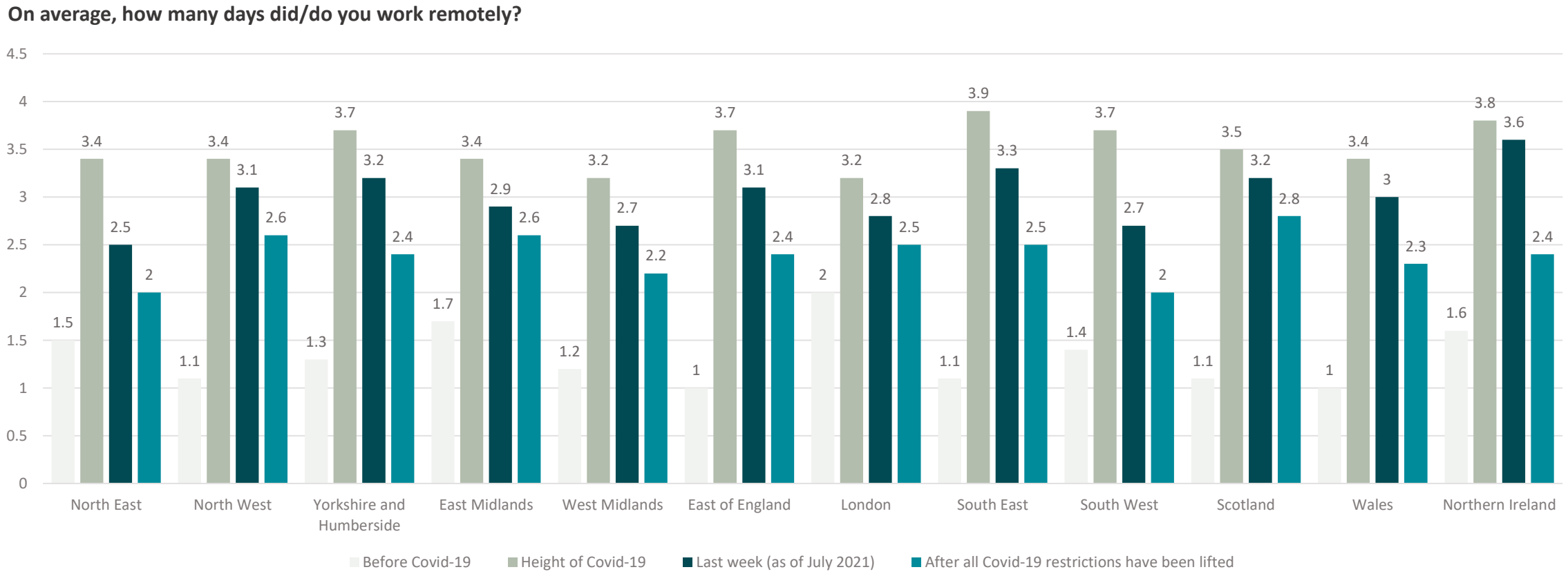
Organisations with sites/offices in Northern Ireland and East Midlands have reported the biggest shift in technology adoption

Thinking about your organisation, by how many years has Covid-19 accelerated the use of technology? Results are reported by organisations' sites/offices location.



Source: Opinium survey, Cebr analysis

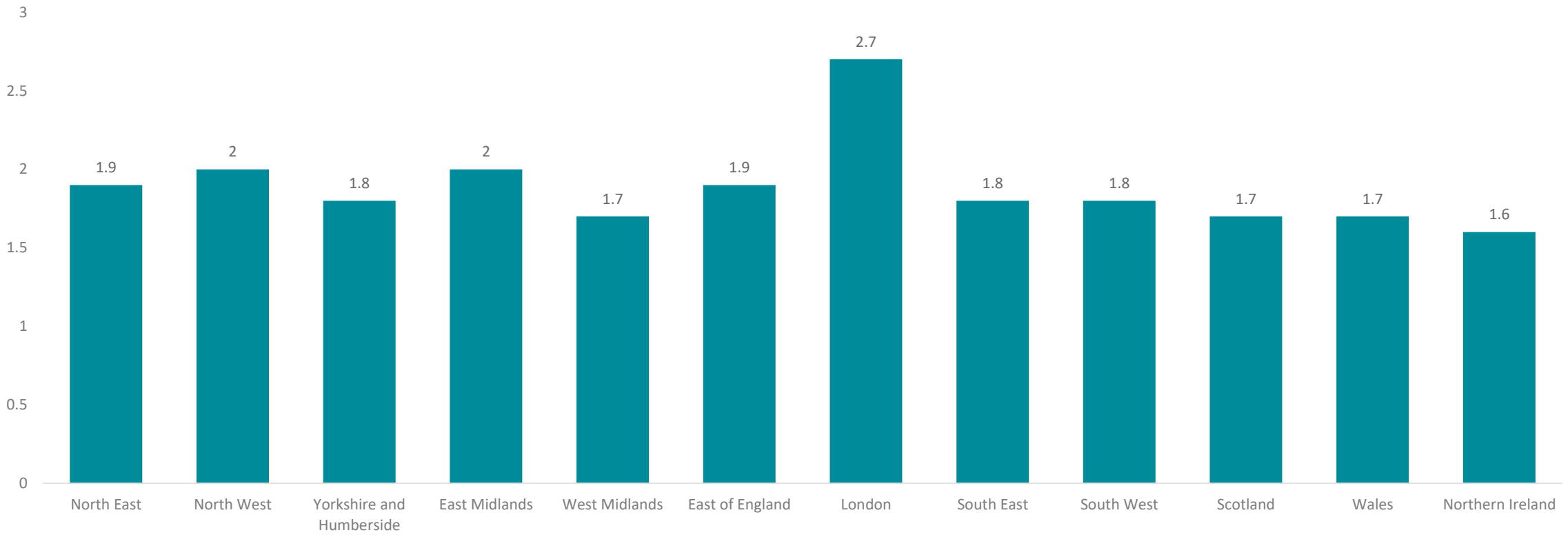
Employees across the UK expect to work from home at least 2 days/week after that all the Covid-19 restrictions have been lifted



Source: Opinium survey, Cebr analysis

Employees in London get almost 3 additional hours of leisure time per day when working from home

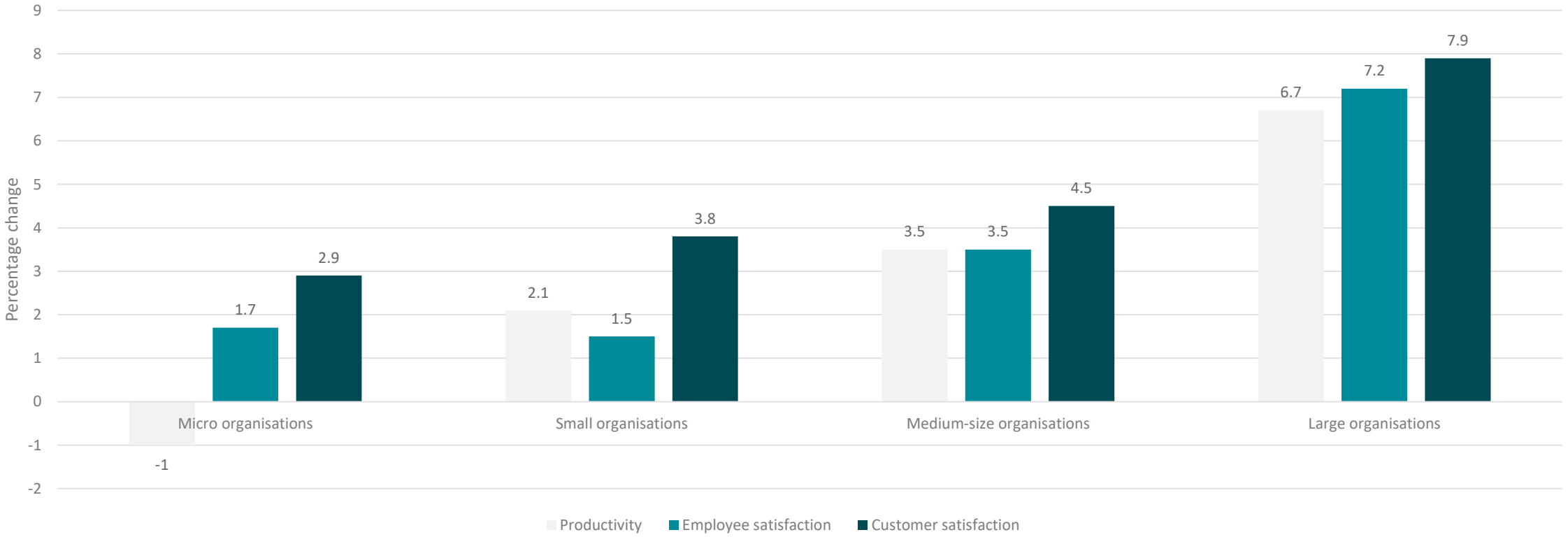
Additional hours of leisure time employees get during a typical day that they work from home compared to a day in the office. Results are reported by employees' location.



Source: Opinium survey, Cebr analysis

Increase in productivity, employee satisfaction and customer satisfaction by size

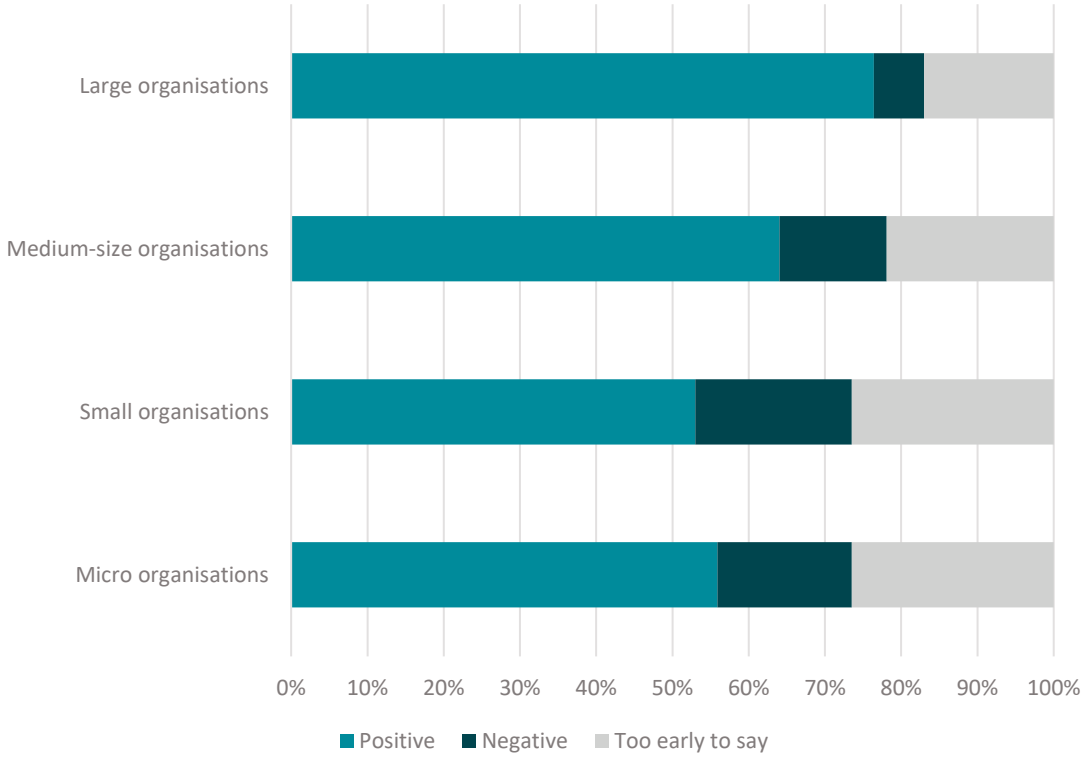
Key organisations' metrics in 2020/2021 compared to 2019. Results are reported by organisations' size.



Source: Opinium survey, Cebr analysis

Looking forward, bigger organisations are more confident that the technological transformation brought in by Covid-19 will have a positive impact

How positive/negative the impact of changes brought by Covid-19 in the way organisations work are. Results are reported by organisations' size.

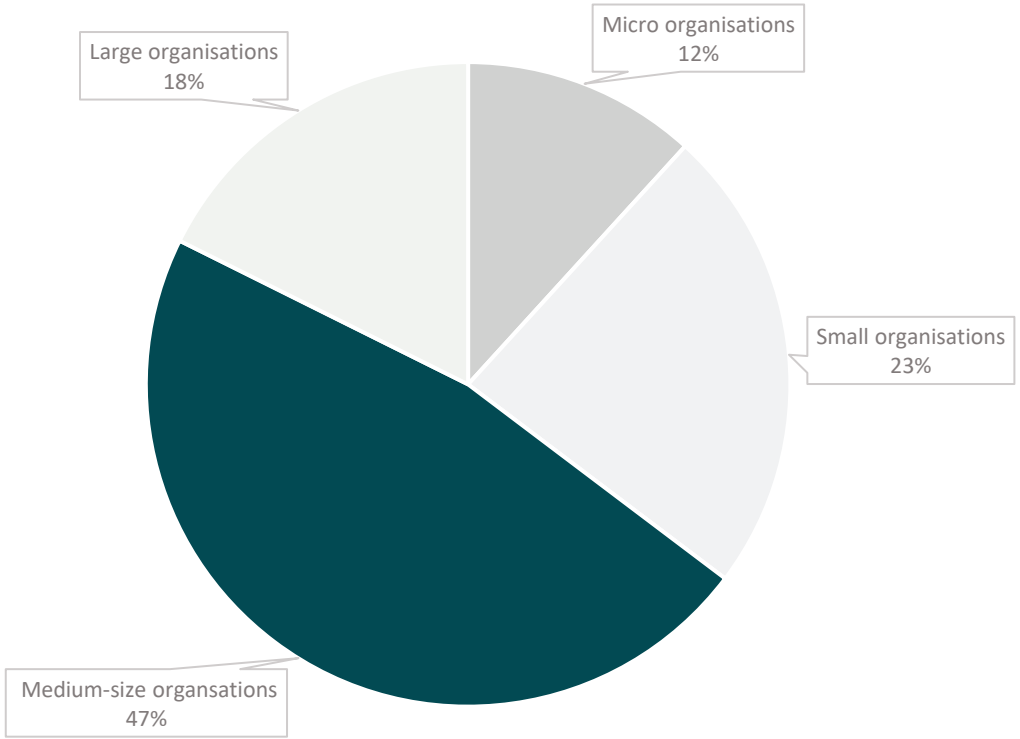


	Positive	Negative	Too early to say
Micro organisations	56%	18%	26%
Small organisations	53%	21%	26%
Medium-size organisations	64%	14%	22%
Large organisations	76%	7%	17%

Source: Opinium survey, Cebr analysis

Professional services organisations by size

Sample composition: organisations in professional services split by size category.



Source: Opinium survey, Cebr analysis

Larger organisations have significantly increased their budget on digital technologies

Percentage increase in organisations' spending on specific technologies in 2020/21, compared to 2019. Results are presented by organisations' size.

	Micro organisations	Small organisations	Medium-size organisations	Large organisations
Collaboration tools e.g. Teams, Zoom, etc.	5	8.4	16.1	18.5
IT equipment	0.3	8.2	12.2	11.4
Customer experience e.g. website enhancement, customer management technologies	7.1	7.4	10	12.2
Digital and contactless payment	5.3	5.8	10.3	13.1
Ecommerce technologies	2.3	4.9	9.3	9.2
Online marketing	6.4	3.7	10.3	13.2
Cybersecurity	3.9	5.8	10.9	11.9
Cloud services	1.2	8.3	13.3	13.8
Automation	3.1	6.9	10.6	11.5
Analytics and insight	3.1	9	10.5	13.8
Machine Learning	0.8	6.8	8.4	16.1

Source: Opinium survey, Cebr analysis

Key reasons for making the change in working policies permanent by size

Key reasons for making the change in working policies permanent. Results are presented by organisations' size.

	Micro organisations	Small organisations	Medium-size organisations	Large organisations
Top three reasons for making the change in working policies permanent	• Employees' demand because of an improved work/life balance • Improved service quality service and experience e.g. digitalising, ecommerce, contact centre, new markets • More sustainable proposition (aligned to UK's environmental agenda)	• Organisation decision making • Improved service quality service and experience e.g. digitalising, ecommerce, contact centre, new markets • Employees' demand because of an improved work/life balance • More sustainable proposition (aligned to UK's environmental agenda)	• Employees' demand because of an improved work/life balance • Organisation decision making • Lower total fixed costs e.g. offices/sites rent	• Employees' demand because of an improved work/life balance • Improved service quality service and experience e.g. digitalising, ecommerce, contact centre, new markets • Employees' demand because of increased productivity

Note: In some instances, more than three reasons have been included. This is due to options in the top three positions scoring the same number of responses.

Source: Opinium survey, Cebr analysis

Key reasons for making the change in digital delivery of services permanent by size

Key reasons for making the change in digital delivery of services permanent. Results are presented by organisations' size.

	Micro organisations	Small organisations	Medium-size organisations	Large organisations
Top three reasons for making the change in digital delivery of services permanent	• Lower total fixed costs e.g. offices/sites rent • Organisation decision making • Improved service quality service and experience e.g. digitalising, ecommerce, contact centre, new markets • Customer demand e.g. next-day delivery, real-time interactions	• Improved service quality service and experience e.g. digitalising, ecommerce, contact centre, new markets • Lower total fixed costs e.g. offices/sites rent • Organisation decision making • Employees' demand because of increased productivity	• Improved service quality service and experience e.g. digitalising, ecommerce, contact centre, new markets • Organisation decision making • More sustainable proposition (aligned to UK's environmental agenda)	• Improved service quality service and experience e.g. digitalising, ecommerce, contact centre, new markets • Employees' demand because of an improved work/life balance • More sustainable proposition (aligned to UK's environmental agenda) • Lower total fixed costs e.g. offices/sites rent

Note: In some instances, more than three reasons have been included. This is due to options in the top three positions scoring the same number of responses.

Source: Opinium survey, Cebr analysis

Key reasons for making the change in the use of big data permanent by size

Key reasons for making the change in the use of big data permanent. Results are presented by organisations' size.

	Micro organisations	Small organisations	Medium-size organisations	Large organisations
Top three reasons for making the change in the use of big data permanent	• Organisation decision making • Realtime data intelligence & insight • Employees' demand because of increased productivity • Improved service quality service and experience e.g. digitalising, ecommerce, contact centre, new markets • Customer demand e.g. next-day delivery, real-time interactions	• Realtime data intelligence & insight • Organisation decision making • Employees' demand because of increased productivity • Improved service quality service and experience e.g. digitalising, ecommerce, contact centre, new markets	• Organisation decision making • Realtime data intelligence & insight • Customer demand e.g. next-day delivery, real-time interactions	• Employees' demand because of increased productivity • Improved service quality service and experience e.g. digitalising, ecommerce, contact centre, new markets • Lower total fixed costs e.g. offices/sites rent

Note: In some instances, more than three reasons have been included. This is due to options in the top three positions scoring the same number of responses.

Source: Opinium survey, Cebr analysis

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CBRE

Report | Creative Resilience

Global E-commerce Outlook 2021

What is driving e-commerce growth in different markets?

17 Jun 2021 20 Minute Read



E-commerce is driving robust industrial & logistics property demand. CBRE's Global Research has conducted an analysis of how e-commerce's future growth will impact industrial & logistics markets worldwide. Our analysis included:

- Studying 43 global markets
- Exploring 27 factors driving e-commerce
- Identifying 6 key drivers that best explain e-commerce penetration
- Creating an index to measure the strength of these drivers in different markets
- Forecasting e-commerce penetration in each market and the additional logistics space required to satisfy demand

Looking for a PDF of this content?



Midyear Industrial Market Update and E-Commerce Spotlight

In this CBRE Roundtable industry experts reviewed the drivers of e-commerce growth across markets and the implications on industrial real estate, as well as market fundamentals and trends in leasing, capital markets, development and debt markets.





Holding page for Statistica site

Global Ecommerce Forecast 2021

Digital Leads the Way, Building on 2020's Growth

Report by Karin von Abrams | Jul 7, 2021



Executive Summary

In-store retail sales fell dramatically when the pandemic forced consumers to stay home and physical stores to close. We estimate that total retail sales worldwide dropped by 2.8% in 2020. Even so, retail ecommerce boomed as internet users went online to buy all manner of goods, including groceries.

How much did the pandemic affect retail sales estimates?

Before the pandemic, we had forecast that total retail sales worldwide would rise by 4.4% in 2020, to $26.460 trillion. We now estimate that retail sales amounted to just $23.624 trillion last year—a decline of 2.8%. But in 2021, this figure will rebound to pre-pandemic (2019) levels, reaching $25.052 trillion.

How much will global retail ecommerce sales rise in 2021?

Following a 25.7% surge in 2020, to $4.213 trillion, we expect retail ecommerce sales worldwide to climb a further 16.8% this year, to $4.921 trillion.

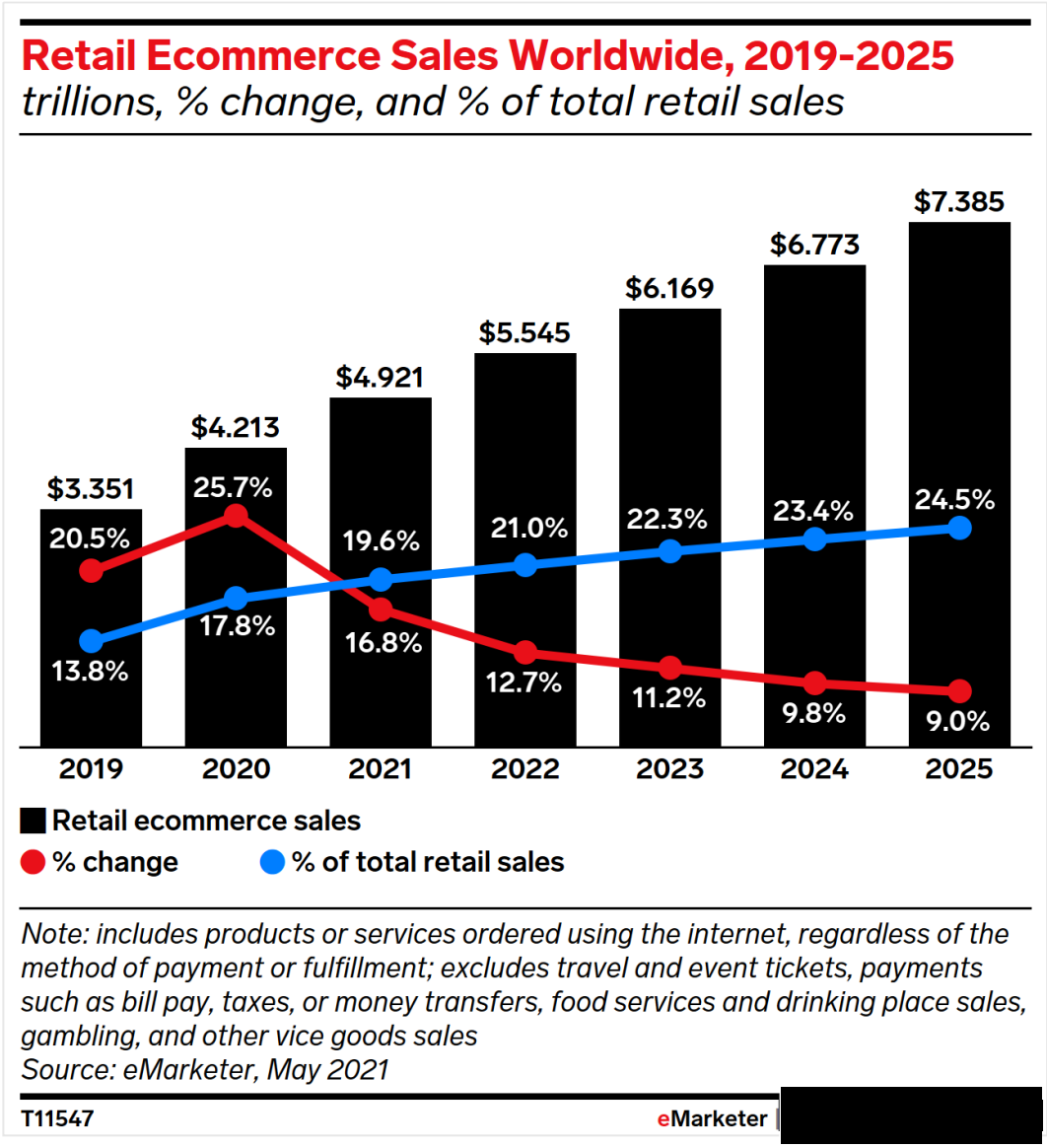
Which ecommerce markets are growing fastest?

Last year, the pandemic fueled rapid acceleration of online buying in several countries that were somewhat lagging—and some of those will continue to see major expansion in 2021. India, Brazil, Russia, and Argentina are all projected to post at least 26% growth in retail ecommerce sales this year.

Which regions will generate the highest digital retail sales?

As in 2020, Asia-Pacific and North America will lead the regional rankings for retail ecommerce sales this year. China's outsize role will mean that Asia-Pacific will account for 60.8% of retail ecommerce sales worldwide in 2021. North America will claim a 20.3% share, and Western Europe 12.6%.

WHAT'S IN THIS REPORT? This report features our latest regional and global forecast for total retail, retail ecommerce, mcommerce, and social commerce sales and digital buyers.



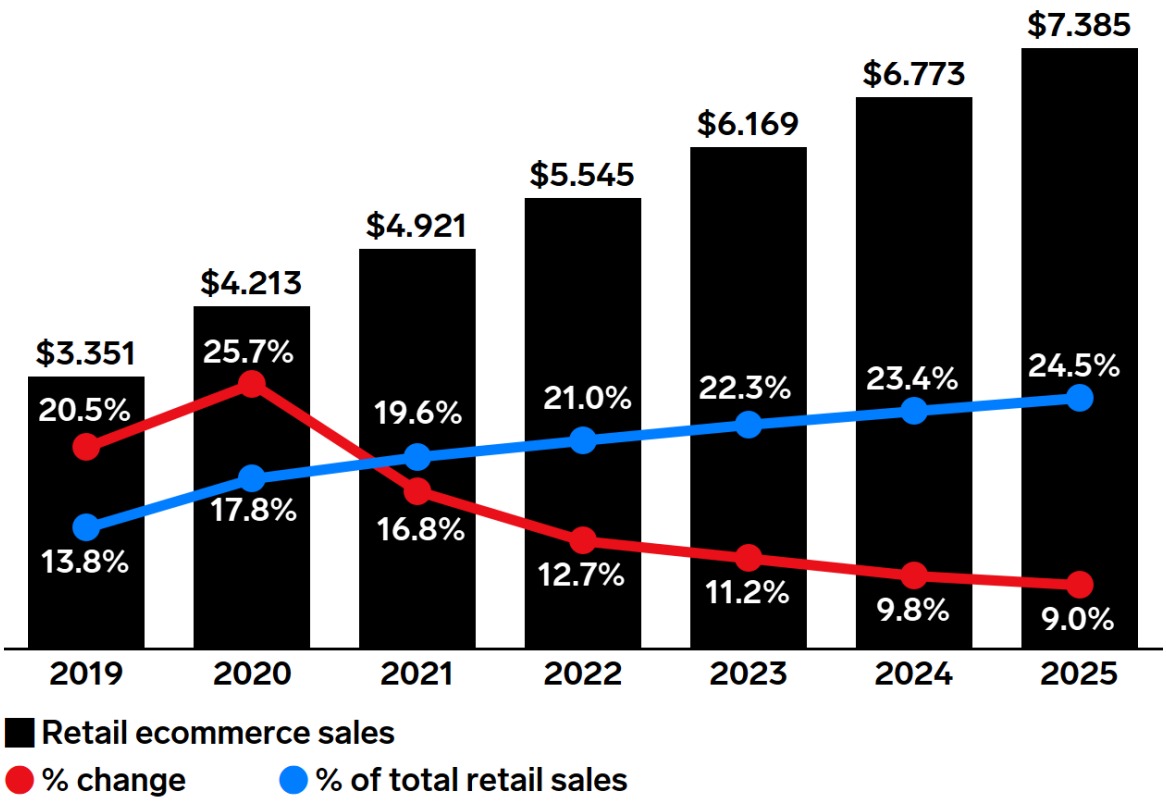
KEY STAT: Following a 25.7% increase in 2020, retail ecommerce sales worldwide will rise to $4.921 trillion in 2021.

21 charts

Reliable data in simple displays for presentations and quick decision making.

Retail Ecommerce Sales Worldwide, 2019-2025

trillions, % change, and % of total retail sales



Note: includes products or services ordered using the internet, regardless of the method of payment or fulfillment; excludes travel and event tickets, payments such as bill pay, taxes, or money transfers, food services and drinking place sales, gambling, and other vice goods sales
Source: eMarketer, May 2021

T11547 eMarketer



Charts in This Report

Retail Ecommerce Sales Worldwide, 2019-2025 (trillions, % change, and % of total retail sales)

Total Retail Sales Worldwide, 2019-2025 (trillions and % change)

Total Retail Sales in China and the US, 2019-2025 (trillions)

Retail Ecommerce Sales Worldwide, by Region, 2021 (billions)

Retail Ecommerce Sales Growth Worldwide, by Region, 2021 (% change)

Retail Mcommerce Sales Worldwide, 2019-2025 (billions, % change, and % of retail ecommerce sales)

Retail Ecommerce vs. Retail Mcommerce Growth Worldwide, 2019-2025 (% change)

Retail Mcommerce Sales Share Worldwide, by Region, 2021 (% of total retail ecommerce sales)

Retail Mcommerce Sales Growth Worldwide, by Region, 2021 (% change)

Top 10 Countries, Ranked by Retail Mcommerce Sales Growth, 2021 (% change)

Top 10 Countries, Ranked by Retail Ecommerce Sales Share, 2021 (% of total worldwide retail ecommerce)

Top 10 Countries, Ranked by Retail Ecommerce Sales Growth, 2021 (% change)

Digital Buyers Worldwide, 2019-2025 (billions, % change, and % of population)

Digital Buyer Growth Worldwide, by Region, 2021 (% change)

Top 10 Countries, Ranked by Digital Buyers, 2021 (billions)

Digital Buyer Penetration Worldwide, by Region, 2021 (% of internet users)

Top 10 Countries, Ranked by Social Buyers as a Percent of Internet Users, 2021 (% of internet users)

Top 10 Countries, Ranked by Social Buyers as a Percent of Digital Buyers, 2021 (% of digital buyers)

Top 10 Countries, Ranked by Social Buyer Growth, 2021 (% change)

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Daily News

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Implications for the Air Freight Sector of Different Airport Capacity Options

Prepared for the Freight Transport Association
and Transport for London

Final Report

January 2015



York Aviation

Contents

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Key Points

Key Points (1)

- So far, the work undertaken by the Airports Commission has focussed strongly on the needs and requirements of the passenger market at London's airports. Issues around the freight market have largely been underestimated and there are also concerns in the freight industry that the Commission has little understanding of how the air freight market operates or its importance in supporting the UK economy.
- Air freight accounts for about 40% of UK imports and exports by value. It is an essential enabler for a wide range of industry sectors, handling high value goods, which require rapid, secure and reliable transport to destinations all over the globe.
- The UK air freight market is dominated by London and more specifically by Heathrow. In 2013, the main London airports handled around 1.8 million tonnes of freight, with Heathrow accounting for around 1.4 million tonnes.
- Air freight tonnage at the London airports has grown over the last 20 years. However, this disguises a worrying trend. The market grew rapidly until 2000, but since that time it has largely stagnated. This stagnation has coincided with growing capacity constraints at Heathrow and the inability of the London hub to grow in terms of Air Transport Movements (ATMs). The air freight market in London is already being constrained by the capacity issues at Heathrow. It is also seems clear that to a significant degree other airports cannot step in to provide relief as they do not have the long haul networks to support bellyhold capacity. Only Stansted, with its significant spare runway capacity, has emerged as an alternative for pure freighter airlines.
- Air freight is a significant driver for the UK economy. Damaging its ability to function effectively in the longer term through the failure to deliver capacity improvements or the development of the wrong options could have serious implications for the UK economy.
- In 2010, Steer Davies Gleave (SDG), as part of their work for Department for Transport on Air Freight in the UK, estimated the total economic footprint of the sector (direct, indirect and induced effects) to be around £7.3 billion in Gross Value Added (GVA) and 135,300 jobs. The impact of the sector on the wider economy is difficult to quantify effectively. However, SDG estimated that the total value of air freight services including wider impacts to the UK economy was around £14.3 billion and 282,400 jobs.
- By 2050, the London system airports will be full if either no capacity is added or a third runway is added at Heathrow or a second runway is built at Gatwick. Only a 4 Runway Hub would provide some spare capacity at 2050. This has significant implications for the ability to service air freight demand from London. We would expect significant volumes to have to be trucked elsewhere by 2050 in constrained scenarios:
  - No Expansion – 2.1 million tonnes of freight or around half of total freight demand in 2050;
  - Heathrow Runway 3 – 1.2 million tonnes of freight or around 85% of the freight throughput of Heathrow now;
  - 2nd Runway at Gatwick – 1.7 million tonnes of freight.
- This will ultimately have significant negative impacts on the UK economy.
- If no additional capacity is provided in London (No Expansion), the additional trucking costs are estimated to be around £41.6 million per annum in 2050. With a 2nd Runway at Gatwick, these costs reduce to a total of around £36.1 million per annum. Heathrow Runway 3 results in additional costs of around £23.5 million per annum. These costs are likely to be passed through to users of freight services.

Key Points (2)

- There are also potentially significant impacts on freight users time costs from increased transit times. No Expansion of capacity will result in a loss of user time costs of around £378 million per annum. The addition of a second runway at Gatwick improves the situation but the costs are still ultimately significant at around £321 million per annum. Heathrow Runway 3 results in a loss of around £213 million per annum.
- The consequent impacts on long term GVA in the wider economy are again significant. No Expansion results in lost GVA of around £978 million per annum by 2050. Heathrow Runway 3 results in a GVA loss of around £551 million per annum by 2050. 2nd Runway at Gatwick results in a GVA loss of around £836 million per annum by 2050.
- In addition, the impact on the sector's economic footprint (direct, indirect and induced impacts) in 2050 could be :
  - No Expansion – around £637 million in GVA and 6,800 jobs;
  - Heathrow Runway 3 - £359 million in GVA and 3,800 jobs;
  - 2nd Runway at Gatwick - £544 million in GVA and around 5,800 jobs.
- Ultimately, our analysis demonstrates clearly the importance of the provision of sufficient concentrated airport hub capacity in London by 2050. Without this capacity the air freight industry will suffer, as, ultimately, will the end users in the UK economy.

Introduction

Introduction

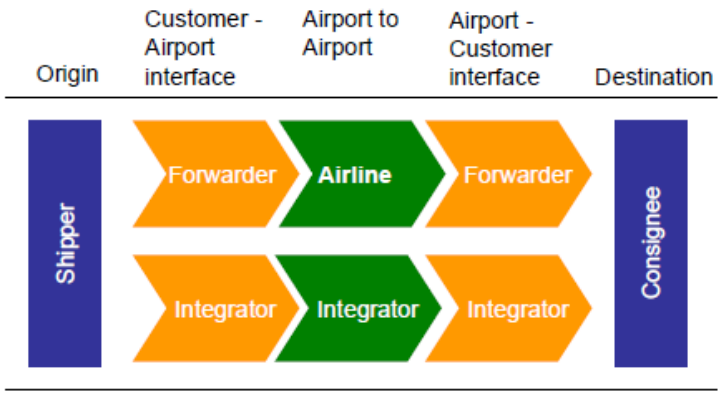
- In August 2014, York Aviation was commissioned by the Freight Transport Association and Transport for London, to consider the potential long term effects on the UK economy from changes in the air freight industry in the UK resulting from different potential development scenarios for runway capacity in London.
- So far, the work undertaken by the Airports Commission has focussed strongly on the needs and requirements of the passenger market at London's airports. The Commission has identified the need for one more runway in London by 2030 and has chosen to focus its work on considering where this additional runway should be located and is currently appraising options at Heathrow and Gatwick and up until September, it was considering the Mayor of London's proposal for a four runway hub in the inner Thames estuary. The Commission has recognised that further runway capacity, beyond the initial additional runway, is likely to be needed soon after 2030 and that certainly by 2050 as, even with one more runway in London, the London airports will be full.
- Clearly, the debate around the location of further runway capacity and, ultimately the amount of further capacity, will not just affect passengers and passenger airlines. There are significant potential implications for air freight operations, with knock-on implications for the broader freight industry and ultimately for freight users. However, to date, issues around the freight market have largely been underestimated in the Commission's publications and there are also concerns in the freight industry that the Commission has limited understanding of how the air freight market operates or its importance in supporting the UK economy.
- This short report seeks to address some of these issues, building on previous work undertaken by York Aviation and on a range of other publicly available information:
  - focussing on potential impacts in the longer term at 2050;
  - examining the implications for air freight capacity in London;
  - considering how the freight industry might react in different scenarios to service demand;
  - identifying and where possible quantifying the potential impacts on freight users.
- The analysis undertaken here necessarily adopts a range of simplifying assumptions given the timescales for the study, the limited availability of information on air freight operations and demand compared to the passenger market and the lack of information on air freight in the forecasting work undertaken by the Department for Transport in its 2013 UK Aviation Forecasts and latterly by the Airports Commission.
- This report is structured as follows:
  - in **Section 2** we set out some basic information on the air freight market in London and across the UK;
  - in **Section 3** we provide some background on the importance of air freight to the economy;
  - in **Section 4** we present our estimates of the impact on air freight capacity in London of the runway development scenarios;
  - in **Section 5** we discuss how the industry might react to these scenarios and present our estimates of the impact on the UK economy;
  - in **Section 6** we outline our conclusions.
- In addition, given the options now being considered by the Airports Commission, we have included an Appendix that specifically considers the relative merits of expansion at Heathrow and Gatwick using the evidence developed during this study.

The Air Freight Market in the UK

Air Freight in the UK

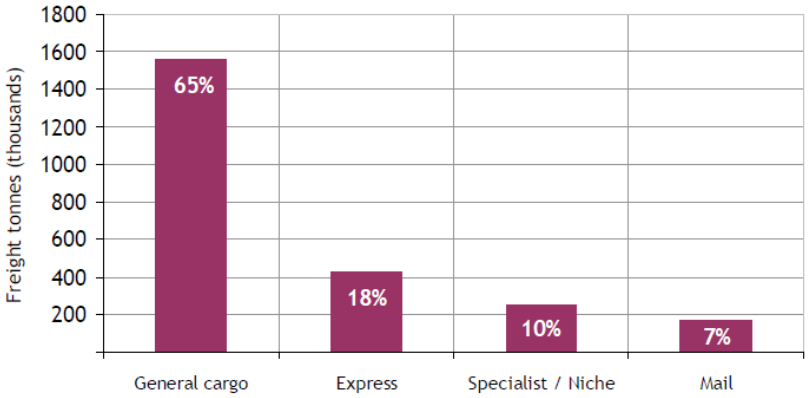
- Air freight accounts for about 40% of UK imports and exports by value. It is an essential enabler for a wide range of industry sectors, handling high value goods, which require rapid, secure and reliable transport to destinations all over the globe. Key users include high end manufacturing, engineering, pharmaceuticals, retailing, financial and business services and the automotive sector.
- Steer Davies Gleave (SDG), in its work for the Department of Transport on UK Air Freight in 2010, identified two broad business models operating in the UK:
  - General Cargo transported by passenger and freight airlines with collection and delivery organised by freight forwarders; and
  - The Integrator model, which tends to focus on smaller consignments, where collection and delivery, and often the air component of the journey are all managed by a single organisation.
- The integrator model, as operated by companies such as DHL, UPS, TNT and Federal Express, has been of growing in importance in the last two decades. This model focussed originally on express courier services but has broadened out substantially. As a consequence, the two models increasingly crossover.
- Broadly, SDG split the air freight market in to four product types. General air cargo, express freight, specialist / niche freight and mail (see figure opposite). Express freight is the fastest growing segment of the market and, while speed is a feature of all air freight, it is within this segment that time critical activities are most extreme.

FIGURE 1.4 SIMPLE DOOR TO DOOR AIR FREIGHT VALUE CHAIN



Source: SDG.

FIGURE 5.1 TOTAL FLOWN UK AIR FREIGHT BY MARKET TYPE 2008 (INBOUND AND OUTBOUND)

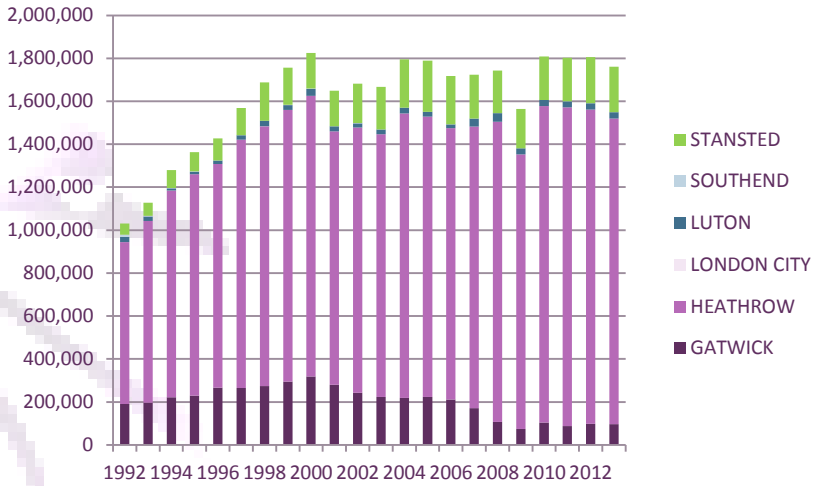


Source: SDG analysis of CAA and other sources.

Air Freight Market in London (1)

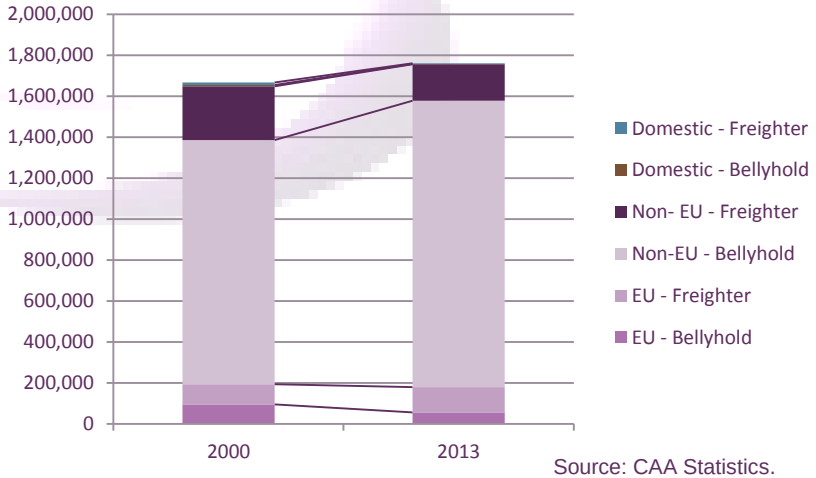
- The UK air freight market is dominated by London and more specifically by Heathrow. In 2013, the main London airports handled around 1.8 million tonnes of freight, with Heathrow accounting for around 1.4 million tonnes. The only other significant player in the London market was Stansted, which handled around 0.2 million tonnes, with Gatwick handling around 0.1 million tonnes. The market has been largely constant over the last 10 years following rapid growth in the 1990s.
- The air freight market is predominantly long haul and had become increasingly so over time. For domestic and short haul destinations in Europe, it is often cheaper, faster and more flexible to truck freight to its destination. It is difficult to precisely define where the tipping point lies between trucking and air freight in terms of distance. However, for overnight parcels it is believed to around 500km but, for less urgent freight, it could be substantially further.
- Air freight is carried in both the bellyhold of passenger aircraft and in dedicated freighter aircraft. The existence of the former method helps to explain the dominance of Heathrow in the market in London. Heathrow, as a global hub airport, offers by far the largest range of long haul destinations of the London airports and by far the most aircraft capacity. Almost all of the 1.4 million tonnes of freight handled at Heathrow in 2013 was carried in the bellyhold of passenger aircraft. Increasingly, pure freighter operations have moved out of Heathrow as higher yielding passenger services have taken over their slots. The same is true of air freight operations at Gatwick
- Conversely, at Stansted Airport, the only other major player in the London market, the focus is on pure freighter aircraft, operated by a range of freight airlines. The Airport's passenger airlines focus on short haul travel using narrow body aircraft. Their business models do not fit well with carrying freight, particularly the low fares airlines.

Freight Tonnage at London Airports



Source: CAA Statistics.

Freight Tonnage at London Airports by Destination and Configuration

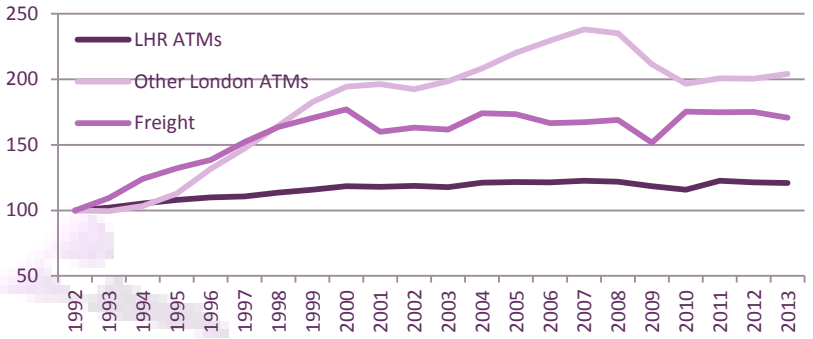


Source: CAA Statistics.

Air Freight Market in London (2)

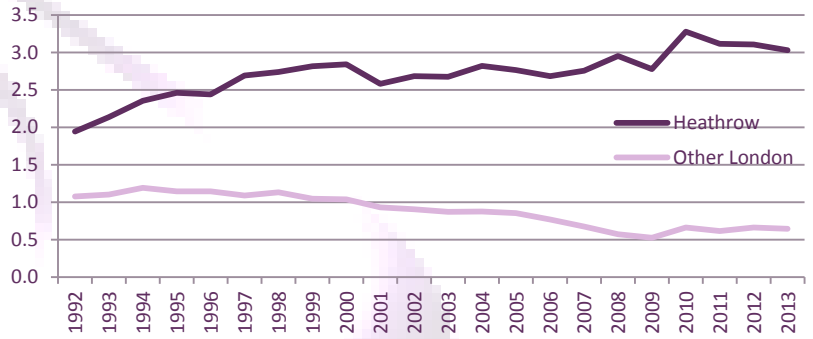
- Air freight tonnage at the London airports has grown over the last 20 years. However, this disguises a worrying trend. The market grew rapidly until 2000, but since that time it has largely stagnated. This stagnation has coincided with growing capacity constraints at Heathrow and the inability of the London hub to grow in terms of Air Transport Movements (ATMs).
- This is demonstrated in the chart opposite which shows freight tonnage tracking ATM growth at Heathrow. The growth in ATMs across the London system as a whole appears to have had no influence at all on air freight growth. This re-emphasises the importance of Heathrow in the air freight market as the primary provider of air freight capacity. The other airports, without Heathrow's long haul connections, simply do not provide an alternative. Only Stansted, with its significant spare runway capacity, has emerged as alternative for pure freighter airlines, albeit the range of destinations served by these aircraft is substantially smaller than is available using bellyhold capacity in passenger aircraft.
- The impact of constraint at Heathrow can also be seen in terms of the increasing freight loads per movement at the airport. Since 1992, the average amount of freight per movement has grown from around two tonnes to around three tonnes. At the same time, the average load at the other London airports has nearly halved, with airlines at the other London airports increasingly focussing on low cost, short haul travel.
- It is also interesting to compare Heathrow's performance to the other major European hub airports. In the last 10 years, both Paris and Frankfurt have outperformed Heathrow. Amsterdam was performing well prior to the global recession but experienced a more significant drop in freight throughput than the others and has still not recovered.
- Overall, it seems to reasonable to suggest that the air freight market in London is already being constrained by the capacity issues at Heathrow. It is also seems clear that to a significant degree other airports cannot step in to provide relief as they do not have the long haul networks to support bellyhold capacity.

Freight Tonnage vs ATM Growth (Index: 1992 = 100)



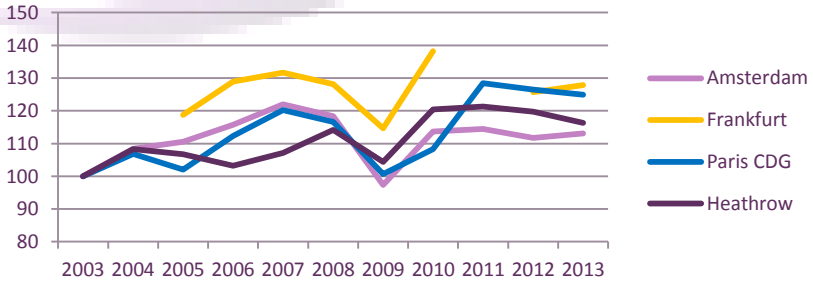
Source: CAA Statistics.

Freight Tonnes per Movement



Source: CAA Statistics.

Freight Tonnes at Europe's Hub Airports (Index: 2003 = 100)



Source: Eurostat.

Air Freight in the Rest of the UK

- Outside of London and the South East, there are only a limited number of UK airports with a significant air freight presence (the main London airports account for 77% of the market).
- East Midlands is by some margin the most significant freight airport outside London, with nearly 0.3 million tonned. It focuses on pure freighter operations and is the main UK base for DHL and a significant base for UPS and TNT.
- Manchester Airport is the largest bellyhold freight airport outside of London. The airport is also the largest long haul passenger gateway outside London, so this is not surprising. Birmingham Airport also has some bellyhold freight traffic, supported by the airport's long haul services, but is substantially smaller than Manchester.
- Manston Airport in Kent did, until recently, provide some additional freighter capacity for London. However, the airport closed in May 2014 following financial difficulties.
- Overall, this suggests that there is no 'ready made' solution to air freight capacity constraints in London immediately obvious in the UK regions.
- East Midlands clearly has the potential and capacity to be significant freighter only location but does not have a long haul passenger offer to support a bellyhold capability.
- Manchester has some potential to offer an alternative for bellyhold freight but is obviously a considerable distance from London and alternatives on the continent, such as Paris CDG or Amsterdam, offer a significantly greater long haul networks if freight needs to be trucked some distance.
- Birmingham may offer some options for bellyhold capacity but again will struggle to compete with the broader long haul networks at the continental hubs.

Air Freight Tonnes at UK Airports

	Tonnes	%
London - Bellyhold	1,455,725	64%
London - Freighter	304,965	13%
East Midlands - Bellyhold	16	0%
East Midlands - Freighter	266,952	12%
Manchester - Bellyhold	81,927	4%
Manchester - Freighter	14,446	1%
Manston - Bellyhold	9	0%
Manston - Freighter	29,297	1%
Belfast - Bellyhold	106	0%
Belfast - Freighter	29,181	1%
Birmingham - Bellyhold	15,269	1%
Birmingham - Freighter	5,797	0%
Other UK - Bellyhold	21,763	1%
Other UK - Freighter	42,356	2%
Total	**2,267,811**	**100%**

Source: CAA Statistics.

Current Economic Importance of Air Freight in the UK

The Economic Impact of Air Freight

GVA and Employment Impact of Air Freight on the UK Economy



Source: SDG.

- The importance of air freight to the UK economy can be demonstrated by its economic impact. It is not only important as an economic activity in its own right, providing jobs and supporting Gross Value Added (GVA), but, as we have described above, it also supports significant employment and Gross Value Added in the wider economy through the provision of its services to a range of industries in the UK economy.
- In 2010, SDG, as part of their work for Department for Transport on Air Freight in the UK, considered the economic impacts of the sector on the UK economy. It estimated that air freight services directly supported around £2 billion in GVA and around 39,100 jobs. In addition, through its supply chain (indirect effects) and through the expenditure of incomes earned in the direct and supply chain activities (induced effects), it supported significant GVA and employment. SDG estimated the total economic footprint of the sector (direct, indirect and induced effects) to be around £7.3 billion in GVA and 135,300 jobs.
- The impact of the sector on the wider economy is difficult to quantify effectively. However, using a multiplier analysis based on the UK input-output tables, SDG developed an estimate of what it termed forward linkage effects in the economy. Taking these impacts into account, SDG estimated that the total value of air freight services to the UK economy was around £14.3 billion and 282,400 jobs.
- Given the dominance of London in the air freight market in the UK, it is reasonable to assume that a significant proportion of these benefits accrue in the greater South East region and relate to activity at the London airports.
- This analysis also begins to demonstrate what is at stake in terms of the potential impact of different airport capacity development scenarios in London. Air freight is a significant driver for the UK economy. Damaging its ability to function effectively in the longer term through the failure to deliver capacity improvements or the development of the wrong options could have serious implications for the UK economy.

Economic Value of Air Freight to Users

- The value of air freight to users and, hence, ultimately its impact on the wider UK economy is driven by what it offers in terms of advantages over freight transport modes. SDG identified four key features and rated their importance to different users based on surveys and consultations.
- It shows that speed is important for all but, for some, it is a key feature of the service. This is potentially important in considering the potential impacts of different capacity scenarios for London, as, if demand cannot be met within the London system, freight will need to be trucked elsewhere, resulting in longer transit times or earlier final pick-up times for shipments. For some parts of the market, this could represent a critical loss of utility with significant impacts on their operations.
- The other key features are subordinate to speed but for some sectors they are valuable features, notably security for jewellery and art, and reach for aircraft parts.
- A number of quotes from the Freight Transport Association's Sky-High Value report, show the real world importance of air freight to example users. FTA members clearly demonstrate the importance of the existing Heathrow hub to their operations.

Ford's air freight needs can vary considerably, from a handful of parts to significant volumes. These can be sent by air in response to scheduling or engineering changes and Ford can also air-freight prototype parts, urgent replacement parts for customer vehicles, and occasionally complete vehicles for auto shows or short-notice testing under different conditions.
Ford

Air Freight Drivers by Importance to Key User Groups

	Security	Speed	Information	Reach
Machinery Parts	●	●●●	●●	●●
Electrical Components	●●	●	●	●
Aircraft Parts	●	●●●	●●	●●●
Jewellery	●●●	●	●●	●
Art	●●●	●	●●	●
High Street Fashion		●		
Pharmaceuticals	●●	●		●
Perishables		●●●		

Key: ● = Important ●● = Very Important ●●● = Key Feature

Source: SDG.

"It is no coincidence that suppliers to the music industry, as with other sectors such as motor sport, are clustered in the West London area. Heathrow's multiple daily departures for a huge number of international destinations are crucial to the company meeting the ever tightening time pressure on tour schedules."
Sound Moves, International Logistics for Bands and Artists

"Our products are used in scanning for, and treating, serious health conditions. However, our products decay continually, so it is essential that we can make and ship the product on the same day a clinician orders it, so that they receive a useable amount"
Pharmaceutical Manufacturer

Estimates of Air Freight Demand and Capacity in 2050

Potential Runway Capacity Development Scenarios

Forecast Movements and Movement Capacity in the London System in 2050 (000s)

	No Expansion	4 Runway Hub	Heathrow Runway 3	2nd Runway at Gatwick
Forecast Movements				
Heathrow / Hub	480,000	903,000	740,000	480,000
Gatwick	280,000	280,000	280,000	540,000
Other London	592,000	592,000	592,000	592,000
Movement Capacity [redacted]				
Heathrow / Hub	480,000	1,080,000	740,000	480,000
Gatwick	280,000	280,000	280,000	540,000
Other London	592,000	592,000	592,000	592,000
% ATM Capacity Used [redacted]	*100%*	*91%*	*100%*	*100%*

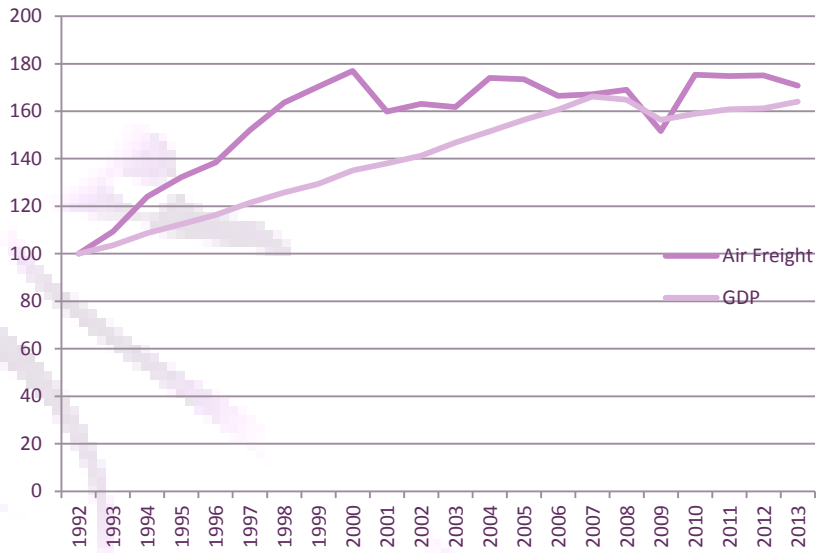
Source: York Aviation analysis of Airports Commission Interim Report, Heathrow and Gatwick submissions.

- In our analysis, we have considered four potential scenarios for runway capacity development in the London system by 2050:
  - No Expansion – no additional runway capacity is built in London before 2050. Movements and movement capacity are as assumed in the Airports Commission Interim Report;
  - 4 Runway Hub – a non-location specific four runway hub airport is developed. This is the only scenario in which there is any spare capacity in the London system. Movements at the hub are assumed to be at a similar level to an unconstrained Heathrow from the Airports Commission Interim Report. Other airports are full and capacities are assumed to be as per the Airports Commission Interim Report. This is included to demonstrate the importance of developing adequate hub capacity in London beyond the 2030 scope of the Airports Commission's current deliberations;
  - Heathrow Runway 3 – a third runway is built at Heathrow, in line with Heathrow Airport Limited's plans as set out on its website. This runway is full before 2050. All other airports are also full and capacities are taken from the Airport's Commission Interim Report;
  - 2nd Runway at Gatwick – a second runway is built at Gatwick in line with Gatwick Airport Limited's published plans on its website. This runway is full before 2050. All other airports are also full and capacities are taken from the Airport's Commission Interim Report.
- These movement forecasts and airport capacities form the basis for our assessment of potential freight capacity in the London system and the extent to which this can meet future demand for air freight in London.

Estimates of Unconstrained Freight Demand at the London Airports in 2050

- Unlike for passenger demand, there are no current published forecasts for air freight demand in the UK. Neither the Department for Transport nor the Airports Commission have produced freight forecasts in any of their recent aviation forecasting work.
- Organisations such as Boeing and Airbus to produce global freight forecasts. However, these typically present an optimistic view of the market, which is not specific to the UK. For instance, Boeing's 2012-2013 World Cargo Forecast predicts global growth of around 5.2% per annum for the next 20 years compared to 3.7% per annum recorded growth over the last 10 years.
- We have, therefore, made a conservative assumption that unconstrained air freight demand in the UK will grow broadly in line with UK GDP through to 2050. The forecasts for GDP growth have been taken from the Office for Budgetary Responsibility's latest short and long term forecasts. These see average per annum growth to 2050 of around 2.3%.
- Given the increasing globalisation of the world economy and the fact that UK trade has tended to grow faster than GDP, we believe this is likely to be a conservative methodology.
- Ultimately, this suggests total unconstrained tonnage demand across the London system in 2050 of around 4.2 million tonnes on a conservative basis.

UK GDP vs. Air Freight at London Airports (Index: 1992 = 100)



Source: ONS and CAA.

Potential Air Freight Capacity in the London System in 2050 (1)

Potential Air Freight Capacity in the London System in 2050

	No Expansion	4 Runway Hub	Heathrow Runway 3	2nd Runway at Gatwick
Total Freight Demand in Tonnes	4,221,831	4,221,831	4,221,831	4,221,831
Bellyhold Capacity				
Heathrow / 4 Runway Hub	1,724,544	3,139,644	2,601,497	1,724,544
Gatwick	127,430	124,775	124,775	465,915
Other London	20,134	19,913	19,913	19,692
Excess Tonnes after Bellyhold	2,349,723	937,499	1,475,646	2,011,680
Residual Freighter Capacity in Constrained Scenarios	240,653	n/a	286,932	286,932
Total Excess Tonnes	2,109,070	937,499	1,188,714	1,724,748
Freighter Movements Required	79,712	35,433	44,927	65,186
Available ATM Capacity	0	177,000	0	0
Accommodated within London with Freighters	0	35,433	0	0
Freight Tonnes to be Diverted Elsewhere	**2,109,070**	**0**	**1,188,714**	**1,724,544**

Source: York Aviation.

- Above, we have considered the potential air freight capacity that might exist in London under different the scenarios. In line with the structure of the market now, we have assumed that the majority of capacity will be provided via aircraft bellyhold freight. We have estimated this capacity based on the number of forecast international movements at the relevant airports in the London system multiplied by the expected average tonnage per international movement in 2050 at each airport. The latter has been derived by taking the tonnes per international movement now estimated from CAA Statistics and growing this by 0.5% per annum to 2050 to reflect increasing loads and larger aircraft. In relation to the 2nd Runway at Gatwick scenario, we have made a further adjustment to allow for the fact that we would expect the airport to attract more long haul services in such a scenario. We have assumed that that tonnage per movement in this scenario would increase significantly to be around double that observed at Gatwick in the other scenarios in 2050. This reflects the Gatwick Airport long term demand forecasts from its submissions to the Airports Commission, which suggest a doubling in the proportion of long haul traffic at the airport by 2050.

Potential Air Freight Capacity in the London System in 2050 (2)

- Within the London system, we have assumed that a hierarchy of preference will exist much as it does now. Heathrow or a 4 Runway Hub will be the first choice for the users of bellyhold freight capacity as they will offer the largest concentration of capacity via their long haul networks and this capacity will be used up first. Excess tonnage will then shift to Gatwick and then finally to other airports in the London system, most likely Stansted.
- For the purposes of this analysis, we have assumed that freighter aircraft primarily act as a means to supplement bellyhold capacity where insufficient bellyhold capacity is available. This is simplification as there are items that cannot be transported on passenger aircraft or for which freighter transport is preferable and destinations that are not served by passenger aircraft. Consequently, we have further assumed that a residual number of freighter movements will still be accommodated in London in capacity constrained scenarios at 2050, i.e. all scenarios other than the 4 Runway Hub.
- These freighter flights may use slots that are not suitable for passenger activities or may simply offer more value than some passenger leisure services and, hence, force such services out of the market. The percentage of total ATMs in the London system accounted for by these services is assumed to be equal to the percentage of pure freighter movements at Heathrow now under these constrained scenarios.
- To the extent that there remains excess tonnage that remains after these two elements of freight capacity have been considered, the scope to accommodate additional freighter aircraft movements within the London system will be dependent on the number of movements entailed and the number of available movements remaining at the airports. As stated above, it is only in the 4 Runway Hub scenario that there is any movement capacity left by 2050 and, hence, it is only in this scenario that any of the excess demand can be accommodated in London. In fact, the available ATM capacity is such all freight demand can be handled at the London airports in this scenario.
- In all the other scenarios, this demand must be satisfied elsewhere at other airports either in the UK or on the continent. By scenario, the excess demand to be accommodated elsewhere is as follows:
  - No Expansion – 2.1 million tonnes of freight or around half of total freight demand in 2050;
  - Heathrow Runway 3 – 1.2 million tonnes of freight or around 85% of the freight throughput of Heathrow now;
  - 2nd Runway at Gatwick – 1.7 million tonnes of freight.

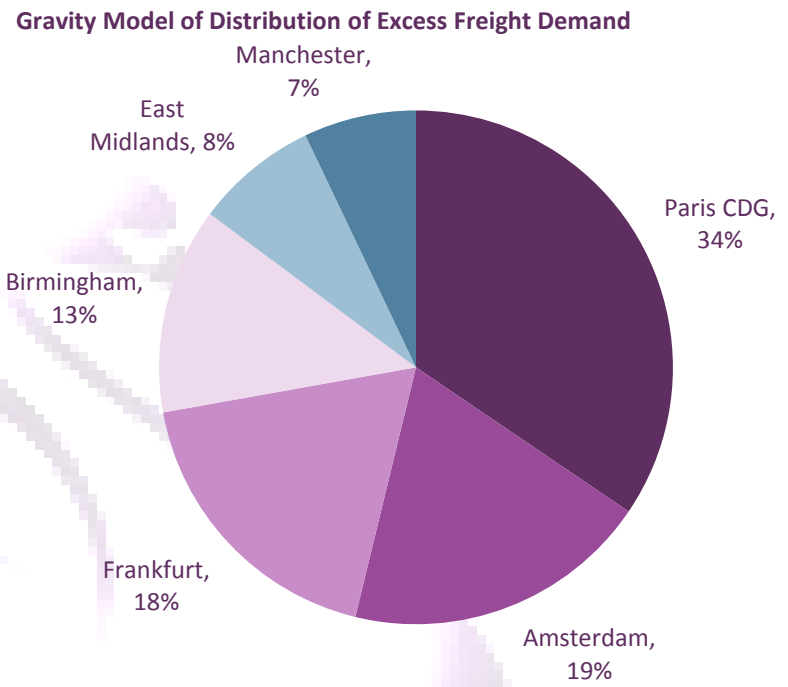
Economic Impacts of Air Freight Development Scenarios

How Will the Freight Industry React

- Our analysis of the potential freight demand and capacity within London in 2050 suggests that the air freight industry is likely to face two issues depending on the runway capacity scenario assumed:
  - if a second runway is built at Gatwick and no additional capacity is developed elsewhere, this has the potential to create a second significant geographic node for bellyhold capacity in London. The industry will need to consider how it structures its operations to make best use of this capacity. It should be noted that, while all scenarios involve some use of bellyhold capacity at airports other than Heathrow or a 4 runway hub, it is only in the 2nd Runway at Gatwick scenario that this is likely to represent any more than a business as usual position;
  - where there is significant excess demand that cannot be accommodated within London, the industry will need to examine how it can meet this demand and, in some cases, if it will choose to meet this demand.
- In terms of the first issue, there are potentially three options for companies in the sector:
  - to effectively ignore the shift in the balance of capacity available towards Gatwick and to continue to focus operations on Heathrow, particularly as it is unlikely that Gatwick will offer a significant number of relevant long haul destinations that are not served from Heathrow in any event. This is certainly a possibility for some time. However, we would expect that freight rates at Heathrow would increase to reflect this, with the result that Gatwick would become more attractive for some operators and with the consequence that ultimately bellyhold capacity at both airports would be fully utilised;
  - to split consolidation operations between the two sites. This is perhaps ultimately the most extreme option and it seems unlikely that many would follow this path as it would likely introduce significant inefficiencies in to their operations through duplication of functions. It should, however, be noted that some functions will have to be duplicated for Gatwick to be used at all, for instance transit shed facilities. So, at a less extreme level, there will be an inefficiency cost to the industry. However, within the scope of this work we have not sought to estimate this;
  - The final option is ultimately the most likely. Operators will continue to focus their operations on the main hub but will truck freight to Gatwick to use bellyhold capacity as appropriate. This will impact on the costs faced by the industry, which, in a competitive market, we would ultimately expect to be passed on to freight users. We present estimates of the impact on these costs below. It should also be recognised that transhipment between the two airports increases the chance of service failures and delays, making the option less attractive to operators and impacting ultimately on users. We have not sought to estimate this latter effect in this work and hence impacts may be conservative.
- The options in relation to the excess demand that cannot be satisfied within the London system are subtly different. Again, some companies may simply choose to step back from the London market, either withdrawing or choosing not to seek to expand with demand. This may be particularly true for major global companies with the ability to shift the emphasis of their activity. However, this will ultimately leave unsatisfied demand in and around London and potentially market space for others to step in and seek to serve the market via a different business model. This is most likely to involve trucking freight from London to other airports either in the UK or on the continent that have the necessary capacity and / or long haul passenger networks to support the required levels of demand. This will, however, come at a cost in terms of both additional trucking costs and a loss of utility to users as these avenues will need more time to ship freight, which in an industry where speed is an essential feature is clearly potentially damaging. Again, there is also the potential for increased service failures and delays via this route.
- We consider potential patterns of distribution of this excess demand below.

Gravity Model of Distribution of Excess Demand

- In considering how excess air freight demand from the London system might be served by trucking to other airports in the UK and on the continent, we have developed a basic gravity model to estimate the distribution.
- The model includes three UK airports: the national freight hub at East Midlands and the two primary regional long haul passenger gateways at Manchester and Birmingham. It also includes the three main European hub airports, which all have a significant freight presence now and are likely to grow both bellyhold and freighter capacity in to the future.
- The attraction factor within this model is forecast workload units (a workload unit is one passenger or 100kg of freight) at each airport in 2050 based on the Airports Commission traffic forecasts in its Interim Report. Passenger numbers have been adjusted to reflect the proportion of long haul passengers. Freight is assumed to grow from current levels through to 2050 in line with passenger numbers.
- The distance decay factor within the model is the road haulage cost of transporting a truck load of freight to the relevant airport from London. Freight rates have been derived from data provided by the Freight Transport Association. Distances have been derived from the fastest road route to the destination airport from Google Maps.
- This demonstrates that we would anticipate that a significant proportion of the excess demand will be trucked overseas to the major continental hub airports to take advantage of their extensive long haul networks.
- UK regional airports, despite being substantially closer to London in most cases, cannot match the level of attractiveness offered by the continental hubs and their wider global networks. Consequently, other UK airports are only expected to handle around 28% of any excess demand.



Impacts on the Wider UK Economy

- Drawing on our analysis of the potential capacity implications and operational impacts of the four runway capacity development scenarios set out, we have considered the potential impacts of each scenario on the UK economy.
- We have examined a number of potential streams of impact:
  - the impact on freight costs from additional trucking, either within London in the case of the 2nd Runway at Gatwick scenario or to other UK regional and continental airports where demand has to satisfied away from the London system;
  - the impact on users' utility from increased transit times / earlier cut-off times. As we have discussed, one of the key reasons users choose air freight as a means of transporting goods is speed and, for some parts of the market, speed and time is critical. Therefore, changes in the operating environment that affect speed of delivery or transit times will have an effect on the usefulness or usability (utility) of air freight for some users, which will represent a disbenefit to the economy;
  - the impact on long term productivity in the wider economy from constraints on air freight demand. Ultimately, rising freight costs from additional trucking and the implied rise in costs associated with lost utility to end users will result in reduced demand and impact on productivity in the wider economy, through changes in the ability to trade effectively or decisions around location and investment. This results in lower GVA in the long term;
  - the impact on the sector's economic footprint in the UK from constraints on air freight demand. As we have set out above, air freight services in themselves support significant employment and GVA through their economic footprint (their direct, indirect and induced impact on the economy). Reduced demand for air freight services will ultimately impact on the sector's ability to support this economy activity.

Impact on Freight Costs from Additional Trucking

The Impact on Freight Costs from Additional Trucking in 2050 (2014 Prices)

	No Expansion	4 Runway Hub	Heathrow Runway 3	2nd Runway at Gatwick
Costs of Trucking within London (1)	£0.0	£0.0	£0.0	£2.0
Costs of Trucking to Other UK Airports	£7.5	£0.0	£4.2	£6.2
Costs of Trucking to Overseas Airports [redacted]	£34.1	£0.0	£19.2	£27.9
Total Additional Costs	£41.6	£0.0	£23.5	£36.1

(1) All scenarios involve some trucking of freight from Heathrow or a new Hub to other airports. However, in most scenarios this is assumed to be 'business as usual', much as it is now. It is only in the second runway at Gatwick scenario that the development of a significant second centre of freight activity is assumed that would result in truly additional trucking costs.

[redacted]

Source: York Aviation.

- Failure to provide sufficient capacity at London's main hub airport or within the London system generally to support the air freight market is likely to result in additional costs to the industry, either from the need to move freight from facilities near to the main hub airport to another airport within London or from London to a range of other airports in the UK or on the continent.
- The costs of trucking in London apply primarily in relation to the scenario whereby a second runway is built at Gatwick and no additional capacity is provided at Heathrow. Using data provided by the Freight Transport Association, we have calculated the number of truck journeys that would be required to move the freight displaced from Heathrow to Gatwick assuming typical loads per truck in the industry and also the likely costs of these journeys based on freight rates. On this basis, we estimate that building a second runway at Gatwick would result in additional costs to the industry of around £2 million per annum from moving freight within London (2014 prices). Much greater costs are, however, incurred by the need to move freight out of the London system to other UK airports or to the continent to meet demand. Again, we have calculated the number of journeys that would be need to accommodate this excess freight tonnage and the associated costs of these journeys.
- If no additional capacity is provided in London (No Expansion) the additional trucking costs are estimated to be around £41.6 million per annum in 2050. With a 2nd Runway at Gatwick, these costs reduce to a total of around £36.1 million per annum. Heathrow Runway 3 results in costs of around £23.5 million. The difference between Heathrow Runway 3 and Second Runway at Gatwick stems primarily from the need to truck freight to Gatwick in the latter scenario.
- A 4 Runway hub provides sufficient capacity such that no additional trucking is required. Hence, there are no additional costs.

Impact on Users Utility from Increased Transit Times / Earlier Cut-off Times

Impact on Users Utility from Increased Transit Times / Earlier Cut Off Times

	No Expansion	4 Runway Hub	Heathrow Runway 3	2nd Runway at Gatwick
Average Increase in Transit Times	158	0	90	136
Time Sensitive Proportion of the Market	30%	30%	30%	30%
Value of Time per Tonne (per hour)	£120.07	£120.07	£120.07	£120.07
Total Impact on Freight User Utility (£m)	**£378**	**£0**	**£213**	**£321**

Source: York Aviation.

- The need to truck freight around London or, more importantly, further afield will impose not only an additional trucking cost but also a utility cost on users that are time sensitive. Users are prepared to pay significant additional amounts for express delivery of air freight and increased transit times or earlier end of day cut off times will impact on these users as the quality of service they experience will be reduced. The value of this time is difficult to calculate and standard values are not available (as they are for passengers). We have, therefore, estimated the extent to which express freight users are willing to pay for an hour's faster delivery for express services using data published in the SDG report for DfT (see assumptions book for additional information). This suggests that value of saving an hour for a tonne of freight for time critical users is around £120.
- For the purposes of this analysis, we have assumed that the time critical portion of the market is approximately represented by the size of the express freight industry. Currently, this is stated by SDG to be around 18% of the market. However, this sector has been growing faster than general air cargo. We estimate that, by 2030 and thereafter, it will account for around 30% of the market.
- The impact on transit times is based on the weighted average of additional time required to truck freight to / from the airport at which it is shipped or received across the market as a whole. This includes freight which continues to travel via its preferred London airport, for which additional trucking time is assumed to be 0. Trucking costs for freight displaced from Heathrow to Gatwick are included.
- The results suggest that there are potentially significant impacts on freight user utility from increased transit times. No Expansion of capacity will result in a loss of user utility of around £378 million per annum. The addition of a second runway at Gatwick improves the situation but the costs are still ultimately significant at around £321 million per annum. Heathrow Runway 3 results in a loss of around £213 million per annum. Only a 4 Runway Hub, which provides sufficient capacity to avoid any additional trucking, does not result in a cost to users.

Impact on Long Term Productivity in the UK Economy (1)

Impact on Wider UK Economy from Lost UK Freight Demand

	No Expansion	4 Runway Hub	Heathrow Runway 3	2nd Runway at Gatwick
Estimated Value of Unconstrained Air Freight Market in 2050 (£m at 2014 prices)	£4,508	£4,508	£4,508	£4,508
Increase in Costs from Trucking and Lost Utility	£419	£0	£236	£358
% Impact on Costs	9.3%	0.0%	5.2%	7.9%
Price Elasticity	-0.5	-0.5	-0.5	-0.5
Lost Tonnage	-196,301	0	-110,639	-167,679
GVA Impact on the Wider Economy (£m at 2014 prices)	**-£978**	**£0**	**-£551**	**-£836**

Source: York Aviation.

- The increase in costs associated with additional trucking and the loss of utility to users will ultimately affect the level of air freight demand in and around London, which will in turn impact on economic activity as productivity will be reduced through channels such as the ability to trade being impaired or companies moving away from the area to a location with the services they need or through lost future investment.
- In previous work for Transport for London Oxford Economics has statistically estimated the link between the level of activity in the economy and a combined index of the level of business air travel and air freight. We have used this relationship to estimate a long term GVA impact of each of the scenarios . The change in the level of demand for air freight is assumed to reflect the percentage increase in total revenues from air freight in the UK caused by increased trucking costs and lost utility to users via a price elasticity relationship. The value of the unconstrained air freight market in 2050 is based on our estimate of air freight demand described above, an analysis of air freight turnover in the UK from the ONS Annual Business Survey and CAA Statistics. This assessment is also consistent with global freight rates as set out in the latest IATA Cargo eChartbook.
- The price elasticity of air freight demand is a poorly researched area. Consequently, we have had to assume an elasticity of around -0.5. This is broadly in line with available data for the price elasticity of business passenger air travel. We believe the figure to be potentially conservative but reasonable in the absence of more specific information.
- The resulting impact on freight tonnage demand in effected scenarios ranges between around 111,000 tonnes (Heathrow Runway 3) and 196,000 tonnes (No Expansion). As before, a 4 Runway Hub has sufficient capacity that the air freight market is not constrained and hence there is no loss.

Impact on Long Term Productivity in the UK Economy (2)

- The consequent impacts on GVA are again significant:
  - No Expansion results in lost GVA of around £978 million per annum by 2050;
  - Heathrow Runway 3 results in a GVA loss of around £551 million per annum by 2050;
  - 2nd Runway at Gatwick results in a GVA loss of around £836 million per annum by 2050.
- In 2013, Oxford Economics in its work for TfL estimated that the GVA loss from constrained business travel would be around £6.9 billion per annum in 2050. Considering the relative sizes of the passenger and freight markets at the London airports, this demonstrates that the impact from the impairment of freight services should be taken at least as seriously as that from passenger markets. The impacts are likely to be proportionately significant.

Impact on Air Freight's Economic 'Footprint'

GVA and Employment Impact on the Air Freight Services Sector Economic Footprint

	No Expansion	4 Runway Hub	Heathrow Runway 3	2nd Runway at Gatwick
Direct Effect				
GVA Lost (£m at 2014 prices)	£174	£0	£98	£149
Employment Lost	2,000	0	1,100	1,700
Total Economic Footprint Effect				
GVA Lost (£m at 2014 prices)	£637	£0	£359	£544
Employment Lost	6,800	0	3,800	5,800

Source: York Aviation analysis of SDG.

- Finally, we have considered the impact of reduced freight demand in the UK on the sector's economic footprint. For the purposes of this analysis, we have assumed that the loss of demand is equal to that described above in relation to the long term impact on GVA in the wider economy. In other words, we have assumed that much of the processing and consolidation of freight will be retained within the UK before freight is ultimately trucked overseas. In this regard, this may mean that the estimates are conservative in terms of the losses demonstrated. However, we believe this to be the most prudent assumption.
- Based on the previous work undertaken by SDG on the economic impact of the sector, we estimate that the impacts of constraint in the London system will be as follows:
  - No Expansion – around £637 million in GVA and 6,800 jobs;
  - 4 Runway Hub – this an unconstrained scenario and hence there are no impacts;
  - Heathrow Runway 3 - £359 million in GVA and 3,800 jobs;
  - 2nd Runway at Gatwick - £544 million in GVA and around 5,800 jobs.

Summary Comparison Between Heathrow & Gatwick Expansion

Summary Comparison Between Heathrow & Gatwick Expansion (1)

- Given the Airports Commission's decision to focus on expansion options relating solely to Heathrow or Gatwick, we have in this Appendix provided some additional analysis of the evidence presented in the main body of the report to consider the relative merits of expansion at Heathrow and Gatwick compared to the No Expansion case.
- We have projected that by 2050, all airports servicing London will have reached full capacity even if either the Gatwick or Heathrow expansions go ahead, which will have significant impact on freight efficiency and the economy. Six key comparisons were made between the Gatwick and Heathrow expansion scenarios and 'No expansion', using the analysis above. These comparisons are presented in the Table below.
- Of the three options, the Heathrow expansion provides the most significant economic benefits, in terms of cost reduction, job creation and minimization of extra costs associated with increased freight transit times. For the six key freight comparisons the Heathrow expansion is on average 43% more economically beneficial than 'No expansion' whereas Gatwick is only on average 15% more beneficial than 'No expansion'. We consider this evidence in more detail overleaf.

Comparison of 'No expansion' to London airports with Gatwick 2nd runway and Heathrow 3rd runway

Projections to 2050	No Expansion	Gatwick 2nd runway	Heathrow 3rd runway	Gatwick 2nd runway % difference	Heathrow 3rd runway % difference
Truck elsewhere (m tonnes)*	2.1	1.7	1.2	19.1%	42.9%
Cost of trucking elsewhere (£m)	41.6	36.1	23.5	13.2%	43.5%
Freight user time costs (£m)	378	321	213	15.1%	43.7%
Lost GVA to wider economy (£m)	978	836	551	14.5%	43.7%
Lost GVA to sector's economy (£m)	637	544	359	14.6%	43.6%
Jobs Lost	6,800	5,800	3,800	14.7%	44.1%

Source: York Aviation

Summary Comparison Between Heathrow & Gatwick Expansion (2)

- The freight comparisons for **six key economic measures** are projections for the year 2050 comparing Gatwick and Heathrow expansions with 'No expansion':
  - **Truck elsewhere:** Significant volumes of freight will be trucked elsewhere to cover the shortfall in air freight capacity in the region. The amount diverted is however reduced if either Gatwick or Heathrow undergo expansion (as opposed to 'No expansion'). If Gatwick is expanded then the amount trucked elsewhere is reduced by almost 20%. Under the Heathrow expansion however, this reduction is more than doubled to 43%;
  - **Cost of Trucking elsewhere:** Heathrow expansion is a saving of nearly 44%, or £18.1 million. Gatwick expansion means the cost reduction is only 13%;
  - **Freight User Time Costs:** Trucking elsewhere also incurs extra costs associated with increased transit times for goods. The 'No expansion' scenario equates to an extra time cost of £378 million. The Gatwick expansion would see this cost lowered by 15%and expansion of Heathrow would result in a lowering of nearly 44% which equates to a saving of £165 million;
  - **Knock-on reduction of Economic Gross Value Addition (GVA):** There is an impact to the wider economy measured by a reduction in Gross Value Addition (GVA) arising from supporting goods and services associated with the air freight industry. The loss to the wider economy is estimated to be £978 million which is reduced by nearly 15% if the Gatwick expansion occurs and around 44% if the Heathrow expansion takes place;
  - **Loss of job creation:** Along with a loss of GVA, there is inevitably a reduction in job creation. With 'No expansion', a total of 6,800 extra jobs would not be created. This is reduced by 1,000 with the expansion of Gatwick and by 3,000 with the expansion of Heathrow.
- Of the three options, the Heathrow expansion provides the most significant economic benefits, in terms of cost reduction, job creation and minimization of extra costs associated with increased freight transit times.

References

References

- Air Freight Economic and Environmental Drivers – Steer Davies Gleave for Department for Transport (March 2010)
- Haulage Trends – Freight Transport Association (April 2014)
- Air Freight: A Market Study with Implications for Landlocked Countries - World Bank (2009)
- CAA Statistics – various. See [redacted]
- Sky-high Value: The Importance of Air Freight to the UK Economy – Freight Transport Association (2014)
- Cargo eChartbook Q2 2014 – IATA Economics
- Impacts on the UK Economy through the Provision of International Connectivity – Oxford Economics for Transport for London (2013)
- London Airports Route Networks in 2050 – York Aviation for Transport for London (July 2013)

[redacted]

Assumptions Book

Bellyhold Capacity Assumptions

% International Passenger Movements by Scenario

	No Expansion	New 4 Runway Hub	Third Runway at LHR	2nd Runway at LGW
Hub	93%	90%	91%	93%
Gatwick	96%	94%	94%	91%
Other London	91%	90%	90%	89%

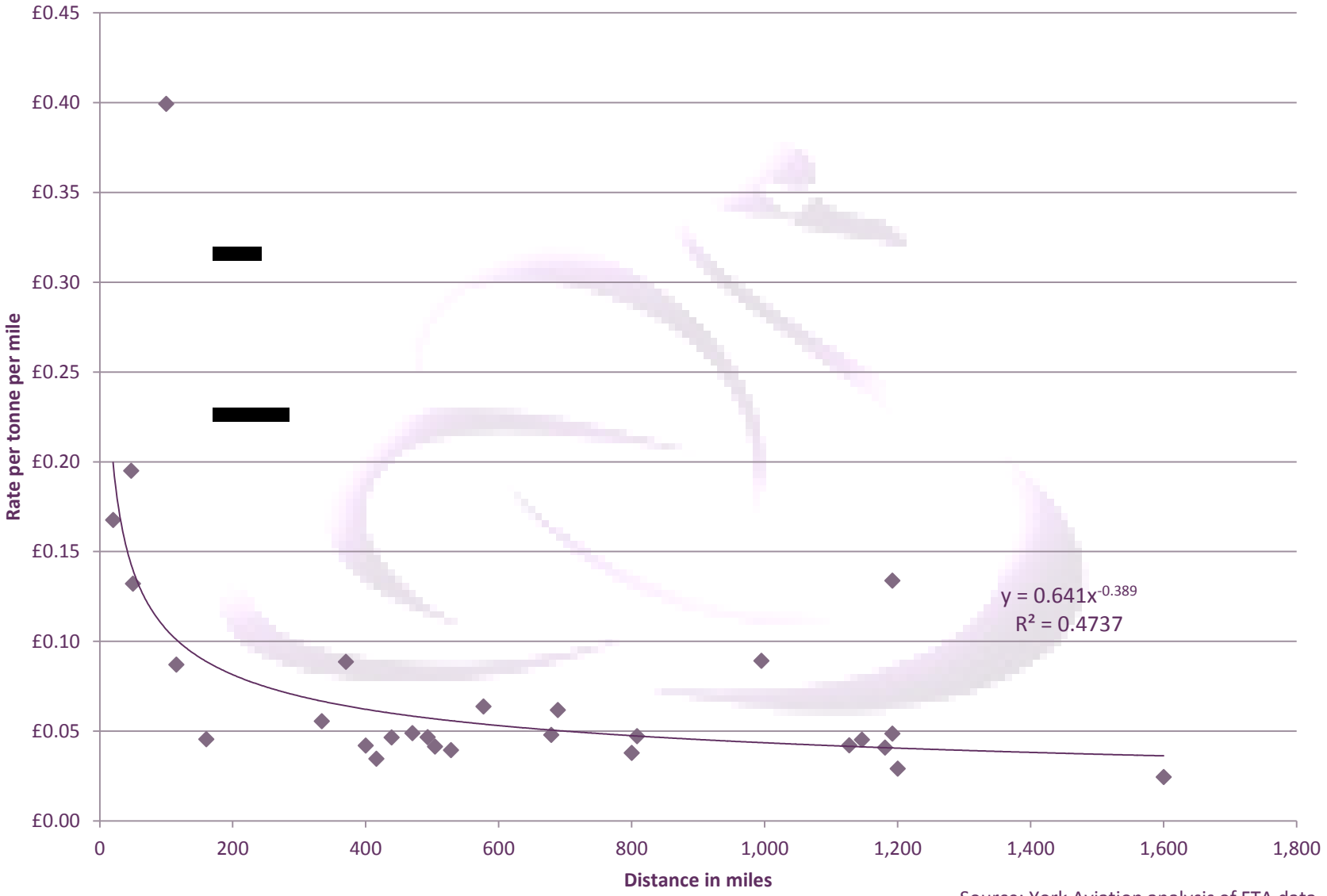
Source: York Aviation London Route Networks 2050 Model.

Freight Tonnes per ATM in 2050

[redacted]	No Expansion	New 4 Runway Hub	Third Runway at LHR	2nd Runway at LGW
Hub				
Tonnes per Freighter	35.6	35.6	35.6	35.6
Tonnes per Bellyhold Movement	3.9	3.9	3.9	3.9
Gatwick				
Tonnes per Freighter	24.6	24.6	24.6	24.6
Tonnes per Bellyhold Movement	0.5	0.5	0.5	0.9
Other London				
Tonnes per Freighter	24.6	24.6	24.6	24.6
Tonnes per Bellyhold Movement	0.0	0.0	0.0	0.0
London Average				
Tonnes per Freighter	26.5	26.5	26.5	26.5
Tonnes per Bellyhold Movement	2.0	2.0	2.0	2.0

Source: York Aviation analysis of CAA Statistics.

Estimated Road Haulage Rates

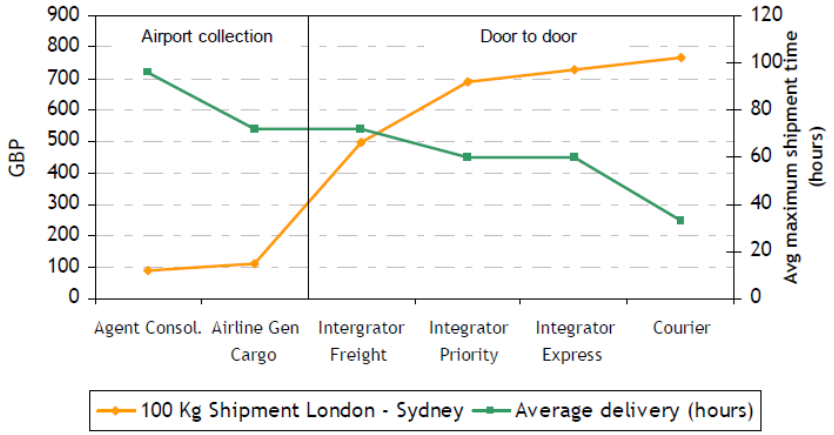


Source: York Aviation analysis of FTA data

Estimate of Value of Time per Hour per Tonne

- A value of time per hour per tonne for time sensitive air freight has been calculated based on the data collected by SDG as part of their work for DfT on Air Freight in 2010.
- The original data has been plotted as an S-curve in the chart below.
- The value of time per hour is assumed to be equal to the average additional amount that would be charged to save an hour on the delivery of a package using an express type service (Integrator Priority, Integrator Express or Courier).
- This has then been converted to a figure for a tonne by multiplying by 10.
- On this basis, the value of time per hour per tonne is around £120.07.

FIGURE 5.3 RELATIONSHIP BETWEEN PRODUCT, SERVICE PROVIDER AND PRICE

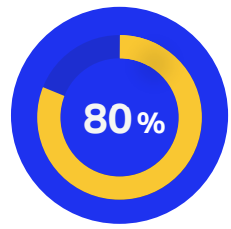


Source: Combined tariff from AMI / integrators.

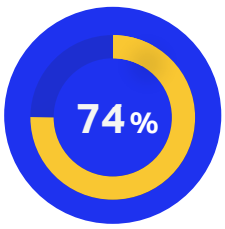
Source: SDG for DfT 2010.

Cost of 100kg Package to Sydney by Delivery Time

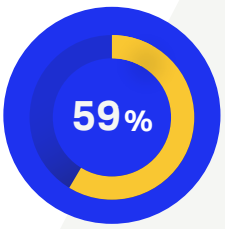




of cross-border e-commerce is transported by air



growth in average transaction volumes in March 2020 compared with 2019



of e-commerce shippers say that air cargo meets their needs only partially



The e-Commerce Impact on Air Cargo Operations

Challenges and Opportunities for Logistics

e-Commerce has revolutionized the way we do logistics. In 2015, online retailing giants began asking for same-day domestic delivery and 72 hours for international shipping, and operating models had to evolve to speed up transportation. As no ship, train, truck or horse is faster than a plane, air cargo was naturally suited for this logistic challenge: IATA estimates that, in December 2019, e-commerce represented up to 15% of air cargo volumes. This number is continuously growing, and the trend has accelerated during and after the COVID-19 pandemic. According to McKinsey, in Q2 2020, e-commerce achieved the growth previously forecasted for the next ten years.

However, shipping e-commerce does require not only speed but also transparency, reliability, and consistency, creating a competitive supply chain. While air cargo welcomes these new volumes, the industry must consider the challenges they bring. Innovation, collaboration, and data-sharing are a must to deliver on online retailer's expectations.

Is the air cargo industry ready?

The top ten largest e-commerce players outsource part of their operations. They do it because the knowledge of a third party enables them to benefit from their vast experience of implementing and running best-in-class operations. Logistics providers bring efficiency by using technologies such as robotics, automation, and software solutions to optimize their entire supply chain. They also enable online retailers to ship anywhere on the planet by leveraging facilities worldwide in economies of scale.

However, today we see some e-commerce giants are moving to integrate their logistics operations vertically to gain more control over their distribution. As the requirements of these stakeholders become increasingly complex, traditional air cargo models risk losing part of the market if they don't address long-known issues.

One of the main challenges is the lagging implementation of digital communications, creating a lack of visibility and transparency. Another factor slowing the supply chain is the lack of adherence to handling standards by some parties, leading to inefficiencies, congested facilities and irreversible mistakes. The insufficient investment in new technologies and lack of adoption of industry standards contribute to perpetuating these issues and hinder speeding up processes.

Compliance with customs regulations also contributes in slowing down operations. Customs controls for e-commerce products can vary from one country to the next, and navigating the regulations can be challenging. IATA and Cargo iQ demonstrated that, on average, it takes 2.1 days to clear customs globally.

Adapting to shippers and society

More than ever, innovation is critical for the air cargo industry. e-Commerce hasn't only changed the way we do logistics, but also changed consumer expectations. Young shoppers drive online businesses and marketplaces, and they will compare services and change their provider in a click if they are not satisfied. The entire supply chain needs to transform to fit into this new behavior.

But consumer expectations today go further than getting their e-commerce products swiftly and transparently. Society has become more environment-conscious and many perceive e-Commerce as a source of CO^2 emissions and waste. Some companies have started to adapt by ensuring a green logistics supply chain. The COVID-19 pandemic hasn't changed this trend: sustainability is expected to stay high in the list of concerns.

Only in a collective effort, transforming the supply chain by focusing on the customer, we will ensure efficiency in our daily operations. The air cargo industry needs to embrace the current and future needs of our e-commerce partners. By adopting new technologies and adhere to operational standards, we will be able to provide what our customers require in an agile and scalable way. Accelerating digitalization is critical if the air cargo supply chain wants to capture online retail volumes and drive efficiency and sustainability in operations ●

Learn how IATA helps the air cargo industry to capitalize on the growth of e-commerce:



IATA CARGO WEBINARS

15 October 2020

Air Cargo E-Commerce

Today's session will begin shortly

IATA CARGO WEBINARS

15 October 2020

Air Cargo E-Commerce

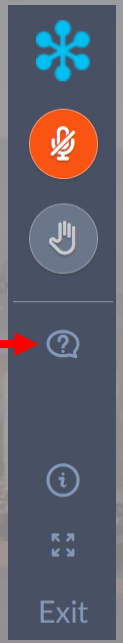
Welcome

IATA CARGO WEBINARS

Microphones have been muted



Please submit your questions through the **Question box** and **send to Everyone**



The webinar is being recorded and will be made available afterwards, including the PPT slides.

IATA



- Participants are cautioned that any discussion regarding matters such as fares, charges, division or sharing of traffic or revenues, or concerning any other competitively sensitive topics outside the scope of the agenda is strictly prohibited.

- As a result, questions pertaining to individual policies or commercial decisions and/or being subject to bilateral commercial discussions between airlines and their suppliers or customers will not be answered.

Agenda

- Welcome Address
- E-Commerce growth & COVID-19 impact
- Supply chain shifts & air cargo gaps
- 3 winning strategies
- Panel and Q&A with our experts
- Wrap up



Biographies are available on the IATA Website

Welcome Address



Brendan Sullivan
Head, Cargo Operations
& E-Commerce
IATA





E-Commerce growth & COVID-19 impact

Maciej Starzyk

Senior Manager, Strategy

PwC



DRAFT

Seizing the E-Commerce Air Cargo Opportunity





IATA,

Maciej Starzyk (PwC)

October 2020

Air cargo is a vital means of transport for cross-border B2C e-Commerce, moving some > 80% (according to ICAO)

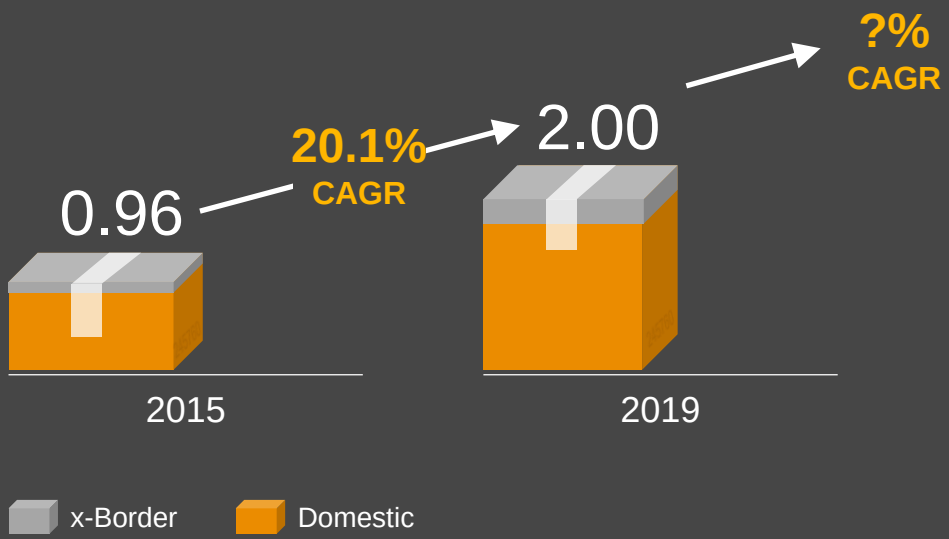
>80%



<20%

The e-Commerce industry has grown globally and its further growth is subject to COVID-19 pandemic impacts

Value of e-Commerce in goods in $T



2015-2019 situation:

- Average annual growth rates > 20%
- Share of cross-border e-Commerce in total e-Commerce in goods grew from 7% to 11%

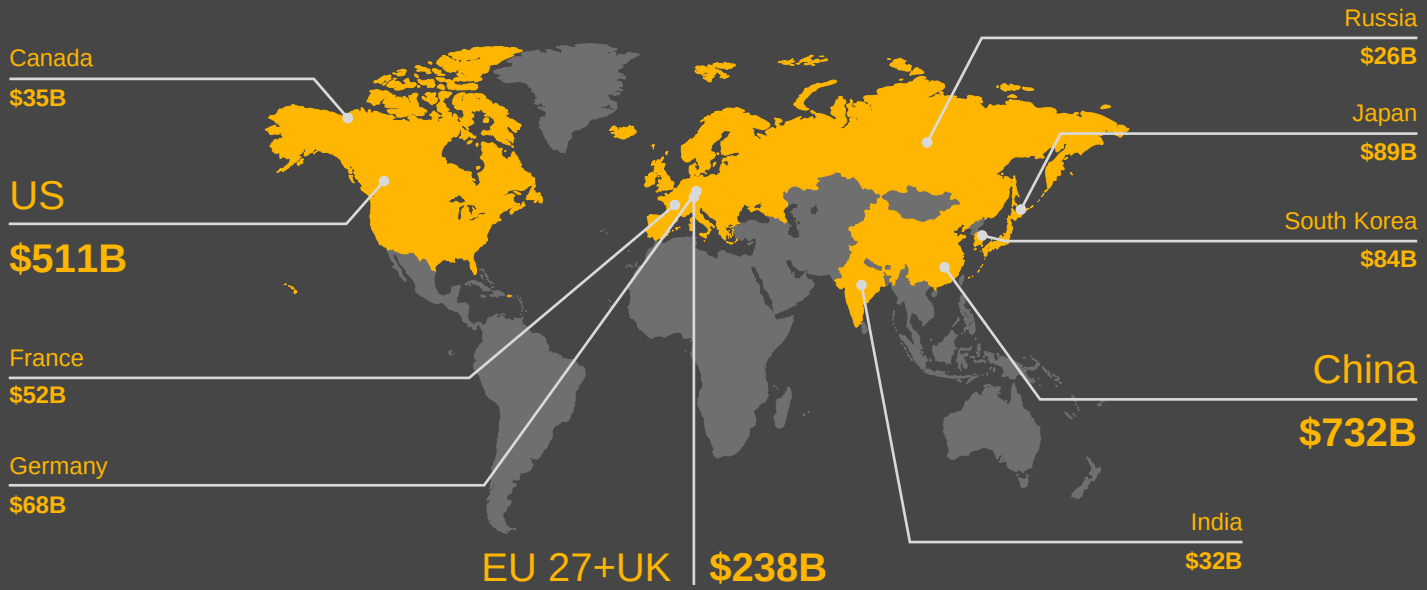
Outlook to 2025:

- Pre- COVID-19 pandemic forecasts at 14.2% CAGR, but total e-Commerce may see a boost due to distancing requirements (visible in courier company performance)

Source: PwC analysis based on Euromonitor International data; values at 2019 end-of-year exchange rates; rounded values

Along largest and fastest-growing markets for e-commerce, emerging markets were expected to start contributing to growth

Absolute e-Commerce market values – 2019



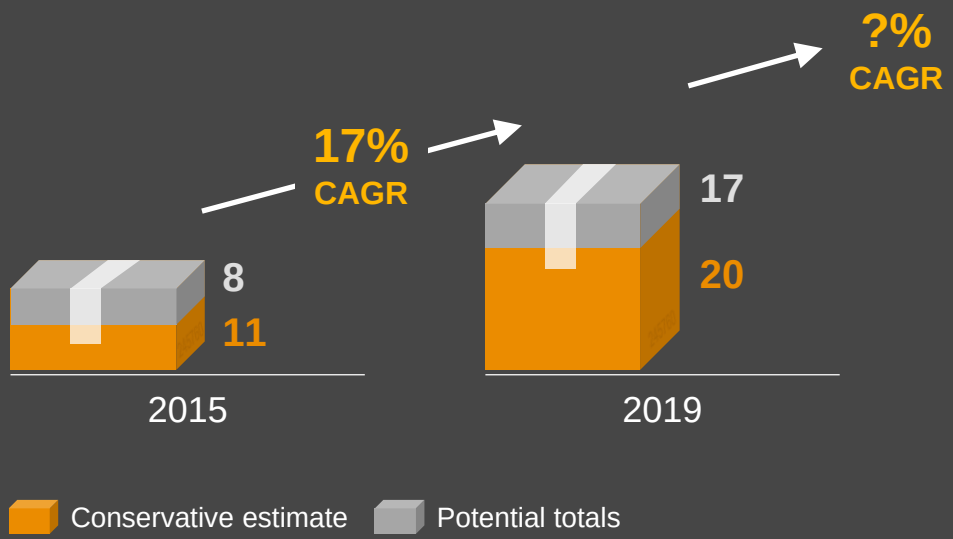
Example EMs with double-digit e-Commerce growth forecasts past 2019:

- Russia
- Philippines
- Thailand
- Saudi Arabia
- Brazil
- Turkey
- Mexico
- India

Source: PwC analysis based on Euromonitor International data

Volumes carried by mail and express players were estimated conservatively at FTK 20 billions, but complete mass carried may be larger, with further growth constrained by capacity

World e-Commerce air cargo estimate (domestic and international) in FTK billions



Source: PwC analysis based on Euromonitor International data, interviews, global air cargo flows data

2015-2019 situation:

- Base market estimates (orange) are conservative values excluding e-Commerce shipped as freight
- Total flows composed of postal, express, freight e-commerce plus unmeasured future-domestic volumes (shipped as freight)
- Share in total FTK 2019: 8.2% to 15.1%
- Part of PPE shipments during pandemic also account for e-Commerce
- Largest routes: inside APAC, Asia-USA, EU-Asia

Outlook to 2025:

- **Formerly forecasted CAGRs at ~10% currently unrealistic due to air cargo capacity constraints**

4 distinct air cargo logistics models function on the market, depending on level of owned vs. outsourced capability and the air dispatch/consolidation profile (single parcels vs. freight)



Model 1:

Owned and fully dedicated air transport capabilities



Model 2:

Air freight shippers



Model 3:

Hybrid models (freight and parcel)



Model 4:

Air parcel shippers (traditional model)

COVID-19 pandemic is changing the ways e-Commerce and transport companies supporting air flows operate

COVID-19 – potential impacts on all e-Commerce logistics models

Labor availability



1. Shift towards more separated/ distanced operations - higher automation
2. Uncertainty
3. Peaks in e-commerce
4. Increase in demand for labor with advanced tech skills

Transport capacities



1. Shift in category mix, growth in demand for online grocery and base means of living, PPE, potential recovery in electronics, fashion, others
2. Restricted capacities in air cargo (due to grounding of passenger planes)
3. Uncertainty and cost pressure causing shift to road and rail

Fulfilment capabilities



1. Need for security of supply chains – fulfillment spreading geographically, located closer to recipients
2. Distancing in fulfillment as a new consumer requirement
3. Higher levels of digitalization across the value chain, allowing integration of track & trace services

Airlines may need to respond to the ways in which e-commerce companies are addressing key gaps in supply chains based on e-Commerce air cargo

Gaps

- Unstandardized services & pricing leading to inflated service prices, consumer confusion
- High international rates
- Lack of products tailored for e-commerce increasing cost and shipping time
- Insufficient service levels in fulfillment
- Low visibility of status for CEP and e-Commerce businesses
- Slow pricing processes, reduced rate competition
- Inflated costs of forwarding due to excessive labor
- Poor visibility to consumers, disconnections in track & trace mechanisms and reverse logistics

How e-Commerce players may respond

- Overcoming border blocks with speed & convenience at the side of shipper processes
- Utilizing rates comparison platforms and mechanisms such as e.g. IATA TACT platform and IATA Net Rates
- Integrating services into emerging digitalized pricing and forwarding services enabling faster and more accurate rates reconciliation & ordering
- E-commerce players developing own fulfillment and logistics capabilities and airlines designing products dedicated for e-commerce, taking into account the inbound and outbound shipping profiles and process integrations of such centers
- Adoption of digital integrations with regards to reporting and track & trace emulation, data flows, including eAWB

Thank you

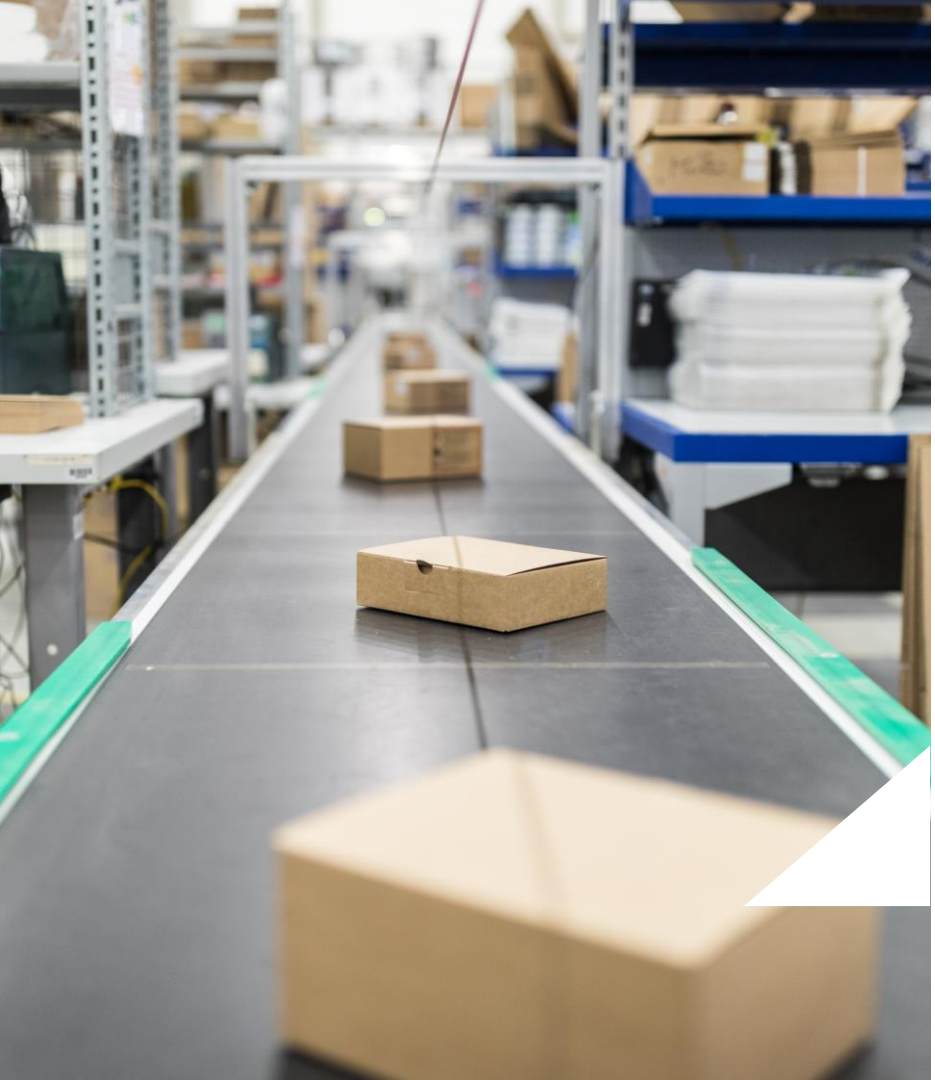
Prepared by:
Julian Brown, Radosław Małkiewicz, Hanna Olszewska, Iryna Kyshko, Jakub Bojanowski

Supervision:
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Supply chain shifts & air cargo gaps

Sebastian Blümmert
Head of Operations & IT
heyworld





Covid-19 & Cross-Border eCommerce

Challenges & Opportunities

Sebastian Blümmert, Head of Operations & IT

IATA Cargo Webinar

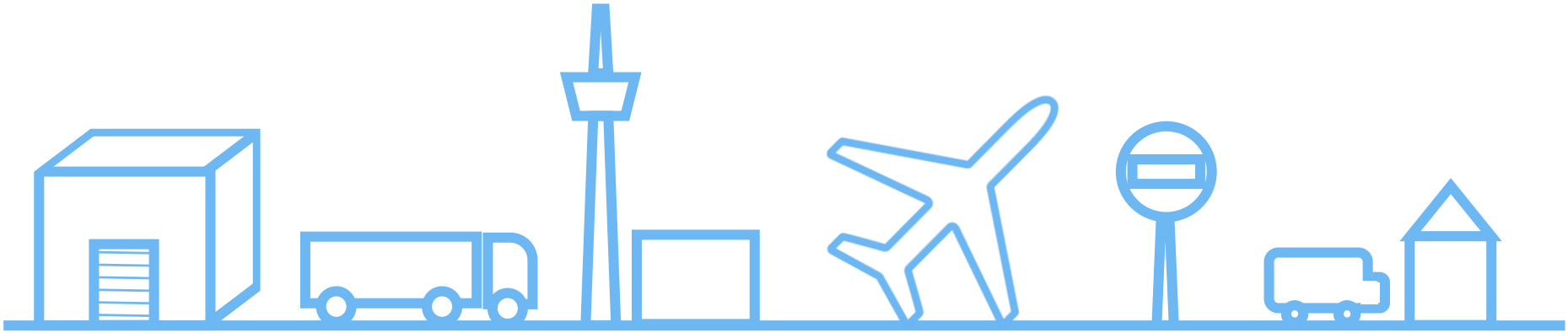
heyworld

About heyworld

Subsidiary of Lufthansa Cargo

Specialist for eCommerce Logistics

Fully Digital & Modular



First Mile

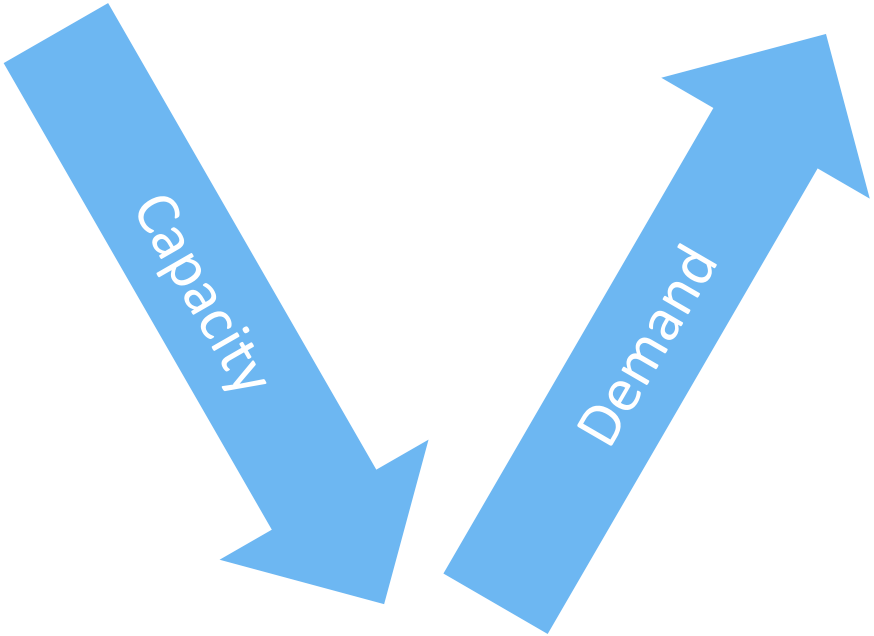
Customized Handling

Air Freight

Customs

Last Mile

The Challenges Summarised

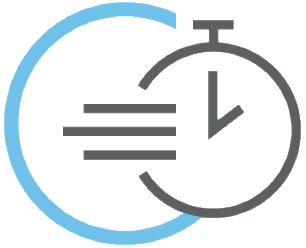


- Volatile Schedules
- Capacity Constraints
- Cost

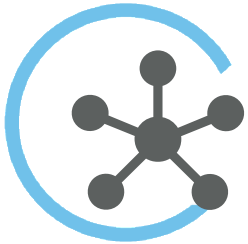
A New Appreciation for Logistics



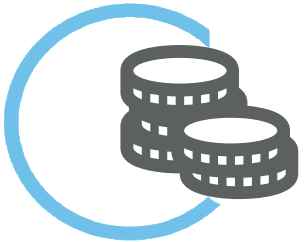
Capacity as a finite good



Speed is (not) everything



The value of resilience



Value for money

The Importance of Data Highlighted

- Data is a powerful tool to cope in challenging times
  - Forecasting
  - Irreg anticipation and management
- Even small steps yield big results
- Shippers more willing to share – are you ready?

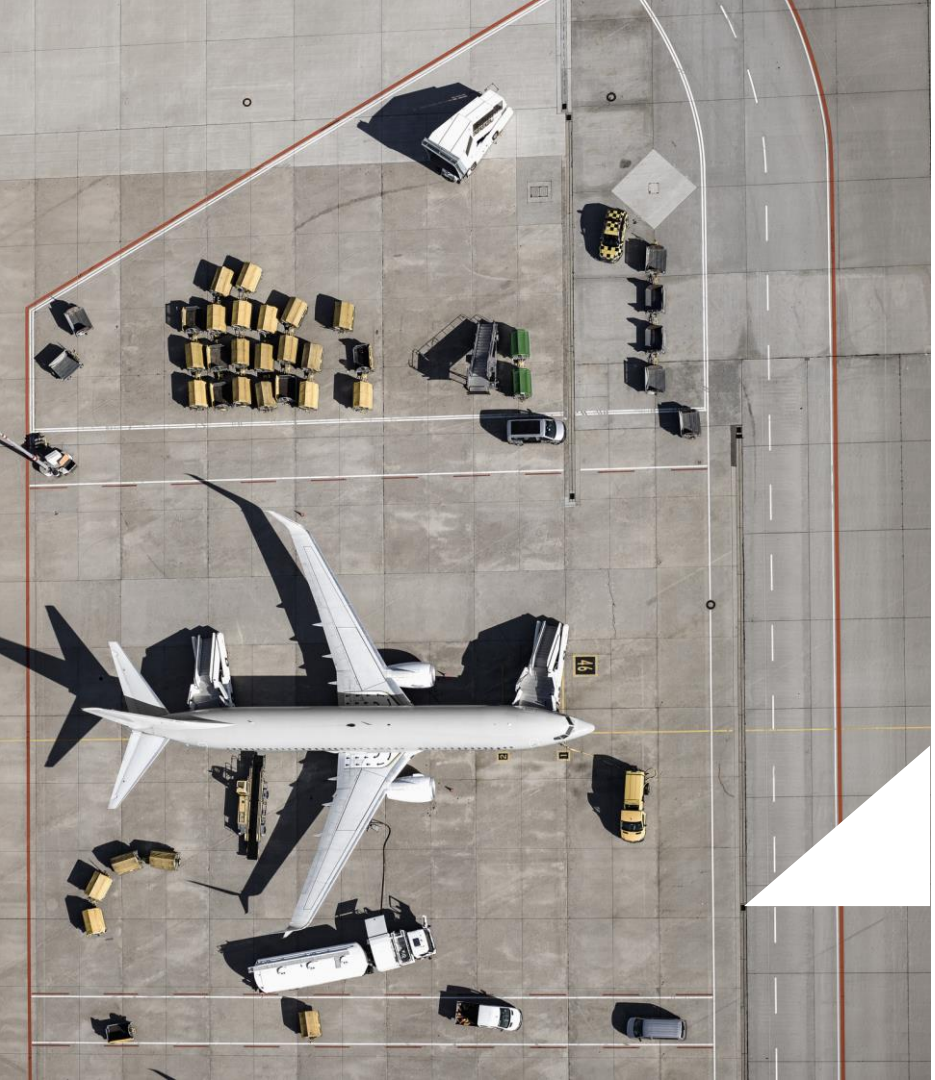


Summary

- Value of Logistics
- Diversification of Logistics
  - Service Levels
  - Sourcing
- The time to use data is now

Thank You!

Sebastian Blümmert
Head of Operations & IT
[redacted]



3 winning strategies

Dr. Ludwig Hausmann
Partner
McKinsey & Co.



McKinsey & Company

Winning strategies in eCommerce for air cargo

Dr. Ludwig Hausmann, Partner, McKinsey

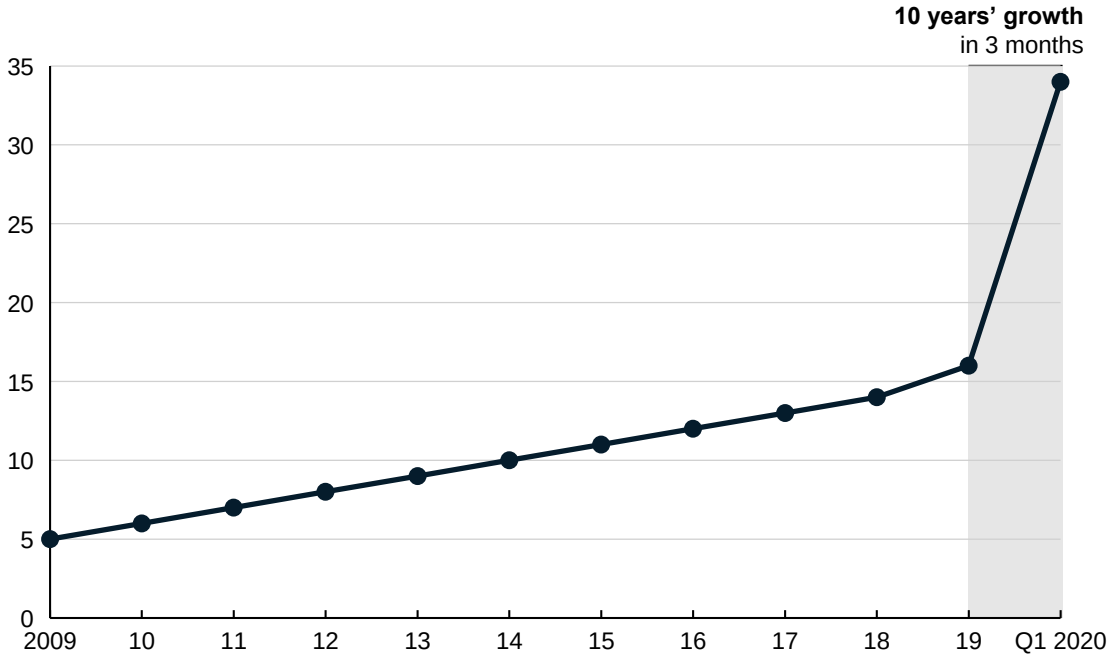
15 October 2020

IATA

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E-commerce has moved 10 years ahead in just 90 days

US e-commerce penetration, percent



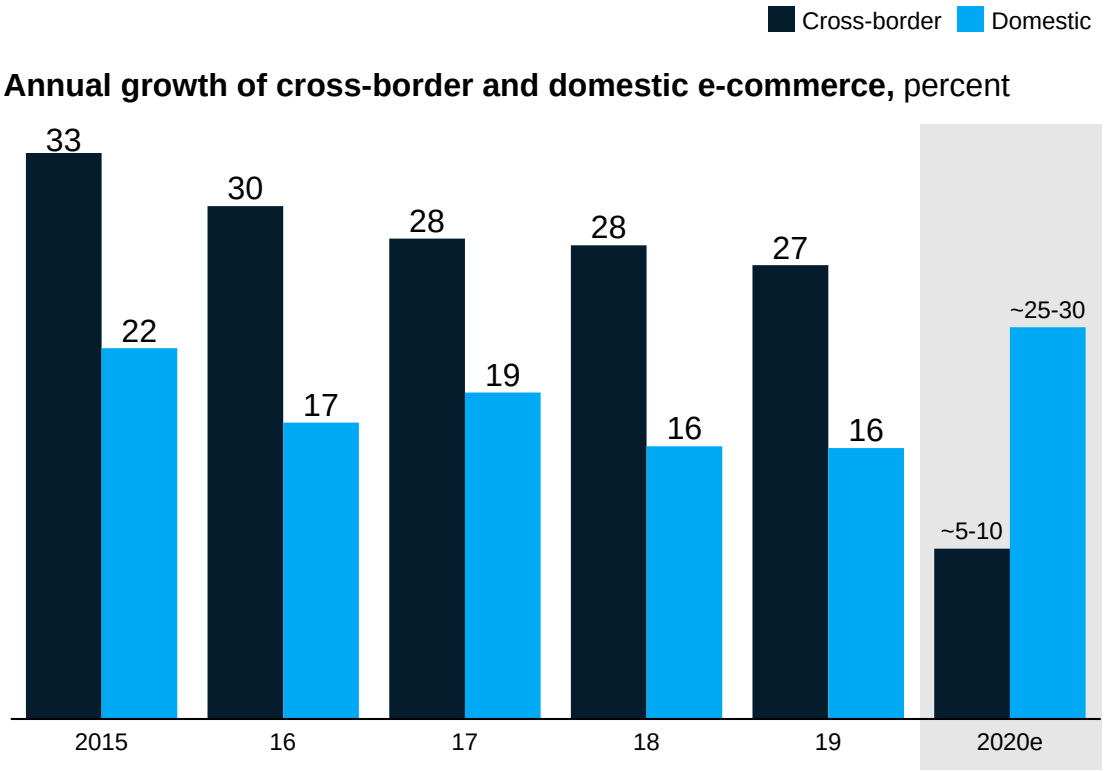
Source: Bank of America; Forrester Analytics; ShawSpring Research; US Department of Commerce; McKinsey analysis

Weekly online orders increased up to 200% YoY during lockdown in Spain, Italy and UK

Amazon revenue for the quarter ending June 30, 2020 was up **40% YoY**

~15-35% growth in consumers who purchase online for most categories post-COVID-19. Especially, over-the-counter **medicine**, **household supplies** and **food delivery** will grow

Cross-border has been outgrowing domestic e-commerce for years – 2020 could be a reversal of this trend



Historical **growth of cross-border e-commerce** of ~25-30% annually from 2015-19 expected to **decelerate to ~5-10% in 2020**

International e-commerce shippers suffering from **shortage of air cargo capacity that declined by >20% in 2020 YTD**

Resulting price increases of 3x and cancelled belly capacity have led e-commerce shippers to **explore alternative transport mode (e.g. expedited LCL, rail freight)**

Source: Euromonitor; Global-e; McKinsey

Three winning formulas in cross-border e-commerce & air cargo

Success criteria



A: Dedicated and guaranteed capacity



B: Trade lane / regional focus



C: Excellence in data management

Rationale

UPU channel will only recover at low growth rates as volumes shift to other, more reliable channels

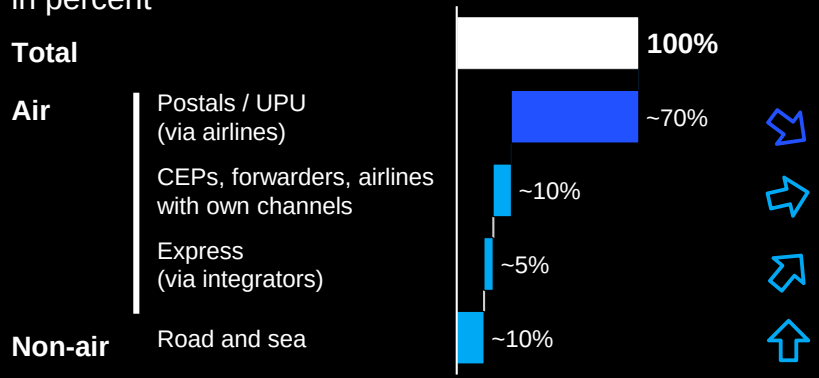
Complexity of international deliveries and diversity of customer landscape requires clear focus to enable fast, reliable delivery service

Transparency of international deliveries is key requirement – solving various data breakpoints and integrating various systems becomes table stakes

A: UPU volumes have declined in light of COVID-19

Growth outlook

Pre-COVID-19 B2C shipment volumes,
in percent



Pre-COVID-19 Trends

Pre-COVID-19 majority of international volumes (~70%) passed through the UPU channel of postal companies (letters and small parcels)

Competitors of postal incumbents grew alternative channels and were growing shares in air, road and sea

European Union announced to introduce VAT on all products, also on previously exempt products

Source: McKinsey analysis; expert interviews

Post-COVID-19 Outlook

Classic postal/UPU volumes have dropped immediately by up to 60% due to significant halt of volumes from Asia

UPU channel will only recover at low growth rates as volumes shift to other channels

- Reduced air mail volumes due to belly shortage are only gradually recovering
- Asian e-commerce giants increase shipment via non-air i.e., via the One-Belt-One-Road (Ocean and Road freight) and a warehouse-to-warehouse model
- General increase in domestic e-commerce to reduce overall demand for international shipments

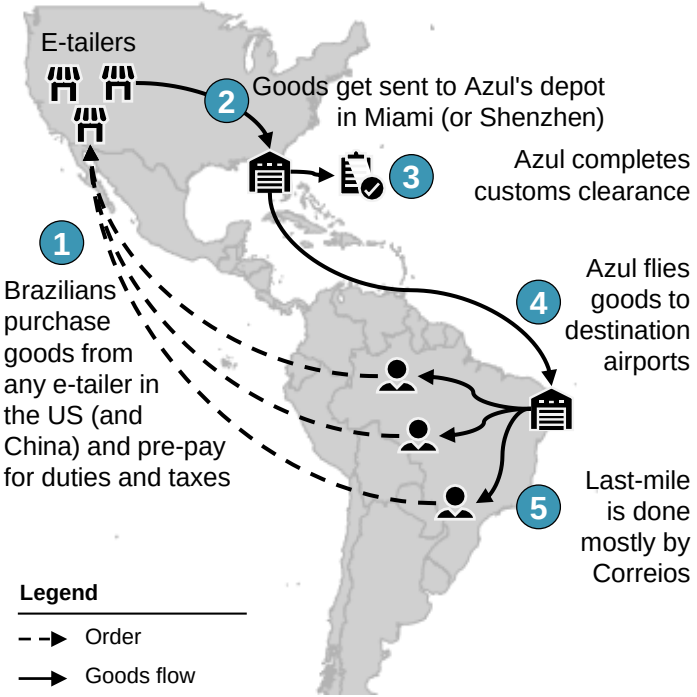
B: Azul's cargo unit has launched a B2C e-commerce shipping product with a clear trade lane focus

Azul's e-commerce offering

- Azul launched **'Azul Box' in May 2018 to deliver small parcels to 3,500 cities** in Brazil and abroad[1] utilizing the **belly capacity of its 800 daily flights**
- Since then it has **leased two B737s freighters** "to support the rapid growth of its cargo business unit"
- **Azul pulled out of a commercial agreement with Correios in early 2019,** an agreement initially developed in 2017 to **create a jointly-owned integrated logistics company**
- Azul's cargo business' **revenue grew by 57% in 2018** and thus the company is in a good position to enter **more favorable commercial agreements**
- **e-commerce was by far the fastest source of revenue growth soaring 314% over the previous year**
- Azul recently entered an agreement with **Mercado Libre, Latam's largest e-commerce company, and expanded their Azul Box service to China**

> We not only handle airport-to-airport, **but also the final-mile**, so we can **provide a full solution**, [...] For this, we are **mainly competing with the large integrators such as DHL and FedEx.**
>
> – Enio Rabelo Frota, Cargo Planning Manager

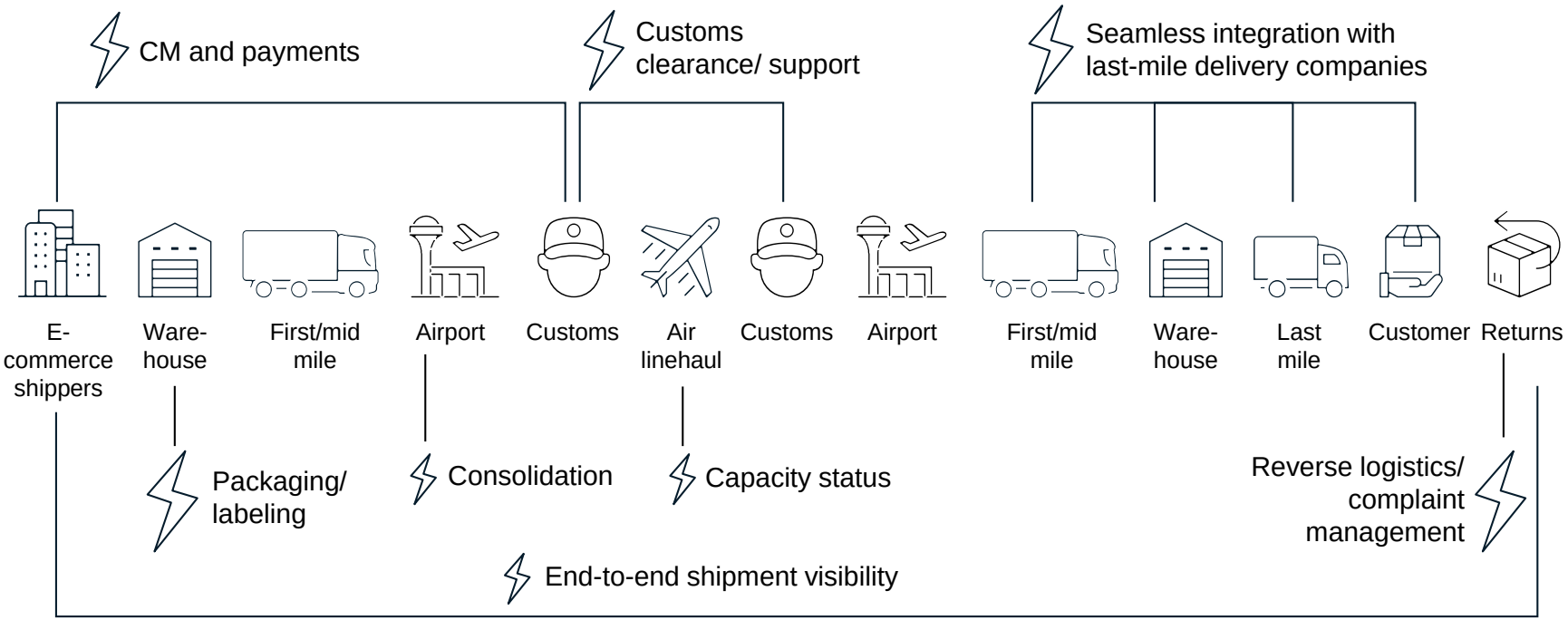
How does Azul Box work?



1. Also flies to Europe and Argentina, and operates a few interline general sales agents in Chile, Puerto Rico and Canada

Source: Factiva, Reuters, Press, Company website

C: A transparent and integrated cross-border e-commerce delivery service needs to solve various breakpoints across providers today



Panel Discussion
Q&A with our experts

Please submit your questions through the **Questions box** and send to **Everyone**



Moderator:

Brendan Sullivan
Head, Cargo Operations & E-Commerce
IATA



Maciej Starzyk

Senior Manager, Strategy

PwC



Sebastian Blümmert

Head of Operations & IT

heyworld



Dr. Ludwig Hausmann

Partner

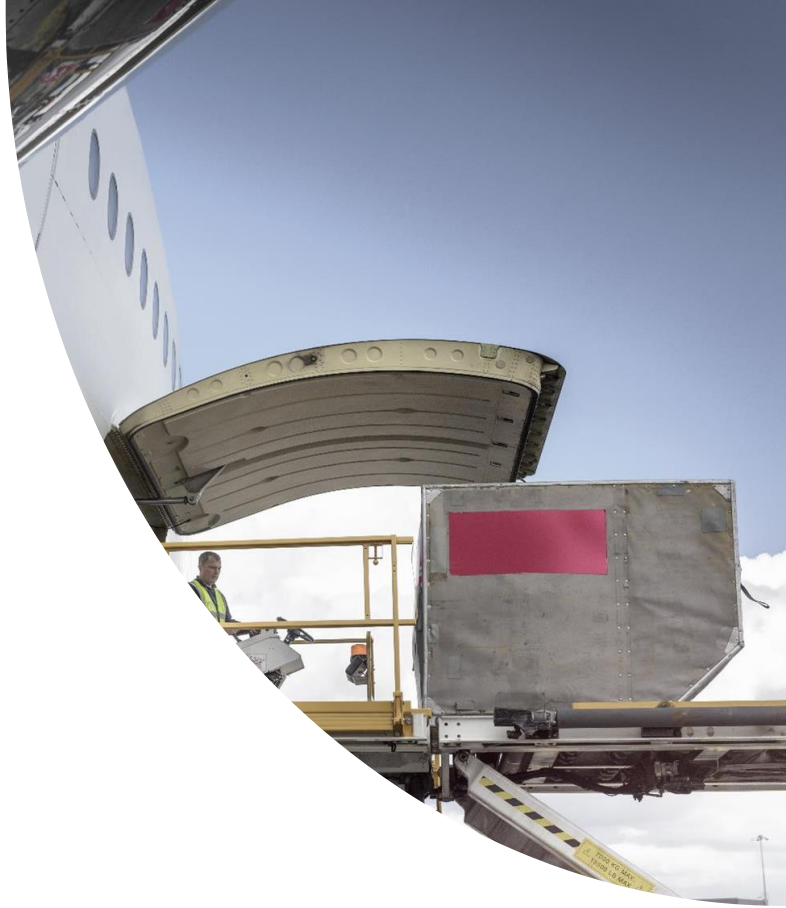
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Wrap Up



Brendan Sullivan
Head, Cargo Operations
& E-Commerce
IATA



Thank you

- Please visit [redacted] for the upcoming webinars
- Please visit [redacted] for all COVID-19 resources
- Please visit [redacted] for articles and insights
- Contact us at cargo@iata.org





AirAsia's Teleport serves e-commerce demand with own-controlled 737 freighter

Freighter to be operated by Thailand-based K-Mile Air

by **Kelly Stroh** — November 3, 2021

in **Asia-Pacific**, **Carriers**, **E-Commerce**, **Freight Forwarders**, **News**

Malaysia-based Teleport, AirAsia's logistics subsidiary, will soon begin its own-controlled freighter service with its first 737-800BCF to support the region's increasing demand for e-commerce and general cargo. The 737-800BCF, operated by Thailand-based K-Mile Air, is part of a multiyear wet lease agreement. The 737-800BCF offers 21 tonnes of containerized capacity, and is also equipped to [...]







Lufthansa Cargo targets e-commerce with A321 conversions

07 / 07 / 2021

By Damian Brett



Source: Lufthansa Cargo

Lufthansa Cargo is targeting the e-commerce market with the conversion of two Airbus freighters to be used on intra-European services

The Frankfurt-headquartered airline today announced that two of its Airbus A321 aircraft would be converted into freighters to be operated by Lufthansa CityLine.

They are set to join Lufthansa's fleet "from the beginning of 2022".

The company pointed out that cross-border e-commerce shipments are forecast to grow by around 20% per year for the next five years.

"Consumers expect ever shorter delivery times for their ordered goods," the cargo business said. "This is also increasing the demand for air freight connections within Europe."

The converted A321s will offer a payload of 28 tons with a range of 3,500 kms. They will have be fitted with large cargo doors and be able to carry standardized cargo pallets on the maindeck.

Lufthansa Cargo chief executive Dorothea von Boxberg said: “Lufthansa Cargo wants to offer customers in the eCommerce segment fast intra-European connections. With the converted A321s, we are meeting our customers’ growing demand for same-day solutions and further strengthening our dense network of global connections as well as our product offering.

“The selected aircraft type can transport 28t per flight, significantly larger cargo volumes than in the short-haul bellies of passenger aircraft. In addition to forwarders, integrators and postal operators, e-commerce providers will be customers for this offering.”

The move is significant for the cargo airline as its freighter focus has been on long-haul routes with B777 and MD-11 aircraft. The decision also highlights the growing demand for e-commerce and comes as airlines find themselves with excess aircraft as a result of the Covid-19 outbreak’s impact on passenger travel.

According to the Lufthansa Cargo website, the carrier currently operates nine B777Fs and two MD-11Fs. The company also sells the capacity on four B777 freighters operated by its AeroLogic joint venture with DHL.

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Cargo market expected to remain tight despite increased passenger demand

09 / 11 / 2021

The resumption of passenger operations has been in the headlines this week as the US eases its travel restrictions, but…

IAG Cargo adds capacity to the US as travel restrictions ease

08 / 11 / 2021

IAG Cargo will expand cargo capacity to the US as restrictions on travellers entering the country are eased. The US…

Turkish Cargo boost airline’s performance in Q3

08 / 11 / 2021

Turkish Cargo saw its revenues increase by 45% in the third quarter of the year, helping the overall airline beat…

PREVIOUS NEWS STORY

IAG Cargo sees demand return to 2019 levels [redacted]

NEXT NEWS STORY

Airfreight rates expected to continue to rise [redacted]

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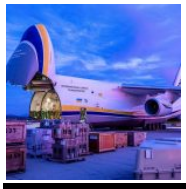
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Latest information on the coronavirus and Schiphol

Last update: 8 November 2021, 08:59

Read more

E-commerce is hot: dnata elaborates on how to handle growing e-commerce volumes

During the 2nd ‘luchtvracht café’, the cargo community gathered at Schiphol to discuss and catch up on growing e-commerce volumes and the challenges this brings.

Saskia van Pelt, Director Business Development at Schiphol, kicked off by explaining the trends in e-commerce.

‘E-commerce is hot; each year we see e-commerce volumes rise, as consumers are more confident to shop online anywhere in the world. Countries with the highest online spend are China, the UK, and Germany.’ (Source: thuiswinkel.org).

‘The Dutch are also becoming more confident, spending 637 million euros in cross-border e-commerce shopping in 2016. For Amsterdam, China is the largest e-commerce market. The most popular items that arrive from China are related to gadgets, high-tech accessories, and low-cost fashion items. The Chinese tend to buy milk and baby powder, and high-end fashion items and cosmetics from the European market.

‘Challenges that we need to tackle as a hub are related to Customs clearance, data transparency in the chain, and processing times, as well as being able to measure exact cross-border e-commerce volumes. Last year the Cargo Community e-commerce workgroup was set up to discuss amongst each other how to best handle these issues.’

Richard Koot, project manager at dnata, took the stage after Saskia and explained how a first line ground handler serves the growing e-commerce business and how they have managed to reduce lead times by 24-48 hours.

Richard explained the importance of a fast and efficient process flow – technically e-commerce comes in as ‘regular’ air cargo which needs to be sorted, scanned, security checked, and weighed, highlighting that this process takes less than 24 hours. He stressed the importance of continually looking at process improvements and product changes in order to be able to keep up with customer demands.

dnata has managed to reduce lead times by looking closely at the entire supply chain, from the shipper, all the way to someone's doorstep. They have managed to reduce lead times by taking out two steps in the chain; that of transport to and from the agent and storage at the agent, by arranging for import cargo to be brought directly from airside to dnata once unloaded. This is only possible by tightly monitoring flights and shipments, as well as maintaining close relationships with ('preferred') airlines, handlers, and forwarders.

Through these relationships information is easily shared and dnata knows what shipments are coming in, making it easier to regulate the flow and plan staff.
Richard mentioned that changing customer demands have impacted the way dnata handles e-commerce shipments; it is separated from general cargo and handled first to ensure delivery times are met. After being asked how dnata will handle growing volumes in the future, Richard commented that they are ready for the future.

Thank you Richard, for sharing your views and best practices!

After the presentation and the discussions drinks and Dutch 'bitterballen' were served.

Save the date! The next Luchtvracht café will take place on Thursday August 31st at 3:30 pm in the Schiphol Head Office.

Feel free to share your thoughts on topics that you would like to discuss with the Cargo Community. Send your ideas, input or feedback to cargo@schiphol.nl.

We're happy to assist anytime. Please get in touch

+31 20 794 0800

cargo@schiphol.nl →

[redacted]

Schiphol

Welcome to Amsterdam Airport

[redacted]

AIR TRANSPORT

Boeing Sees Big Need for Freighters amid E-commerce Growth

by Gregory Polek
November 17, 2020, 11:24 AM

Boeing's newly released 2020 World Air Cargo Forecast anticipates more than 60 percent fleet growth over 20 years, driven largely by market requirements for medical supply transport and continuing e-commerce growth.

Enabled by a rebound in global trade and long-term growth, Boeing's forecast projects a demand for 2,430 freighters over the next 20 years, including 930 new production freighters and 1,500 freighters converted from passenger airplanes.

According to the new forecast, world air cargo traffic will grow at 4 percent annually over the next 20 years. Growing at double-digit rates prior to the pandemic, e-commerce has accelerated its effect on the air cargo market as more businesses shifted to online selling platforms. As a result, express carriers saw a 14 percent increase in traffic through September compared with the same period last year.

Meanwhile, a significant decline in belly capacity due to a steep drop in passenger traffic caused by the Covid-19 pandemic resulted in a 13 percent increase in dedicated freighter capacity. Still, as total capacity declined by 25 percent, freight operators saw yields increase 42 percent from January through September.

So far in 2020, about 200 airlines used more than 2,000 passenger widebody aircraft for cargo-only operations to generate cash flow and support global supply chains. Those so-called passenger freighters have compensated for some of the capacity shortfall and, in some cases, generated quarterly profits for carriers despite minimal passenger operations.

"Freighter operators have been in a unique position in 2020 to meet market requirements for speed, reliability, and security, transporting medical supplies and other goods for people and communities around the world," said Boeing vice president of commercial marketing Darren Hulst. "Looking ahead, dedicated freighters will be even more critical to compete in air cargo markets; they carry more than half of air cargo traffic, and airlines operating them earn nearly 90 percent of air cargo industry revenue."

AIRLINES

Korean Air's Boeing 747s Save Christmas With PS5 Flights To Heathrow

by **Joanna Bailey** · November 5, 2021 · 22 shares · 3 minute read

Sony's rare PlayStation 5 is being flown to the UK in droves with the help of Korean Air. The highly in-demand console has been out of stock everywhere, but is top of the wish list for many Christmas presents. To save Christmas, Sony has chartered several flights using Korean's 747 freighters to get the PS5s to London in time.



Korean Air has been bringing 747s full of PS5s to the UK. Photo: Steve Lynes via Flickr

Santa charters for Sony

Christmas is coming (sorry) and with the warnings of shortages of high-demand goods ringing in their ears, many British families are looking to secure their top-tier presents in good time this year. One such top present is the Sony PlayStation 5 (PS5), which has been notoriously difficult to get hold of all year, let alone in time for Christmas.

The PS5 has been incredibly rare in the UK since its launch, with some being sold on eBay for £1,000 ($1,350) or more, way in excess of its typical £450 ($499) recommended retail price. As soon as a new batch arrives with a retailer, the item sells out again, causing fury for avid gamers keen to get their hands on the latest technology.

But Sony is not giving up. In a bid to restock the UK with this popular gift, the company has chartered flights on Boeing 747s from Korean Air to restock the UK's shelves in time for Christmas. Speaking to the Sun, a Sony spokesperson said,

"A phenomenal operation has been under way to stock UK shelves of PS5s for Christmas. Sony just wants to keep fans happy after a slew of issues with its new kit, and this is an unprecedented airlift.

"The 747 plane is rare after being decommissioned by British Airways, but carries a vast amount of cargo as a freighter aircraft. Each plane can bring in 100 tonnes of equipment on almost 50 pallets. It means millions of gamers will now be smiling this Christmas."

The PS5 is one of this Christmas' hottest presents. Photo: Marco Verch via Flickr

The shortage has been caused by a combination of external forces, including higher than expected demand, a global shortage of computer chips, a short supply of shipping containers, and backlogged ports worldwide.

Love aviation? Find out what the future holds at the Future Flying Forum 2021, book your seat today.

Four flights so far

So far, four Korean Air 747s have touched down in the UK – two last week, one on Monday and the most recent yesterday, November 4th. Yesterday's flight took off from Seoul mid-morning Korean time, flying for more than 11 and a half hours to get to London Heathrow.

It took 12 articulated lorries to unload all the consoles from one flight. Photo: Aero Icarus via Wikimedia

According to the Sun, the 747 was packed out with almost 50 pallets of the PS5 onboard. To get the console off the plane and out to retailers around the country, 12 huge articulated lorries were used. Each truck could only take four of the three-meter-wide monster pallets.

Apparently, at least one more 747 will be arriving from Korea with the PS5 onboard. The efforts of Sony are starting to pay dividends. The Sun reports that, last month, only four stores received new stock of the console. In the past couple of weeks, 13 retailers have got their hands on stock, including John Lewis, Amazon, and Argos.

Sony has already sold a staggering 13.4 million PS5 consoles since its launch a year ago, making it the fastest-selling PlayStation in history. While airfreighting the goods like this will help retailers get more presents under the tree in time for Christmas, it could result in a dry period over the new year as supplies revert to shipping by sea.

Joanna Bailey

Managing Editor - Joanna has worked in publishing for more than a decade and is fast becoming a go-to source for commercial aviation analysis. Providing commentary for outlets including the BBC, CNBC, Reuters Thomson and others, she works closely with IATA, AviaDev and various airlines and suppliers to get the inside track on the global marketplace.

More great Simple Flying content:

NEXT WAVE OF E-COMMERCE GROWTH

Press Release: Bonn, March 30, 2021



- **Whitepaper predicts online B2B increase of more than 70% by 2027 to US$ 20.9 trillion (2019: US$ 12.2 trillion)**
- **Covid-19 pandemic drives digital transformation and significantly accelerates B2C and B2B E-commerce growth**
- **DHL Express closed FY2020 with best result in its history (EBIT: €2.7bn, +34.9% yoy)**

Today, DHL Express, the world's leading international express service provider, released a new Whitepaper " *The Ultimate B2B E-commerce Guide: Tradition is out. Digital is in*". The study predicts strong growth for the B2B E-commerce market in the coming years: by 2025, 80% of all B2B sales interactions between suppliers and professional buyers will take place in digital channels. The impact of the Covid-19 pandemic on the pace of digitalisation and the purchasing behaviour of technology-savvy millennials, who are now of an age to be the professional B2B decision-makers, are the main drivers of this global E-commerce growth. What is predicted for the future of the B2B sector, has already been visible in the significant B2C E-commerce rise over the last years, where DHL Express experienced high growth rates particularly during the holiday peak seasons (e.g. Easter, Christmas) and mega shopping days (e. g. Black Friday, Cyber Monday). In total the B2C E-commerce volumes within the DHL Express network increased in 2020 by approximately 40%, compared to 2019.

This positive business development is also reflected in the FY2020 financial results of the company: With a total revenue of €19.1 billion (+11.9% year-on-year) and EBIT of €2.7 billion (+34.9%) the Express division of Deutsche Post DHL Group closed 2020 with the best result in its more than 50 years history. With its worldwide network and breadth of industries served, DHL Express was able to accommodate fast-changing trade flows. Furthermore its presence in more than 220 countries and territories helped consumers and businesses to stay connected by enabling them to trade around the world – also during the Covid-19 pandemic.

"Even in times of worldwide shutdowns, globalization has shown its resilience, fuelled by digitalization and the power of global trade", says John Pearson, CEO of DHL Express. "These trends have led to an ever growing number of consumers to shift their shopping activities online. The pandemic has accelerated this development like never before, with a sharp rise in businesses selling their goods in the global marketplace. E-commerce and global logistics thus provided the key to unlock local shutdowns, keep economies running and mitigate the impact of Covid-19 for many of our customers."



Acceleration of E-commerce growth through Covid-19

It was not only B2C E-commerce that was growing due to ongoing digitalisation and changed shopping behaviour of consumers. In 2019, before the pandemic, global sales on B2B E-commerce sites and marketplaces had already increased by 18.2% to reach USD 12.2 trillion[1], outpacing the market size of the B2C sector. Through Covid-19 and the resulting acceleration of digitalisation, this global B2B E-commerce volume is estimated to reach USD 20.9 trillion by 2027[2].

“We have been facing the pandemic for over one year now”, says Michiel Greeven, Executive Vice President Global Sales at DHL Express. “A year that showed how nearly a decade of digital evolution happened in just a few months’ time, with online shopping and cross-border shipping as the new normal. And this is true not only for B2C retailers, but also in terms of B2B E-commerce as companies started recognising that online selling platforms are crucial for their business success, today and in the future. As a result, there will also be an additional need for global Express shipping and DHL Express is well positioned to support all B2B companies on their journey.”

Huge potential in B2B E-commerce also driven by Millennials

The Whitepaper, compiled by DHL Express, uncovers factors driving the growth of the global B2B E-commerce market: besides general trends such as globalisation and digitalisation, a new technology-oriented generation of millennials is starting to make its mark. Already, millennials account for 73% of all professional B2B purchasing decisions. As digital natives, their experiences in the B2C-sector translate to high expectations when making B2B transactions, pushing companies to invest in digital solutions, such as selling platforms, while offering great growth potential.

“If B2B businesses want to make the most out of the new cross-border and E-commerce opportunities they need to start adapting to the changing buying behaviours. Especially with the upcoming generation of millennial as B2B decision-makers, who are further driving the digitalisation of the sector. B2B customer experiences have to be more aligned with the digital B2C experiences. As international E-commerce specialists, we have the know-how and insights to support businesses to adapt to the ongoing changes and unleash their full potential” says Leendert van Delft, Vice President Global Sales Programs and Global E-commerce.

DHL Express is investing to continue to meet high customer demands

In 2020 DHL Express delivered 484 million shipments in total for its customers (B2C and B2B) around the globe, around 9% more per day than in 2019. To adapt to this significant growth of its network, DHL Express continues to invest annually more than €1 billion in new state-of-the-art facilities around the world to multiply its sorting capacity (+65% since 2013), hires new employees (+10,000 year-on-year) and adds new freighter aircraft to its fleet (+20 units year-on-year). In this context, DHL Express recently announced the purchase of eight more Boeing B777 wide body freighters and a partnership with Smartlynx Malta to add two Airbus A321 to its fleet. With these measures, DHL Express ensures that its worldwide customers can benefit from the global
E-commerce boom.

[redacted]



E-Commerce & Logistics

E-Commerce has revolutionized the way we do logistics. With online businesses and consumers requesting fast deliveries, operating models had to evolve to speed up transportation.

Air cargo is naturally suited for this logistic challenge: IATA estimates that e-commerce represented 15% of air cargo volumes in 2019. This number is continuously growing, and the trend has accelerated during the COVID-19 pandemic. IATA helps the air cargo industry to capitalize on the growth of e-commerce.

- Read the June 2021 IATA e-Commerce Monitor (pdf)
- Read the March 2021 IATA e-Commerce Monitor (pdf)
- Read the December 2020 IATA e-Commerce Monitor (pdf)

Air cargo serving e-commerce

Air cargo is an essential component of cross-border e-commerce. IATA works to advise the industry and enhance their understanding of the opportunities and challenges that exist. IATA also ensures the air cargo industry has the right regulations, standards, and global framework to offer the right logistics solutions for the e-commerce industry.

e-Commerce Insights

- Cross-Border Strategies for Online Retailers (pdf) June 2021
- e-Commerce Strategies for Air Cargo Airlines (pdf) February 2021
- The e-Commerce Logistics Landscape (pdf) December 2020
- The e-Commerce Impact in Air Cargo Operations (pdf) November 2020
- Air Cargo e-Commerce & COVID-19 Impact (pdf) October 2020

COVID-19 impact

The global pandemic has changed the world. The ban on social gatherings, the closing of stores, restaurants, grocery shops, gardening centers, theatres and concerts have led consumers to live their lives online, including shopping. The consumers' behavioral change towards online retail is now established. E-commerce rose to 18% of the total retail sales in 2020, four points higher than forecast. The air cargo industry should transform today to stay relevant in this digital shift.

e- Commerce White Paper

Find out how the air cargo industry is addressing e-commerce and IATA's role in driving these initiatives in the Air Cargo serving e-commerce (pdf) white paper.

[redacted]

THE LOADSTAR
MAKING SENSE OF THE SUPPLY CHAIN

[redacted]

News / Transatlantic capacity opens up, but Heathrow [redacted]

TAC Index I-08 BAI00 ↑4684.00 10.3% | 2021-11-08 BAI01 ↑206



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By Alex Lennane 08/11/2021

[redacted]

In a move that could see significantly more transatlantic air freight capacity, the US today re-opened borders, allowing in fully vaccinated passengers from most of Europe, Canada and Mexico.

But severe congestion at Heathrow in the UK could limit movements.

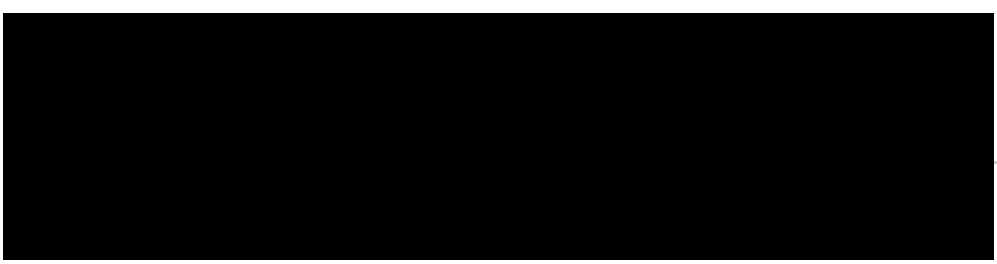
IAG Cargo announced it would serve 21 destinations in the US from today, including New York, Austin, Miami, Philadelphia and Los Angeles, while services to Baltimore, Orlando Tampa and Las Vegas will begin on 15 November.

The carrier said the additional capacity had ...

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Ongoing boost from shipping and bellyhold shortages for freighter operators

11 / 08 / 2021

By Damian Brett



Credit: Shutterstock

A slow recovery in belly capacity and higher rates in ocean shipping are expected to boost air cargo for the coming years, according to Boeing's Tom Crabtree.

Speaking to *Air Cargo News*, Crabtree, who is regional director, Boeing Commercial Airplanes market analysis — air cargo, said that air cargo demand had now recovered to pre-pandemic levels.

Its latest statistics show that over the first five months of 2021, traffic in revenue tonne km (RTK) terms was up 9% on pre-pandemic 2019 levels for the period, while capacity was 13% down.

As a result, average load factors for the five month period are up by 11 percentage points on 2019 levels and yields are up by 75%.

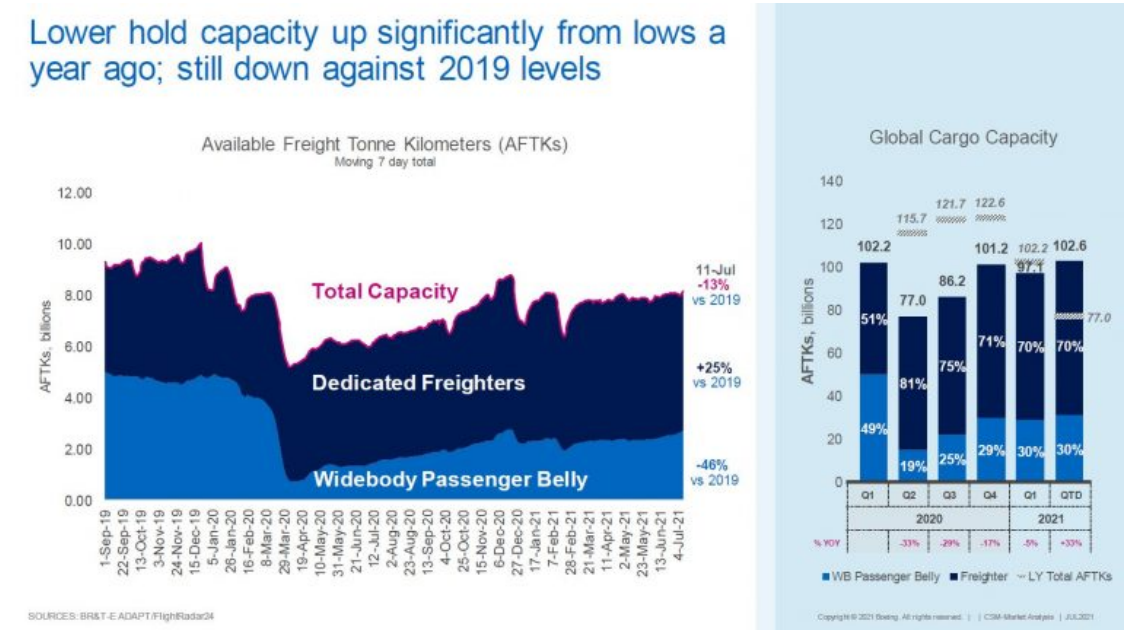
“The economic dent due to Covid has been relatively minor,” Crabtree said. “It has impacted the service sector more than it has the merchandise goods sector.

“As a consequence, airfreight and freight transportation in general was moderately affected globally compared to the service sector.”

And looking ahead, Crabtree is not expecting the current strength of the market to change in the short term.

Crabtree highlighted the ongoing issues in box shipping, e-commerce demand and an expected slow return of belly capacity as three factors benefitting air cargo.

Crabtree pointed to IATA figures that show lower-hold cargo capacity is not expected to return to 2019 levels until late 2023 or early 2024.



Copyright: Boeing

On the demand side, e-commerce will continue to boost air cargo. Figures from Statista show that e-commerce revenues are expected to grow from an estimated $4.9trn this year to $6.5trn in 2023.

On container shipping, he said that the sector is suffering from box and crew shortages.

“Boxes are in the wrong place and crews can’t get to their boats,” Crabtree said. “It is really chaotic right now.”

As a result of the issues in ocean shipping, rates have increased rapidly and figures from consultant Drewry show that in June prices were up by around 215% year on year. Crabtree said they have increased further since then.

Meanwhile, consolidation in the container industry means that carriers have become more supply disciplined than they were in the past.

Crabtree said the higher prices in ocean have narrowed the cost differential between air and sea.

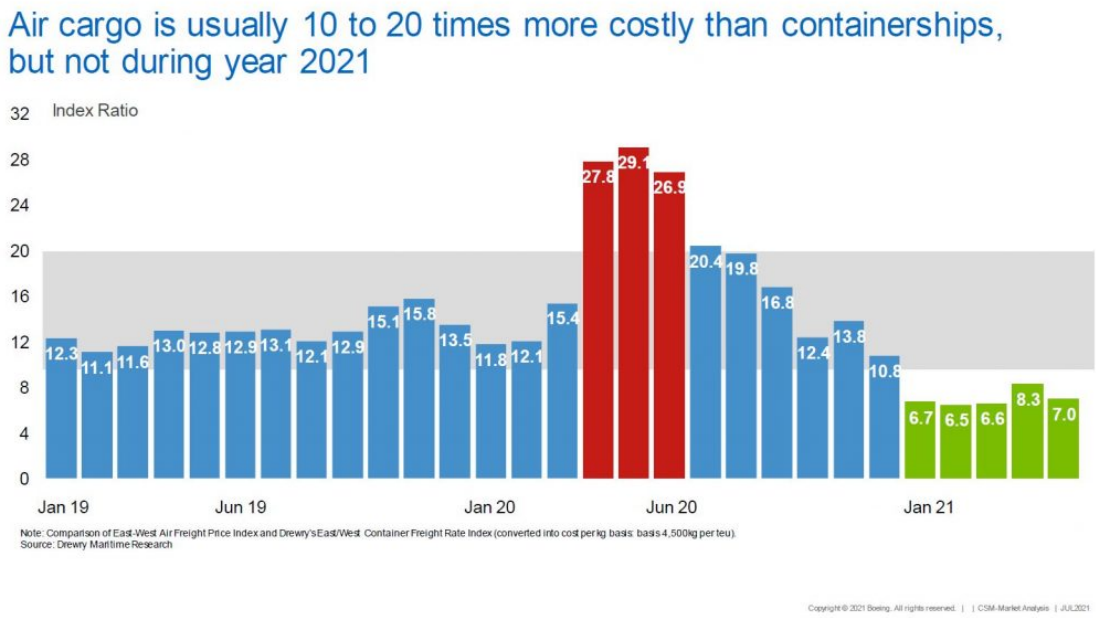
Air cargo prices are this year around six-eight times higher than seafreight, much lower than the 2019 price differential of 11-15 times.

Although shipping rates are expected to decrease, the price difference between the two modes is expected to continue to be closer than in the past.

“There is much more pricing control in the hands of the liner companies,” Crabtree said. “It is a sellers’ market, it is not a buyers’ market.

“Containership pricing will eventually come back down to levels we saw late last year, but do I see it going back to a 40ft movement only costing $1,500 from coastal China to Felixstowe, Rotterdam or Los Angeles? I have great doubts simply because the liner companies can make money now because they control so much capacity. In my opinion that is a long-term fillip for airfreight.”

He added: "I have no doubt that container shipping will be the 2bn tonne per annum industry that it is today but I do think that airfreight will figure more in the future decision tree of shippers where in the past they would have tried to avoid it at all costs because of the expense."



[redacted]

Copyright: Boeing

On the current market, Crabtree said that airlines with access to freighters have benefitted the most.

He pointed out that express operators' international RTKs – excluding ACMI – are up by around 25% over the first five months compared with the same period in 2019 and all-cargo carriers are up by around 32%.

In contrast, combination carriers' cargo traffic growth for January-May is up 1% on 2019 and passenger bellyhold operators are 36% down.

Overall, freighters now have a market share of 70% compared with 51% in the first quarter of 2020.

Crabtree said that while Boeing does not yet have a position on whether freighters will continue to have a higher market share than in the past, he personally feels all-cargo aircraft will become more important.

"We [Boeing] are taking a wait and see approach, we want to see what happens in the next year or so," Crabtree said.

"It is my hunch that freighters are going to have a heightened role in air transport compared to pre-pandemic times.

"It wasn't that long ago that some were saying you don't need freighters, just pax bellies — they will take care of the entire industry. Nothing can be further from the truth.

"If shippers want their needs tended to and prioritised, they have to go on a freighter at some point. Pax bellies are quite capable but shippers' needs are tended to in a primary manor by those folks that operate freighters."

Boeing has seen demand for its freighter aircraft increase since the start of the outbreak as airlines look to capitalise on market demand.

In 2019 the manufacturer received 28 orders for production freighters, in 2020 the number stood at 23 and by the end of July this year 35 orders had already been placed.

Orders received this year include 13 B777Fs, 18 B767Fs and four B747-8Fs.

In 2020, Boeing delivered 46 production freighters, and so far in 2021 it has delivered 23.

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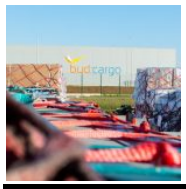
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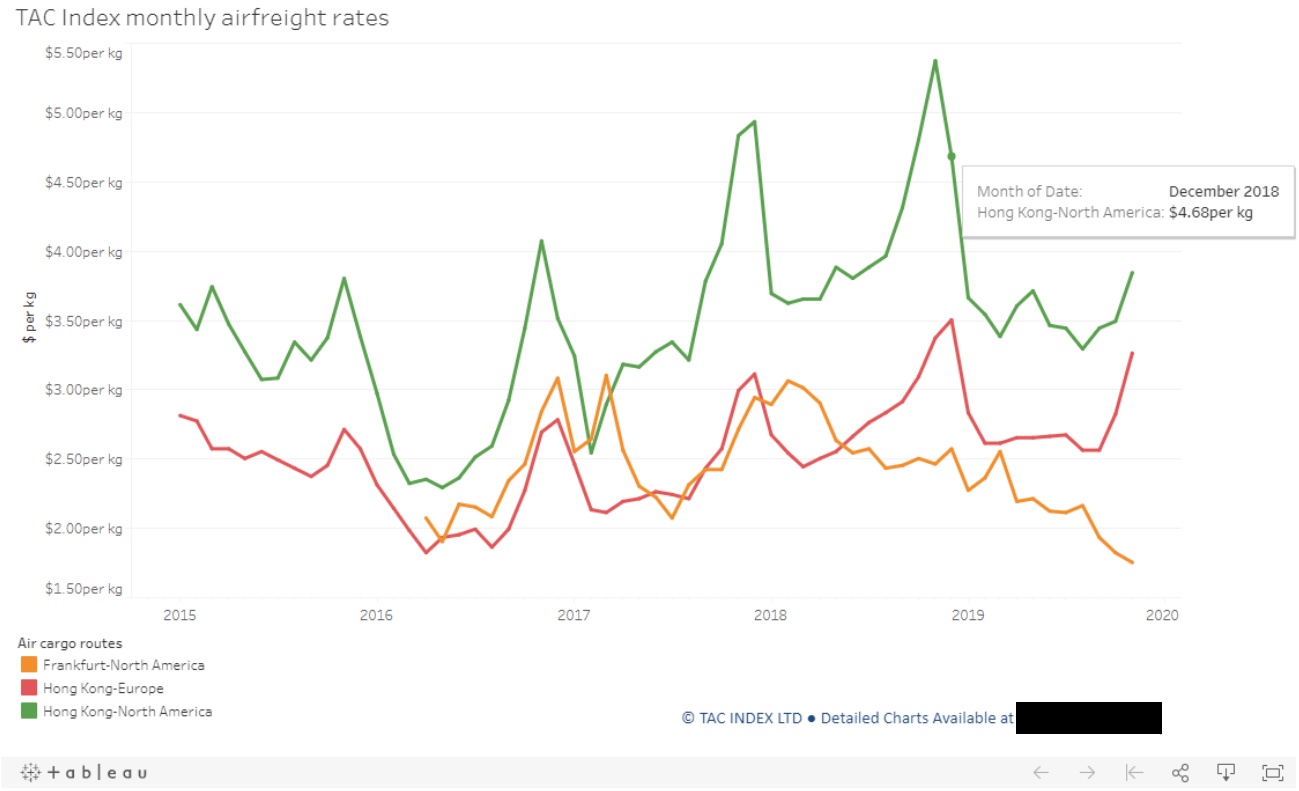


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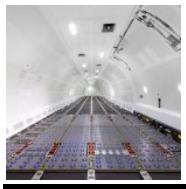
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July 14, 2021

International Airport Review – Heathrow and UK aviation industry to support economic pivot post-Brexit

View this article here.

New research has highlighted how the UK could undergo an economic pivot post-Brexit, with non-European Union (EU) trade potentially increasing by 20 per cent over the next five years, from nearly £473 billion in 2019 to £570 billion in 2025.

According to the Centre for Economics and Business Research, aviation will need to be at the heart of this pivot. The findings suggest that the value of trade through London Heathrow Airport (LHR) to non-EU countries could increase by 11 per cent by 2025, while trade with EU countries decreases by seven per cent over the same period. Regions across the UK would benefit from these new trading links, with Heathrow playing a key role in opening up valuable new markets, from Asia Pacific and Australia to the U.S.

Aviation is critical to the UK government's plans for a Global Britain post-Brexit. Heathrow alone has the potential to facilitate a £204 billion trade bonanza, benefitting British businesses in every corner of the country, creating opportunities for the entire aviation sector and strengthening the UK's trade network.

specific support during the pandemic, such as the Netherlands and Germany, are seeing the fastest growth. Cargo tonnage at the UK's hub airport is still down by 19 per cent on 2019 levels, compared to both Amsterdam Airport Schiphol (AMS) and Frankfurt Airport (FRA), which have surpassed their 2019 levels, growing by 14 per cent and nine per cent respectively over the same time period.

This research comes as Heathrow works with British Airways (BA) and Virgin Atlantic to launch trials that aim to help government and industry understand how to practically ease restrictions for fully vaccinated passengers, a move which is key for restarting travel and trade. By capitalising on the country's vaccine dividend, ministers can help to deliver this economic stimulus for exporters across Britain, ensuring that the UK retains its competitive edge as the country comes out of lockdown.

The Global Britain report reveals that:

- By 2025, the value of trade through Heathrow could grow to over £204 billion (up from £188 billion in 2019), representing 21.2 per cent of the UK's total trade in goods and 14.6 per cent of its trade in goods and services
- The growth in trade could boost every part of the UK: regions with high manufacturing propensities – including the Midlands and the North East – are likely to benefit most from future trade agreements with fast growing economies around the world. Scotland and Wales could also benefit from increased trade in agriculture, forestry and fishing
- Heathrow could help to drive future Free Trade Agreements – with 46 per cent of trade by value with CPTPP countries facilitated through the airport – while the airport is ideally placed to play a major role in deals with the U.S. and Australia
- Heathrow is a major facilitator of UK trade, accounting for two thirds of all trade transported by air in the UK (by value), with this figure rising to over 75 per cent for non-EU trade
- While 90 per cent of the UK's trade by volume is transported by sea, high value goods are transported by air. Heathrow is the UK's largest port by value, accounting for 21.2 per cent of UK trade in goods by value in 2019.

connections and providing more choice of destinations for passengers, businesses, entrepreneurs, exporters and importers.

Heathrow's CEO, John Holland-Kaye, said: "Heathrow is well placed to supercharge the government's Global Britain ambitions and deliver a post-lockdown, post-Brexit economic stimulus worth billions of pounds. As the UK's only hub airport and largest port by value, we are ready to play a central role in creating economic opportunities for businesses across the country, facilitating new free trade agreements and serving as a vital link to our key trading partners. Ministers must seize the opportunity to secure this crucial economic boost by backing British aviation and its own vaccination programme by safely easing travel restrictions for fully vaccinated passengers from 19 July 2021."

The UK's Minister for Exports, Graham Stuart MP, commented: "As we continue to strike free trade agreements with countries across the world, our airports will play an important role in the UK's global ambitions – from our accession to CPTPP to the recently-signed UK-Australia trade deal. Our trade policy agenda will help to level up all parts of the UK, reduce tariffs and cut red tape for businesses. Support from the aviation sector will help to facilitate this, ensuring the even smoother journey of UK exports to key markets such as New Zealand, the Middle East and India."

To showcase the work of British businesses up and down the country that export their goods and services via Heathrow, the airport will also be launching a Global Britain Business Champions campaign. These businesses have kept the country trading over the course of 2020 and 2021 amidst the pandemic, and are set to play a central role in driving a global Britain in the years ahead.



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United Kingdom

Thames Estuary 2050 Growth Commission

2050 Vision

June 2018



Thames Estuary 2050 Growth Commission

Sir John Armitt (Chair), Chairman, City & Guilds Group and National Express

Prof. Sadie Morgan (Deputy Chair), Director, dRMM Architects

Lord Norman Foster, Chairman and Founder, Foster + Partners

Prof. Alice Gast, President, Imperial College

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Sir George Iacobescu, Chairman and Chief Executive, Canary Wharf Group

Sir Stuart Lipton, Partner, Lipton Rogers Developments LLP

Sir Edward Lister, Chairman, Homes England

Tony Pidgley, Group Chairman, Berkeley Group

Nick Roberts, President, Atkins

Geoffrey Spence, Infrastructure Finance Expert

Note: All figures quoted in this document are referenced in the accompanying Technical Document.

Foreword



The Thames Estuary flows from one of the world's greatest cities and passes through areas of extraordinary natural beauty. It stretches from the global financial centre at Canary Wharf past the country's busiest river crossing to world-class coastal wetlands.

The Thames Estuary area faces some real challenges, including significant pockets of deprivation. But we believe it has the potential to support growth across the country. Our vision reflects both the interconnectedness and the distinctiveness of the places that make up the Thames Estuary; a tapestry of productive places along a global river, generating an additional £190 billion GVA and 1.3 million new jobs by 2050. At least 1 million new homes will need to be delivered to support this growth.



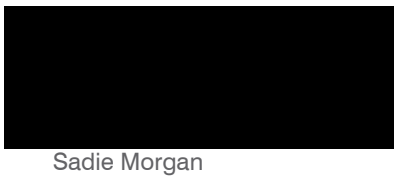
The Thames Estuary 2050 Growth Commission was established in March 2016 to develop an ambitious vision and delivery plan for north Kent, south Essex and east London. We are honoured to have been given the opportunity to lead this vital piece of work, which began under Lord Heseltine's chairmanship.

We have carried out the work in close collaboration with our fellow Commissioners and in consultation with local partners. We ran a Call for Ideas from July to September 2016 and were overwhelmed by the response: there were over 100 respondents, including public, private and third sector organisations, and members of the public, all brimming with great ideas and ambitions for the Thames Estuary. We worked with our fellow Commissioners over the next few months to review these responses alongside supporting analysis on the area's key challenges and opportunities. From this, we began to crystallise our thinking on a 2050 Vision for the Thames Estuary, announcing our priorities in December 2017. The conclusions of this work are presented within this 2050 Vision.

Throughout this exciting journey, we took part in numerous visits to the Thames Estuary, including along the river itself, and met with a wide range of stakeholders. We would like to thank all those who have provided input and hosted visits. Your contributions have helped to bring our vision for this exciting area to life.



Sir John Armitt
Chair, Thames Estuary 2050 Growth Commission



Sadie Morgan
Deputy Chair, Thames Estuary 2050 Growth Commission

The Case for Investment

The Thames Estuary is an area with great potential. It has sizeable economic power, a strong feeling of collaboration and a 'can do attitude' from London right out to the sea. The Estuary has an important brand and status, which makes a significant contribution to the UK economy and UK plc.

However, over the past few decades it has consistently been unable to deliver the same levels of economic growth as other parts of the UK. Whilst there are recent success stories, including Canary Wharf and the Thames Estuary's ports, the benefits of these pockets of growth have not necessarily been felt across the area. This has resulted in a large disparity in wealth and opportunity. The Thames Estuary partners want to work together to ensure that this is not an enduring problem.

The Thames Estuary has significant strengths: its proximity to London; international trade via its ports, strong universities, further education and research institutions; and availability of land to deliver high-quality homes. Yet, given its underperformance across a range of social and economic measures (see opposite), identifying what is needed to spread opportunity and growth is a complex task.

In order to answer this question, the Commission has interrogated what has not worked, and why. It has also sought to understand how the significant strengths in the area can be capitalised upon to make sure that economic growth is not reserved for some; rather it can have a lasting impact for existing and new businesses and residents across the area. It has done this through a detailed review of the existing context, engagement with stakeholders over the last two years and a review of existing and proposed projects.

The evidence gathered reaffirms the Commission's view that the 'business as usual' approach is not working. Without concerted action, there is a risk that the Thames Estuary will fail to achieve its potential, at huge opportunity cost to local communities and the national economy. By way of example since 2008, the Thames Estuary (outside London) grew more slowly than any of the other London corridors including, for example, the Thames Valley, London-Stansted-Cambridge corridor.

The Commission acknowledges that the area needs strong delivery and investment to make sure that, as other high growth corridors around London expand, the Thames Estuary is not left behind. The Thames Estuary has vast potential and could catch up with other London corridors that have outpaced UK growth. To do this it needs a clear vision and a focus on delivery.

This 2050 Vision sets out the key challenges and opportunities of the area, alongside future trends. It then presents a vision for the Thames Estuary and resulting recommendations and priorities which will be central to its delivery. This was informed by a review and prioritisation of existing and proposed projects. It concludes with a focus on the governance reforms and delivery models needed to realise the Commission's aspirations.

The Challenges

Scale of the area: The Thames Estuary is home to many boroughs, cities, towns and villages, which have their own distinctive characteristics. The diversity of the area, the natural barrier provided by the River Thames and the different functional economic areas mean that developing a singular 'vision' is challenging; it makes more sense to 'read' the area as a series of interconnected places.

Stimulating economic growth: The Kent and Essex parts of the area have struggled to keep pace with the scale of employment growth in east London. Between 2009 and 2016 east London employment grew by 27%, in comparison to the Thames Estuary average of 19% and the London average of 21%.

Low skills and education levels: There is a higher proportion of adults with no formal qualifications compared with the regional average across the Thames Estuary although this challenge is particularly acute in Essex. Relative to the London, South East and East regions, residents in the Thames Estuary are more likely to work in trade, sales or machine activities, which have historically been less highly skilled. This makes the area a less attractive location for employers seeking skilled and agile workers.

Entrenched deprivation: The area is characterised by a 'low wage' economy with limited connectivity to employment centres and a shortage of jobs and skills. The average weekly household income in the area is £800 before housing costs, which is below the combined average for London, South East and East of England at £885. Most settlements in the Thames Estuary therefore contain neighbourhoods with high levels of deprivation (in the top two deciles of the Index of Multiple Deprivation). The area also has higher levels of unemployment (5.3%) compared with the average for England (4.5%).

Delivering homes: The area needs to cater for population growth and demographic change. Whilst an increased number of planning permissions are being granted, this is not being reflected in delivery rates. Between 2012/2013 and 2014/2015, on average, fewer than 10,000 homes were built per annum against Local Plan targets of 19,495 per annum. Low land values, challenging site conditions and a limited number of house builders are all contributing to the delivery gap.

Limited mobility: Outside of London, the high speed railway network has been the focus of historic transport investment. Beyond this, access to affordable, high-quality public transport or active transport links is more limited between and within cities and towns. This is affecting access to jobs.

Environmental constraints: The Environment Agency estimates that the sea level will rise between 20cm and 90cm by 2100. Without intervention, this could affect up to 1.25 million people who live in the Thames tidal floodplain and 1,200 hectares of internally designated habitats. The Thames Estuary 2100 Plan is the Government's current strategy to adapt to the challenges of future sea level rise. The area also suffers from poor air quality, particularly near congested river crossing points.

Fragmented governance: There are 18 local authorities alongside the Greater London Authority, Kent and Essex County Councils and two development corporations in the area. The lack of coordinated governance structures makes strategic planning and prioritisation of interventions more difficult. This is in the context of significant funding gaps, particularly for infrastructure delivery.

The Future

Jobs: The Commission believes that up to 1.3 million new jobs could be created in the Thames Estuary by 2050. The Industrial Strategy identifies the pillars and priorities for national focus. The Thames Estuary, given its assets, is well placed to deliver against these priorities including boosting economic growth, increasing employment, skills and earning potential and delivering infrastructure to support jobs and homes. This supports the National Infrastructure Assessment which seeks to reduce congestion and carbon whilst increasing the capacity of the country's infrastructure.

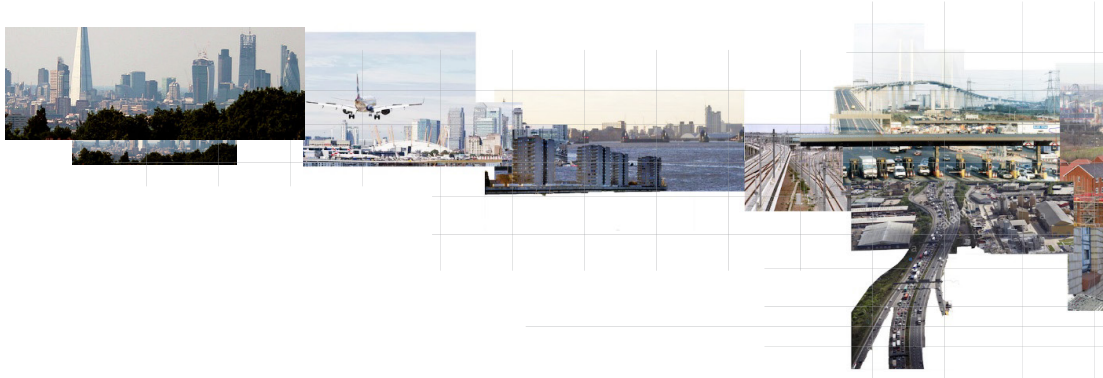
Homes: A minimum of 1 million homes will be required to support economic growth in the Thames Estuary by 2050. This equates to 31,250 homes per annum. The Commission believes that the scale and pace of delivery will need to increase to meet this demand. In terms of the distribution of these homes, based on the Ministry of Housing, Communities and Local Government's standardised methodology for calculating housing need, around two thirds of these homes should be delivered in east London. The Commission believes that solely focusing on homes in London is unsustainable and that more of these homes should be provided in Kent and Essex.

Technology and innovation: Sectors and jobs could take a variety of forms in the future. The Commission believes that a skilled and agile workforce will be most able to respond to this uncertainty. Traditional sectors in the Thames Estuary, including ports, logistics and construction, must respond to automation and technical innovation by changing operating practices and the number and types of jobs required.

Economic resilience: The impacts of Brexit on economies are still uncertain and may require changes to the ports, logistics and aviation sectors. The Commission believes that the Thames Estuary can capitalise on the challenges and opportunities presented by Brexit, transforming the area and reducing pressure and reliance on London. This is reflected in the planned and on-going investment, for example, at the Port of Tilbury and London Gateway Port.

Environmental change: The Government's 25 Year Environment Plan sets out action to help the natural world regain and retain good health. It includes a number of policy areas which are relevant to the future of the Thames Estuary: using and managing land sustainably; recovering nature and enhancing landscapes; connecting people with the wider environment; and increasing resource efficiency and reducing pollution. The Commission believes the long view of the 2050 Vision provides an opportunity to embed these principles in the future of the area.

The River Thames is an iconic driver of economic activity. It has led to the rich tapestry of places, communities, landscapes and economies, which characterise the Estuary today. They contribute to the breadth of challenge and opportunity in the area.



The Opportunities

Strengthen existing sectors: The Commission believes that the area should continue to grow 'traditional' industries of freight, logistics and construction, capitalising on the five major ports and growing logistics and manufacturing sectors around them as well as the planned modular homes factories. The creative and cultural industries (spearheaded through the Thames Estuary Production Corridor) and medical sectors (e.g. medical instruments manufacturing at Southend-on-Sea) should also be supported.

Diversify sectoral mix: Locally distinctive sectors which capitalise on the area's assets should continue to be supported, whether they are existing or emerging sectors. The Commission believes this includes health, tourism, creative and cultural industries, agriculture and renewable energy and green technologies.

Utilise higher education institutions: The Commission believes that links between the South East Local Enterprise Partnership, institutions, employers and schools should be strengthened to maximise economic growth and provide pathways from school to employment. This includes building on the skills legacy from large infrastructure schemes in the area such as High Speed 1.

Prioritise infrastructure investment: There are over 327 infrastructure projects identified by local authorities to address existing constraints and/or support future growth in the area. The Commission believes that delivery of infrastructure will support delivery of homes and jobs. For example, the extension of Crossrail to Ebbsfleet could support up to 50,000 jobs and 55,000 new homes. Investment in and delivery of green infrastructure will also be key to securing good growth.

Improve intra-town connectivity: The Commission believes this should be achieved by making better use of existing capacity, and delivering currently planned road and rail infrastructure. Providing additional capacity within the transport network will reduce congestion and journey times. The delivery of transport hubs will provide opportunities for agglomeration and regeneration.

Integrate environmental assets: The Commission believes that the Thames Estuary area provides the long term solution to managing the impacts of sea level rise on London. If appropriately planned, opportunities including maximising flood attenuation and improving air quality should be pursued alongside provision of replacement habitats and improved access for recreation and leisure (as promoted by the Thames Estuary 2100 Plan).

Realise planned development: There is an opportunity to deliver the homes (including affordable homes) and employment space that are needed to support demographic change and new jobs in the area. Homes and jobs should be delivered across the Thames Estuary to support the tapestry of places.

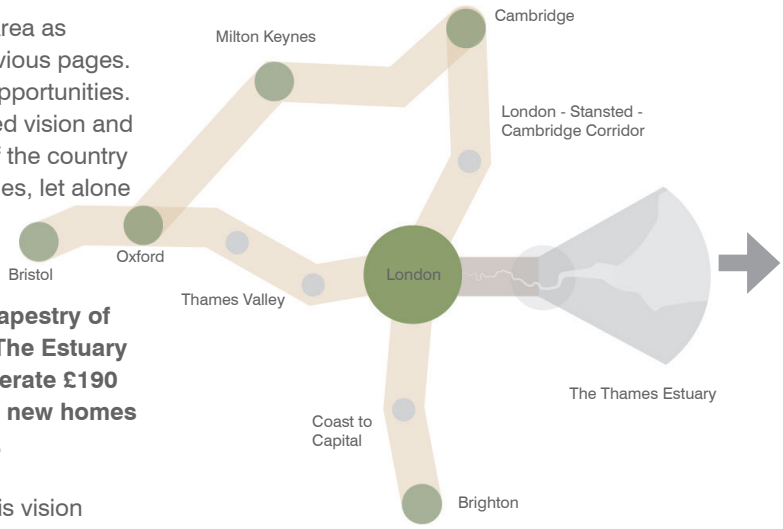


The Vision

From an underperforming river region to a tapestry of ‘productive places’ along a global river.

A lot of good work is already taking place in the Thames Estuary. Examples include public and private investment in the economy (e.g. Port of Tilbury and London Gateway Port), homes (e.g. through Ebbsfleet Development Corporation) and infrastructure (e.g. Lower Thames Crossing). The foundations to build on are strong.

There is significant latent potential in the area as illustrated through the analysis on the previous pages. There are also common challenges and opportunities. However, without a coherent and integrated vision and associated priorities, this important part of the country will not deliver ‘business as usual’ outcomes, let alone more ambitious ones.



By 2050, the Thames Estuary will be a tapestry of productive places along a global river. The Estuary will create 1.3 million new jobs and generate £190 billion additional GVA. At least 1 million new homes will be delivered to support this growth.

The Commission believes that realising this vision requires a change in thinking. The evidence shows that the Thames Estuary will not be successful when considered as a single functional economic area, single place or single community. It is a tapestry of interconnected but different economies, places and people, performing well in parts, but underperforming in others.

The Commission therefore recommends a different structure: a structure of five ‘productive places’, which are based on existing areas and their assets; with a clear vision for each area, a tight focus on priorities and stronger, streamlined governance.

In 2050, this tapestry of ‘productive places’ in the Thames Estuary will form part of the series of productive and connected places that ‘orbit’ London. Like Cambridge and Oxford, the ‘productive places’ of the Thames Estuary will be higher performing places, retaining their own distinct character and economic function.

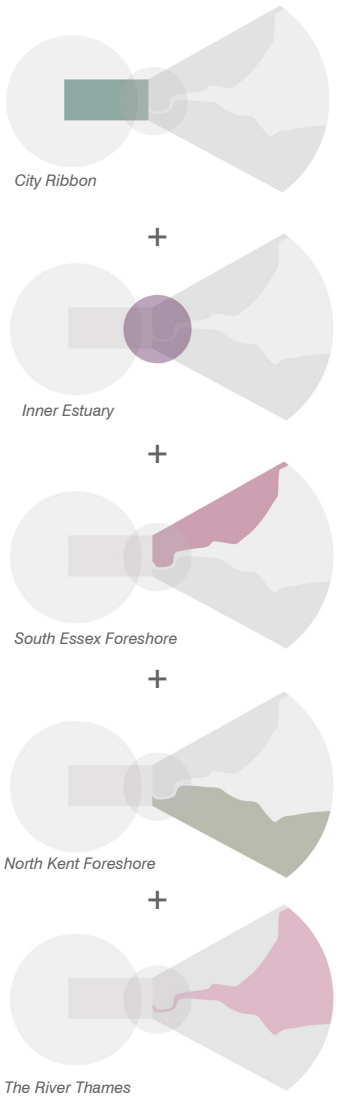
Thames Estuary Today

There is significant potential as an economic area, but there is not a clear economic or spatial framework to realise this potential in comparison to other successful corridors and cities around London like Cambridge, Oxford and Brighton. The current context is:

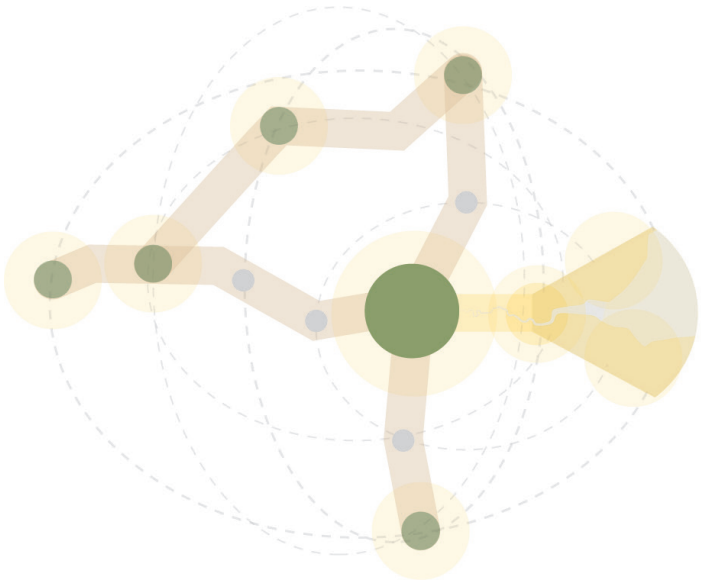
1.3 million jobs

£89 billion GVA

1.4 million homes



=



Five Productive Places

The different areas and characters of the Thames Estuary form into the proposition for five 'productive places'. Individually these places will be more productive and set up to deliver. Places will deliver the Commission's key priorities of:

Sectors

Connectivity and Communities

Delivery

Vision for Thames Estuary 2050

Each of the five places focuses on: developing strong and specific sectors, increasing skills, delivering homes and jobs at scale and pace, addressing the 'low wage economy', connecting to and enhancing natural assets and green infrastructure, and planning for long term and resilient development. This vision aims to deliver:

1.3 million new jobs

£190 billion* additional GVA

At least 1 million new homes

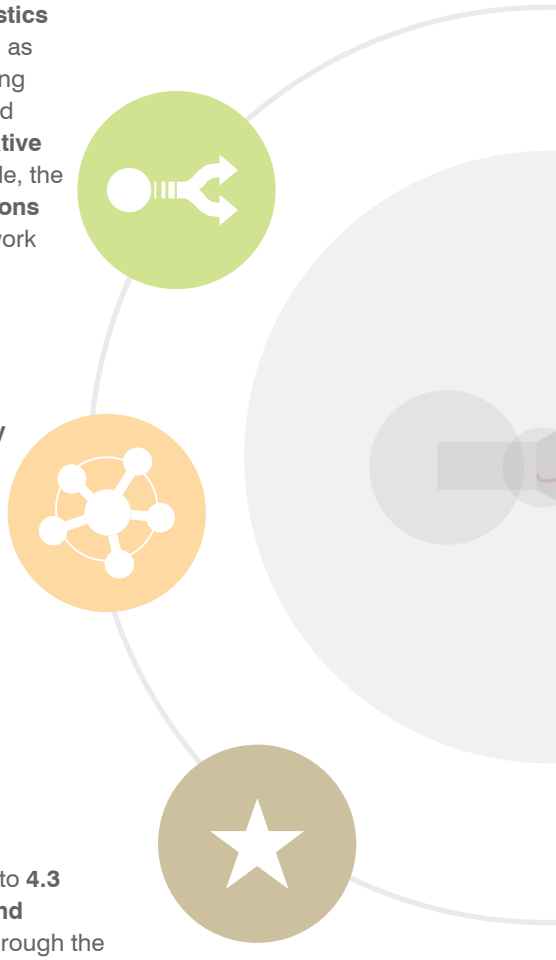
* assuming an annual average growth rate of 1.25% at current GVA per job

The Objectives

The Vision is underpinned by six objectives. They provide further direction on how the Thames Estuary can boost productivity, make a greater contribution to the UK economy and deliver a series of positive outcomes by 2050.

Productive Places

The places of the Thames Estuary will support the sustained growth of its high value, healthy wage sectors achieving up to **1.3 million new jobs by 2050**. Existing sectors will be strengthened including **freight and logistics** and **construction**, maximising opportunities from existing assets such as the **ports**. Emerging sectors will be nurtured including: **health**, reflecting the supercentre in Kent; niche heritage and wildlife **tourism** in Kent and Essex; and the Thames Estuary Production Corridor - a ribbon of **creative and cultural industries** along the River Thames. In part and as a whole, the places will harness entrepreneurial spirit, **strong educational institutions** and **unique natural assets** to create a distinctive and productive network of economies.

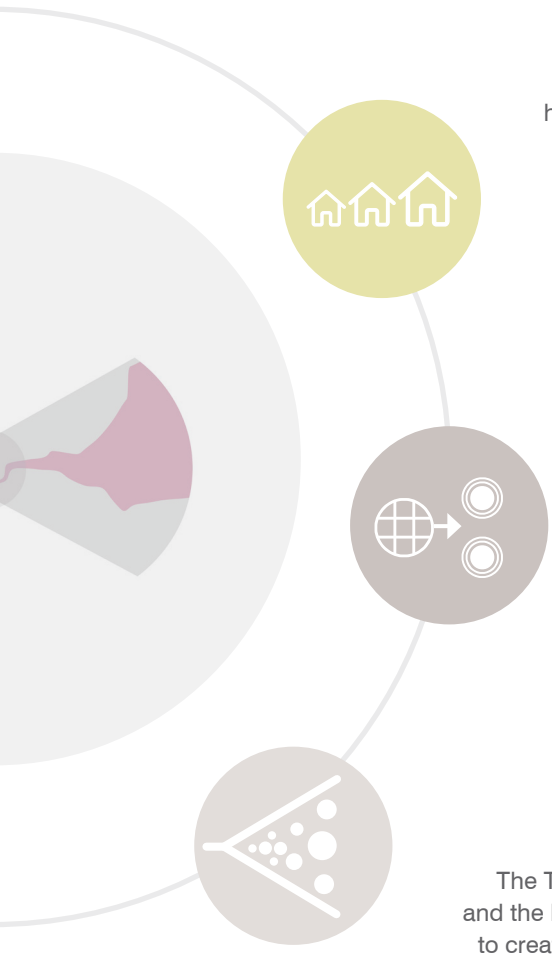


Connected Places

There will be **improved connections** between and within cities, towns, villages and industries be it for people or goods. This will support **improved productivity** through increased access to jobs and services. New and improved rail, bus, cycle and pedestrian links will reduce car dependency and increase the use of the area's **integrated public transport** systems. Completing the Thames Path will also improve connections for recreation for cyclists and pedestrians. The area will benefit from the highest level of **digital connectivity**, adopting the latest technological innovation. New **river crossings** such as the Lower Thames Crossing and Silvertown Tunnel will strengthen local and national links. New railway infrastructure including the extension of **Crossrail 1 to Ebbsfleet** and the **Thames East Line** will connect into the country's high speed network and complete the orbital railway around the Capital.

Thriving Places

The growing communities of the Thames Estuary, which will be home to **4.3 million people by 2035**, will pride themselves on their **rich cultural and economic activity**. Through **people-led projects** - in part delivered through the Thames Estuary Fund - each distinctive city, town and village will be the well-loved **heart of the community**. They will demonstrate the importance of good design and creating attractive places that work for the community. Improved **educational attainment** and **local skills** will **increase aspiration** and show that new job opportunities are for them. These thriving places will be **attractive to investors** and will celebrate their **individual sense of place** by offering bespoke opportunities to live, work, visit and play within the Thames Estuary setting.



Affordable Places

A further **1 million high-quality homes,** balanced to suit the affordable needs of the community, will be provided by 2050. They will offer a diversity of choice to all parts of the community, including **ageing populations**, and ensure that **supply keeps pace with demand**. The production of **statutory Joint Spatial Plans** will set out where these homes will be located and include tools, such as design review panels, to ensure high-quality development is delivered. **Healthy lifestyles** will be supported by the provision of new social places alongside integration with existing places and community networks. This will support **resilient communities** that respond to the needs of residents throughout their lives.

Adaptable Places

The many places and spaces in the Thames Estuary will adapt to the changing environment ensuring the people, economies and ecology of the area **thrive**. Infrastructure investment will be **integrated and multi-functional**, maximising the benefits to people, places, and ecology. This will assist in the creation of nearly **900 hectares of new habitat by 2100** to replace the 1,200 hectares lost to tidal flooding. Projects such as the completion of the Thames Path will provide **improved access to the natural environment**. The use of natural assets for recreation and economic activity will be balanced with their **protection and enhancement**.

Deliverable Places

The Thames Estuary will complete what it has started; delivering the homes and the balanced jobs it has planned, at the required **scale and pace**, in order to create thriving and affordable places. This will be achieved through robust, **locally-led governance** structures, which **build on existing** partnerships and bring together, as needed, the **18 local authorities**, plus the three upper tier authorities. The area will also be a space to try something - a place that **supports innovative models of delivery** be that through capitalising on Modern Methods of Construction (such as modular homes) or innovative models of public sector housing delivery. Across the many places of the Thames Estuary this will enable the **significant aspirations to become meaningful realities**.

City Ribbon

The area 'City Ribbon' includes the east London boroughs of Tower Hamlets, Newham, Barking and Dagenham, Havering, Lewisham, Bexley and Greenwich and the London Legacy Development Corporation.

The core strengths of this place include the **growing cultural and creative industries sector**, supported by the Mayor's Production Corridor, and significant projected **population growth**, which is collectively one of the **youngest on average in London**. This is allied to major regeneration programmes in areas including Barking Riverside and Thamesmead.

The challenges of the area include integrating and delivering **future connectivity** projects, including river crossings and the Crossrail 1 extension to Ebbsfleet, and ensuring this unlocks the delivery of **affordable housing**. The area suffers from some of the **highest levels of deprivation** in London with **high levels of unemployment** and **low skills**.

Within this context the Commission's vision for City Ribbon is:



City Ribbon will be a hub for production. Space will be created for start-ups and grow-on spaces for small and medium sized businesses. Communities will be connected by multiple public transport links and served by culturally rich town centres. Through the implementation of a multi-generational skills strategy, the area will connect the creative and cultural industries to a highly skilled workforce.



"Both banks of the Thames were rejuvenated. There are now large blocks of apartments where there were once derelict wharves. Shopping areas, apartments, public houses and walkways . . . The neighbourhood of the river is recovering its ancient exuberance and energy, and is reverting to its existence before the residents and houses were displaced by the building of the docks in the 19th century."

Peter Ackroyd, Sacred River

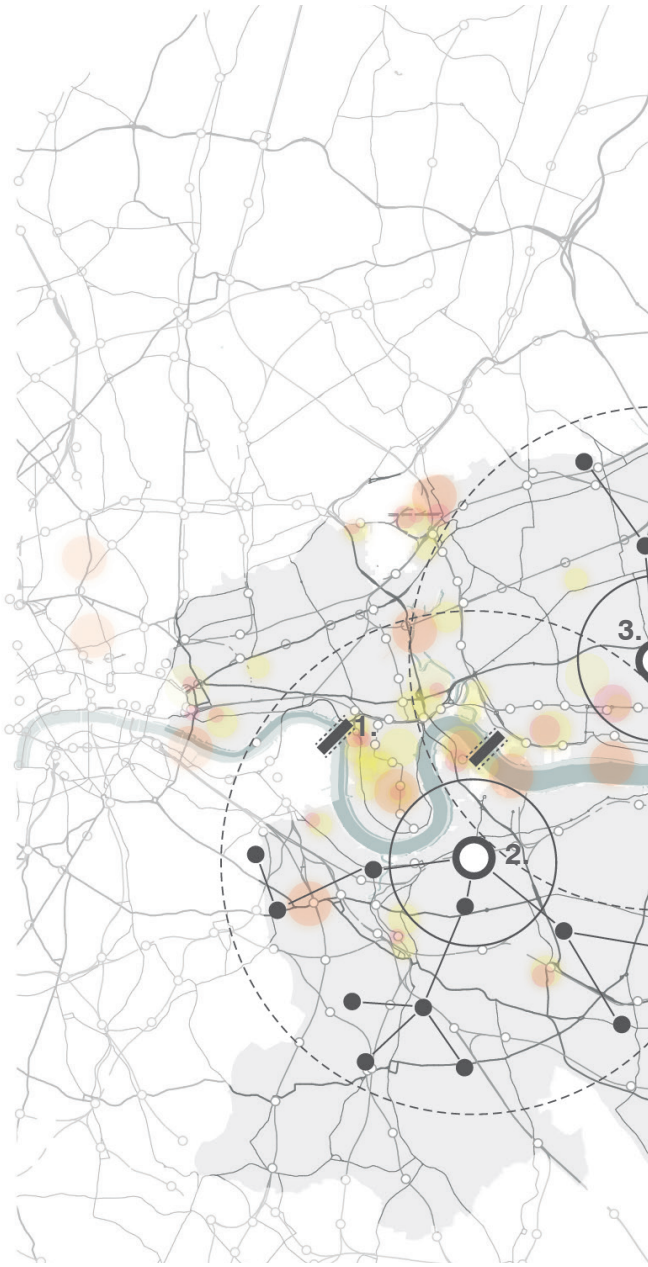
City Ribbon

Within City Ribbon, 196 infrastructure, skills and employment projects were subject to the prioritisation review. Some 139 projects were sifted out where they were either: a duplicate entry; there was insufficient information available on the project to meaningfully assess it; or because it represented 'business as usual' where it was considered that the project would not make a significant contribution to meeting the Commission's vision for the area. Of the remaining 57 projects, 88% contributed to connected places, 82% towards adaptable places and 70% to productive places. Half contributed to affordable places.

In addition, 209 large scale known and proposed employment and residential developments were identified. All the developments were categorised as 'business as usual'.

There is much already happening in City Ribbon, with existing delivery structures in place. However, the Commission believes there are opportunities to make more of what is planned to realise the aspirations for the area. The Commission's priorities are set out opposite.

Beyond these three priorities, there are other projects which the Commission supports and considers are central to its vision for City Ribbon being achieved. These include the expansion of City Airport, the continued growth of Canary Wharf, the delivery of Thamesmead which could provide up to 20,000 new homes - the largest regeneration project in Europe - and the extension of Crossrail 1 to Ebbsfleet. This project is discussed further in the Inner Estuary; within City Ribbon the project could help to accelerate delivery of 30,000 new homes in Bexley, directly unlocking 16,000 of these and support Canary Wharf's ambitious expansion, which is set to create up to 80,000 new jobs.



Commission's Priorities

Accelerated Delivery Pilot

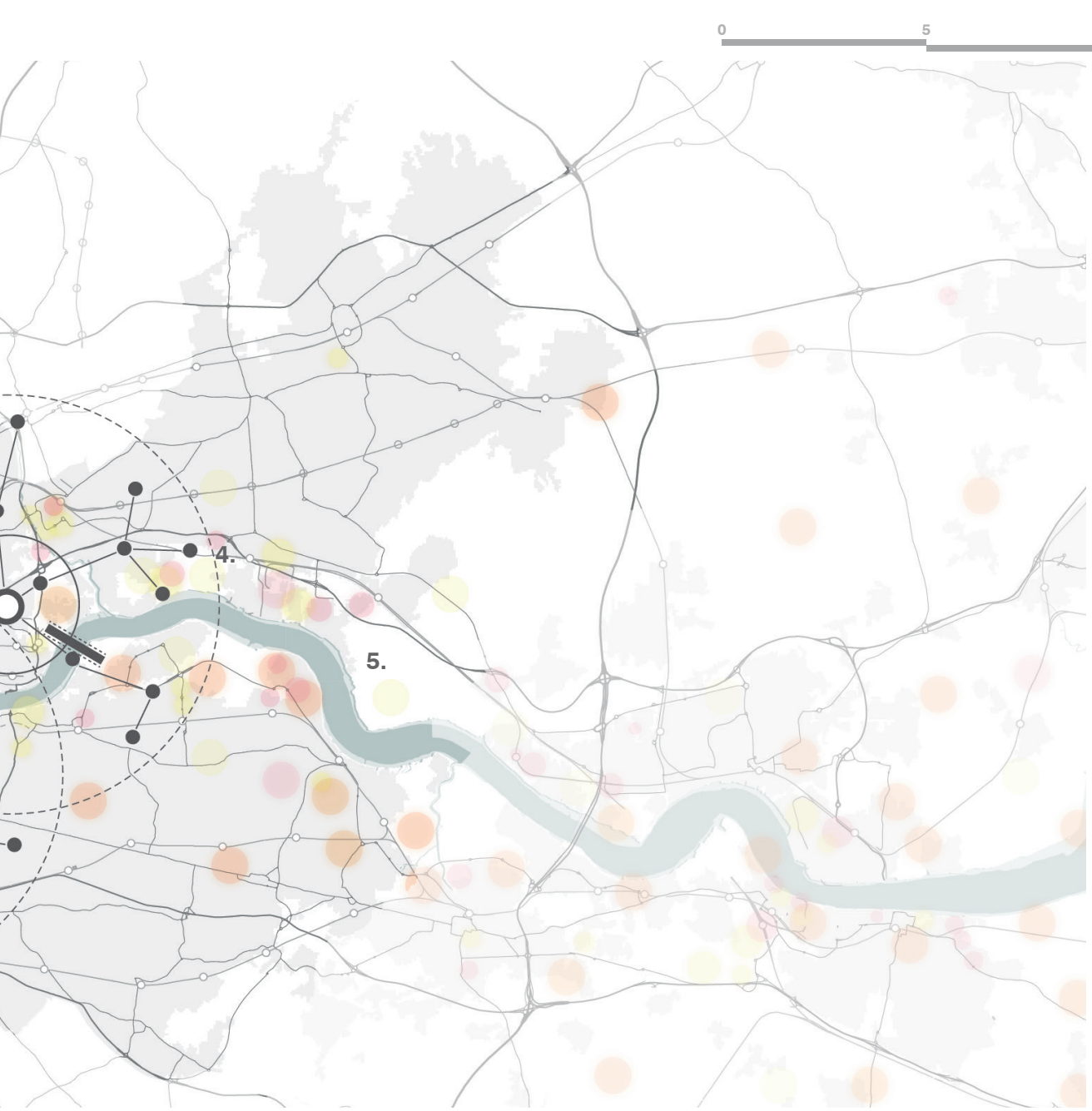


What: *Trial new delivery models to accelerate the scale and pace of delivery of homes and jobs in the Opportunity Areas within City Ribbon to bring forward the development stated in the London Plan by 2035. This could be done through housing delivery companies and the public sector acting as master developers.*

Why: *East London is a major focus for home and job growth. It should showcase how Government is delivering against the Industrial Strategy and need for new homes.*

How: *The Mayor of London, London boroughs and Homes England should work together to expedite delivery of jobs and homes. These organisations should make best use of existing powers, find solutions to current constraints such as borrowing caps and develop the skills and expertise to enable delivery.*

When*: Short term to bring forward stated delivery in 50% less time.*



New Thames Crossings



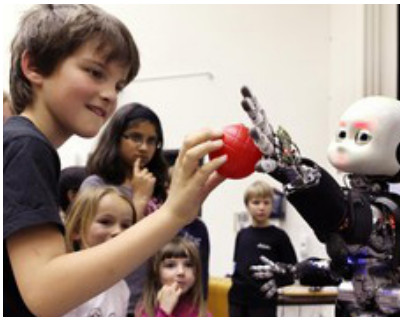
What: *Prioritise the planning and funding of river crossings. The Silvertown Tunnel and the DLR extension to Thamesmead should be operational by 2030. A third river crossing should be considered to facilitate homes and jobs.*

Why: *Poor accessibility limits the ability of the area to realise its full potential. New public transport and active travel crossings will unlock homes and jobs and contribute to place making.*

How: *The Mayor of London should deliver Silvertown Tunnel as quickly as possible. He should prioritise and bring forward the planning for public transport and active travel crossings.*

When*: Medium term delivery of the three crossings; short term priority planning.*

An Integrated Skills Strategy

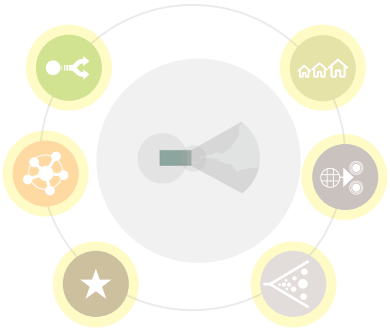


What: *Implement a more targeted skills strategy that provides clear pathways to employment. It should support the area's existing and emerging economic sectors including the Production Corridor and the growing interest in the cultural and creative industries.*

Why: *Build on the success of the London Schools programme and be thought leaders for the Thames Estuary. The strategy should showcase how education and skills training can be used to address generational skills shortfalls and reduce levels of unemployment.*

How: *The Mayor of London should work with the boroughs, the Local Enterprise Partnership, employers and/or educational institutions to translate his Skills for Londoners strategy into a targeted plan for the area to ensure it meets current and future employer needs.*

When*: Quick win building off existing skills strategies including the Skills for Londoners Strategy and Place Making Institute.*



Inner Estuary

High performing dock infrastructure which creates opportunities for a wide range of sectors based in the surrounding community

The area 'Inner Estuary' includes Thurrock, Dartford and Gravesham Councils, and Ebbsfleet Development Corporation. The area has approximately **22km of Thames waterfront**.

The core strengths of this place are its **connectivity** (which supports a growing higher value logistics and freight sector, including the **£1 billion investment in the Port of Tilbury** and further investment in the London Gateway Port) and the planned growth of **new town centres** at Ebbsfleet, Bluewater and Lakeside. The place is also promoting innovation in construction through **Modern Methods of Construction** with a particular focus on modular housing construction.

The challenges for the area include the unresolved **approach to the Swanscombe Peninsula**, **air quality** issues as a result of congested **river crossings**, the **slow pace of delivery** at Ebbsfleet Garden City (where delivery of 15,000 planned homes has slowed and there is a lack of job creation), **poor education and skills attainment**, and the need to maximise the homes and jobs that could be unlocked through **infrastructure investment** including the Lower Thames Crossing and Crossrail 1 extension to Ebbsfleet.



Innovations in mobility and public transport will connect communities to the adjacent landscapes and diverse employment opportunities

Within this context the Commission's vision for the Inner Estuary is:

A thriving and higher value Port of Tilbury and London Gateway Port will create opportunities for an upskilled and aspirational population. Healthy town centres will be home to creative businesses and high achieving schools. The delivery of Ebbsfleet Garden City, including a new Medical Campus and integrated sustainable transport systems, will bring new homes and jobs to a unique river landscape.



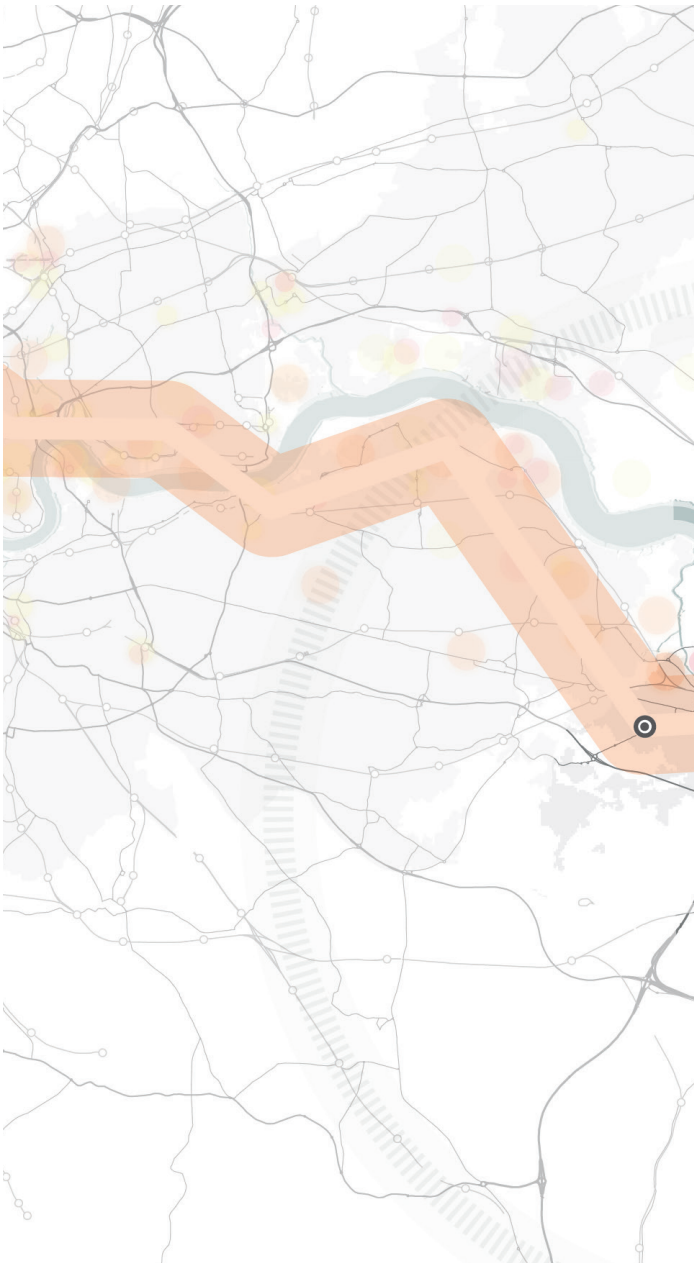
Public sector partnerships and businesses will deliver world leading technology

New skills focussed training will integrate with the work spaces to create thriving centres of medical excellence connected to open spaces that support healthy lifestyles

"A great future lies before Tilbury Docks... free of the trammels of the tide, easy of access, magnificent and desolate, they are already there, prepared to take and keep the biggest ships that float right upon the sea. They are worthy of the oldest river port in the world."

Joseph Conrad, The Mirror and the Sea

Inner Estuary



Within Inner Estuary, 109 infrastructure, skills and employment projects were subject to the prioritisation review. Some 73 projects were sifted out where they were either: a duplicate entry; there was insufficient information available on the project to meaningfully assess it; or because it represented 'business as usual' where it was considered that the project would not make a significant contribution to meeting the Commission's vision for the area. Of the remaining 369 projects, almost 64% contributed to productive places and 58% to connected places. Around a third of the projects contributed to each of the affordable, thriving and adaptable places.

In addition, 58 large scale known and proposed employment and residential developments were identified. All of the developments were categorised as 'business as usual'.

The Commission believes there is the potential to increase the scale and pace of delivery through some transformative projects; these priorities are set out opposite.

Beyond the three priorities, there are other projects which the Commission considers central to achieving its aspirations for the Inner Estuary. This includes resolving the proposals for the Swanscombe Peninsula. The Commission encourages the promoters of the London Resort to submit a Development Consent Order application for the proposal as soon as possible. Should an application not be submitted by the end of 2018, the Government should consider all the options for resolving the uncertainty this scheme is creating for the delivery of the wider Ebbsfleet Garden City.

The Commission is supportive of the proposals for the Lower Thames Crossing. However, in order to future-proof the proposed crossing, the Commission believes that the design should, as a minimum, not preclude the future delivery of infrastructure to support rail transport links and/or autonomous vehicles. Highways England should also work with the relevant local authorities to ensure that the design and location of the crossing and connector roads minimise impact on traffic flows, unlock jobs and homes growth in the surrounding area.

Commission's Priorities

Extension of Crossrail 1



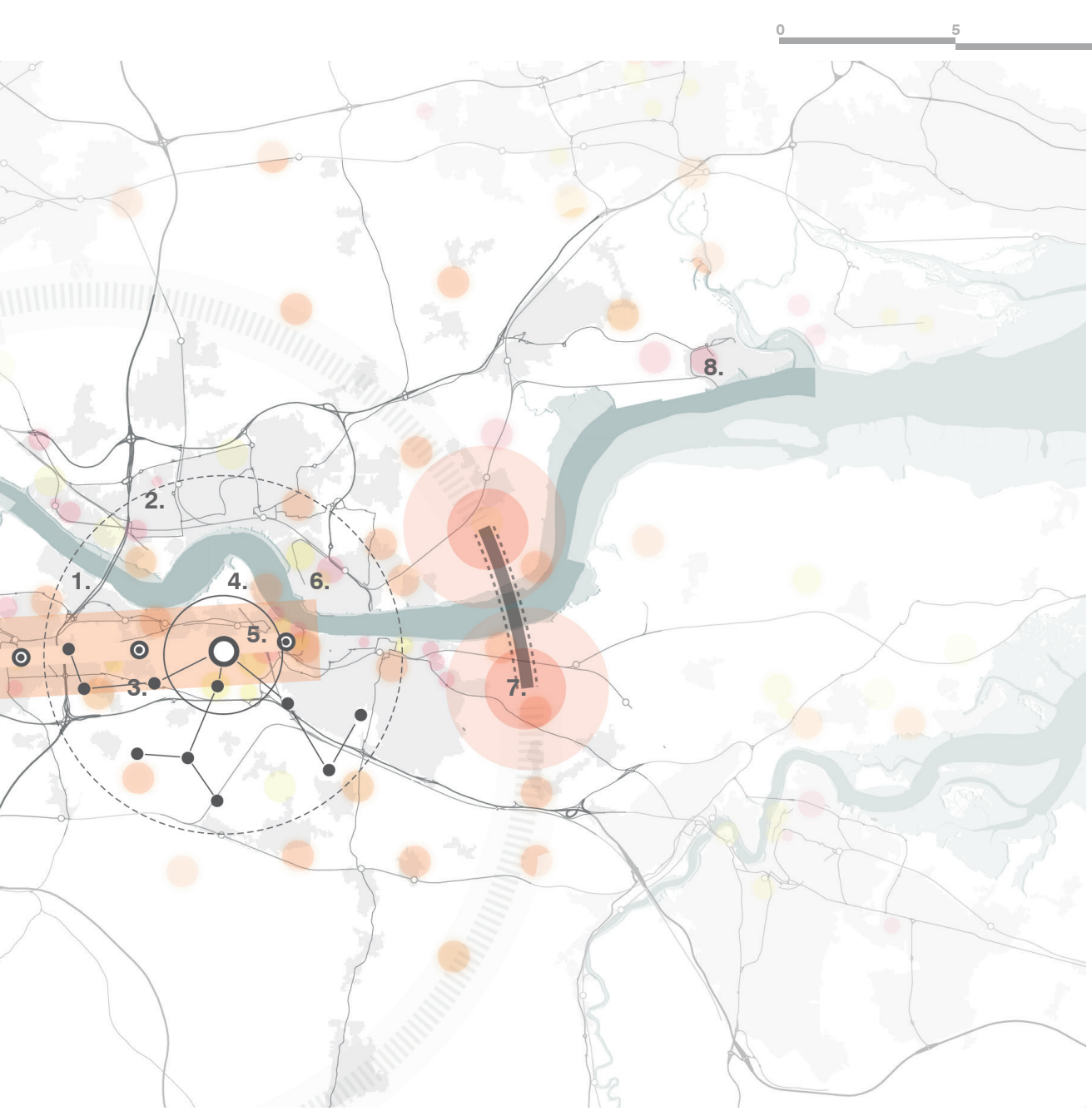
Crossrail ©

What: *Deliver an extension to Crossrail 1 from Abbey Wood to Ebbsfleet.*

Why: *The project could help to unlock 55,000 new homes, up to 50,000 new jobs and uplift skills and education by increasing rail capacity and creating new connections between economic hubs. This would need to go ahead in conjunction with upgrading supporting junctions. Key growth areas include Dartford town centre, Ebbsfleet Garden City and Swanscombe Peninsula.*

How: *Government should provide funding for the expected £20m cost of the next phase of project development. This would enable the detailed engineering, design, land and financial modelling and legal framework to be progressed.*

When*: Medium term delivery of the railway (by 2029); quick win to provide funding for the next phase of project development.*



Transport Innovation Zone



What: *Create a Transport Innovation Zone which promotes clean technology in transportation, logistics and data systems and unlocks housing opportunities with new means of public transport.*

Why: *The area forms part of the national road network for freight movements, and has a high density of tech and digital logistic usage. Also, due to the volume of traffic using its crossings and associated congestion, it suffers from significant air quality issues.*

How*: Government should incentivise research and development into sustainable travel and related digital technologies where it supports 'clean' movement.*

When: *Quick win to establish the governance arrangements and associated incentives for the Zone.*

Medical Campus

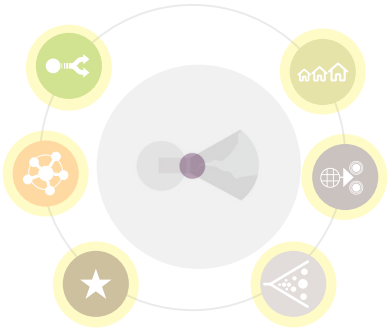


What: *Expedite the delivery of the Medical Campus at Ebbsfleet.*

Why: *Delivery of jobs at Ebbsfleet Garden City has been slower than planned. To make the area more attractive to the market, the delivery of the Medical Campus will provide an anchor employment institution.*

How: *Government should work with Kings College London to deliver the Medical Campus.*

When*: Short term (delivery by 2022).*



South Essex Foreshore

The area 'South Essex Foreshore' includes Basildon, Castle Point, Southend-on-Sea and Rochford Councils. Southend-on-Sea and Basildon are the major centres of a string of towns to the north of Canvey Island and the marshes around Hadleigh Ray and Holehaven Creek.

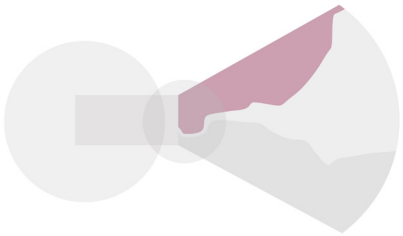
The core strengths of this place include the established and coordinated voice of **Opportunity South Essex**, the **unique wetland habitats** of the river edge and the emerging **cultural sectors** and medical and aviation related **advanced manufacturing in Southend-on-Sea**. The challenges of the area include **poorly performing town centres**, **slow speeds of delivery** linked to limited clarity on priorities across the area, and a **skills and jobs mismatch** between the primary employers and the majority of the workforce. In the future, the threat from **sea level rise** will require major investment in integrated flood defences.

Within this context the Commission's vision for South Essex Foreshore is:

Local Investment in the public realm of High Streets including child friendly spaces



The rich patchwork of places which form the South Essex Foreshore will be celebrated. Empowered by a statutory Joint Spatial Plan the area will go beyond 'business as usual'. Locally driven town centre transformation will help create lively places that people choose to work, live, learn and play in. These policies and local initiatives will see development unlocked, post-industrial landscapes restored, and the filling of empty business spaces to create a thriving and creative economy.



Innovative delivery models for affordable housing and workspace in town centre environments



Continued support for distinctive 'Essex' architecture in housing design



Strong connections to Southend Airport to add value / skills to local centres



Protection of, and increased access to, unique foreshore landscapes through partnership

Continued support for local culture and creative enterprises

"What we've seen over the past 10 years is this huge burgeoning of the artistic scene in Southend...You've got a lot of creative people coming out of London and looking for new, affordable spots. Southend has such an opportunity to be a thriving place for the creative industries, but you need that underlying structure to support it. This is only the starting point."

Joe Hill, Focal Point Gallery

South Essex Foreshore

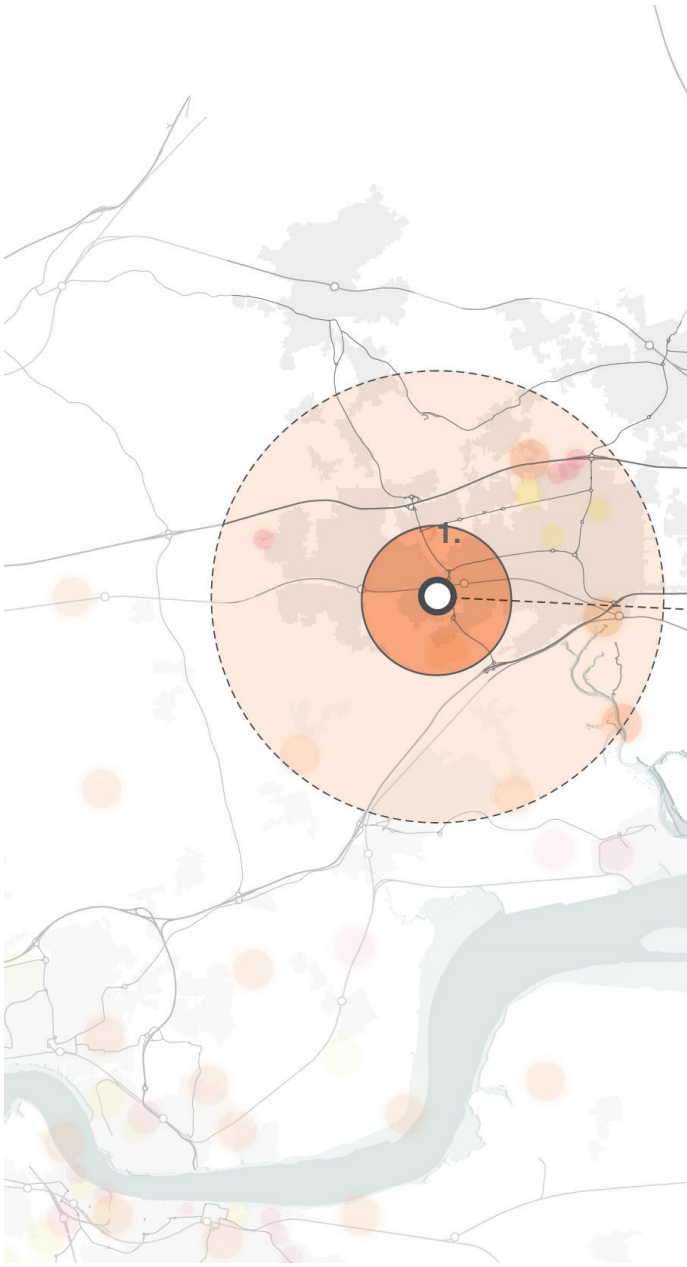
Within the South Essex Foreshore area, 119 infrastructure, skills and employment projects were subject to the prioritisation review. Some 56 projects were sifted out where they were either: a duplicate entry; there was insufficient information available on the project to meaningfully assess it; or because it represented 'business as usual' where it was considered that the project would not make a significant contribution to meeting the Commission's vision for the area. Of the remaining 63 projects, around 71% contributed to productive places, with 49% contributing to connected places and 46% contributing to affordable places.

In addition, 35 large scale known and proposed employment and residential developments were identified. All of the developments were categorised as 'business as usual'.

There is a large number of identified local and strategic projects throughout South Essex Foreshore. The Commission believes that these projects can be better coordinated and prioritised to maximise their impact. The Commission therefore supports the work already being undertaken by local authorities on a Joint Spatial Plan and believes it should have a statutory footing. In completing the Plan, the local authorities should continue to work with other authorities within the Housing Market Area/neighbouring areas, Essex County Council and Opportunity South Essex to produce an integrated strategy for delivering and funding high-quality homes, employment, transport and other infrastructure. The Plan should also be ambitious - going above the minimum housing numbers set by Government - to attract substantial infrastructure investment from Government.

The Commission also supports a number of related initiatives, which are central to achieving its vision for the area. Firstly, local authorities should explore what support can be provided to SMEs, financial or otherwise, to help bring forward needed new employment space. Secondly, planned railway improvements, particularly around Southend-on-Sea and London Southend Airport, should be delivered to increase capacity. Lastly, road, rail and relevant local authorities should work together to minimise conflict between goods and people on the transport network, with the aim of increasing road capacity/number of services on existing railway lines.

Beyond these projects, the Commission has identified three other priorities.



Commission's Priorities

SE Foreshore Fund



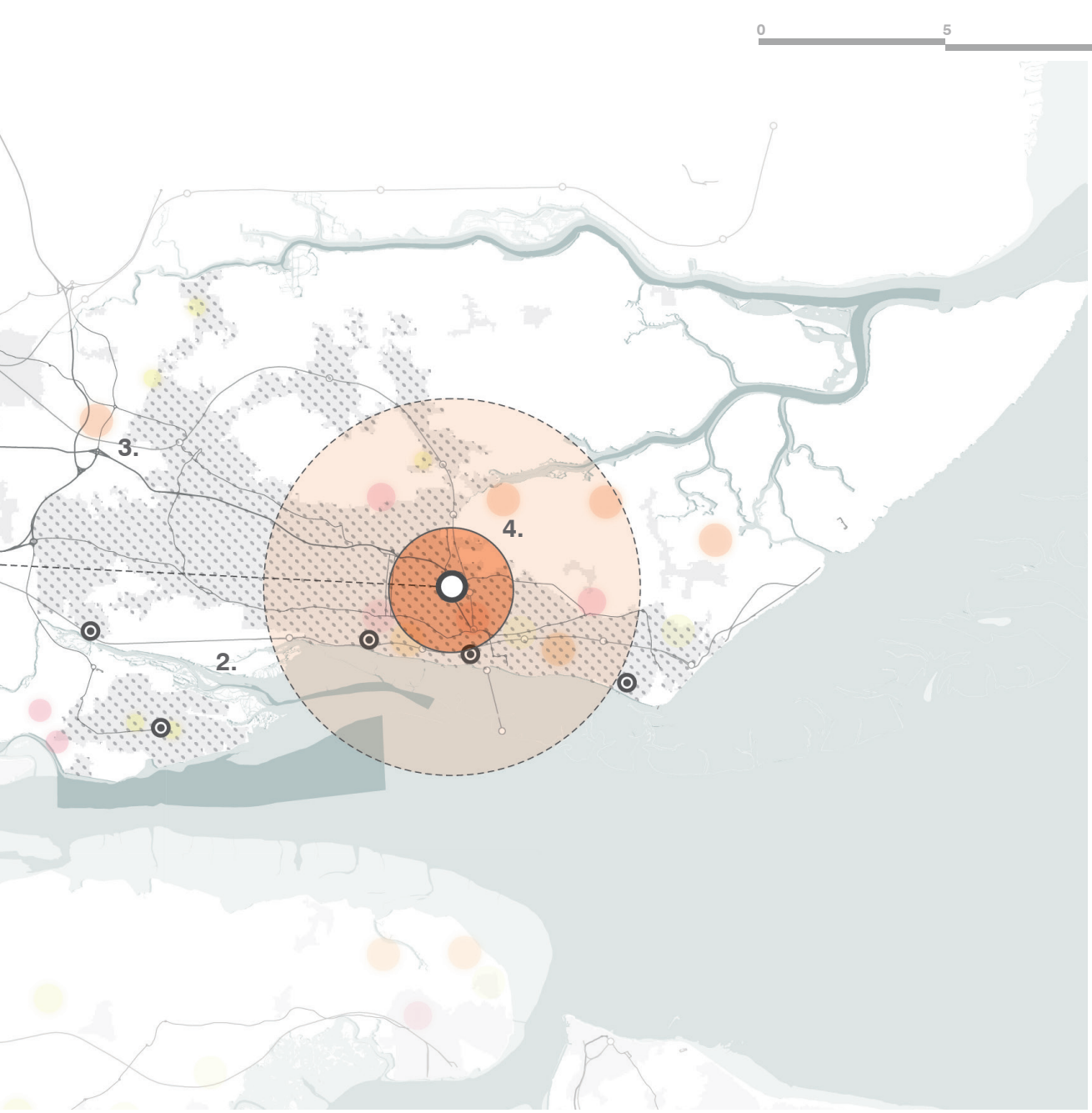
Rose Street Market ©

What: *Create a fund which local authorities and local communities can bid for. Projects should support town centre regeneration and/or community development.*

Why: *Give local communities and organisations the opportunity to direct investment where it is most needed to support local aspirations and town centre regeneration.*

How: *Government to make available a £20 million fund and provide support to the four local authorities and local communities in their funding bids.*

When*: Quick win for first raft of funding in 2019.*



SEC Relocation



What: *Expedite the relocation of the South Essex College's Nethermayne campus to Basildon town centre.*

Why: *This site is central to the Council's aspirations for redevelopment of Basildon town centre. It provides the opportunity to introduce new courses which align with the needs of local employers and sectors and address lower education and skills levels in the area across multiple generations.*

How: *Basildon Council and Essex County Council should work with South Essex College to deliver the re-location.*

When*: Short term (delivery by 2022).*

Institute for Resilient Infrastructure

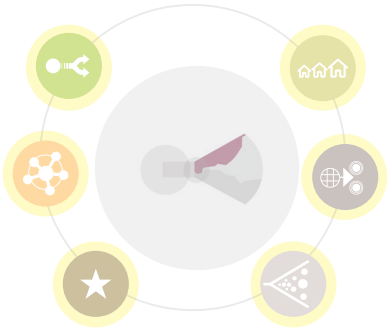


What: *Establish a centre for the research, design and funding and financing of integrated infrastructure to address contemporary and future city challenges.*

Why: *The Institute needs to be up and running to ensure the Thames Estuary has the skills and knowledge needed to design and deliver key infrastructure such as the second Thames Barrier. It will also identify delivery and governance models that can enable strategic infrastructure to be funded by the private sector.*

How: *Government to approach existing institutions to identify interest. If possible, Government should explore the potential for collaboration with private sector education and technology leaders to provide teaching and skills development training space.*

When*: Short term delivery (by 2024); Quick win to approach existing institutions.*



North Kent Foreshore

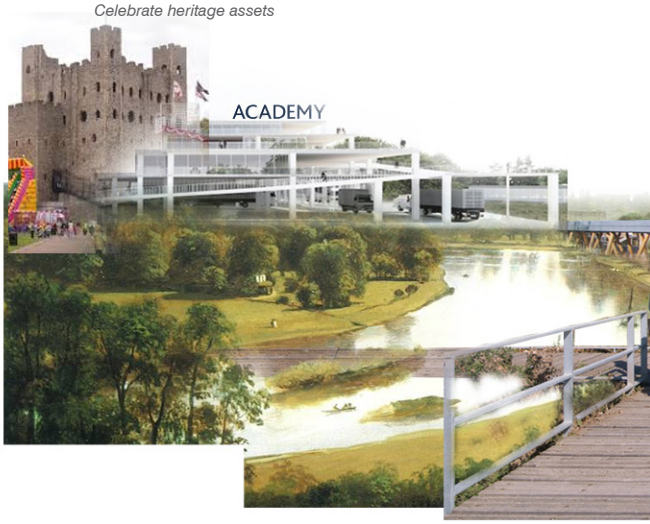
The area 'North Kent Foreshore' includes Medway, Swale, Canterbury and Thanet Councils. It is a rich and diverse area formed by the **ancient Medway Towns**, and the settlements that stretch along the Roman '**Wattling Way**' between Sittingbourne, Canterbury and the arc of distinctive coastal places between Whitstable and Ramsgate.

The strengths of this place include its **universities** which together form an emerging **medical research corridor** connecting the Francis Crick Institute through Chatham to Canterbury. The historic assets of the area's cities are matched by **productive agricultural landscapes** which spread out between them, both of which provide opportunities for continued growth of niche tourism.

The challenges of the area include the connection between the **skills** needs of employers and the education and skills training available to the community. The area also has a high level of '**digital deprivation**' which is seen to stymie start-up and SME growth in the digital industries.

Within this context the Commission's vision for North Kent Foreshore is:

Celebrate heritage assets



Improved and managed access to unique wetland landscapes

At the heart of a new medical research corridor, North Kent Foreshore will be home to a supercentre of health and wellbeing. Through a statutory Joint Spatial Plan, and strong connections between local government and business, the area will balance delivering growth in the health sector with new jobs, new homes, a renewed focus on skills, and high-quality town centres set around world-class heritage and natural assets.

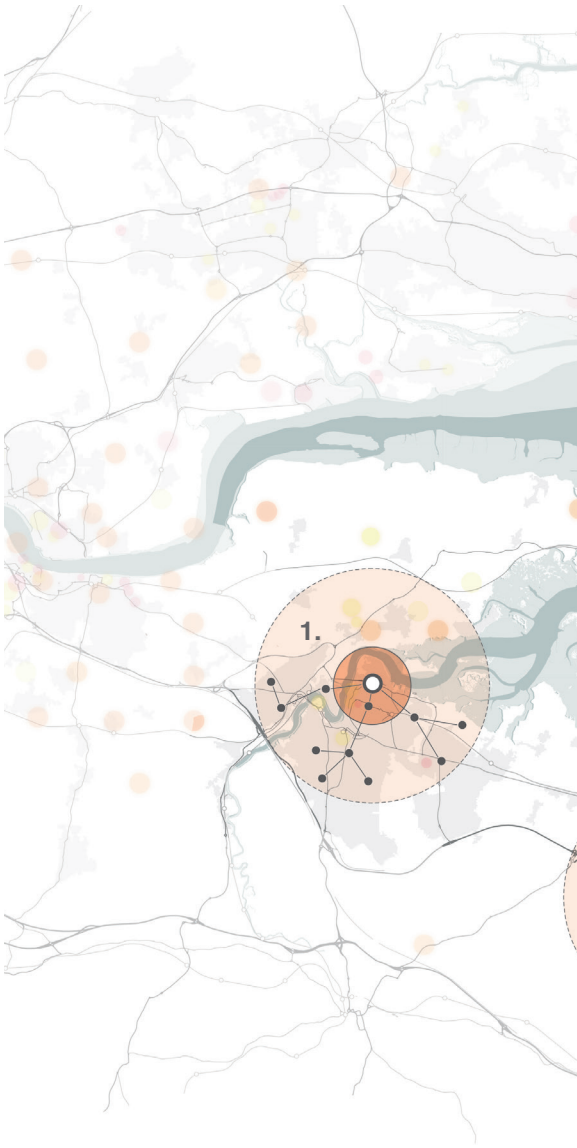


Increased access to landscape as part of strong links between nature, agriculture, health innovation and wellbeing

"The Thames Estuary is an edgeland - not quite river, not quite the open sea. It is an in-between place, a place of transition, a welcoming gateway, a corridor of trade, the front line for the defence of the realm and a gradual opening into the rest of the world."

Colette Bailey, Artist Director of Metal

North Kent Foreshore



Within the North Kent Foreshore area, 152 infrastructure, skills and employment projects were subject to the prioritisation review. Some 67 projects were sifted out where they were either: a duplicate entry; there was insufficient information available on the project to meaningfully assess it; or because it represented 'business as usual' where it was considered that the project would not make a significant contribution to meeting the Commission's vision for the area. Of the remaining 85 projects around 80% contributed to productive places, 75% to connected places and 42% to affordable places.

In addition, 54 large scale known and proposed employment and residential developments were identified. All of the developments were categorised 'business as usual'.

There are significant opportunities for growth and development in North Kent Foreshore. The Commission believes that further work is needed to coordinate initiatives already underway and to propose new initiatives to optimise the potential outcomes. This should be achieved through a statutory Joint Spatial Plan led by the local authorities, with the participation of other authorities within the Housing Market Area/ neighbouring areas, Kent County Council and Thames Gateway Kent Partnership to produce an integrated strategy for delivering and funding high-quality homes, employment, transport and other infrastructure. The Plan should also be ambitious - going above the minimum housing numbers set by Government - to attract substantial infrastructure investment from Government.

The Commission also supports the following related initiatives, which are central to achieving its vision for the area: local authorities should explore what financial and other support can be provided to SMEs to help them bring forward needed employment floorspace; planned railway improvements particularly around Canterbury should be delivered to increase capacity; and road and rail authorities should work together (with local authorities where relevant) to minimise conflict between goods and people with the aim of increasing road capacity/number of services on existing railway lines.

Beyond these projects, the Commission has identified three other priorities. These are set out opposite.

Commission's Priorities

NK Foreshore Fund

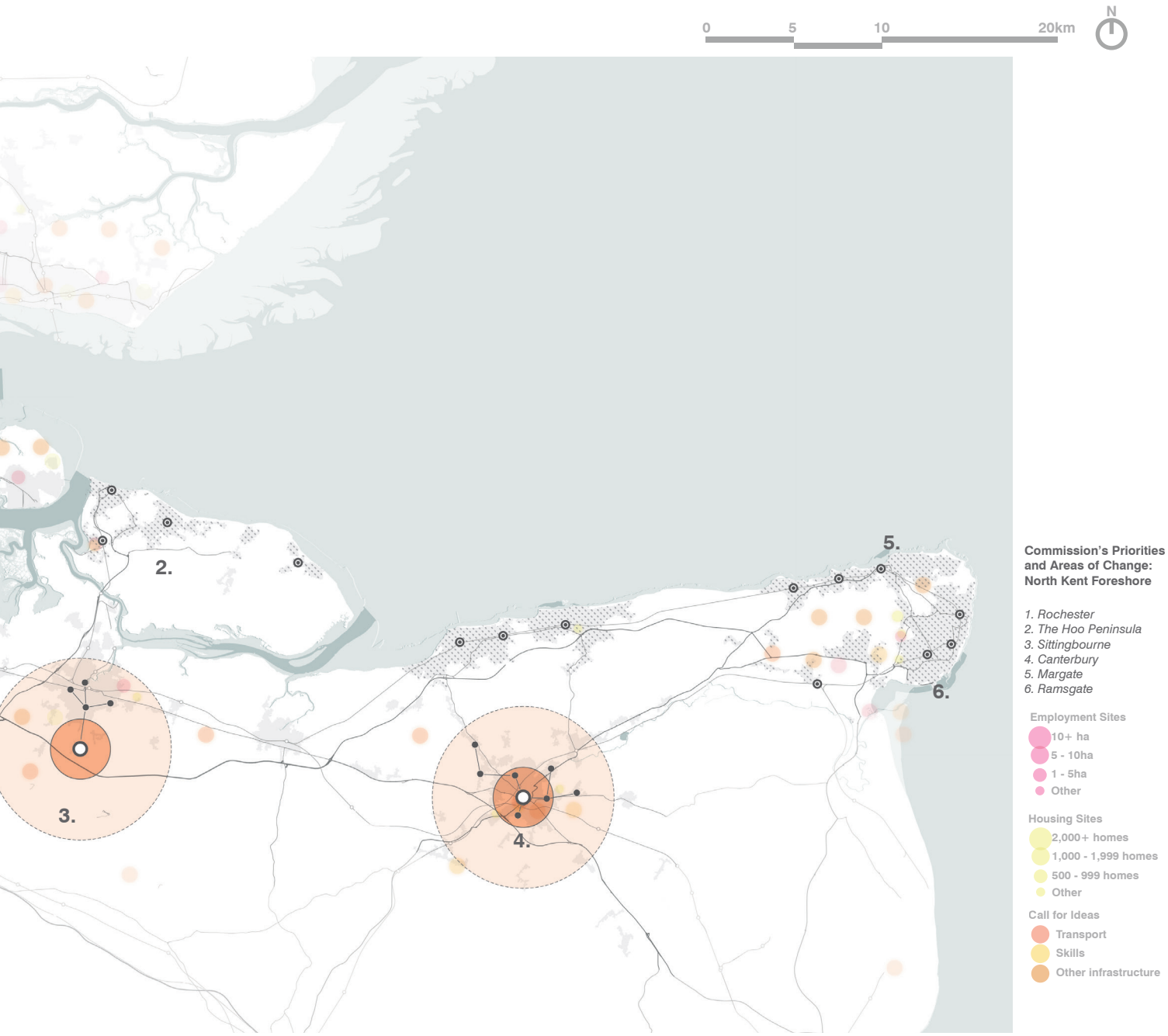


What: *Create a fund which local authorities and local communities can bid for. Projects should support town centre regeneration and/or community development.*

Why: *Give local communities and organisations the opportunity to direct investment where it is most needed to support local aspirations and town centre regeneration.*

How: *Government to make available a £20 million fund and provide support to the four local authorities and local communities in their funding bids.*

When*: Quick win for first raft of funding in 2019.*



Education and Skills



What: *Implement a more targeted skills strategy with employers and educational institutions that provides clear pathways to employment that support the area's existing and growing economic sectors.*

Why: *The 30 year vision allows this project to address generational skills shortfalls. It will improve educational attainment and skills in the area, across multiple age groups, therefore reducing levels of unemployment.*

How: *Kent County Council should work with the local authorities, the Local Enterprise Partnership, employers and/or educational institutions to develop a targeted plan for the area, which meets current and future employer needs.*

When*: Quick win building off existing skills strategies in place.*

Health Supercentre

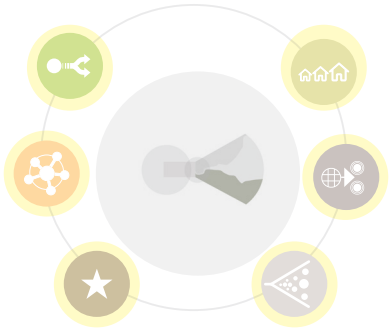


What: *Develop the new health and medical facilities at Canterbury to provide the eastern anchor to the supercentre.*

Why: *This project will act as a catalyst to the health supercentre building on the emerging health sector, cluster of academic institutions and transport connections in the area to increase productivity and jobs in the area.*

How: *Universities should be supported by Government and work closely with local communities to deliver promised facilities, to boost medical research and services while supporting workforce retention.*

When*: Short term delivery of facilities (by 2023).*



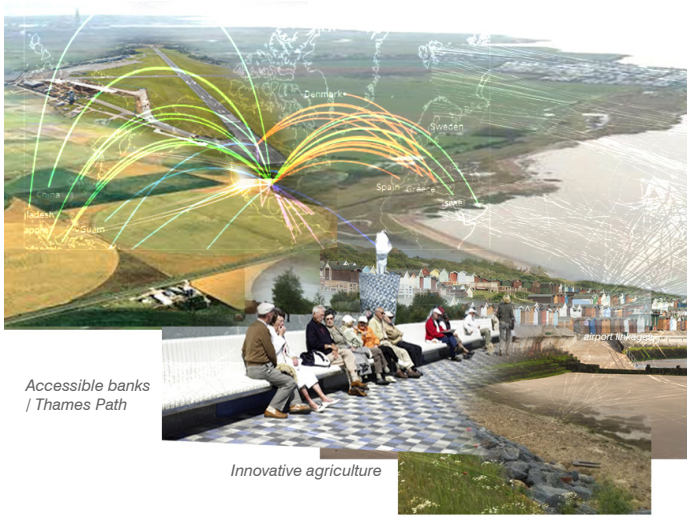
The River Thames

The River Thames is the **ancient heart** of the places of the Thames Estuary. It is a **global river** - connecting the Capital and five of the UK's largest ports to the rest of the world.

The strengths of the river remain its **strategic role** as a gateway to UK trade and industry and a vital and **flexible** component of the national infrastructure strategy. This is **balanced** by its **unique natural qualities** of ecology, habitat and landscape, which have long inspired the area's cultural and creative industries. The River Thames defines the quality of place of the cities, settlements and deep 'foreshores' which line it.

One of the challenges to the River Thames supporting the growth of the area is its **fragmented governance.** The multiple agencies (including the Environment Agency, Natural England, Port of London Authority, Marine Management Organisation) and private agendas prevent integrated solutions to some of the river's key challenges. **New crossings** will require careful integration, and the mitigation of sea level rise with **multi-functional defences**, which protect people and infrastructure from flooding will require new and innovative ways of working. Improving **water quality** and increased use of the river for **aquaculture** and **leisure** will enable the river to play a key role in the area's sustained growth.

Within this context the Commission's vision for the River Thames is:



Accessible banks / Thames Path

Innovative agriculture

A continuous Thames Path - celebrating the diversity of the River along its length

The river's ebb and flow will continue to connect the Foreshores, Inner Estuary and City Ribbon. Its multi-functionality will continue to evolve, from freight to fishing and from beach to boardroom - constantly emphasising the value of the river to its surrounding places and ensuring that the current level of flood protection is maintained. Its vital contribution to economic and social prosperity will place it at the heart of Thames Estuary 2050.



Centre for future logistics - connecting the assets of the river to local skills and local jobs

Continued investment in culture and programming of the River and its connected communities

"The River Thames is ancient; older than England, older than humanity, even older than the British Isles themselves. Its life cycle operates on a geological timescale. The river is almost a living being, writhing sinuously across its flood plain, eroding its banks and altering its channel, constantly changing."

Andrew Sargent, The Story of the Thames

The River Thames



Within the River Thames, 25 infrastructure, skills and employment projects were subject to the prioritisation review. Some 15 projects were sifted out where they were either: a duplicate entry; there was insufficient information available on the project to meaningfully assess it; or because it represented 'business as usual' where it was considered that the project would not make a significant contribution to meeting the Commission's vision for the area. Of the remaining 10 projects, 80% contributed to adaptable places and 70% contributed to connected places. This reflects that the projects largely focus on environmental improvements associated with flood defences and increasing access to the river.

No large scale known and proposed employment and residential developments were identified.

The Commission believes the River Thames can be a catalyst for growth and change in the four other 'productive places'. In order to do so it must be well used and well-loved. Three priorities have been identified to achieve this.

Commission's Priorities

Great Thames Park

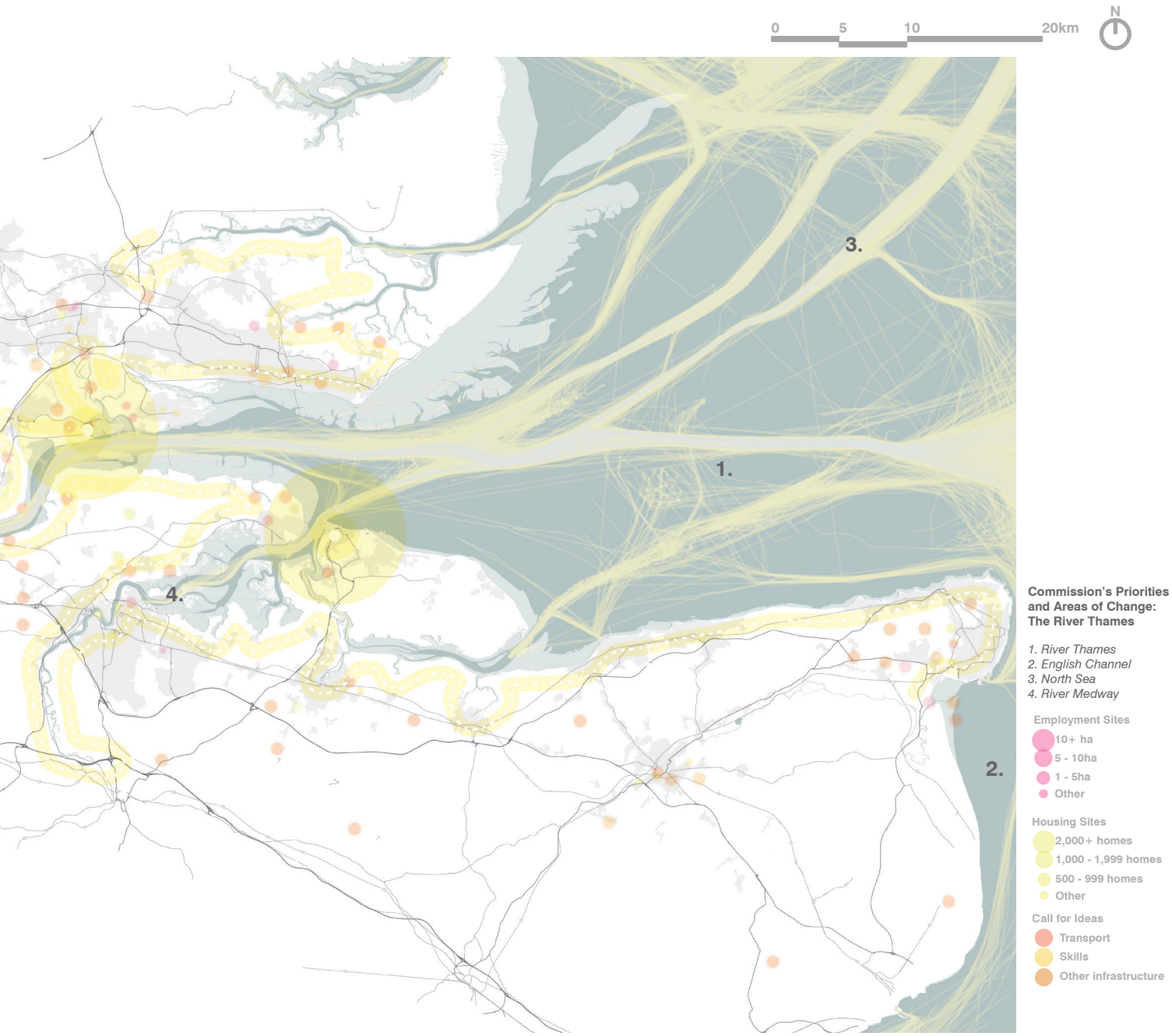


What: *Establish the Great Thames Park to celebrate and maximise the value of the area's natural assets. This should include improving access to and use of the River Thames for pedestrians and cyclists.*

Why: *It will create a 'brand' which attracts inward investment as well as residents and visitors to the area and improves connections between places.*

How: *Local authorities, environmental bodies and river regulators should prioritise investment in the Thames Path and associated projects. Government to consider the governance arrangements required to support the Great Thames Park.*

When: *Medium term with measures in the short term to put governance strategies in place. Quick win to deliver first new section of the Thames Path by 2020.*



Thames East Line



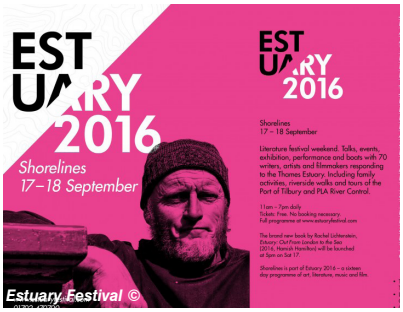
What: *Delivery of new multi-modal (including rail) crossing east of the Lower Thames Crossing combined with the second Thames Barrier. Potential interchange points could be Basildon and the Medway Towns.*

Why: *To maximise the benefits arising from a second Thames Barrier (which will provide a world-class standard of flood protection) including improved north-south connectivity, enhanced linkages with other high productivity corridors around London, agglomeration opportunities at interchanges and improved access to England's high speed railway network.*

How: *Government should consider a multi-modal crossing as part of its planning for the next Thames Barrier. This includes the financing models which could be used to deliver the project by 2050.*

When*: Long term delivery with measures in the short and medium term to commence project planning.*

Celebrate the Thames

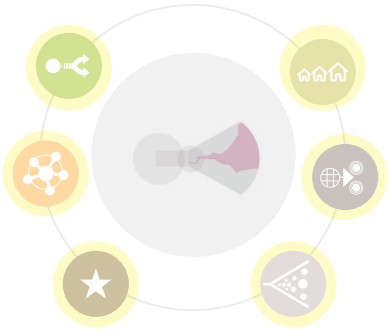


What: *Build on the success of the existing Thames Festival and the Port of London Authority's Thames Vision to create a programme of festivals, events and promotional activities.*

Why: *To celebrate the River Thames, its creative and cultural industries and to attract inward investment and visitors to the area.*

How: *A programme of events should be developed and led by the Thames Gateway Strategic Group working with local businesses and community groups.*

When*: Quick win to ensure additional funding and support for Estuary Festival 2019.*



Governance and Delivery

The Commission has an ambitious vision for the Thames Estuary, which it believes has the potential to deliver 1.3 million new jobs and £190 billion additional GVA by 2050. At least 1 million new homes will need to be delivered to support this growth, but the Commission believes there is scope for the Thames Estuary to be even more ambitious in responding to London's ever growing housing need. Realising this ambition will require a coordinated delivery plan, which will in turn be dependent on strong, streamlined governance.

The resounding message from the consultation that the Commission has undertaken is that there is ambition in the Thames Estuary to deliver high-quality development and the best economic outcomes for people. However, the Commission believes that a 'business as usual' approach will not deliver growth at scale and pace; governance reform and new delivery models are needed.

The Commission believes that Government should work closely with local partners to determine the governance reform required to drive growth in the Thames Estuary. In the first instance, the Commission recommends that a **robust, locally-led review of governance arrangements be undertaken, to be concluded within six months**. This review should bring forward proposals for strong, streamlined governance arrangements to drive growth - particularly in Kent and Essex - but encompassing the whole area. In undertaking the review, local partners should draw on lessons learned from places that have secured City, Devolution and Growth Deals, attracted major private sector investment, and delivered significant change.

It is right that local partners should, in the first instance, define the governance reform needed to drive growth in the Thames Estuary. However, if robust proposals to reform governance and drive delivery are not forthcoming from local partners within six months, a more top-down approach will be required.

The Commission has undertaken extensive engagement over the past two years and carefully considered the case for the role of governance reform in driving growth in the area. The Commission believes that the optimal governance arrangements should include the following:

A single voice for the Thames Estuary through a strengthened and streamlined Thames Gateway Strategic Group (TGSG): The TGSG as presently constituted is ill-equipped to articulate a shared vision and strategy for the area. Local authorities should strengthen it by providing capacity funding and streamlining membership, so that it may speak to Government with a single voice on key strategic, Estuary-wide issues. Government should endorse the Chair of the TGSG, who would act as a single 'champion' for the Thames Estuary to spearhead collaboration and help make the case for inward investment.

The development of statutory Joint Spatial Plans in Kent and Essex: The Commission believes that, to enable the continued prioritisation of investment, statutory Joint Spatial Plans should be produced in Kent and Essex. The precise geography should be defined by local partners in the first instance as part of the locally-led governance review, building on existing collaborations and administrative boundaries. On this basis, there is a clear case for focusing a Joint Spatial Plan on south Essex, where work is already underway. The optimal geography for a Joint Spatial Plan in north Kent is less clear, and local authorities should work

toward agreeing a preferred geography within the next six months. The Plans should build consensus around areas of focus, continue to strengthen the growth narrative for the area, and package and prioritise key projects. This will enable more effective delivery and provide a stronger focus for attracting private sector investment. If these Plans demonstrate sufficient growth ambition - going above the minimum threshold set out by Government for local housing need; and being given statutory status - **Government should reward this ambition with substantial infrastructure investment and freedoms and flexibilities**. This could take the form of a 'roof tax', or other incentive to accelerate housing delivery and support growth.

A revision of the geographical boundaries of South East Local Enterprise Partnership (LEP): Analysis undertaken by the Commission suggests that the Thames Estuary is a tapestry of productive places, requiring tailored growth strategies. Through the locally-led governance review, local partners should bring forward proposals to revise the geographical boundaries of South East LEP. South East LEP is one of the biggest LEPs in the country, second only to London in terms of population and number of local authorities. The Commission suggests that local partners consider the formation of two new LEPs within the Thames Estuary, one for Essex, Southend-on-Sea and Thurrock, and another for Kent and Medway. Aside from geography, the Government review into strengthening LEPs should consider the best organisational structure for LEPs, and whether they are adequately resourced to drive growth.

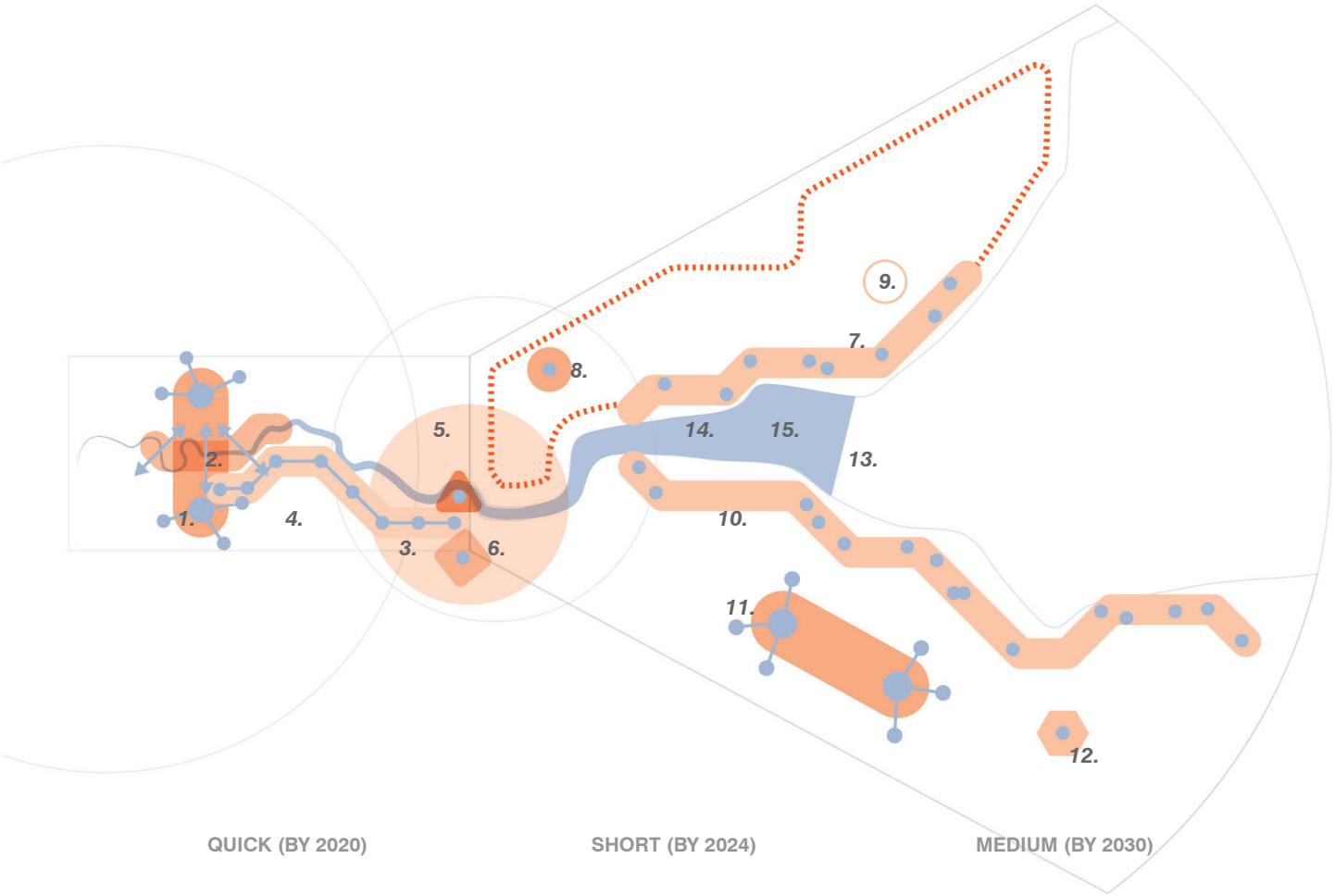
Development corporation(s) with planning, and compulsory purchase powers to drive the delivery of homes and jobs aligned to major infrastructure investment: Whether these are locally-led should be dependent on the scale of the development. In addition, local partners should consider whether Homes England's full resources and powers, including plan-making and development control powers, should be deployed to maximise the local growth benefits of major infrastructure investments like the Lower Thames Crossing. The Commission believes that development corporations, backed by substantial investment, planning powers and freedoms and flexibilities from Government, and coordinated by a strengthened and streamlined TGSG would be an effective way to drive growth in the Thames Estuary in key opportunity areas across the Thames Estuary.

Strengthened governance arrangements for the River Thames itself: The creation of a co-ordination office or lead organisation could be more effective in maximising the potential of the River Thames.

In return for strengthened and streamlined governance arrangements, the Commission would like to see **revenue raising powers and tax (or other) incentives granted to the Thames Estuary** to drive delivery of infrastructure, housing and jobs.

The Commission's Priorities

The Commission believes that the fifteen priorities identified in this document are critical to achieving its vision for the Thames Estuary by 2050. The priorities for each 'productive place' should be pursued simultaneously so that their impact is maximised and they work together to provide 'whole place' solutions.



QUICK (BY 2020)

3. An Integrated Skills Strategy

5. Transport Innovation Zone

7. SE Foreshore Fund

9. Institute for Resilient Infrastructure

10. NK Foreshore Fund

11. Education and Skills

13. Great Thames Park

15. Celebrate the Thames

SHORT (BY 2024)

1. Accelerated Delivery Pilot

6. Medical Campus

8. SEC Relocation

12. Health Supercentre

MEDIUM (BY 2030)

2. Three New Thames Crossings

4. Extension of Crossrail 1

LONG (BY 2050)

14. Thames East Line

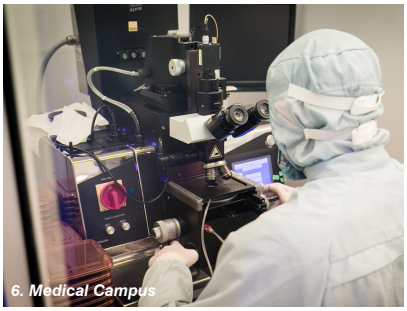

1. Accelerated Delivery Pilot


2. Three New Thames Crossings


3. An Integrated Skills Strategy


4. Extension of Crossrail 1


5. Innovation Zone


6. Medical Campus



7. SE Foreshore Fund


8. SEC Relocation

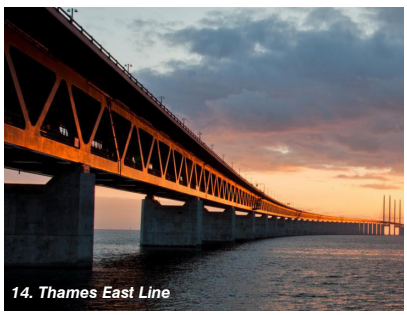

9. Institute for Resilient Infrastructure

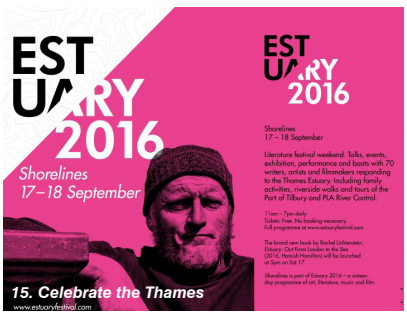

10. NK Foreshore Fund


11. Education and Skills


12. Health Supercentre

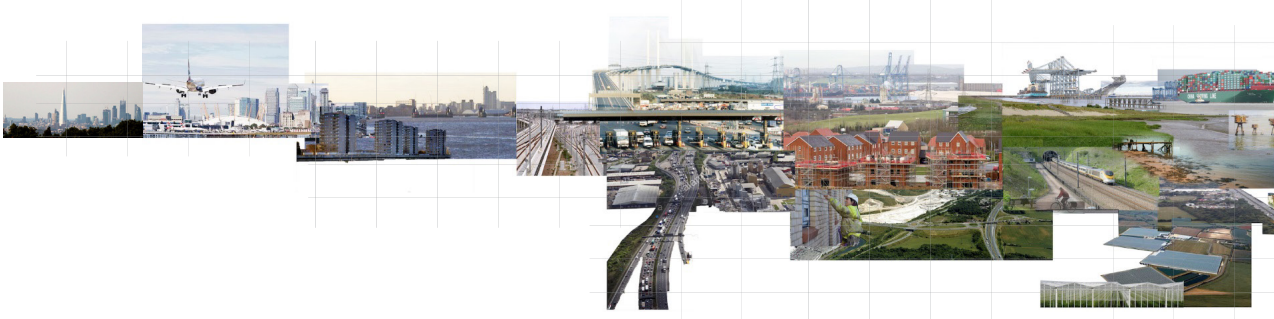

13. Access to the River


14. Thames East Line



15. Celebrate the Thames

ARUP



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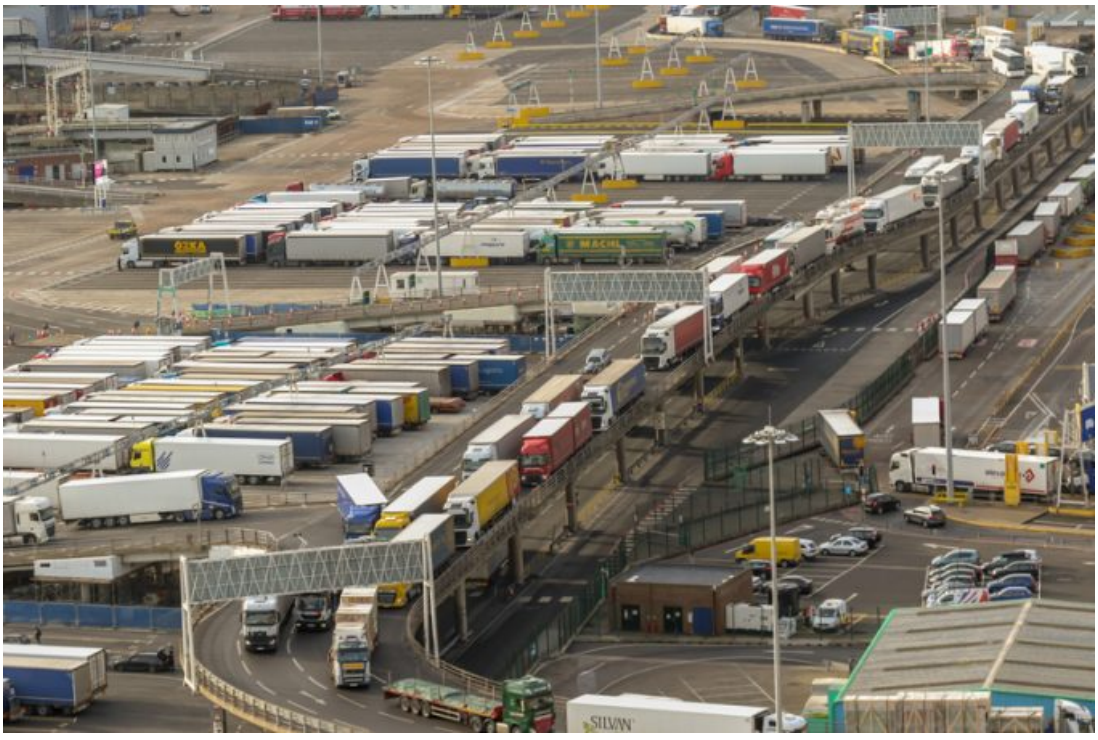
THE LOADSTAR

MAKING SENSE OF THE SUPPLY CHAIN

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© Ben Gingell |

By Alex Whiteman, Brexit reporter 10/03/2021

More than a quarter of the trucks crossing into the EU from the UK are travelling empty, as Brexit eats into UK export figures.

Data from the Road Haulage Association (RHA) shows empty lorries leaving the UK accounted for 26% of all truck movements into the EU, with total loaded haulage exports down 47% last month, compared with last year.

A spokesperson for the port of Portsmouth told *The Loadstar* empty EU-bound containers were making up a larger share of its post-Brexit activity.

And press officer for the RHA Paul Mummery said the surge in empties was, “by and large, Brexit-related”, although he noted that there were some positive signs in the data.



Between week three and week seven this year, the number of trucks moving empty fell from 37% to 26%, and the year-on-year drop for total export movements fell from 68% to 47%.

Meanwhile, one forwarder told *The Loadstar* it had yet to experience any effect from Brexit on its UK-EU export business.

Mr Mummery said the RHA expected to continue to record improvements month on month until the end of the month, but forecasts for April and beyond remained uncertain, with expectations of “major changes” when new UK import processes are applied.

“Things are easing slowly as firms are making it work, but they still face fundamental problems,” Mr Mummery told *The Loadstar.* “There aren’t

enough customs intermediaries to help them through mountains of red tape, and more challenges are ahead with SPS checks on imports next month and full checks in July… we're encouraged Cabinet is considering a 'light touch' approach to this next phase."

'Light touch' or not, the export figures remain alarming, with data from Germany's federal statistics office showing demand for UK goods has plummeted by close to 57%.

Italy recorded a 70.3% decline in UK imports in January, compared with a year earlier, and, while coronavirus has played its part in hitting EU economies, demand for Swiss goods (Switzerland and the UK both hold a 2.5% share in the Italian market) dropped just 1.6%.



















Lack of lorry drivers in UK leads to empty shelves and uncertain futures

COMMENTS

By **Luke Hanrahan** • Updated: 03/09/2021



Lorries heading to Britain in the first ferry after Brexit, arrive Friday Jan.1, 2021 - Copyright AP

Lorries heading to Britain in the first ferry after Brexit, arrive Friday Jan.1, 2021 - Copyright AP

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TEXT SIZE Aa Aa

"This is COVID. This is Brexit," says David Henig from the European Centre for Political Economy, as supply chains for delivered produce are in danger in the UK.

A lack of lorry drivers in Britain has sparked a new crisis that has left some shelves empty across the country due to delivery problems.

"One of the key issues is the shortage of drivers, plus the bureaucracy of all the paperwork, getting up to speed with what legislation is required," says a grocery store manager Matt Hargreaves.

He adds, "Those two things combined just totally slowed down the supply to us."

A long-running shortage of HGV drivers has been made worse by the post Brexit exodus of European Union workers.



"Modern supply chains are really complex, they rely on a lot of moving parts, a lot of labour supplies, lorry drivers. And if one of those bits doesn't quite work or if several of them don't work, you will get shortages and that is what is happening. And it's quite possible that is going to continue for quite a while to come. This is COVID, this is Brexit."

Gary Knight runs a distribution centre in south-east England, connecting Brits with their goods. But the shortage is

Gary Knight runs a distribution centre in south-east England, connecting Brits with their goods. But the shortage is so severe he's now having to pay extra to persuade drivers to work for him.

"As much as customers don't want to hear that their prices are going up, we've got to do that in order to get stuff from A to B. The wheels stop turning and subsequently the shops have no produce," says Knight.

When Britain finally left the EU, it meant drivers from continental Europe could no longer be employed at short notice.

Some drivers are now earning hundreds of pounds more every day for their shifts. And companies are competing against the giants. Supermarkets simply can't afford the same wages.

The UK Government has encouraged businesses to hire more UK workers saying foreign labour only offered "a short term, temporary solution".



Supply chain crisis

Is Brexit or Covid to blame for Britain's supply chain crisis?

Analysis: Decision to shut out low-skilled workers is exacerbating labour shortages, say industry bosses

10 days to save Christmas: shops warn of disruption due to lack of lorry drivers

Lisa O'Carroll *Brexit correspondent*

@lisaocarroll

Fri 24 Sep 2021 16.15 BST

A recent report by the accountancy firm Grant Thornton concluded there were

almost 1m vacancies in the UK. Half of them were in the food and drink sectors, industries that have for the past 20-30 years relied heavily on an EU workforce.

The chronic labour shortage has led to a crisis in supply chains, affecting a lengthening list of products. So what is the root cause of the problem?

The government argues it is the lingering impact of the pandemic. But industry bosses say it is the cliff-edge cause by Brexit with a lack of British workers filling the gaps left in the haulage industry, warehousing, hospitality and the meat production sectors.

Grant Thornton's research showed that since the start of the pandemic, 1.3 million foreign-born workers had left the UK and were yet to return.

"These shortages are placing huge pressure on the sector and there is a very real chance that they could quickly reach breaking point," Grant Thorton said in its report, Establishing the labour availability issues of the UK food and drink sector.

"They are shortages that cover the full breadth of the supply chain from the initial inputs into farming all the way through to those that serve food and drink 'at the table'."

As the crisis spread to petrol supplies on Friday, the transport secretary, Grant Shapps, dismissed claims that Brexit had caused the problem, insisting that Covid was the "main reason".

The supply of lorry drivers was down to the fact 40,000 tests could not take place during the pandemic, he said.

"The pandemic is the cause, but Brexit is limiting our options for solutions," said Shane Brennan, the chief executive of the Cold Chain Federation, which represents chilled and ambient food warehousing owners.

Or put another way, Priti Patel's decision, supported by many Brexit supporters, to shut the door to low-skilled workers in new immigration laws seems to be exacerbating the problem.

"It is not EU policy that is to blame here. This is a domestic policy by the Home Office about who can and can't come into the country," said a spokesperson for the British Meat Processors Association (BMPA), which commissioned the Grant Thornton report.

The problem is that meat processing plants, retailers, care homes, hospitality and companies such as Amazon are all competing for a limited supply of low-skilled

workers at entry-level salaries. So even if there were enough lorry drivers, the supply chain has come under severe strain from labour shortages.

The Labour party, which has largely avoided commenting on Brexit since January, blames lack of planning in the face of countless warnings over shortages of EU nationals in the workforce.

Anneliese Dodds, the chair of the party and former shadow chancellor, told Sky News on Friday the crisis was a reflection of "big failures in planning for this situation". The Liberal Democrats went further, calling on the government to rethink their immigration policy.

Industry leaders say the pandemic has exposed the weaknesses in the just-in-time supply chain model. Brennan said the food shortage crisis meant that supermarkets, and in turn consumers, may have to permanently reset their expectations as the model perishes.

"It's not that we won't have strawberries all year round, it's that we won't have 12 varieties of strawberries in supermarkets. Retailers are going to have to adjust their supply chain and may end up ordering every two days or once a week," said Brennan.

The government has rejected all calls to solve the problem by issuing short-term visas to truckers and other workers from the EU. It is convinced that Brexit is the solution, as it can prod British employers to wean themselves off a low-wage culture and recruit and train local staff.

But industry bosses say their very survival is at stake. With the pandemic and Brexit already taking its toll, a winter of wage inflation is not the answer.

Topics

Supply chain crisis

Brexit / analysis









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Coronavirus (COVID-19) (/coronavirus)
Guidance and support

1. Home [redacted]
2. Brexit [redacted]
3. Brexit: business guidance [redacted]

Part of
Brexit: business guidance (/guidance/brexit-guidance-for-businesses)

Guidance
UK trade agreements with non-EU countries

Find out about the trade agreements the UK has concluded that are in effect and the progress of our discussions with other countries.

From:
Department for International Trade (/government/organisations/department-for-international-trade)
Published
29 January 2020
Last updated
23 November 2021 —

Contents

- Trade agreements in effect
- Trade agreements still in discussion
- Mutual recognition agreements
- More information

As of 1 January 2021, EU trade agreements no longer apply to the UK.

The UK has sought to reproduce the effects of trading agreements that previously applied to it to ensure continuity for UK business.

Trade agreements in effect

Agreements with the following countries and trading blocs took effect from 1 January 2021. Where the agreement has not yet been ratified, provisional application or bridging mechanisms have been put in place to ensure continuity of trade.

Agreement	Country	Entry into effect mechanism (1)	Total UK trade with countries, 2020 (£ million) (2)
Albania	Albania	Full ratification	80
Andean countries	Colombia	Bridging mechanism	2,043 (total for Andean countries)
Andean countries	Ecuador	Full ratification	2,043 (total for Andean countries)
Andean countries	Peru	Full ratification	2,043 (total for Andean countries)
Canada	Canada	Full ratification	19,061
Cameroon	Cameroon	Full ratification	169
CARIFORUM trade bloc	Antigua and Barbuda	Provisional application	2,713 (total for CARIFORUM trade bloc)
CARIFORUM trade bloc	Bahamas	Provisional application	2,713 (total for CARIFORUM trade bloc)
CARIFORUM trade bloc	Barbados	Provisional application	2,713 (total for CARIFORUM trade bloc)
CARIFORUM trade bloc	Belize	Provisional application	2,713 (total for CARIFORUM trade bloc)

Agreement	Country	Entry into effect mechanism (1)	Total UK trade with countries, 2020 (£ million) (2)
CARIFORUM trade bloc [redacted]	Dominica	Provisional application	2,713 (total for CARIFORUM trade bloc)
CARIFORUM trade bloc [redacted]	Dominican Republic	Provisional application	2,713 (total for CARIFORUM trade bloc)
CARIFORUM trade bloc [redacted]	Grenada	Provisional application	2,713 (total for CARIFORUM trade bloc)
CARIFORUM trade bloc [redacted]	Guyana	Provisional application	2,713 (total for CARIFORUM trade bloc)
CARIFORUM trade bloc [redacted]	Jamaica	Provisional application	2,713 (total for CARIFORUM trade bloc)
CARIFORUM trade bloc [redacted]	St. Kitts and Nevis	Provisional application	2,713 (total for CARIFORUM trade bloc)
CARIFORUM trade bloc [redacted]	Saint Lucia	Provisional application	2,713 (total for CARIFORUM trade bloc)
CARIFORUM trade bloc [redacted]	St. Vincent and the Grenadines	Provisional application	2,713 (total for CARIFORUM trade bloc)
CARIFORUM trade bloc [redacted]	Suriname	Provisional application	2,713 (total for CARIFORUM trade bloc)

Agreement	Country	Entry into effect mechanism (1)	Total UK trade with countries, 2020 (£ million) (2)
CARIFORUM trade bloc [redacted]	Trinidad and Tobago	Provisional application	2,713 (total for CARIFORUM trade bloc)
Central America [redacted]	Costa Rica	Full ratification	1,276 (total for Central America)
Central America [redacted]	El Salvador	Full ratification	1,276 (total for Central America)
Central America [redacted]	Guatemala	Full ratification	1,276 (total for Central America)
Central America [redacted]	Honduras	Full ratification	1,276 (total for Central America)
Central America [redacted]	Nicaragua	Full ratification	1,276 (total for Central America)
Central America [redacted]	Panama	Full ratification	1,276 (total for Central America)
Chile [redacted]	Chile	Full ratification	1,391
Côte d'Ivoire [redacted]	Côte d'Ivoire	Full ratification	511
Eastern and Southern Africa (ESA) trade bloc [redacted]	Mauritius	Full ratification	1,534 (total for Eastern and Southern Africa trade bloc)

[redacted]

Agreement	Country	Entry into effect mechanism (1)	Total UK trade with countries, 2020 (£ million) (2)
Eastern and Southern Africa (ESA) trade bloc [redacted]	Seychelles	Full ratification	1,534 (total for Eastern and Southern Africa trade bloc)
Eastern and Southern Africa (ESA) trade bloc [redacted]	Zimbabwe	Full ratification	1,534 (total for Eastern and Southern Africa trade bloc)
Egypt [redacted]	Egypt	Full ratification	2,739
Faroe Islands [redacted]	Faroe Islands	Full ratification	358
Georgia [redacted]	Georgia	Full ratification	163
Ghana [redacted]	Ghana	Provisional application	905
Iceland and Norway [redacted]	Iceland	Provisional application	21,214 (total for Iceland and Norway)
Iceland and Norway [redacted]	Norway	Provisional application	21,214 (total for Iceland and Norway)
Israel [redacted]	Israel	Full ratification	4,815
Japan [redacted]	Japan	Full ratification	24,230
Jordan [redacted]	Jordan	Full ratification	607

[redacted]

Agreement	Country	Entry into effect mechanism (1)	Total UK trade with countries, 2020 (£ million) (2)
Kenya	Kenya	Bridging mechanism	1,095
Kosovo	Kosovo	Full ratification	14
Lebanon	Lebanon	Full ratification	602
Liechtenstein	Liechtenstein	Full ratification	178
Mexico	Mexico	Full ratification	3,750
Moldova	Moldova	Provisional application	831
Morocco	Morocco	Provisional application	1,513
North Macedonia	North Macedonia	Provisional application	1,488
Pacific states	Fiji	Provisional application	255 (total for Pacific States)
Pacific states	Papua New Guinea	Provisional application	255 (total for Pacific States)
Pacific states	Samoa (4)	Bridging mechanism	255 (total for Pacific States)

Agreement	Country	Entry into effect mechanism (1)	Total UK trade with countries, 2020 (£ million) (2)
Pacific states	Solomon Islands (4)	Bridging mechanism	255 (total for Pacific States)
Palestinian Authority	Palestinian Authority	Full ratification	19
Serbia	Serbia	Provisional application	615
Singapore	Singapore	Full ratification	15,756
South Korea	South Korea	Full ratification	12,468
Southern Africa Customs Union and Mozambique (SACUM) trade bloc	Botswana	Full ratification	9,088 (total for SACUM trade bloc)
Southern Africa Customs Union and Mozambique (SACUM) trade bloc	Eswatini	Full ratification	9,088 (total for SACUM trade bloc)
Southern Africa Customs Union and Mozambique (SACUM) trade bloc	Lesotho	Full ratification	9,088 (total for SACUM trade bloc)
Southern Africa Customs Union and Mozambique (SACUM) trade bloc	Mozambique	Full ratification	9,088 (total for SACUM trade bloc)
Southern Africa Customs Union and Mozambique (SACUM) trade bloc	Namibia	Full ratification	9,088 (total for SACUM trade bloc)

Agreement	Country	Entry into effect mechanism (1)	Total UK trade with countries, 2020 (£ million) (2)
Southern Africa Customs Union and Mozambique (SACUM) trade bloc [redacted]	South Africa	Full ratification	9,088 (total for SACUM trade bloc)
Switzerland [redacted]	Switzerland	Full ratification	33,873
Tunisia [redacted]	Tunisia	Full ratification	430
Turkey [redacted]	Turkey	Provisional application	15,014
Ukraine [redacted]	Ukraine	Full ratification	1,3096
Vietnam [redacted]	Vietnam	Provisional application	4,840

Notes

1) Provisional application is a method well established in international treaty practice to bring agreements into effect ahead of entry into force. Bridging mechanisms are an alternative means to ensure continuity of trade, where the UK or treaty partners are unable to fully ratify or provisionally apply an agreement. These non-binding mechanisms include Memoranda of Understanding or Exchange of Diplomatic Notes and ensure continuity of trade.

2) Source of trade statistics: ONS UK total trade: all countries, non-seasonally adjusted April to June 2021 [redacted]

3) This agreement is open to accession by other members of East African Community.

4) Samoa and the Solomon Islands have not yet acceded to the Pacific States-UK Interim Economic Partnership Agreement (pending a decision on their accession), however preferences under the agreement took effect on 1 January 2021 through a Memorandum of Understanding.

Trade agreements still in discussion

[redacted]

The following agreements are still under discussion with countries where trading agreements were in place before 1 January 2021.

For these countries:

- the government has put in place the UK global tariff
- trade with other WTO members is taking place (https://www.gov.uk/guidance/trading-under-wto-rules)
- trade with eligible developing countries is taking place under the UK's Generalised Scheme of Preferences

Country or bloc	Status of discussions
Algeria (1)	Engagement ongoing, agreement is not yet in place. Trade takes place under the Generalised Scheme of Preferences for imports. UK exports will be subject to partner country national legislation.
Bosnia and Herzegovina (1)	Engagement ongoing, agreement is not yet in place. Trade takes place under WTO terms for imports. UK exports will be subject to partner country national legislation.
Montenegro	Engagement ongoing, agreement is not yet in place. Trade takes place under WTO terms.

Note

(1) Algeria, Bosnia and Herzegovina are not members of the World Trade Organization.

Trading with countries in Customs Unions with the EU

Andorra and San Marino are part of customs unions with the EU. The UK has agreed with the EU that all products originating in San Marino and all non-agricultural products (chapters 25-97) originating in Andorra are to be treated as originating in the EU under the UK-EU Trade and Cooperation Agreement as long as Andorra and San Marino apply to UK products the same preferences that the EU applies to them. These products benefit from zero tariffs, where they meet the relevant rules of origin. Trade with Andorra of agricultural products (chapters 01-24) is not in scope of the UK-EU Trade and Cooperation Agreement and takes place under WTO terms.

Mutual recognition agreements

A mutual recognition agreement (MRA) is one in which countries recognise the results of one another's conformity assessments.

A conformity assessment is a set of processes that confirm whether a product meets the specified legal requirements. This can include testing, inspection, and certification.

The UK has signed MRAs with:

- Australia

- New Zealand
- United States of America

MRA coverage in trade agreements

The UK's trade agreement with Switzerland incorporates elements of the EU-Switzerland MRA.

The UK's trade agreement with Israel covers conformity assessment of industrial products. This means that existing arrangements with Israel remain in place.

The UK-Japan CEPA replicates the effects of the existing EU-Japan MRA.

More information

Check:

- duties and customs procedures for exporting goods
- tariffs, taxes and rules to trade with the UK
- get proof of origin for your goods

Find out:

- how you trade with a country if there is no trade agreement in place
- about bridging mechanisms and provisional applications
- about the notice of fulfilment from the United Kingdom on cumulation with trading partners: December 2020
- about EU free trade agreements
- about EU mutual recognition agreements

Published 29 January 2020
Last updated 23 November 2021

1. 23 November 2021
   Total trade value for each country or trading bloc updated to 2020 statistics.
2. 19 July 2021
   Cameroon changed to full ratification.
3. 1 June 2021
   Mexico moved into 'Trade agreements in effect' section following full ratification of agreement.
4. 14 May 2021

Changed status of Albania, Canada and Jordan to full ratification and moved to 'Trade agreements in effect' section. Serbia added as provisional application agreement. Trade statistics for all countries updated.

5. 1 May 2021
   Cameroon 'entry into effect mechanism' changed from bridging mechanism to provisional application.
6. 22 April 2021
   Updated because Suriname is now covered by the CARIFORUM States economic partnership agreement.
7. 22 April 2021
   Links updated to reflect the interim trade partnership agreement with Ghana and interim economic partnership agreement with Cameroon.
8. 9 March 2021
   Removed the agreement in principle for Cameroon because the agreement is now signed.
9. 5 March 2021
   Updated to reflect the entry into effect of the Ghana-UK EPA.
10. 2 March 2021
    Updated to reflect the signing of the Ghana-UK EPA.
11. 12 February 2021
    Update to reflect the full ratification of the UK-Egypt and UK-Singapore agreements.
12. 8 February 2021
    Trade agreements that took effect from 1 January 2021’ table updated with the most recent statistics from the Office for National Statistics.
13. 5 February 2021
    Moved Albania from 'under discussion' to 'signed but not in effect' table. Also updated the St. Kitts and Nevis entry as they have now ratified the CARIFORUM agreement.
14. 14 January 2021
    Updated to reflect the full ratification of the UK-Andean agreement with Peru.
15. 31 December 2020
    Updated to add links to the agreement documents for Mexico, Moldova, Vietnam and Turkey. Added a link to the summary of the Cameroon trade agreement.
16. 30 December 2020
    Updated to reflect the agreement in principle of the UK-Cameroon Agreement.
17. 29 December 2020
    Updated the table for Signed trade agreements, expected to be in effect from 1 January 2021 to include Turkey, Vietnam, Solomon Islands, Samoa and Republic of Guyana.
18. 24 December 2020
    Updated to reflect the signing of the UK-Moldova Agreement.
19. 23 December 2020
    Updated to make it clear how agreements will come into force on 1 January 2021.
20. 18 December 2020
    Added links to the trade agreement documents for Kenya.
21. 16 December 2020
    Added links to the trade agreement documents for Singapore, Norway and Iceland.
22. 15 December 2020
    Updated to reflect the signing of the UK-Mexico Agreement.
23. 14 December 2020
    Added links to the Egypt trade agreement documents.
24. 11 December 2020

Updated to reflect the agreement in principle of the UK-Vietnam Agreement.

25. 11 December 2020
    Amended the progress on the agreement with Montenegro.
26. 10 December 2020
    Added links to the Canada and North Macedonia trade agreement documents.
27. 10 December 2020
    Updated to reflect the signing of the UK-Singapore Agreement.
28. 9 December 2020
    Updated to reflect the signing of the UK-Canada Trade Continuity Agreement.
29. 8 December 2020
    Updated to reflect the signing of the UK-Kenya EPA and Iceland-Norway-UK goods only agreement.
30. 7 December 2020
    Updated to reflect the signing of the UK-Egypt Association Agreement.
31. 3 December 2020
    Updated to reflect the signing of the UK-North Macedonia agreement.
32. 25 November 2020
    Amended the progress on agreements with Algeria, Bosnia and Herzegovina and Serbia. Updated the statistics for total UK trade with countries we have signed an agreement with using latest statistics.
33. 23 November 2020
    Updated to reflect the agreement in principle of the UK-Canada Trade Continuity Agreement.
34. 11 November 2020
    Added links to the agreement documents for Côte d’Ivoire and Ukraine.
35. 3 November 2020
    Kenya added to the list of countries where trade agreements have been signed and East African Community (EAC) removed from the list of countries where trade agreements are still in discussion.
36. 28 October 2020
    Updated to reflect the signing of the UK-Japan Comprehensive Economic Partnership Agreement (CEPA).
37. 15 October 2020
    Updated to reflect the signing of the UK-Côte d’Ivoire Economic Partnership Agreement (EPA).
38. 8 October 2020
    Updated to reflect the signing of the UK-Ukraine agreement.
39. 6 August 2020
    'Trade agreements that have been signed' table updated with the most recent statistics from the Office for National Statistics
40. 29 June 2020
    Updated to reflect ongoing trade discussions with Turkey and Vietnam
41. 15 May 2020
    Updated the total UK trade statistics to correct an error.
42. 4 May 2020
    Updated 'Trade agreements that have been signed’ table after publication of the Office for National Statistics' UK trade statistics.
43. 4 February 2020
    Updated as the EU has notified those countries with which it has trade agreements that EU trade agreements can continue to apply to the UK during the transition period.

44. 29 January 2020
    First published.

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747-400

Airplane Characteristics for

Airport Planning

BOEING®

Boeing Commercial Airplanes

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REV B 1 to 156	March 1990
REV C 1 to 164	October 1994
REV D 1 to 218	December 2002

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1.0 SCOPE AND INTRODUCTION

1.1 Scope

1.2 Introduction

1.3 A Brief Description of the 747-400

1.0 SCOPE AND INTRODUCTION

1.1 Scope

This document provides, in a standardized format, airplane characteristics data for general airport planning. Since operational practices vary among airlines, specific data should be coordinated with the using airlines prior to facility design. Boeing Commercial Airplanes should be contacted for any additional information required.

Content of the document reflects the results of a coordinated effort by representatives from the following organizations:

- Aerospace Industries Association
- Airport Operators Council International
- Air Transport Association of America
- International Air Transport Association

The airport planner may also want to consider the information presented in the "CTOL Transport Aircraft, Characteristics, Trends, and Growth Projections," available from the US AIA, 1250 Eye St., Washington DC 20005, for long-range planning needs. This document is updated periodically and represents the coordinated efforts of the following organizations regarding future aircraft growth trends:

- International Coordinating Council of Aerospace Industries Associations
- Airports Council International
- Air Transport Association of America
- International Air Transport Association

1.2 Introduction

This document conforms to NAS 3601. It provides characteristics of the Boeing Model 747-400 airplane for airport planners and operators, airlines, architectural and engineering consultant organizations, and other interested industry agencies. Airplane changes and available options may alter model characteristics. The data presented herein reflect typical airplanes in each model category.

For additional information contact:

Boeing Commercial Airplanes
P.O. Box 3707
Seattle, Washington 98124-2207
U.S.A.

Attention: Manager, Airport Technology
Mail Code: 20-93

1.3 A Brief Description of the 747-400

The 747-400 is the latest derivative of the 747 family of airplanes. The -400 is externally similar to the 747-300, with the additional wingtip extension with winglets and advanced high bypass ratio engines. Other characteristics unique to the 747-400 include:

- Two-crew cockpit with digital avionics
- Lightweight aluminum alloys
- Structural carbon brakes
- Optional 910,000-pound maximum takeoff weight
- Optional 3,300-gallon fuel tank in horizontal stabilizer
- Optional fuel tanks in forward cargo compartment
- Vacuum lavatories with single-point servicing
- Enhanced passenger appeal in cabin interior
- Optional crew rest compartment in aft cabin
- Fly-by-wire system

747-400

The basic 747-400 has a tri-class passenger interior arrangement. Optional arrangements include a two-class or a one-class configuration to suit traffic demands.

747-400 Domestic

The 747-400 Domestic is a high-capacity airplane designed for domestic short routes. It has a lighter maximum takeoff weight. The -400D airplane has the same wingspan planform as the -300 and has no winglets.

747-400 Combi

The 747-400 Combi airplane has a main deck cargo door installed on the left side aft of the wing. This door is used for loading pallets or containerized cargo up to 20 feet long. The main deck of the Combi airplane can be converted to either an all-passenger or a passenger/cargo configuration. In the latter configuration, cargo is in the aft fuselage. Several cargo configurations can be loaded compatible with size limits and operational procedures. The Combi can accommodate up to seven 10-foot pallets or containers.

747-400 Freighter

The 747-400 Freighter has a main deck nose door and a mechanized cargo handling system. The nose door swings up so that pallets or containers up to 40 ft (12 m) can be loaded straight in on motor-driven rollers. An optional main deck side cargo door (like the 747-400 Combi) allows loading of dimensionally taller cargo modules.

747-400ER

The 747-400ER is an increased gross weight derivative of the 747-400. The increased weight allows it carry additional fuel in order to fly over longer ranges. The 747-400ER can be equipped with up to two 3,060-gallon fuel tanks in the forward lower cargo compartment.

747-400ER Freighter

The 747-400ER Freighter is similar to the 747-400 Freighter, except for the increased gross weight capability which allows it to carry more cargo weight. This airplane is not fitted with the cargo compartment fuel tanks.

Engines

The 747-400 is equipped with four advanced high bypass ratio engines. The following table shows the available engines:

MANUFACTURER	MODEL NUMBER	RATED TAKEOFF THRUST (LB)
GENERAL ELECTRIC	CF6-80C2B1F	57,900
PRATT & WHITNEY	PW4056	56,750
ROLLS-ROYCE	RB211-524G2	58,000

The 747-400ER is equipped with four advanced high bypass ratio engines. The following table shows the available engines:

MANUFACTURER	MODEL NUMBER	RATED TAKEOFF THRUST (LB)
GENERAL ELECTRIC	CF6-80C2B5F	62,100
PRATT & WHITNEY	PW4062	63,300
ROLLS-ROYCE	RB211-524H8-T	59,500

Additional models of the above engines may be available through customer options.

Crew Rest Compartment

The 747-400 can be equipped with a cabin crew rest compartment. This is located in the aft cabin above the ceiling at Door No. 5. The compartment can be configured to a combination of bunks and seats for up to 10 crew members. Access to the compartment is through a ladder near Right Door No. 5. This is standard on the 747-400ER.

Another compartment is located in the upper deck, outside of the cockpit.

Document Applicability

This document (D6-58326-1) contains airplane characteristics data for the 747-400 and 747-400ER airplanes.

Document D6-58326-2, which contained preliminary airplane characteristics information for the 747-400ER airplanes is now cancelled and will not be revised and should be discarded.

The earlier airplane models (747-100, -200, -300, SP) are described in Document D6-58326, 747 Airplane Characteristics for Airport Planning.

2.0 AIRPLANE DESCRIPTION

2.1 General Characteristics

2.2 General Dimensions

2.3 Ground Clearances

2.4 Interior Arrangements

2.5 Cabin Cross Sections

2.6 Lower Cargo Compartments

2.7 Door Clearances

2.0 AIRPLANE DESCRIPTION

2.1 General Characteristics

Maximum Design Taxi Weight (MTW). Maximum weight for ground maneuver as limited by aircraft strength and airworthiness requirements. (It includes weight of taxi and run-up fuel.)

Maximum Design Landing Weight (MLW). Maximum weight for landing as limited by aircraft strength and airworthiness requirements.

Maximum Design Takeoff Weight (MTOW). Maximum weight for takeoff as limited by aircraft strength and airworthiness requirements. (This is the maximum weight at start of the takeoff run.)

Operating Empty Weight (OEW). Weight of structure, powerplant, furnishing systems, unusable fuel and other unusable propulsion agents, and other items of equipment that are considered an integral part of a particular airplane configuration. Also included are certain standard items, personnel, equipment, and supplies necessary for full operations, excluding usable fuel and payload.

Maximum Design Zero Fuel Weight (MZFW). Maximum weight allowed before usable fuel and other specified usable agents must be loaded in defined sections of the aircraft as limited by strength and airworthiness requirements.

Maximum Payload. Maximum design zero fuel weight minus operational empty weight.

Maximum Seating Capacity. The maximum number of passengers specifically certificated or anticipated for certification.

Maximum Cargo Volume. The maximum space available for cargo.

Usable Fuel. Fuel available for aircraft propulsion.

CHARACTERISTICS	UNITS	CF6-80C2B1 ENGINES				
MAX DESIGN	POUNDS	803,000	836,000	853,000	873,000	877,000
TAXI WEIGHT	KILOGRAMS	364,235	379,204	386,915	395,987	397,801
MAX DESIGN	POUNDS	800,000	833,000	850,000	870,000	875,000
TAKEOFF WEIGHT	KILOGRAMS	362,874	377,843	385,554	394,626	396,894
MAX DESIGN	POUNDS	574,000	574,000	630,000	630,000	630,000
LANDING WEIGHT (1)	KILOGRAMS	260,362	260,362	285,764	285,764	285,764
MAX DESIGN	POUNDS	535,000	535,000	535,000	542,500	542,500
ZERO FUEL WEIGHT (2)	KILOGRAMS	242,672	242,672	242,672	246,074	246,074
SPEC OPERATING	POUNDS	394,088	394,088	394,088	394,088	394,088
EMPTY WEIGHT (3)	KILOGRAMS	178,756	178,756	178,756	178,756	178,756
MAX STRUCTURAL	POUNDS	140,912	140,912	140,912	148,412	148,412
PAYLOAD	KILOGRAMS	63,917	63,917	63,917	67,319	67,319
TYPICAL SEATING CAPACITY	UPPER DECK	42 BUSINESS CLASS				
(INCLUDES UPPER DECK)	MAIN DECK	24 FIRST, 32 BUSINESS, 302 ECONOMY				
MAX CARGO - LOWER DECK	CUBIC FEET	5,536	5,536	5,536	5,536	5,536
CONTAINERS (LD-1)	CUBIC METERS	157	157	157	157	157
MAX CARGO - LOWER DECK	CUBIC FEET	835	835	835	835	835
BULK CARGO	CUBIC METERS	24	24	24	24	24
USABLE FUEL CAPACITY (4)	U.S. GALLONS	53,765	53,763	53,765	57,065	57,065
	LITERS	203,501	203,493	203,501	215,991	215,991
	POUNDS	360,226	360,226	360,226	382,336	382,336
	KILOGRAMS	163,396	163,396	163,396	173,425	173,425

NOTES:

1. 630,000 LB LANDING WEIGHT IS OPTIONAL
2. 542,500 LB ZERO FUEL WEIGHT IS OPTIONAL
3. SPEC OPERATING EMPTY WEIGHT REFLECTS THREE-CLASS 400-PASSENGER ARRANGEMENT AND STANDARD ITEM ALLOWANCES. ACTUAL OEW WILL VARY WITH AIRPLANE CONFIGURATION. CONSULT USING AIRLINE FOR ACTUAL OEW.
4. OPTIONAL TAIL FUEL OF 3,300 US GAL IS REFLECTED IN THE HIGHER FUEL CAPACITY.

2.1.1 GENERAL CHARACTERISTICS

MODEL 747-400 (GENERAL ELECTRIC ENGINES)

CHARACTERISTICS	UNITS	PW 4056 ENGINES				
MAX DESIGN	POUNDS	803,000	836,000	853,000	873,000	877,000
TAXI WEIGHT	KILOGRAMS	364,235	379,204	386,915	395,987	397,801
MAX DESIGN	POUNDS	800,000	833,000	850,000	870,000	875,000
TAKEOFF WEIGHT	KILOGRAMS	362,874	377,843	385,554	394,626	396,894
MAX DESIGN	POUNDS	574,000	574,000	630,000	630,000	630,000
LANDING WEIGHT (1)	KILOGRAMS	260,362	260,362	285,764	285,764	285,764
MAX DESIGN	POUNDS	535,000	535,000	535,000	542,500	542,500
ZERO FUEL WEIGHT (2)	KILOGRAMS	242,672	242,672	242,672	246,074	246,074
SPEC OPERATING	POUNDS	394,660	394,660	394,660	394,660	394,660
EMPTY WEIGHT (3)	KILOGRAMS	179,015	179,015	179,015	179,015	179,015
MAX STRUCTURAL	POUNDS	140,340	140,340	140,340	147,840	147,840
PAYLOAD	KILOGRAMS	63,657	63,657	63,657	67,059	67,059
TYPICAL SEATING CAPACITY	UPPER DECK	42 BUSINESS CLASS				
(INCLUDES UPPER DECK)	MAIN DECK	24 FIRST, 32 BUSINESS, 302 ECONOMY				
MAX CARGO - LOWER DECK	CUBIC FEET	5,536	5,536	5,536	5,536	5,536
CONTAINERS (LD-1)	CUBIC METERS	157	157	157	157	157
MAX CARGO - LOWER DECK	CUBIC FEET	835	835	835	835	835
BULK CARGO	CUBIC METERS	24	24	24	24	24
USABLE FUEL CAPACITY (4)	U.S. GALLONS	53,985	53,985	53,985	57,285	57,285
	LITERS	204,333	204,333	204,333	216,824	216,824
	POUNDS	361,700	361,700	361,700	383,810	383,810
	KILOGRAMS	164,064	164,064	164,064	174,093	174,093

NOTES

1. 630,000 LB LANDING WEIGHT IS OPTIONAL
2. 542,500 LB ZERO FUEL WEIGHT IS OPTIONAL
3. SPEC OPERATING EMPTY WEIGHT REFLECTS THREE-CLASS 400-PASSENGER ARRANGEMENT AND STANDARD ITEM ALLOWANCES. ACTUAL OEW WILL VARY WITH AIRLINE CONFIGURATION AND OPTIONAL EQUIPMENT. CONSULT USING AIRLINE FOR ACTUAL OEW
4. OPTIONAL TAIL FUEL OF 3,300 US GAL IS REFLECTED IN THE HIGHER FUEL CAPACITY

2.1.2 GENERAL CHARACTERISTICS

MODEL 747-400 (PRATT & WHITNEY ENGINES)

CHARACTERISTICS	UNITS	RB211-524G2 ENGINES				
MAX DESIGN	POUNDS	803,000	836,000	853,000	873,000	877,000
TAXI WEIGHT	KILOGRAMS	364,235	379,204	386,915	395,987	397,801
MAX DESIGN	POUNDS	800,000	833,000	850,000	870,000	875,000
TAKEOFF WEIGHT	KILOGRAMS	362,874	377,843	385,554	394,626	396,894
MAX DESIGN	POUNDS	574,000	574,000	630,000	630,000	630,000
LANDING WEIGHT (1)	KILOGRAMS	260,362	260,362	285,764	285,764	285,764
MAX DESIGN	POUNDS	535,000	535,000	535,000	545,000	545,000
ZERO FUEL WEIGHT (2)	KILOGRAMS	242,672	242,672	242,672	247,208	247,208
SPEC OPERATING	POUNDS	396,284	396,284	396,284	396,284	396,284
EMPTY WEIGHT (3)	KILOGRAMS	179,752	179,752	179,752	179,752	179,752
MAX STRUCTURAL	POUNDS	138,716	138,716	138,716	148,716	148,716
PAYLOAD	KILOGRAMS	62,921	62,921	62,921	67,457	67,457
TYPICAL SEATING CAPACITY	UPPER DECK	42 BUSINESS CLASS				
(INCLUDES UPPER DECK)	MAIN DECK	24 FIRST, 32 BUSINESS, 302 ECONOMY				
MAX CARGO - LOWER DECK	CUBIC FEET	5,536	5,536	5,536	5,536	5,536
CONTAINERS (LD-1)	CUBIC METERS	157	157	157	157	157
MAX CARGO - LOWER DECK	CUBIC FEET	835	835	835	835	835
BULK CARGO	CUBIC METERS	24	24	24	24	24
USABLE FUEL CAPACITY (4)	U.S. GALLONS	53,985	53,985	53,985	57,285	57,285
	LITERS	204,333	204,333	204,333	216,824	216,824
	POUNDS	361,700	361,700	361,700	383,810	383,810
	KILOGRAMS	164,064	164,064	164,064	174,093	174,093

NOTES:

1. 630,000 LB LANDING WEIGHT IS OPTIONAL
2. 545,000 LB ZERO FUEL WEIGHT IS OPTIONAL
3. SPEC OPERATING EMPTY WEIGHT REFLECTS THREE-CLASS 400-PASSENGER ARRANGEMENT AND STANDARD ITEM ALLOWANCES. ACTUAL OEW WILL VARY WITH AIRLINE CONFIGURATION AND OPTIONAL EQUIPMENT. CONSULT USING AIRLINE FOR ACTUAL OEW.
4. OPTIONAL TAIL FUEL OF 3,300 US GAL IS REFLECTED IN THE HIGHER FUEL CAPACITY.

2.1.3 GENERAL CHARACTERISTICS

MODEL 747-400 (ROLLS-ROYCE ENGINES)

CHARACTERISTICS	UNITS	CF6-80C2B1 ENGINES				
MAX DESIGN	POUNDS	803,000	836,000	853,000	873,000	877,000
TAXI WEIGHT	KILOGRAMS	364,235	379,204	386,915	395,987	397,801
MAX DESIGN	POUNDS	800,000	833,000	850,000	870,000	875,000
TAKEOFF WEIGHT	KILOGRAMS	362,874	377,843	385,554	394,626	396,894
MAX DESIGN	POUNDS	574,000	574,000	630,000	630,000	630,000
LANDING WEIGHT (1)	KILOGRAMS	260,362	260,362	285,764	285,764	285,764
MAX DESIGN	POUNDS	545,000	545,000	545,000	565,000	565,000
ZERO FUEL WEIGHT (2)	KILOGRAMS	247,208	247,208	247,208	256,280	256,280
SPEC OPERATING	POUNDS	407,107	407,107	407,107	402,900	402,900
EMPTY WEIGHT (3)	KILOGRAMS	184,661	184,661	184,661	182,753	182,753
MAX STRUCTURAL	POUNDS	137,893	137,893	137,893	162,100	162,100
PAYLOAD	KILOGRAMS	62,547	62,547	62,547	73,527	73,527
TYPICAL SEATING CAPACITY	PASSENGER	400: 24 FIRST, 74 BUSINESS, 302 ECONOMY				
(INCLUDES UPPER DECK)	COMBI	345: 28 FIRST, 110 BUSINESS, 207 ECONOMY, 7 PALLETS				
MAX CARGO - MAIN DECK	CUBIC FEET	4,290	4,290	4,290	4,290	4,290
PALLETS (4)	CUBIC METERS	122	122	122	122	122
MAX CARGO - LOWER DECK	CUBIC FEET	5,536	5,536	5,536	5,536	5,536
CONTAINERS (LD-1)	CUBIC METERS	157	157	157	157	157
MAX CARGO - LOWER DECK	CUBIC FEET	710	710	710	710	710
BULK CARGO	CUBIC METERS	20	20	20	20	20
USABLE FUEL CAPACITY (5)	U.S. GALLONS	53,765	53,763	53,765	57,065	57,065
	LITERS	203,501	203,493	203,501	215,991	215,991
	POUNDS	360,226	360,226	360,226	382,336	382,336
	KILOGRAMS	163,396	163,396	163,396	173,425	173,425

NOTES:

1. 630,000 LB LANDING WEIGHT IS OPTIONAL
2. 565,000 LB ZERO FUEL WEIGHT IS OPTIONAL
3. SPEC OPERATING EMPTY WEIGHT REFLECTS THREE-CLASS 400-PASSENGER ARRANGEMENT AND STANDARD ITEM ALLOWANCES. ACTUAL OEW WILL VARY WITH AIRLINE CONFIGURATION AND OPTIONAL EQUIPMENT. CONSULT USING AIRLINE FOR ACTUAL OEW. THE LOWER OEW VALUE REFLECTS PASSENGER/CARGO CONFIGURATION.
4. SEVEN PALLETS AT 613 CUBIC FEET EACH
5. OPTIONAL TAIL FUEL OF 3,300 US GAL IS REFLECTED IN THE HIGHER FUEL CAPACITY

2.1.4 GENERAL CHARACTERISTICS

MODEL 747-400 COMBI (GENERAL ELECTRIC ENGINES)

CHARACTERISTICS	UNITS	PW 4056 ENGINES				
MAX DESIGN	POUNDS	803,000	836,000	853,000	873,000	877,000
TAXI WEIGHT	KILOGRAMS	364,235	379,204	386,915	395,987	397,801
MAX DESIGN	POUNDS	800,000	833,000	850,000	870,000	875,000
TAKEOFF WEIGHT	KILOGRAMS	362,874	377,843	385,554	394,626	396,894
MAX DESIGN	POUNDS	574,000	574,000	630,000	630,000	630,000
LANDING WEIGHT (1)	KILOGRAMS	260,362	260,362	285,764	285,764	285,764
MAX DESIGN	POUNDS	545,000	545,000	545,000	565,000	565,000
ZERO FUEL WEIGHT (2)	KILOGRAMS	247,208	247,208	247,208	256,280	256,280
SPEC OPERATING	POUNDS	407,479	407,479	407,479	403,400	403,400
EMPTY WEIGHT (3)	KILOGRAMS	184,830	184,830	184,830	182,979	182,979
MAX STRUCTURAL	POUNDS	137,521	137,521	137,521	161,600	161,600
PAYLOAD	KILOGRAMS	62,379	62,379	62,379	73,301	73,301
TYPICAL SEATING CAPACITY	PASSENGER	400: 24 FIRST, 74 BUSINESS, 302 ECONOMY				
(INCLUDES UPPER DECK)	COMBI	345: 28 FIRST, 110 BUSINESS, 207 ECONOMY, 7 PALLETS				
MAX CARGO - MAIN DECK	CUBIC FEET	4,290	4,290	4,290	4,290	4,290
PALLETS (4)	CUBIC METERS	122	122	122	122	122
MAX CARGO - LOWER DECK	CUBIC FEET	5,536	5,536	5,536	5,536	5,536
CONTAINERS (LD-1)	CUBIC METERS	157	157	157	157	157
MAX CARGO - LOWER DECK	CUBIC FEET	710	710	710	710	710
BULK CARGO	CUBIC METERS	20	20	20	20	20
USABLE FUEL CAPACITY (5)	U.S. GALLONS	53,985	53,985	53,985	57,285	57,285
	LITERS	204,333	204,333	204,333	216,824	216,824
	POUNDS	361,700	361,700	361,700	383,810	383,810
	KILOGRAMS	164,064	164,064	164,064	174,093	174,093

NOTES:

1. 630,000 LB LANDING WEIGHT IS OPTIONAL
2. 565,000 LB ZERO FUEL WEIGHT IS OPTIONAL
3. SPEC OPERATING EMPTY WEIGHT REFLECTS THREE-CLASS 400-PASSENGER ARRANGEMENT AND STANDARD ITEM ALLOWANCES. ACTUAL OEW WILL VARY WITH AIRLINE CONFIGURATION AND OPTIONAL EQUIPMENT. CONSULT USING AIRLINE FOR ACTUAL OEW. THE LOWER OEW VALUE REFLECTS PASSENGER/CARGO CONFIGURATION.
4. SEVEN PALLETS AT 613 CUBIC FEET EACH
5. OPTIONAL TAIL FUEL OF 3,300 US GAL IS REFLECTED IN THE HIGHER FUEL CAPACITY.

2.1.5 GENERAL CHARACTERISTICS

MODEL 747-400 COMBI (PRATT & WHITNEY ENGINES)

CHARACTERISTICS	UNITS	RB211-534G2 ENGINES				
MAX DESIGN	POUNDS	803,000	836,000	853,000	873,000	877,000
TAXI WEIGHT	KILOGRAMS	364,235	379,204	386,915	395,987	397,801
MAX DESIGN	POUNDS	800,000	833,000	850,000	870,000	875,000
TAKEOFF WEIGHT	KILOGRAMS	362,874	377,843	385,554	394,626	396,894
MAX DESIGN	POUNDS	574,000	574,000	630,000	630,000	630,000
LANDING WEIGHT (1)	KILOGRAMS	260,362	260,362	285,764	285,764	285,764
MAX DESIGN	POUNDS	545,000	545,000	545,000	565,000	565,000
ZERO FUEL WEIGHT (2)	KILOGRAMS	247,208	247,208	247,208	256,280	256,280
SPEC OPERATING	POUNDS	410,103	410,103	410,103	405,900	405,900
EMPTY WEIGHT (3)	KILOGRAMS	186,020	186,020	186,020	184,113	184,113
MAX STRUCTURAL	POUNDS	134,897	134,897	134,897	159,100	159,100
PAYLOAD	KILOGRAMS	61,188	61,188	61,188	72,167	72,167
TYPICAL SEATING CAPACITY	PASSENGER	400: 24 FIRST, 74 BUSINESS, 302 ECONOMY				
(INCLUDES UPPER DECK)	COMBI	345: 28 FIRST, 110 BUSINESS, 207 ECONOMY, 7 PALLETS				
MAX CARGO - MAIN DECK	CUBIC FEET	4,290	4,290	4,290	4,290	4,290
PALLETS (4)	CUBIC METERS	122	122	122	122	122
MAX CARGO - LOWER DECK	CUBIC FEET	5,536	5,536	5,536	5,536	5,536
CONTAINERS (LD-1)	CUBIC METERS	157	157	157	157	157
MAX CARGO - LOWER DECK	CUBIC FEET	710	710	710	710	710
BULK CARGO	CUBIC METERS	20	20	20	20	20
USABLE FUEL CAPACITY (5)	U.S. GALLONS	53,985	53,985	53,985	57,285	57,285
	LITERS	204,333	204,333	204,333	216,824	216,824
	POUNDS	361,700	361,700	361,700	383,810	383,810
	KILOGRAMS	164,064	164,064	164,064	174,093	174,093

NOTES:

1. 630,000 LB LANDING WEIGHT IS OPTIONAL
2. 565,000 LB ZERO FUEL WEIGHT IS OPTIONAL
3. SPEC OPERATING EMPTY WEIGHT REFLECTS THREE-CLASS 400-PASSENGER ARRANGEMENT AND STANDARD ITEM ALLOWANCES. ACTUAL OEW WILL VARY WITH AIRLINE CONFIGURATION AND OPTIONAL EQUIPMENT. CONSULT USING AIRLINE FOR ACTUAL OEW THE LOWER OEW VALUE REFLECTS PASSENGER/CARGO CONFIGURATION
4. SEVEN PALLETS AT 613 CUBIC FEET EACH
5. OPTIONAL TAIL FUEL OF 3,300 US GAL IS REFLECTED IN THE HIGHER FUEL CAPACITY

2.1.6 GENERAL CHARACTERISTICS

MODEL 747-400 COMBI (ROLLS-ROYCE ENGINES)

CHARACTERISTICS	UNITS	CF6-80C2B1 ENGINES				
MAX DESIGN	POUNDS	803,000	836,000	853,000	873,000	877,000
TAXI WEIGHT	KILOGRAMS	364,235	379,204	386,915	395,987	397,801
MAX DESIGN	POUNDS	800,000	833,000	850,000	870,000	875,000
TAKEOFF WEIGHT	KILOGRAMS	362,874	377,843	385,554	394,626	396,894
MAX DESIGN	POUNDS	652,000	652,000	652,000	666,000	666,000
LANDING WEIGHT (1)	KILOGRAMS	295,743	295,743	295,743	302,093	302,093
MAX DESIGN	POUNDS	610,000	610,000	610,000	635,000	635,000
ZERO FUEL WEIGHT (2)	KILOGRAMS	276,692	276,692	276,692	288,031	288,031
SPEC OPERATING	POUNDS	363,954	363,954	363,954	363,954	363,954
EMPTY WEIGHT (3)	KILOGRAMS	165,087	165,087	165,087	165,087	165,087
MAX STRUCTURAL	POUNDS	246,046	246,046	246,046	271,046	271,046
PAYLOAD	KILOGRAMS	111,605	111,605	111,605	122,945	122,945
TYPICAL CARGO - MAIN DECK	CUBIC FEET	18,720	18,720	18,720	18,720	18,720
CONTAINERS (4)	CUBIC METERS	530	530	530	530	530
MAX CARGO - LOWER DECK	CUBIC FEET	5,536	5,536	5,536	5,536	5,536
CONTAINERS (LD-1)	CUBIC METERS	157	157	157	157	157
MAX CARGO - LOWER DECK	CUBIC FEET	520	520	520	520	520
BULK CARGO	CUBIC METERS	15	15	15	15	15
USABLE FUEL CAPACITY (5)	U.S. GALLONS	53,765	53,763	53,765	57,065	57,065
	LITERS	203,501	203,493	203,501	215,991	215,991
	POUNDS	360,226	360,226	360,226	382,336	382,336
	KILOGRAMS	163,396	163,396	163,396	173,425	173,425

NOTES:

1. 666,000 LB LANDING WEIGHT IS OPTIONAL
2. 635,000 LB ZERO FUEL WEIGHT IS OPTIONAL
3. SPEC OPERATING EMPTY WEIGHT REFLECTS STANDARD ITEM ALLOWANCES. ACTUAL OEW WILL VARY WITH AIRPLANE CONFIGURATION. CONSULT WITH USING AIRLINE FOR ACTUAL OEW
4. TWENTY-NINE 10-FT CONTAINERS. ACTUAL VOLUME WILL DEPEND ON AIRPLANE CONFIGURATION
5. OPTIONAL TAIL FUEL OF 3,300 US GAL IS REFLECTED IN THE HIGHER FUEL CAPACITY.

2.1.7 GENERAL CHARACTERISTICS

MODEL 747-400 FREIGHTER (GENERAL ELECTRIC ENGINES)

CHARACTERISTICS	UNITS	PW 4056 ENGINES				
MAX DESIGN	POUNDS	803,000	836,000	853,000	873,000	877,000
TAXI WEIGHT	KILOGRAMS	364,235	379,204	386,915	395,987	397,801
MAX DESIGN	POUNDS	800,000	833,000	850,000	870,000	875,000
TAKEOFF WEIGHT	KILOGRAMS	362,874	377,843	385,554	394,626	396,894
MAX DESIGN	POUNDS	652,000	652,000	652,000	666,000	666,000
LANDING WEIGHT (1)	KILOGRAMS	295,743	295,743	295,743	302,093	302,093
MAX DESIGN	POUNDS	610,000	610,000	610,000	635,000	635,000
ZERO FUEL WEIGHT (2)	KILOGRAMS	276,692	276,692	276,692	288,031	288,031
SPEC OPERATING	POUNDS	364,526	364,526	364,526	364,526	364,526
EMPTY WEIGHT (3)	KILOGRAMS	165,346	165,346	165,346	165,346	165,346
MAX STRUCTURAL	POUNDS	245,474	245,474	245,474	270,474	270,474
PAYLOAD	KILOGRAMS	111,345	111,345	111,345	122,685	122,685
TYPICAL CARGO - MAIN DECK	CUBIC FEET	18,720	18,720	18,720	18,720	18,720
CONTAINERS (4)	CUBIC METERS	530	530	530	530	530
MAX CARGO - LOWER DECK	CUBIC FEET	5,536	5,536	5,536	5,536	5,536
CONTAINERS (LD-1)	CUBIC METERS	157	157	157	157	157
MAX CARGO - LOWER DECK	CUBIC FEET	520	520	520	520	520
BULK CARGO	CUBIC METERS	15	15	15	15	15
USABLE FUEL CAPACITY (5)	U.S. GALLONS	53,985	53,985	53,985	57,285	57,285
	LITERS	204,333	204,333	204,333	216,824	216,824
	POUNDS	361,700	361,700	361,700	383,810	383,810
	KILOGRAMS	164,064	164,064	164,064	174,093	174,093

NOTES:

1. 666,000 LB LANDING WEIGHT IS OPTIONAL
2. 635,000 LB ZERO FUEL WEIGHT IS OPTIONAL
3. SPEC OPERATING EMPTY WEIGHT REFLECTS STANDARD ITEM ALLOWANCES.
   ACTUAL OEW WILL VARY WITH AIRPLANE CONFIGURATION. CONSULT WITH USING AIRLINE FOR ACTUAL OEW.
4. TWENTY-NINE 10-FT CONTAINERS. ACTUAL VOLUME WILL DEPEND ON AIRPLANE CONFIGURATION.
5. OPTIONAL TAIL FUEL OF 3,300 US GAL IS REFLECTED IN THE HIGHER FUEL CAPACITY.

2.1.8 GENERAL CHARACTERISTICS

MODEL 747-400 FREIGHTER (PRATT & WHITNEY ENGINES)

CHARACTERISTICS	UNITS	RB211-524G2 ENGINES				
MAX DESIGN	POUNDS	803,000	836,000	853,000	873,000	877,000
TAXI WEIGHT	KILOGRAMS	364,235	379,204	386,915	395,987	397,801
MAX DESIGN	POUNDS	800,000	833,000	850,000	870,000	875,000
TAKEOFF WEIGHT	KILOGRAMS	362,874	377,843	385,554	394,626	396,894
MAX DESIGN	POUNDS	652,000	652,000	652,000	666,000	666,000
LANDING WEIGHT (1)	KILOGRAMS	295,743	295,743	295,743	302,093	302,093
MAX DESIGN	POUNDS	610,000	610,000	610,000	635,000	635,000
ZERO FUEL WEIGHT (2)	KILOGRAMS	276,692	276,692	276,692	288,031	288,031
SPEC OPERATING	POUNDS	366,082	366,082	366,082	366,082	366,082
EMPTY WEIGHT (3)	KILOGRAMS	166,052	166,052	166,052	166,052	166,052
MAX STRUCTURAL	POUNDS	243,850	243,850	243,850	268,850	268,850
PAYLOAD	KILOGRAMS	110,609	110,609	110,609	121,948	121,948
TYPICAL CARGO - MAIN DECK	CUBIC FEET	18,720	18,720	18,720	18,720	18,720
CONTAINERS (4)	CUBIC METERS	530	530	530	530	530
MAX CARGO - LOWER DECK	CUBIC FEET	5,536	5,536	5,536	5,536	5,536
CONTAINERS (LD-1)	CUBIC METERS	157	157	157	157	157
MAX CARGO - LOWER DECK	CUBIC FEET	520	520	520	520	520
BULK CARGO	CUBIC METERS	15	15	15	15	15
USABLE FUEL CAPACITY (5)	U.S. GALLONS	53,985	53,985	53,985	57,285	57,285
	LITERS	204,333	204,333	204,333	216,824	216,824
	POUNDS	361,700	361,700	361,700	383,810	383,810
	KILOGRAMS	164,064	164,064	164,064	174,093	174,093

NOTES:

1. 666,000 LB LANDING WEIGHT IS OPTIONAL
2. 635,000 LB ZERO FUEL WEIGHT IS OPTIONAL
3. SPEC OPERATING EMPTY WEIGHT REFLECTS STANDARD ITEM ALLOWANCES. ACTUAL OEW WILL VARY WITH AIRPLANE CONFIGURATION. CONSULT WITH USING AIRLINE FOR ACTUAL OEW.
4. TWENTY-NINE 10-FT CONTAINERS. ACTUAL VOLUME WILL DEPEND ON AIRPLANE CONFIGURATION.
5. OPTIONAL TAIL FUEL OF 3,300 US GAL IS REFLECTED IN THE HIGHER FUEL CAPACITY.

2.1.9 GENERAL CHARACTERISTICS

MODEL 747-400 FREIGHTER (ROLLS ROYCE ENGINES)

CHARACTERISTICS	UNITS	GE ENGINES CF6-80C2B5-F	PW ENGINES PW4062	RR ENGINES RB211-524H8-T
MAX DESIGN TAXI WEIGHT	POUNDS	913,000	913,000	913,000
	KILOGRAMS	414,130	414,130	414,130
MAX DESIGN TAKEOFF WEIGHT	POUNDS	910,000	910,000	910,000
	KILOGRAMS	412,770	412,770	412,770
MAX DESIGN LANDING WEIGHT	POUNDS	652,000	652,000	652,000
	KILOGRAMS	295,743	295,743	295,743
MAX DESIGN ZERO FUEL WEIGHT	POUNDS	555,000	555,000	555,000
	KILOGRAMS	251,744	251,744	251,744
SPEC OPERATING EMPTY WEIGHT (1)	POUNDS	406,900	406,900	406,900
	KILOGRAMS	184,567	184,567	184,567
MAX STRUCTURAL PAYLOAD	POUNDS	148,100	148,100	148,100
	KILOGRAMS	67,177	67,177	67,177
TYPICAL SEATING CAPACITY (INCLUDES UPPER DECK)	TWO-CLASS	500: 42 FIRST CLASS, 458 ECONOMY CLASS		
	THREE-CLASS	416: 23 FIRST CLASSS, 78 BUSINESS CLASS, 315 ECONOMY CLASS		
MAX CARGO - LOWER DECK LD-2 CONTAINERS (2)	CUBIC FEET	4,550	4,550	4,550
	CUBIC METERS	129	129	129
MAX CARGO - LOWER DECK BULK CARGO	CUBIC FEET	789	789	789
	CUBIC METERS	22	22	22
USABLE FUEL CAPACITY (3)	U.S. GALLONS	63,240	63,460	63,460
	LITERS	239,363	240,196	240,196
	POUNDS	423,708	425,182	425,182
	KILOGRAMS	192,191	192,860	192,860

NOTES:

1. SPEC OPERATING EMPTY WEIGHT REFLECTS THREE-CLASS 416-PASSENGER ARRANGEMENT AND STANDARD ITEM ALLOWANCES. ACTUAL OEW WILL VARY WITH AIRPLANE CONFIGURATION. CONSULT USING AIRLINE FOR ACTUAL OEW.
2. REFLECTS TWO BODY FUEL TANKS IN THE FORWARD CARGO COMPARTMENT.
3. INCLUDES TWO BODY FUEL TANKS OF 3,060 U.S. GALLONS EACH.

2.1.10 GENERAL CHARACTERISTICS

MODEL 747-400ER

CHARACTERISTICS	UNITS	GE ENGINES CF6-80C2B5-F	PW ENGINES PW4062	RR ENGINES RB211-524H8-T
MAX DESIGN TAXI WEIGHT	POUNDS	913,000	913,000	913,000
	KILOGRAMS	414,130	414,130	414,130
MAX DESIGN TAKEOFF WEIGHT	POUNDS	910,000	910,000	910,000
	KILOGRAMS	412,770	412,770	412,770
MAX DESIGN LANDING WEIGHT	POUNDS	666,000	666,000	666,000
	KILOGRAMS	302,093	302,093	302,093
MAX DESIGN ZERO FUEL WEIGHT	POUNDS	611,000	611,000	611,000
	KILOGRAMS	277,145	277,145	277,145
SPEC OPERATING EMPTY WEIGHT (1)	POUNDS	362,400	362,400	362,400
	KILOGRAMS	164,382	164,382	164,382
MAX STRUCTURAL PAYLOAD	POUNDS	248,600	248,600	248,600
	KILOGRAMS	112,763	112,763	112,763
TYPICAL CARGO – MAIN DECK CONTAINERS (2)	CUBIC FEET	18,720	18,720	18,720
	CUBIC METERS	530	530	530
MAX CARGO - LOWER DECK CONTAINERS (LD-2)	CUBIC FEET	5,600	5,600	5,600
	CUBIC METERS	159	159	159
MAX CARGO - LOWER DECK BULK CARGO	CUBIC FEET	520	520	520
	CUBIC METERS	15	15	15
USABLE FUEL CAPACITY	U.S. GALLONS	53,765	53,985	53,985
	LITERS	203,501	204,333	204,333
	POUNDS	360,226	361,700	361,700
	KILOGRAMS	163,396	164,064	164,064

NOTES:

1. SPEC OPERATING EMPTY WEIGHT REFLECTS STANDARD ITEM ALLOWANCES.
   ACTUAL OEW WILL VARY WITH AIRLINE CONFIGURATION AND OPTIONAL EQUIPMENT.
   CONSULT USING AIRLINE FOR ACTUAL OEW.
2. TWENTY-NINE 10-FOOT CONTAINERS. ACTUAL VOLUME WILL DEPEND ON AIRPRLANE CONFIGURATION.

2.1.11 GENERAL CHARACTERISTICS

MODEL 747-400ER FREIGHTER

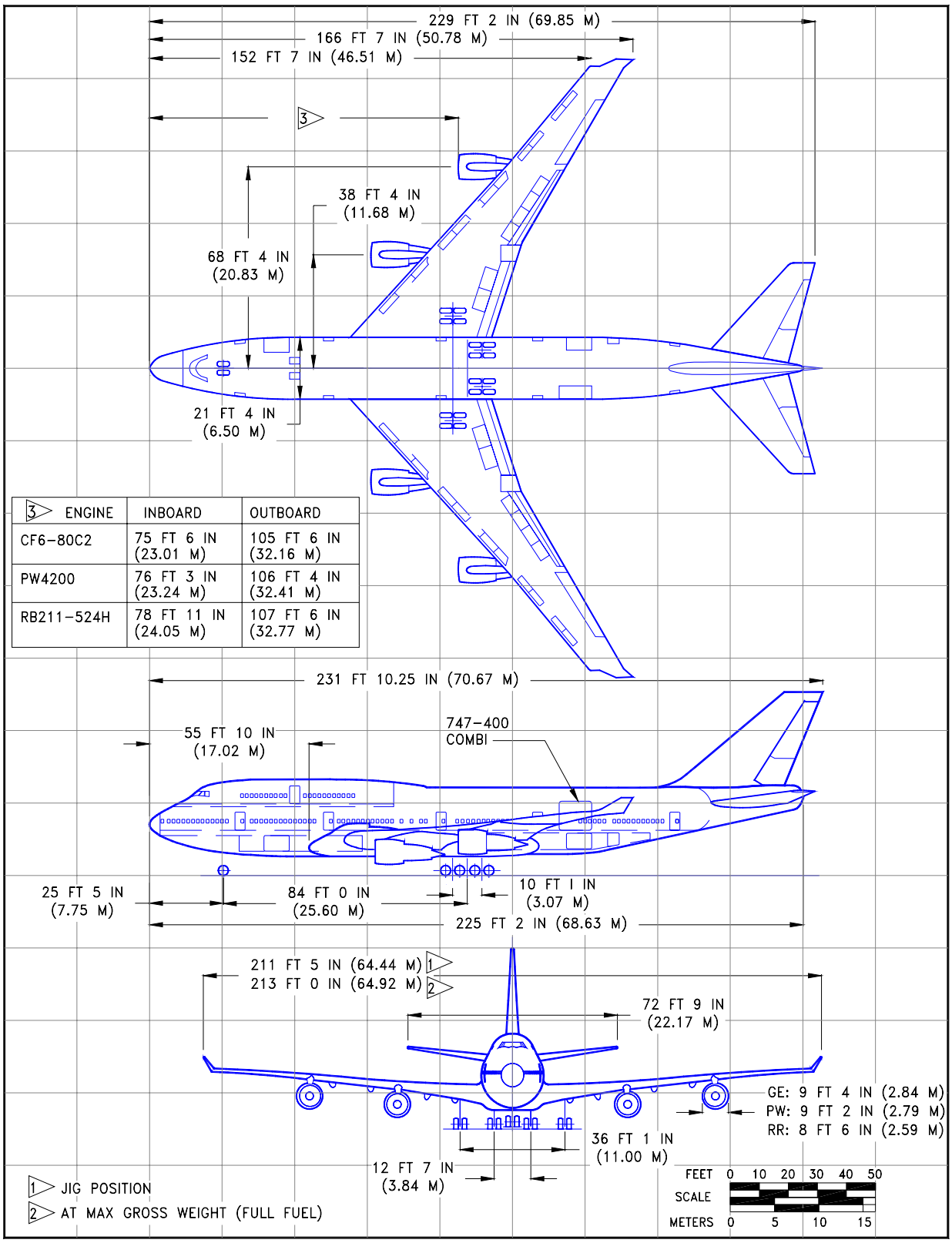
CHARACTERISTICS	UNITS	CF6-80C2B1 ENGINES	
MAX DESIGN	POUNDS	603,000	613,500
TAXI WEIGHT	KILOGRAMS	273,517	278,279
MAX DESIGN	POUNDS	600,000	610,000
TAKEOFF WEIGHT	KILOGRAMS	272,156	276,692
MAX DESIGN	POUNDS	574,000	574,000
LANDING WEIGHT	KILOGRAMS	260,362	260,362
MAX DESIGN	POUNDS	535,000	535,000
ZERO FUEL WEIGHT	KILOGRAMS	242,672	242,672
SPEC OPERATING	POUNDS	400,630	400,630
EMPTY WEIGHT (1)	KILOGRAMS	181,723	181,723
MAX STRUCTURAL	POUNDS	134,370	134,370
PAYLOAD	KILOGRAMS	60,949	60,949
TYPICAL SEATING CAPACITY	UPPER DECK	89 ECONOMY	
(INCLUDES UPPER DECK)	MAIN DECK	539 ECONOMY	
MAX CARGO - LOWER DECK	CUBIC FEET	5,600	5,600
CONTAINERS (LD-1)	CUBIC METERS	159	159
MAX CARGO - LOWER DECK	CUBIC FEET	835	835
BULK CARGO	CUBIC METERS	24	24
USABLE FUEL CAPACITY	U.S. GALLONS	53,765	53,763
	LITERS	203,501	203,493
	POUNDS	360,226	360,226
	KILOGRAMS	163,396	163,396

NOTES:

1. SPEC OPERATING EMPTY WEIGHT REFLECTS ALL-ECONOMY 624-PASSENGER ARRANGEMENT AND STANDARD ITEM ALLOWANCES. ACTUAL OEW WILL VARY WITH AIRLINE CONFIGURATION AND OPTIONAL EQUIPMENT. CONSULT USING AIRLINE FOR ACTUAL OEW.

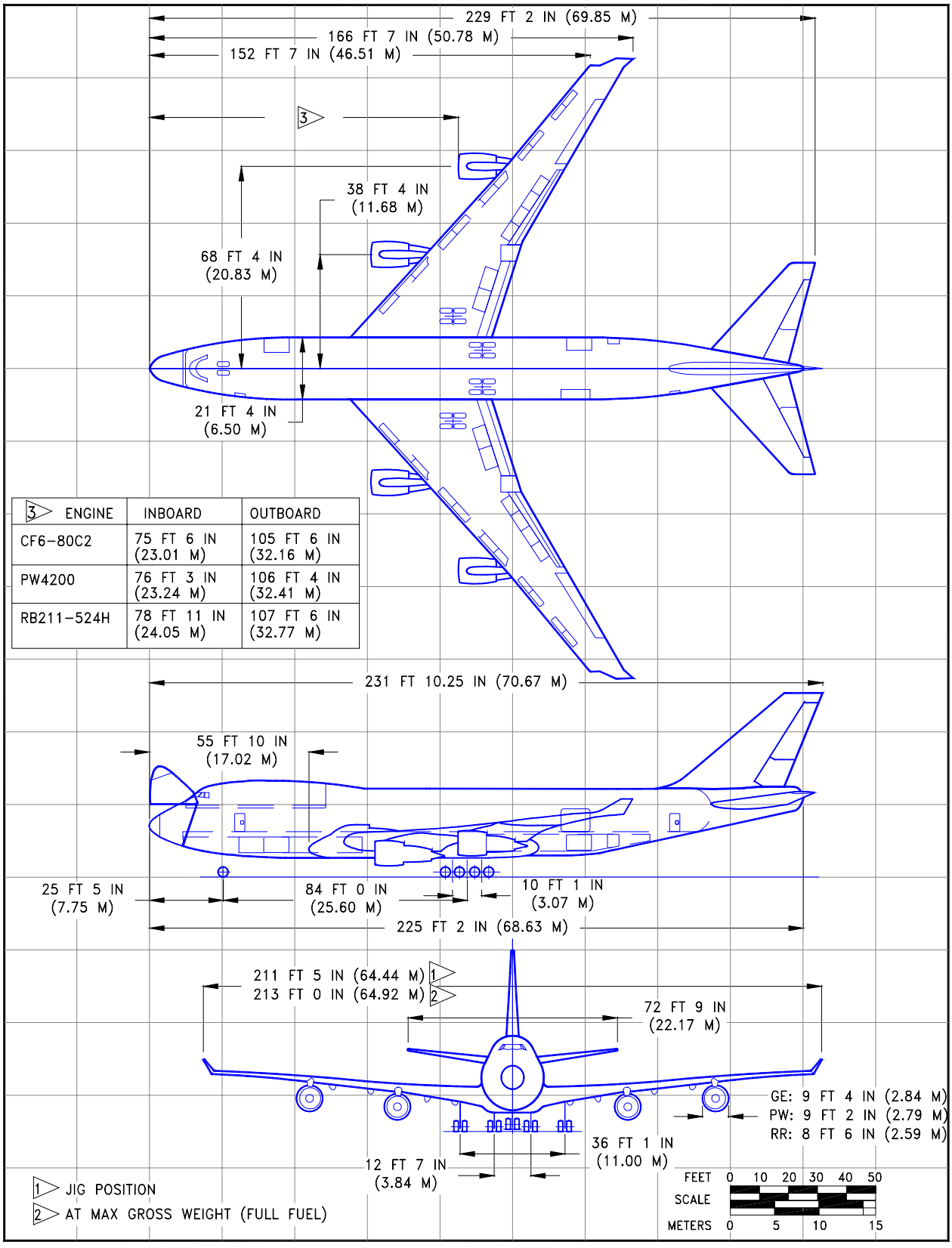
2.1.12 GENERAL CHARACTERISTICS

MODEL 747-400 DOMESTIC (GENERAL ELECTRIC ENGINES)



2.2.1 GENERAL DIMENSIONS

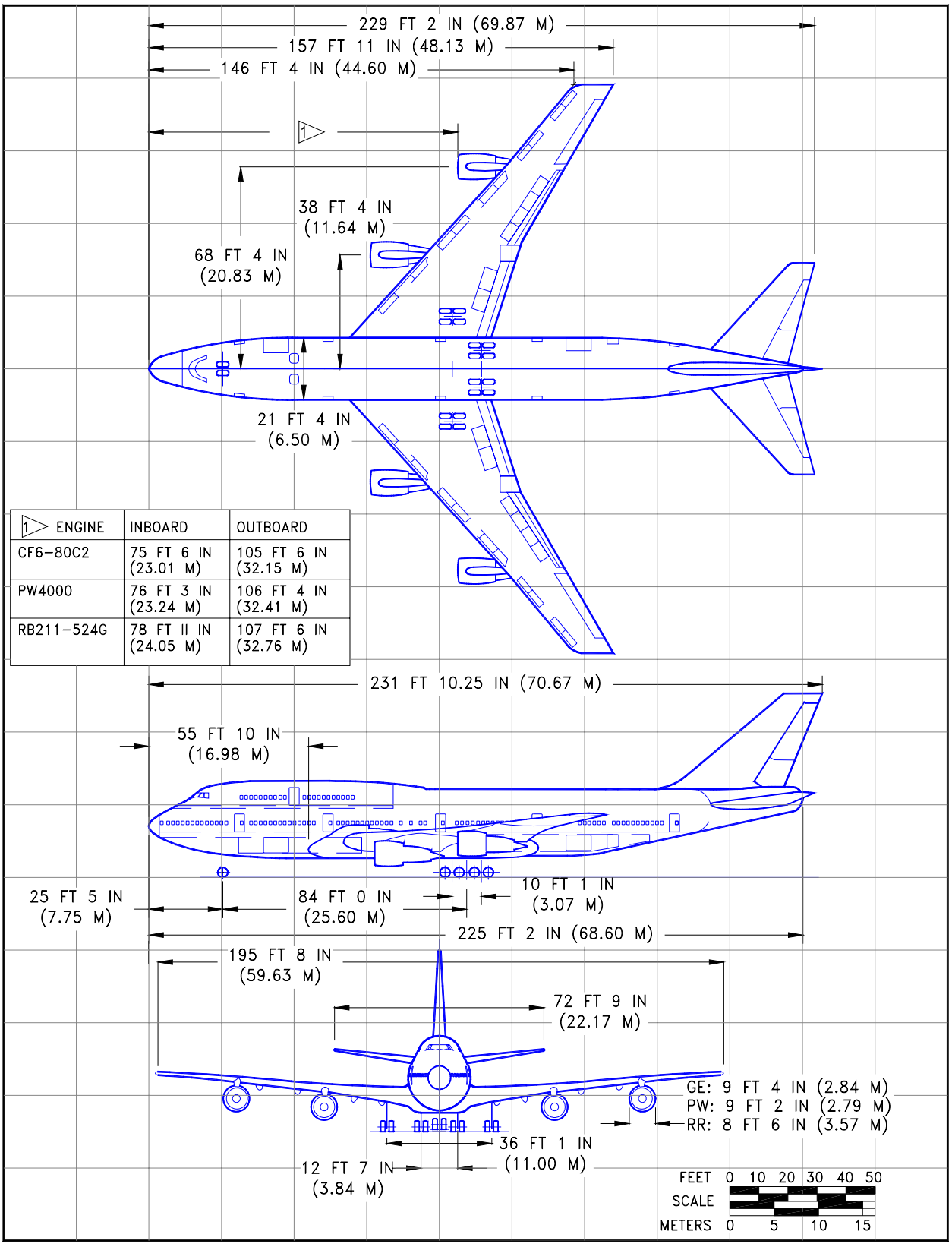
MODEL 747-400, -400 COMBI, -400ER



3 ENGINE	INBOARD	OUTBOARD
CF6-80C2	75 FT 6 IN (23.01 M)	105 FT 6 IN (32.16 M)
PW4200	76 FT 3 IN (23.24 M)	106 FT 4 IN (32.41 M)
RB211-524H	78 FT 11 IN (24.05 M)	107 FT 6 IN (32.77 M)

2.2.2 GENERAL DIMENSIONS

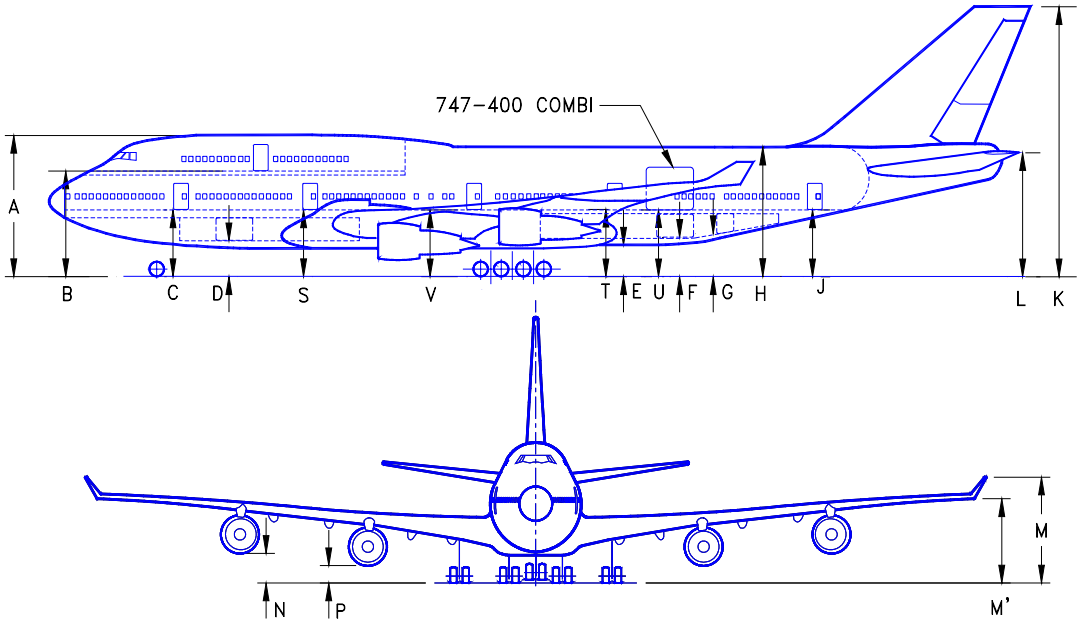
MODEL 747-400 FREIGHTER, -400ER FREIGHTER



1 ENGINE	INBOARD	OUTBOARD
CF6–80C2	75 FT 6 IN (23.01 M)	105 FT 6 IN (32.15 M)
PW4000	76 FT 3 IN (23.24 M)	106 FT 4 IN (32.41 M)
RB211–524G	78 FT II IN (24.05 M)	107 FT 6 IN (32.76 M)

2.2.3 GENERAL DIMENSIONS

MODEL 747-400 DOMESTIC



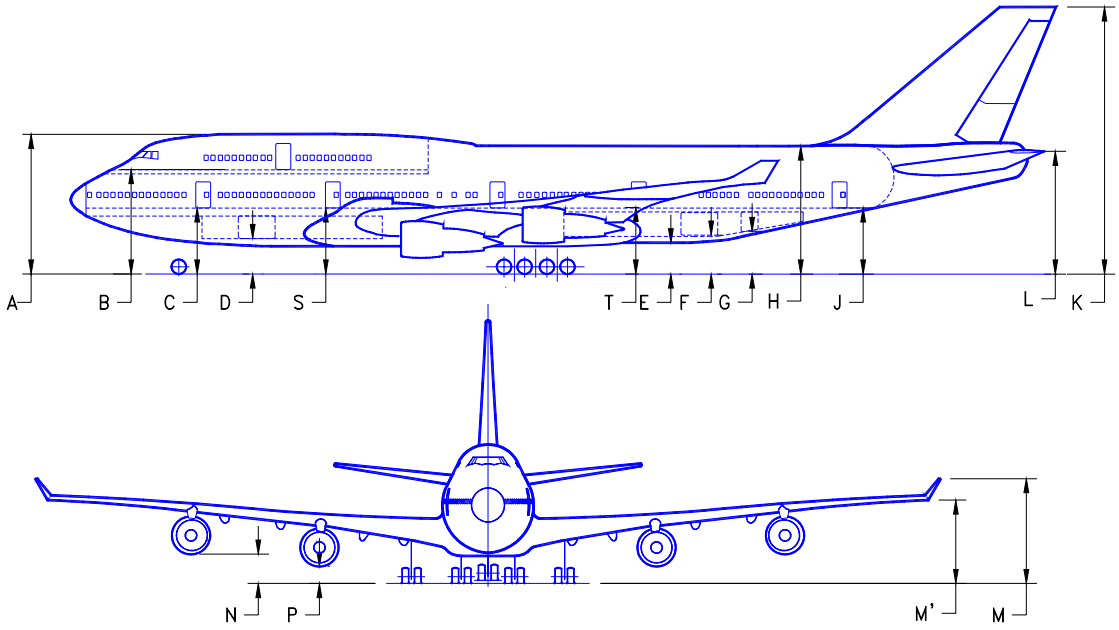
	MINIMUM		MAXIMUM	
	FT - IN	M	FT - IN	M
A	32 - 1	9.80	33 - 6	10.23
B	24 - 8	7.53	25 - 11	7.91
C	15 - 6	4.74	16 - 11	5.18
D	8 - 10	2.71	10 - 2	3.11
E	6 - 10	2.09	7 - 11	2.42
F	9 - 3	2.82	10 - 5	3.18
G	9 - 10	3.00	11 - 2	3.41
H	29 - 7	9.02	31 - 4	9.56
J	15 - 9	4.82	17 - 5	5.33
K	61 - 7	18.80	64 - 0	19.51
L	27 - 6	8.39	29 - 9	9.09
M	22 - 0	6.71	24 - 0	7.32
M'	16 - 9	5.11	18 - 9	5.71
N	4 - 4	1.32	5 - 10	1.80
P	2 - 3	0.71	3 - 0	0.93
S	15 - 9	4.80	16 - 10	5.15
T	16 - 0	4.88	17 - 0	5.19
U	16 - 0	4.88	17 - 3	5.28
V	15 - 11	4.87	16 - 9	5.11

NOTES: VERTICAL CLEARANCES SHOWN OCCUR DURING MAXIMUM VARIATIONS OF AIRPLANE ATTITUDE. COMBINATIONS OF AIRPLANE LOADING AND UNLOADING ACTIVITIES THAT PRODUCE THE GREATEST POSSIBLE VARIATIONS IN ATTITUDE WERE USED TO ESTABLISH THE VARIATIONS SHOWN.

DURING ROUTINE SERVICING, THE AIRPLANE REMAINS RELATIVELY STABLE, PITCH AND ELEVATION CHANGES OCCURRING SLOWLY.

2.3.1 GROUND CLEARANCES

MODEL 747-400, -400 COMBI

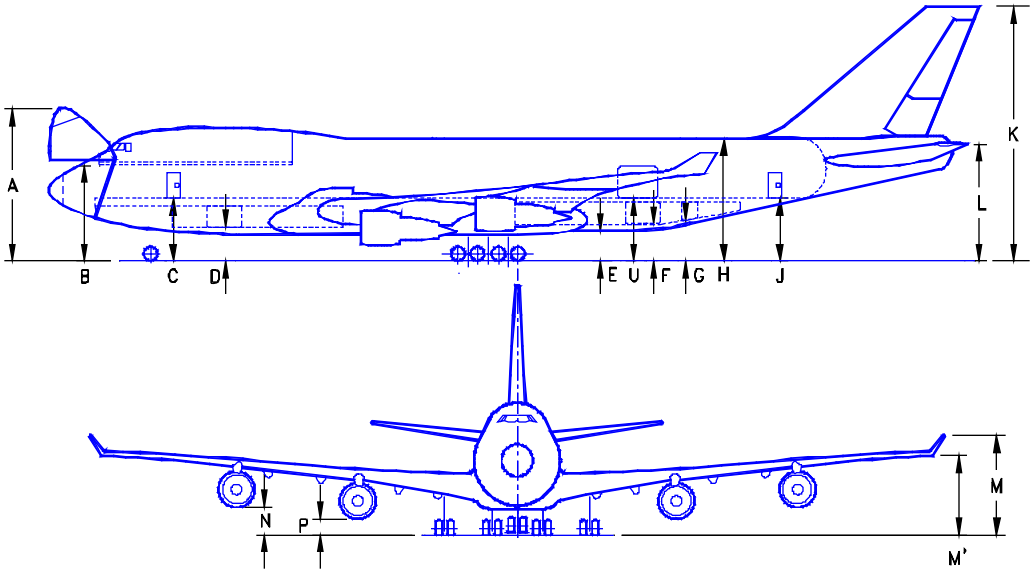


	MINIMUM		MAXIMUM	
	FT - IN	M	FT - IN	M
A	32 - 3	9.82	33 – 7	10.25
B	24 – 9	7.55	26 – 1	7.94
C	15 – 7	4.75	17 – 1	5.20
D	8 – 11	2.73	10 – 3	3.13
E	7 – 1	2.16	8 – 1	2.47
F	9 – 6	2.9	10 – 7	3.23
G	10 – 2	3.11	11 – 5	3.47
H	27 – 9	8.46	31 – 7	9.63
J	16 – 4	4.99	17 – 8	5.40
K	62 - 6	19.06	64 – 3	19.59
L	28 – 4	8.64	30 – 1	9.17
M	22 - 0	6.71	24 - 0	7.32
M'	16 - 9	5.11	18 - 9	5.71
N (PW)	4 – 7	1.40	5 – 10	1.78
N (GE)	4 - 7	1.40	5 – 11	1.80
N (RR)	4 – 4	1.32	5 – 7	1.71
P (PW)	2 – 4	0.71	3 – 0	0.91
P (GE)	2 – 5	0.72	3 – 0	0.91
P (RR)	2 - 4	0.71	3 – 0	0.91
S	15 – 10	4.82	16 – 11	5.16
T	16 - 3	4.95	17 - 2	5.25

NOTES: 1. VERTICAL CLEARANCES SHOWN OCCUR DURING MAXIMUM VARIATIONS OF AIRPLANE ATTITUDE. COMBINATIONS OF AIRPLANE LOADING AND UNLOADING ACTIVITIES THAT PRODUCE THE GREATEST POSSIBLE VARIATIONS IN ATTITUDE WERE USED TO ESTABLISH THE VARIATIONS SHOWN.
2. DURING ROUTINE SERVICING, THE AIRPLANE REMAINS RELATIVELY STABLE, PITCH AND ELEVATION CHANGES OCCURRING SLOWLY.

2.3.2 GROUND CLEARANCES

MODEL 747-400ER



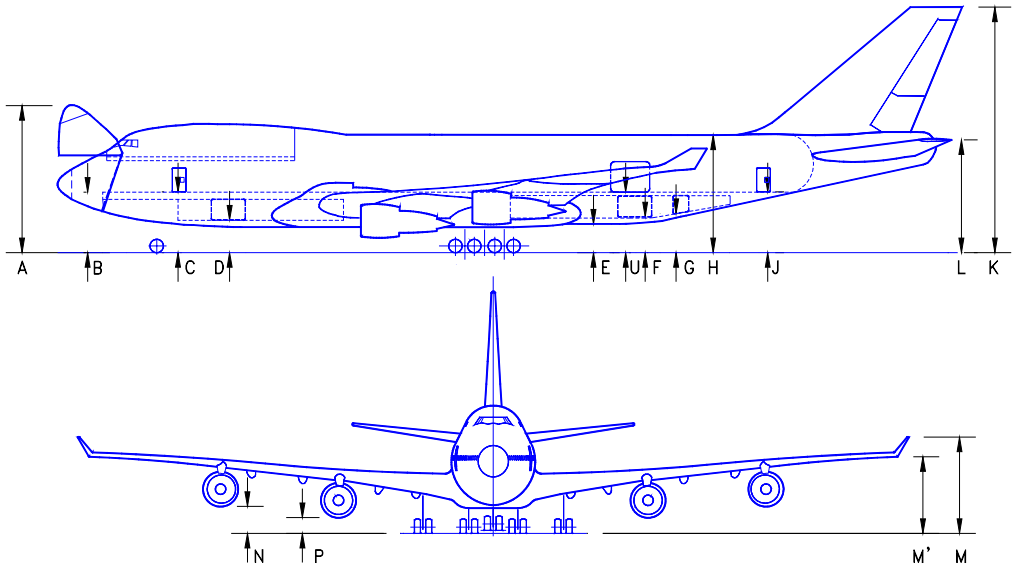
	MINIMUM		MAXIMUM	
	FT - IN	M	FT - IN	M
A	38 - 1	11.63	40 - 1	12.24
B	24 - 9	7.54	25 – 2	7.67
C	15 - 6	4.72	17 - 0	5.18
D	8 - 10	2.71	10 - 3	3.14
E	6 - 10	2.09	7 - 11	2.42
F	9 - 1	2.79	10 - 6	3.21
G	9 - 9	2.98	11 - 3	3.44
H	29 - 6	9.00	31 - 4	9.57
J	15 - 8	4.80	17 - 7	5.37
K	61 - 7	18.78	64 - 1	19.54
L	27 - 5	8.37	29 - 11	9.13
M	22 - 0	6.71	24 - 0	7.32
M'	16 - 9	5.11	18 - 9	5.71
N	4 - 4	1.32	5 - 10	1.80
P	2 - 3	0.71	3 - 0	0.93
S	15 - 9	4.80	16 - 10	5.15
T	16 - 0	4.88	17 - 0	5.19
U	16 - 0	4.88	17 - 3	5.28

NOTES: VERTICAL CLEARANCES SHOWN OCCUR DURING MAXIMUM VARIATIONS OF AIRPLANE ATTITUDE. COMBINATIONS OF AIRPLANE LOADING/UNLOADING ACTIVITIES THAT PRODUCE THE GREATEST POSSIBLE VARIATIONS OF ATTITUDE WERE USED TO ESTABLISH THE VARIATIONS SHOWN. DURING ROUTINE SERVICING, THE AIRPLANE REMAINS RELATIVELY STABLE; PITCH AND ELEVATION CHANGES OCCUR SLOWLY.

AT MAJOR TERMINALS, A GSE TETHERING DEVICE MAY BE USED TO MAINTAIN STABILITY BETWEEN THE MAIN DECK DOOR SILL AND THE LOADING DOCK. CARGO BRIDGE ATTACHMENT FITTINGS LOCATED ON THE NOSE DOOR SILL AT THE FORWARD EDGE OF THE MAIN CARGO DOOR DECK MAY BE USED FOR NOSE DOOR SILL STABILIZATION.

2.3.3 GROUND CLEARANCES

MODEL 747-400 FREIGHTER



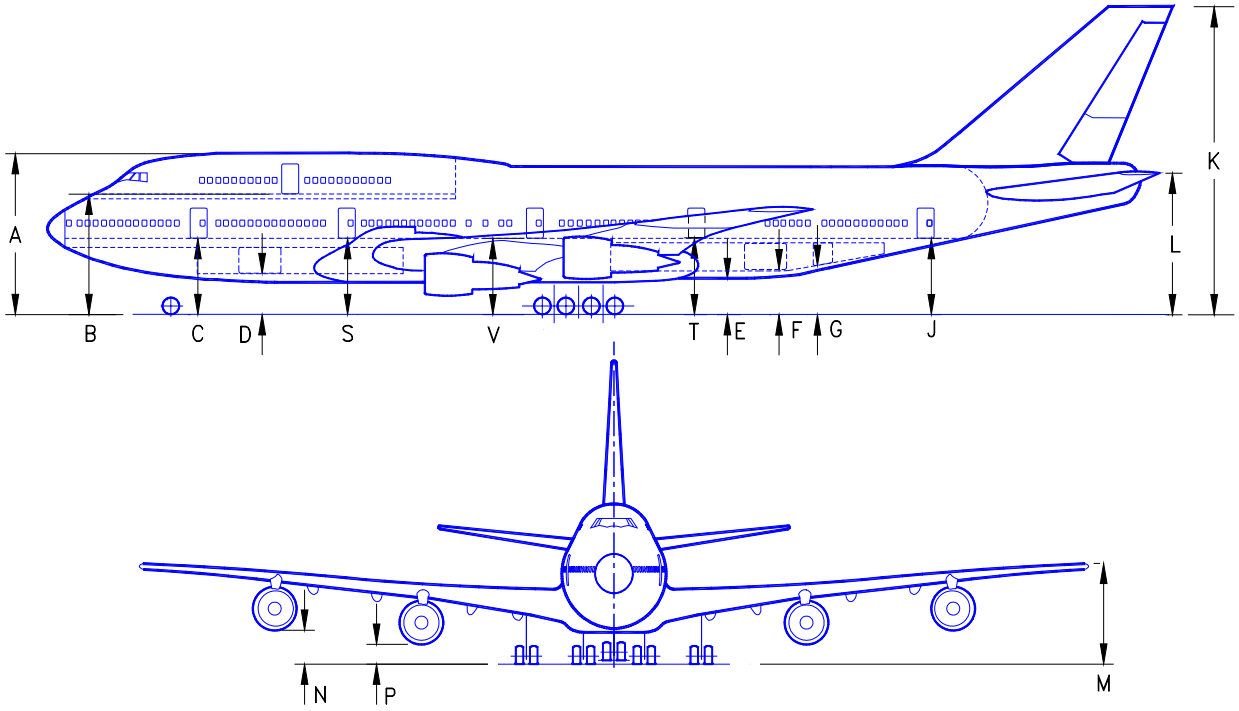
	MINIMUM		MAXIMUM	
	FT - IN	M	FT-IN	M
A	38 - 2	11.79	40 - 2	12.24
B	15 – 6	4.72	17 – 2	5.23
C	15 - 7	4.74	17 - 8	5.37
D	9 - 0	2.75	10 - 9	3.28
E	7 – 1	2.16	8 – 1	2.47
F	9 – 6	2.89	10 – 7	3.23
G	10 – 2	3.10	11 – 4	3.46
H	27 – 9	8.46	31 – 7	9.63
J	16 - 3	4.97	17 - 8	5.38
K	61 - 11	18.87	64 - 1	19.54
L	27 - 9	8.47	29 - 11	9.12
M	22 - 0	6.71	24 - 0	7.32
M'	16 - 9	5.11	18 - 9	5.71
N (PW)	4 – 7	1.40	5 – 10	1.78
N (GE)	4 - 7	1.40	5 – 11	1.80
N (RR)	4 – 4	1.32	5 – 7	1.71
P (PW)	2 – 4	0.71	3 – 0	0.91
P (GE)	2 – 5	0.72	3 – 0	0.91
P (RR)	2 - 4	0.71	3 – 0	0.91
U	16 - 3	4.97	17 - 5	5.31

NOTES: (1) VERTICAL CLEARANCES SHOWN OCCUR DURING MAXIMUM VARIATIONS OF AIRPLANE ATTITUDE. COMBINATIONS OF AIRPLANE LOADING/UNLOADING ACTIVITIES THAT PRODUCE THE GREATEST POSSIBLE VARIATIONS OF ATTITUDE WERE USED TO ESTABLISH THE VARIATIONS SHOWN. DURING ROUTINE SERVICING, THE AIRPLANE REMAINS RELATIVELY STABLE; PITCH AND ELEVATION CHANGES OCCUR SLOWLY.

(2) AT MAJOR TERMINALS, A GSE TETHERING DEVICE JULY BE USED TO MAINTAIN STABILITY BETWEEN THE MAIN DECK DOOR SILL AND THE LOADING DOCK. CARGO BRIDGE ATTACHMENT FITTINGS LOCATED ON THE NOSE DOOR SILL AT THE FORWARD EDGE OF THE MAIN CARGO DOOR DECK JULY BE USED FOR NOSE DOOR SILL STABILIZATION.

2.3.4 GROUND CLEARANCES

MODEL 747-400ER FREIGHTER



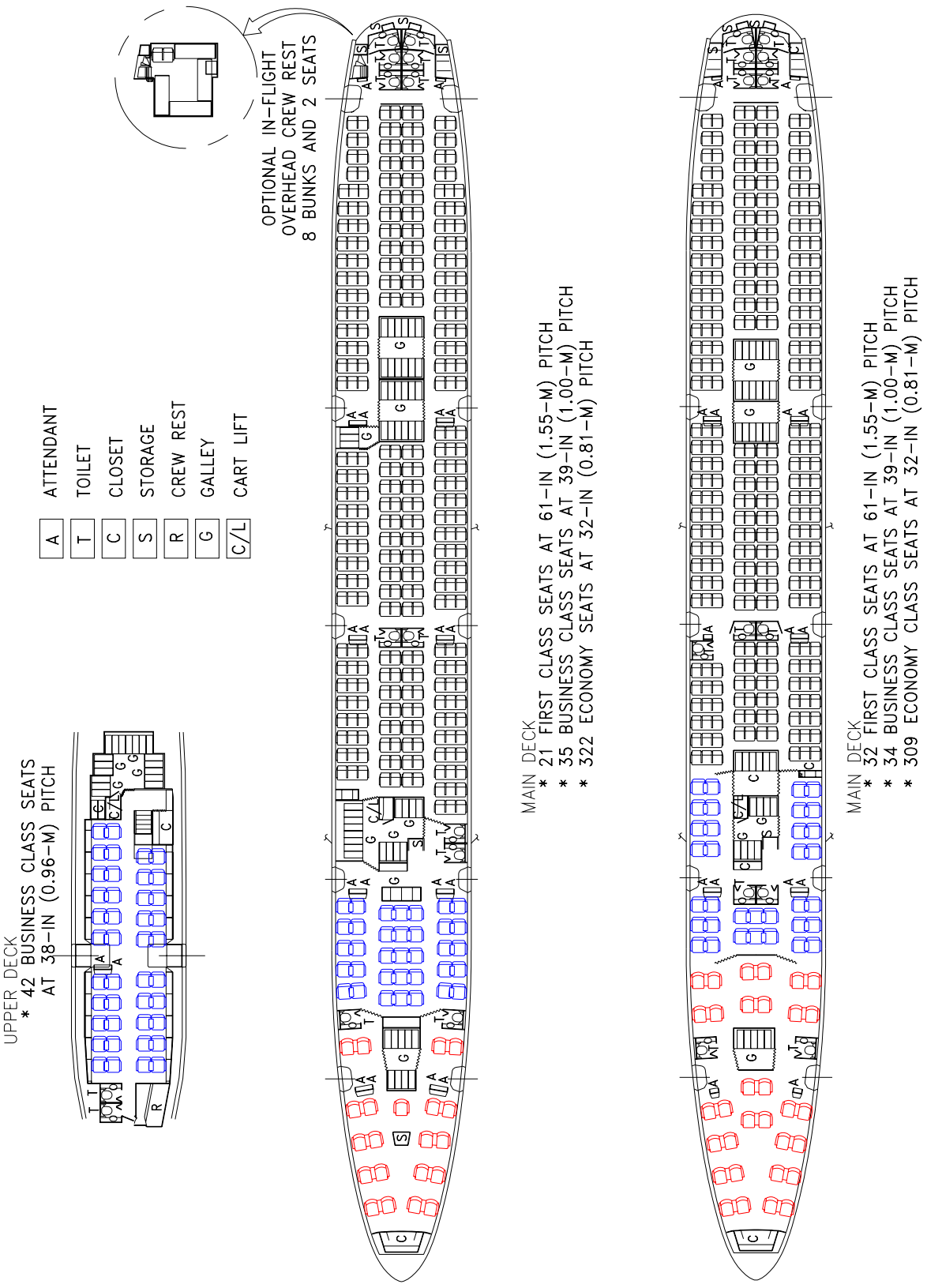
	MINIMUM		MAXIMUM	
	FT - IN	M	FT - IN	M
A	31 - 10	9.70	34 - 1	10.39
B	24 - 10	7.57	27 - 5	8.36
C	15 - 3	4.65	17 - 7	5.36
D	8 - 8	2.64	10 - 8	3.25
E	6 - 3	1.91	6 - 9	2.06
F	8 - 10	2.69	10 - 4	3.15
G	9 - 6	2.90	11 - 4	3.45
H	28 - 6	8.69	31 - 0	9.45
J	15 - 0	4.57	17 - 6	5.33
K	60 - 2	18.34	64 - 3	19.58
L	27 - 0	8.23	30 - 8	9.35
M	17 - 7	5.36	19 - 2	5.84
N	6 - 0	1.83	7 - 0	2.13
P	3 - 9	1.14	4 - 6	1.37
S	15 - 8	4.78	17 - 2	5.23
T	15 - 8	4.78	16 - 7	5.05

NOTES: VERTICAL CLEARANCES SHOWN OCCUR DURING MAXIMUM VARIATIONS OF AIRPLANE ATTITUDE. COMBINATIONS OF AIRPLANE LOADING AND UNLOADING ACTIVITIES THAT PRODUCE THE GREATEST POSSIBLE VARIATIONS IN ATTITUDE WERE USED TO ESTABLISH THE VARIATIONS SHOWN.

DURING ROUTINE SERVICING, THE AIRPLANE REMAINS RELATIVELY STABLE, PITCH AND ELEVATION CHANGES OCCURRING SLOWLY.

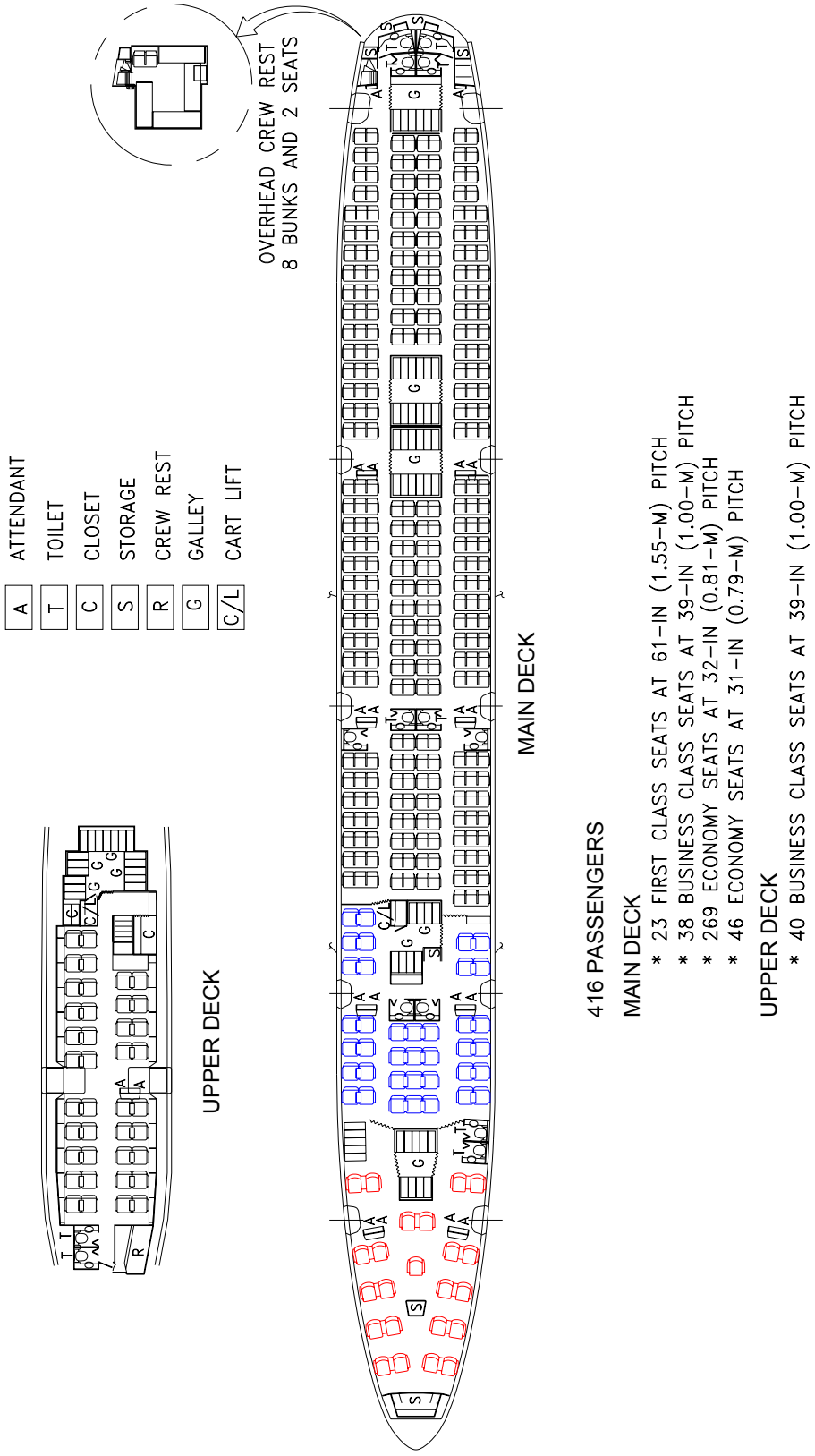
2.3.5 GROUND CLEARANCES

MODEL 747-400 DOMESTIC



2.4.1 INTERIOR ARRANGEMENTS - TRI-CLASS CONFIGURATION

MODEL 747-400



416 PASSENGERS

MAIN DECK

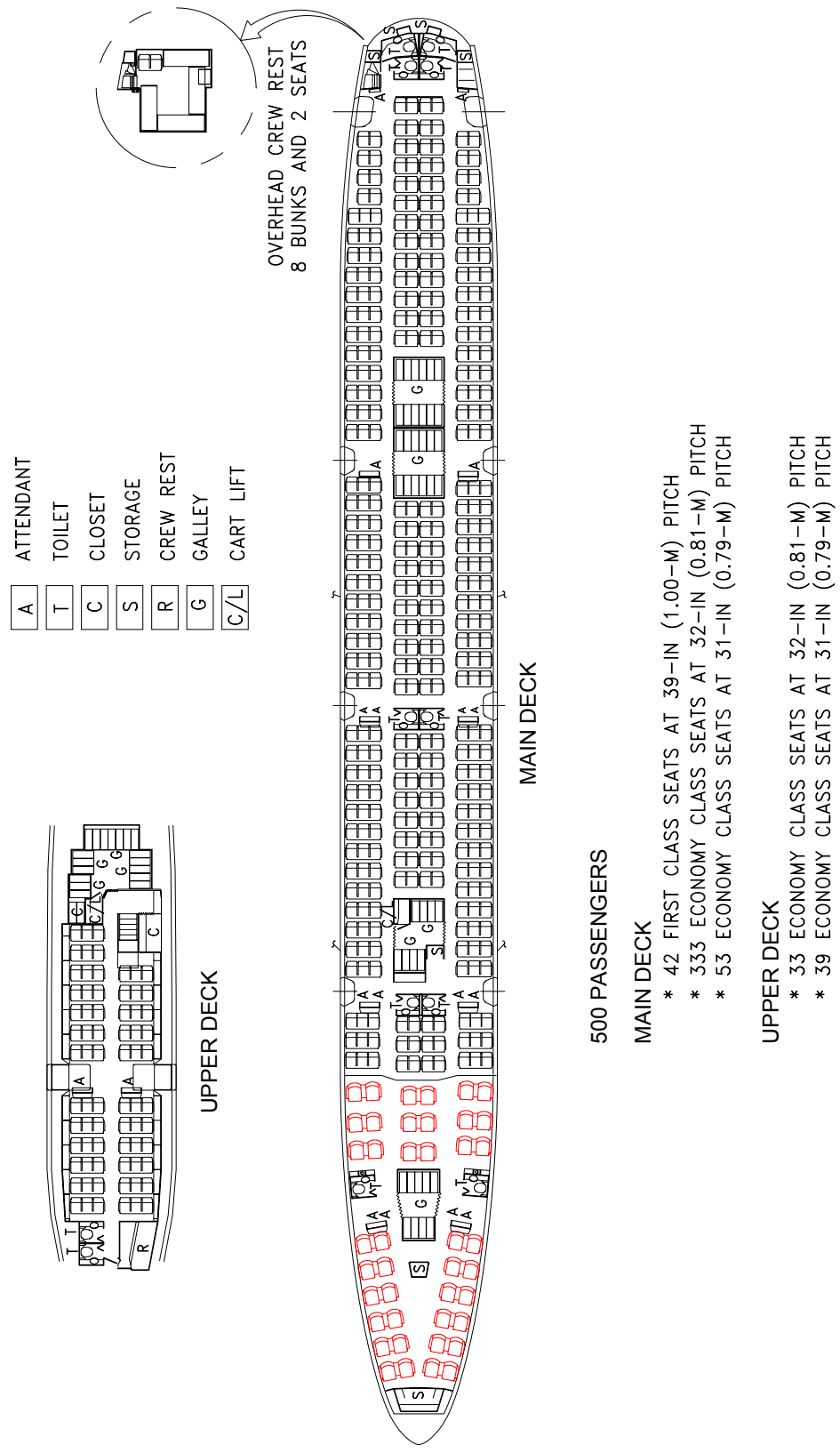
* 23 FIRST CLASS SEATS AT 61-IN (1.55-M) PITCH
* 38 BUSINESS CLASS SEATS AT 39-IN (1.00-M) PITCH
* 269 ECONOMY SEATS AT 32-IN (0.81-M) PITCH
* 46 ECONOMY SEATS AT 31-IN (0.79-M) PITCH

UPPER DECK

* 40 BUSINESS CLASS SEATS AT 39-IN (1.00-M) PITCH

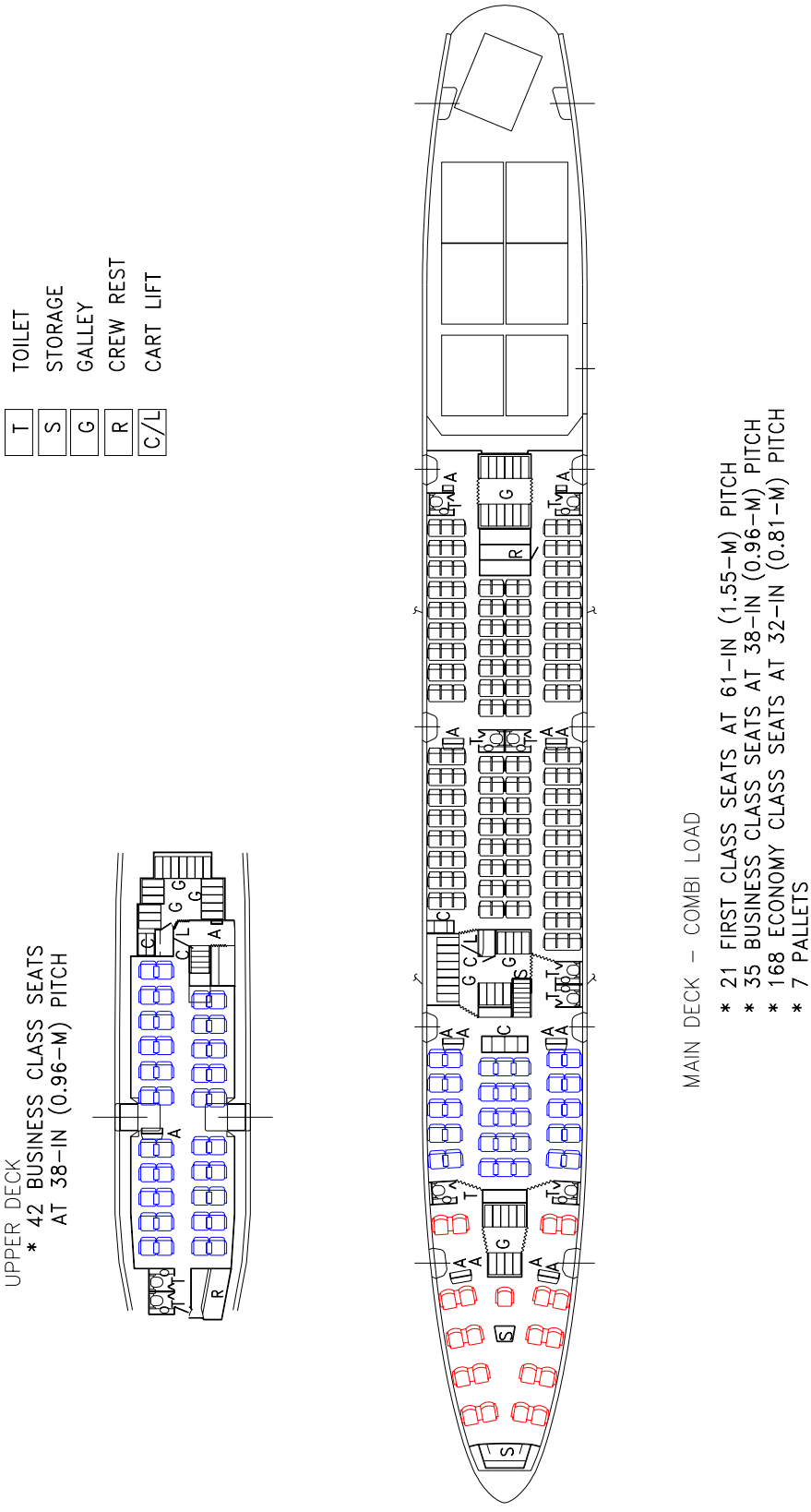
2.4.2 INTERIOR ARRANGEMENTS - TRI-CLASS CONFIGURATION

MODEL 747-400ER



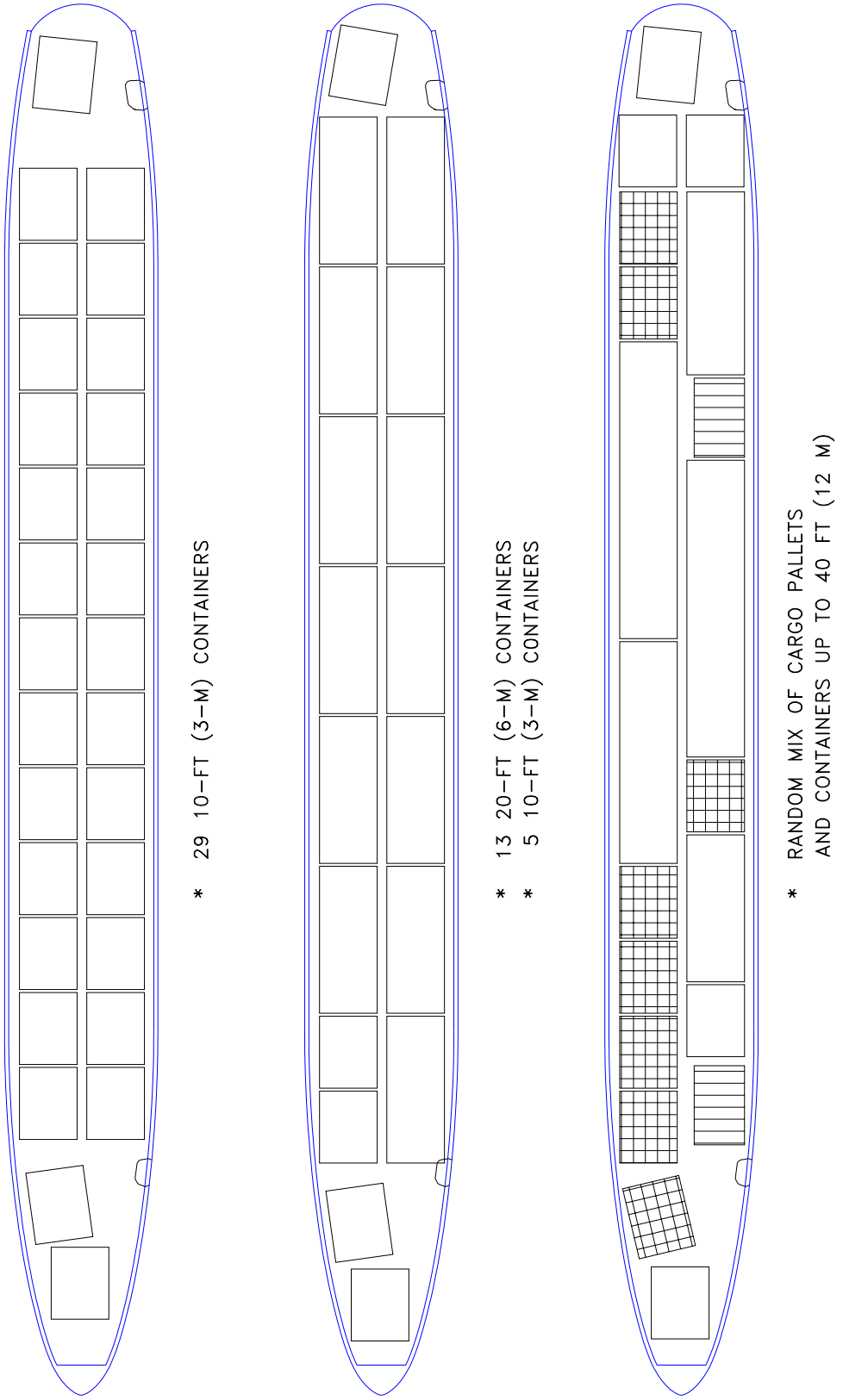
2.4.3 INTERIOR ARRANGEMENTS – DUAL CLASS CONFIGURATION

MODEL 747-400ER



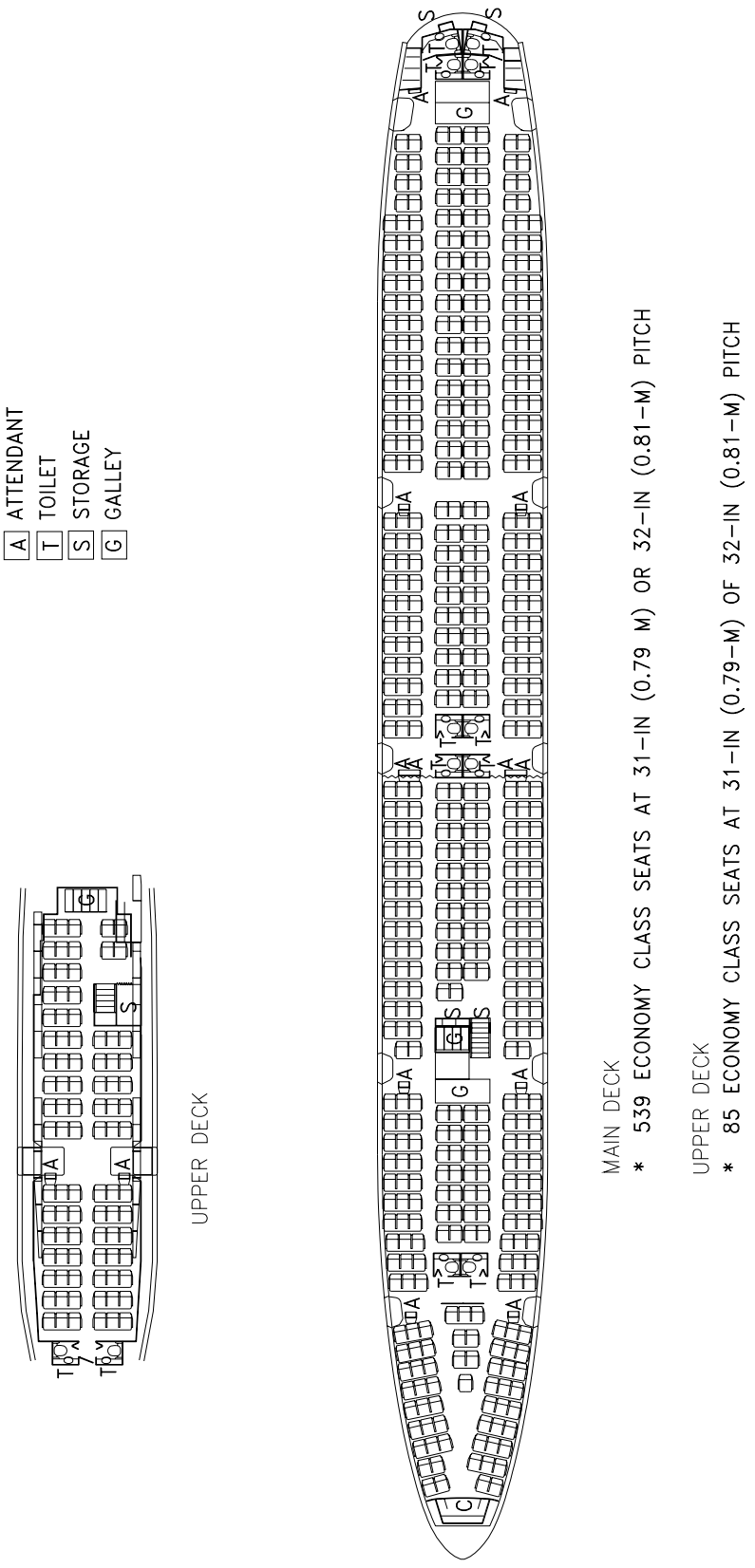
2.4.4 INTERIOR ARRANGEMENTS - PASSENGER/CARGO CONFIGURATION

MODEL 747-400 COMBI



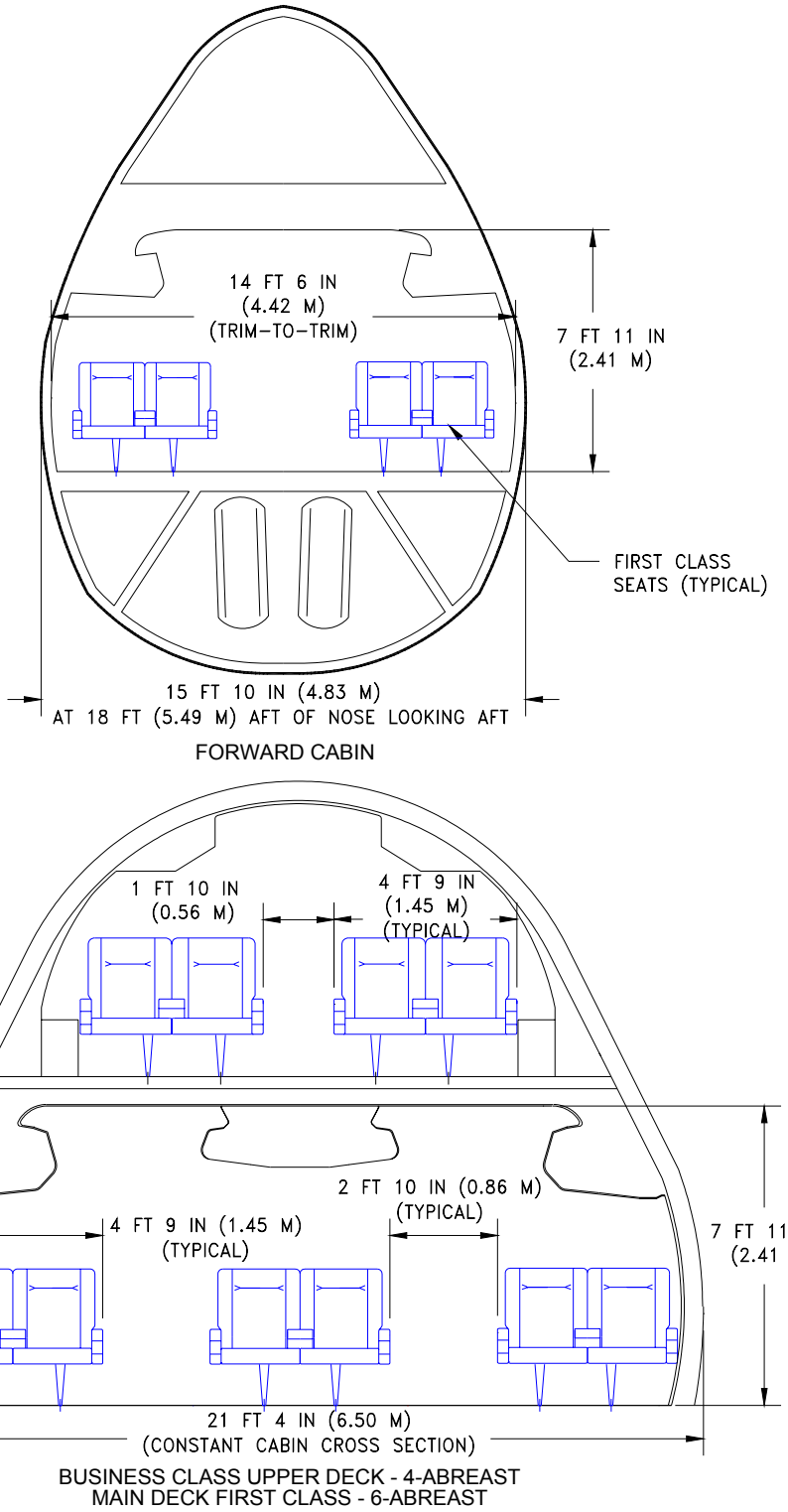
2.4.5 INTERIOR ARRANGEMENTS - MAIN DECK CARGO

MODEL 747-400 FREIGHTER, -400ER FREIGHTER



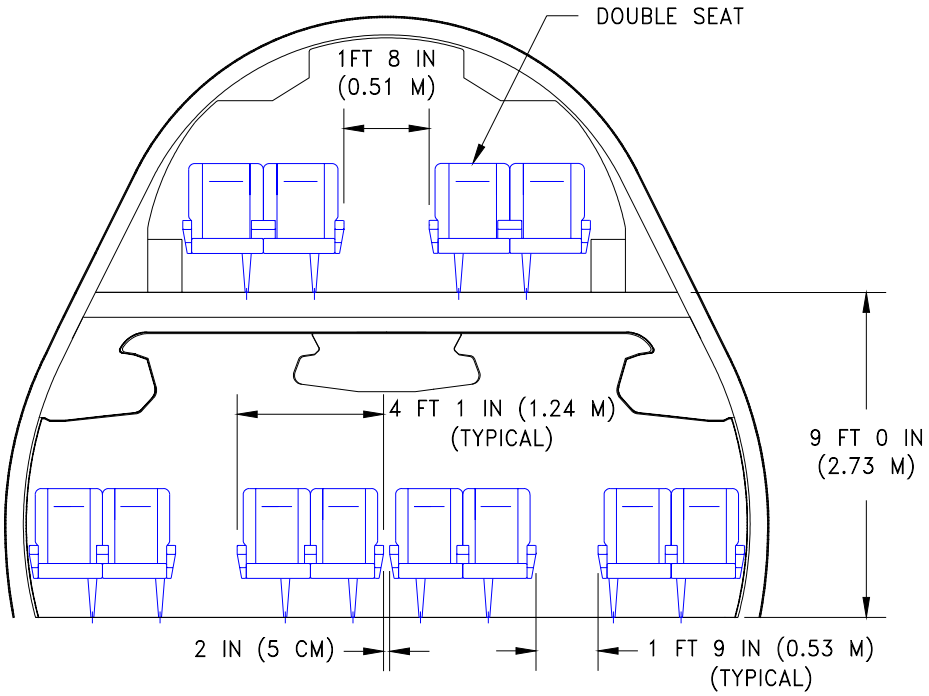
2.4.6 INTERIOR ARRANGEMENTS - HIGH-DENSITY SEATING CONFIGURATION

MODEL 747-400 DOMESTIC

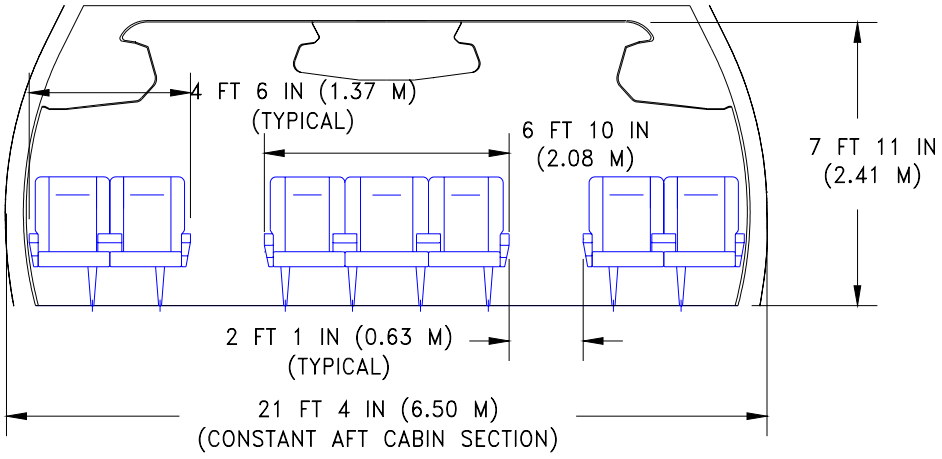


2.5.1 CABIN CROSS-SECTIONS - FIRST AND BUSINESS CLASS SEATS

MODEL 747-400



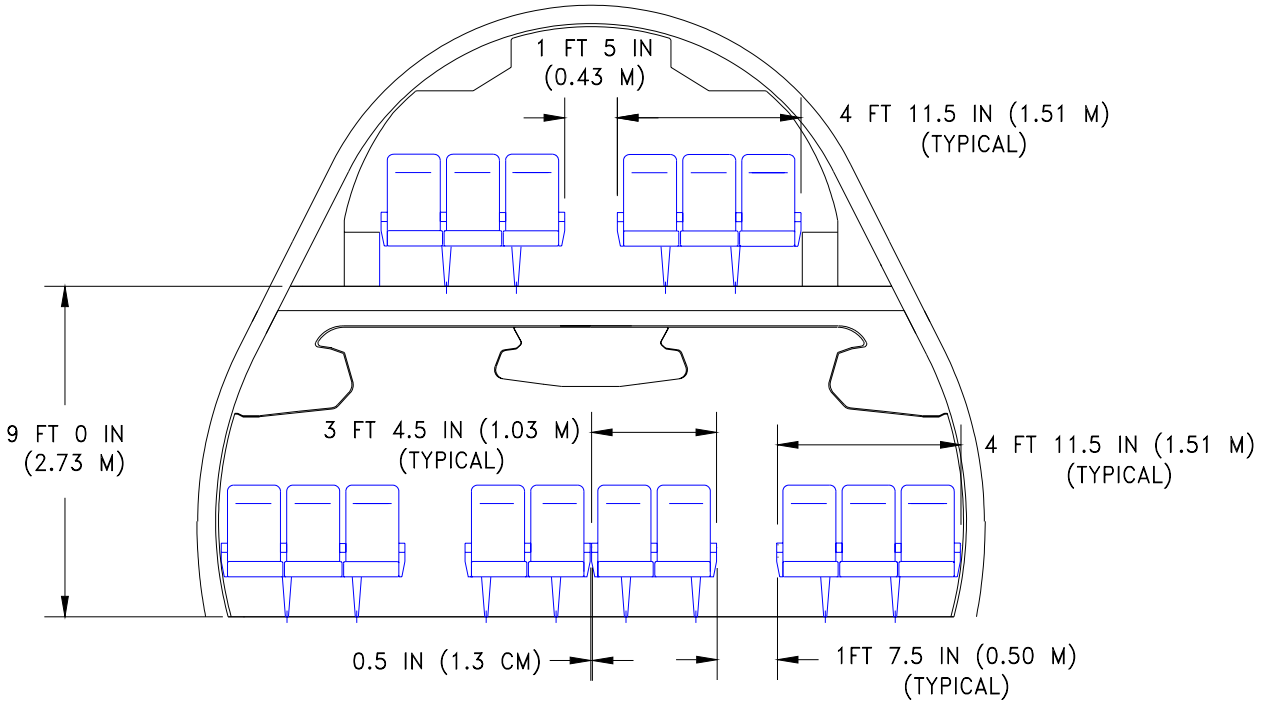
UPPER DECK - 4-ABREAST
MAIN DECK - 8-ABREAST



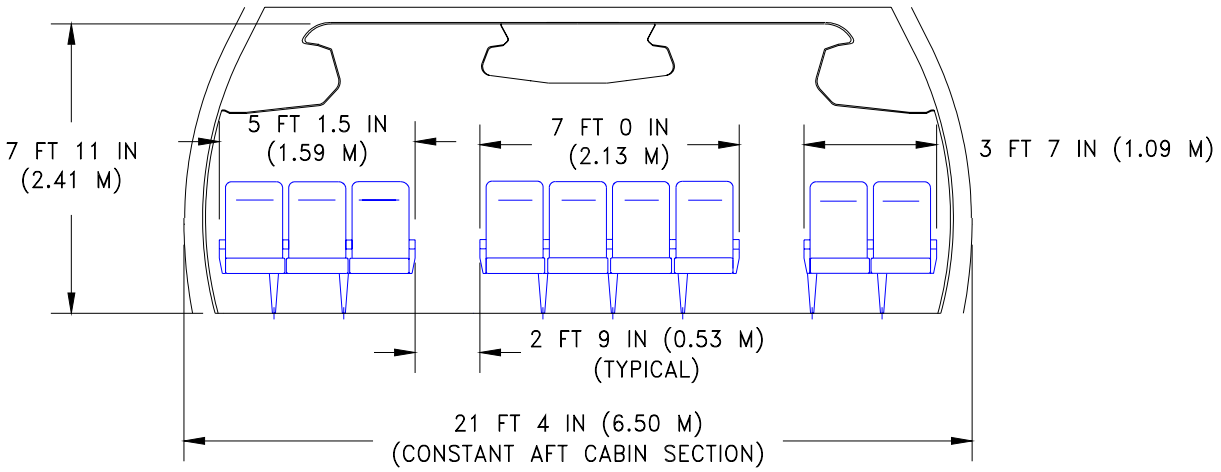
MAIN DECK - 7-ABREAST

2.5.2 CABIN CROSS-SECTIONS - BUSINESS CLASS SEATS

MODEL 747-400



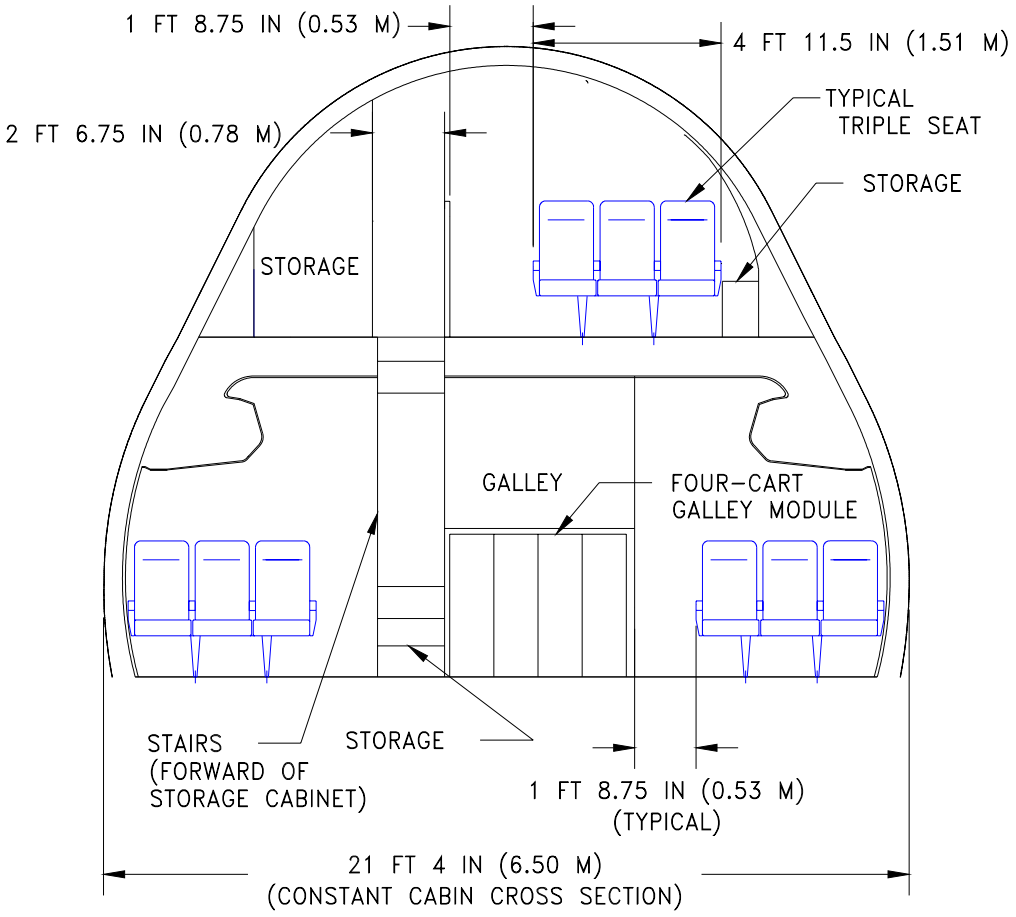
UPPER DECK – 6–ABREAST
MAIN DECK – 10–ABREAST



MAIN DECK – 9–ABREAST

2.5.3 CABIN CROSS-SECTIONS - ECONOMY CLASS SEATS

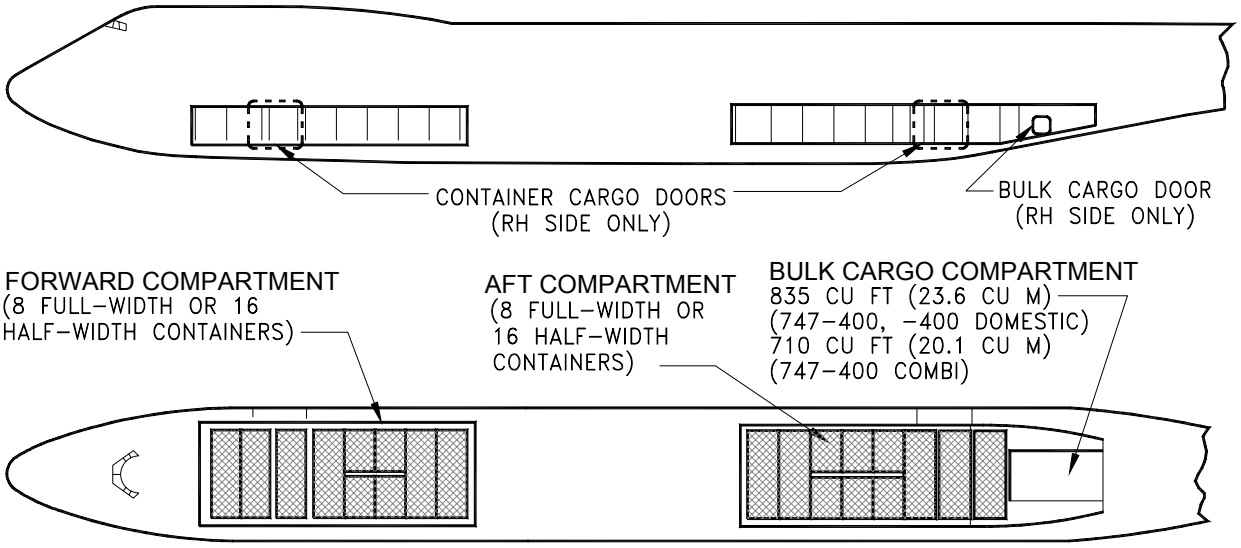
MODEL 747-400

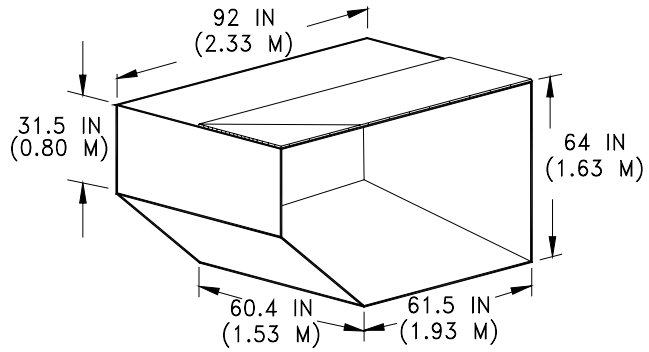


SECTION THROUGH STAIRS
(VIEW LOOKING FORWARD)

2.5.4 CABIN CROSS-SECTIONS - GALLEY AND STAIRS

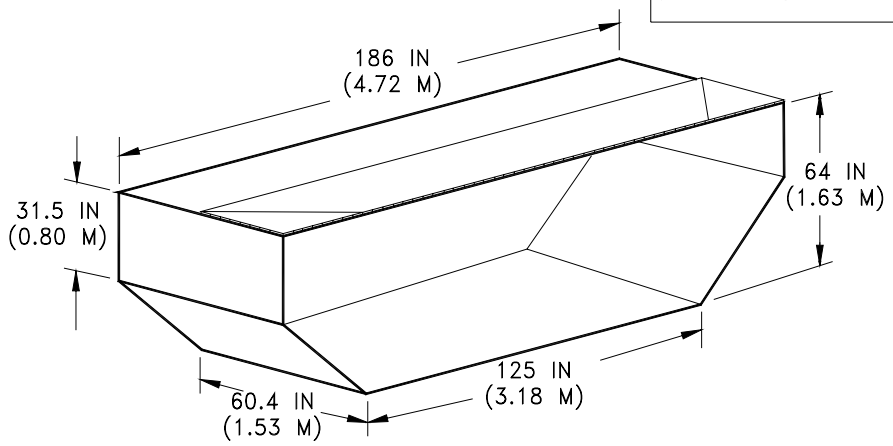
MODEL 747-400





HALF-WIDTH CONTAINER (LD1)

CONTAINER DATA		
	HALF–WIDTH	FULL–WIDTH
INTERNAL VOLUME PER CONTAINER	173 CU FT 4.9 CU M	350 CU FT 9.9 CU M
TARE WEIGHT	270 LB 123 KG	470 LB 213 KG
MAXIMUM CARGO WEIGHT PER CONTAINER	3,230 LB 1,467 KG	6,530 LB 2,965 KG
MAXIMUM GROSS WEIGHT PER CONTAINER	3,500 LB 1,590 KG	7,000 LB 3,180 KG
TOTAL VOLUME OF 16 FULL–WIDTH CONTAINERS IS 5,600 CU FT (158.6 CU M)		
GROSS WEIGHT FOR 16 FULL–WIDTH OR 32 HALF–WIDTH CONTAINERS IS 112,000 LB (50,802 KG)		



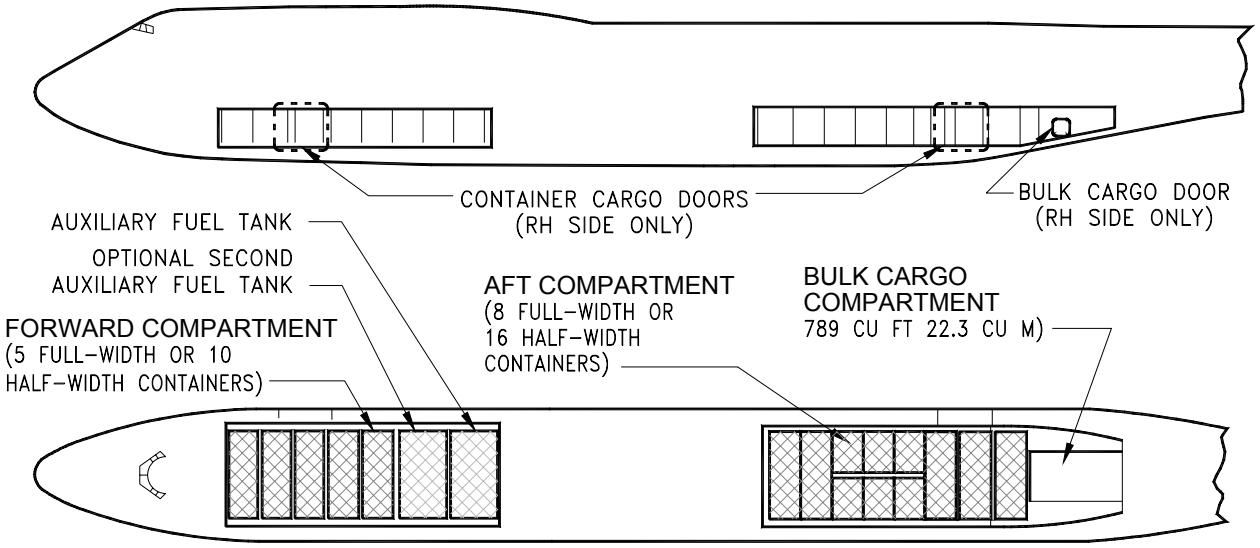
FULL-WIDTH CONTAINER (LD2)

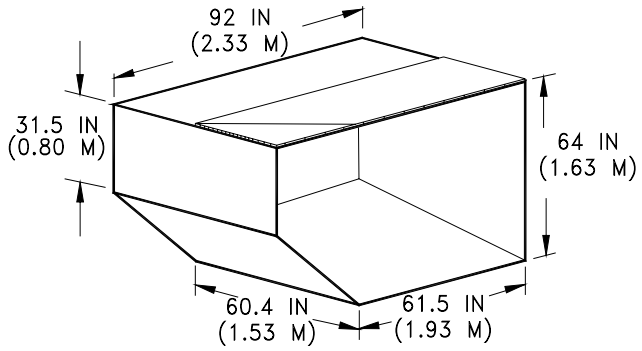
NOTES:

1. CONTAINER WEIGHT AND DATA ARE TYPICAL. CONSULT USING AIRLINE FOR SPECIFIC DATA.
2. OPTIONS ARE OFFERED FOR CARRAIGE OF CERTAIN STANDARD MILITARY AND COMMERCIAL PALLETS IN CONTAINER COMPARTMENTS.

2.6.1 LOWER CARGO COMPARTMENTS - CONTAINERS AND BULK CARGO

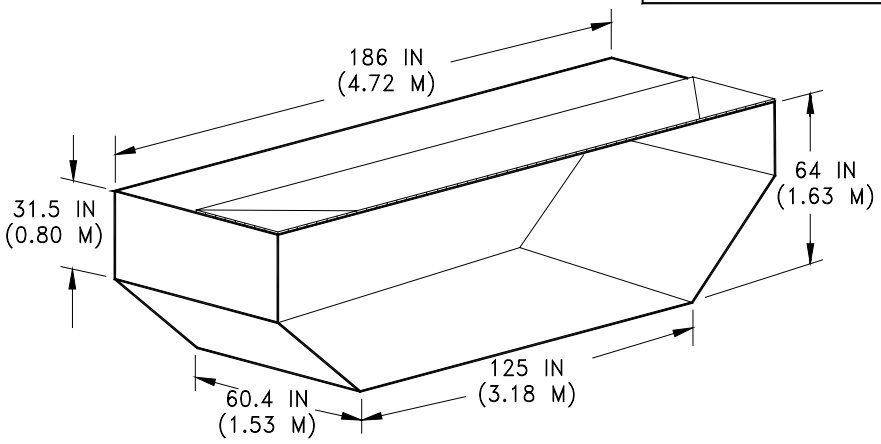
MODEL 747-400, -400 COMBI, -400 DOMESTIC





HALF-WIDTH CONTAINER (LD1)

CONTAINER DATA		
CONTAINER DATA	HALF-WIDTH	FULL-WIDTH
INTERNAL VOLUME PER CONTAINER	173 CU FT 4.9 CU M	350 CU FT 9.9 CU M
TARE WEIGHT	270 LB 123 KG	470 LB 213 KG
MAXIMUM CARGO WEIGHT PER CONTAINER	3,230 LB 1,467 KG	6,530 LB 2,965 KG
MAXIMUM GROSS WEIGHT PER CONTAINER	3,500 LB 1,590 KG	7,000 LB 3,180 KG
TOTAL VOLUME OF 13 FULL-WIDTH CONTAINERS IS 4,550 CU FT (128.8 CU M)		
GROSS WEIGHT FOR 13 FULL-WIDTH OR 26 HALF-WIDTH CONTAINERS IS 91,000 LB (35,872 KG)		



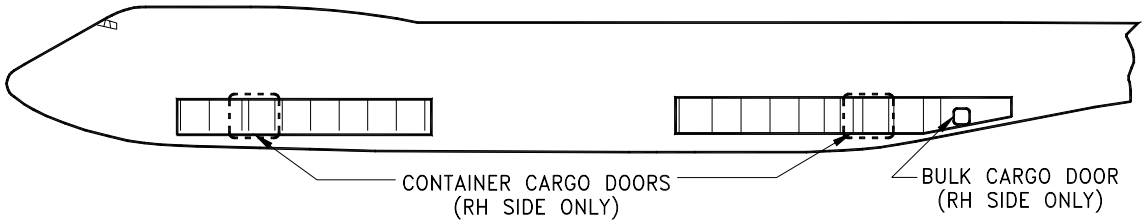
FULL-WIDTH CONTAINER (LD2)

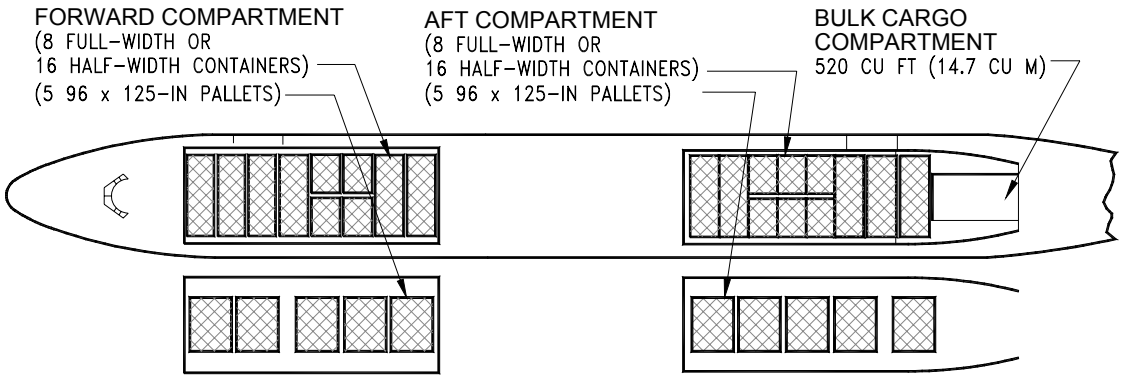
NOTES:

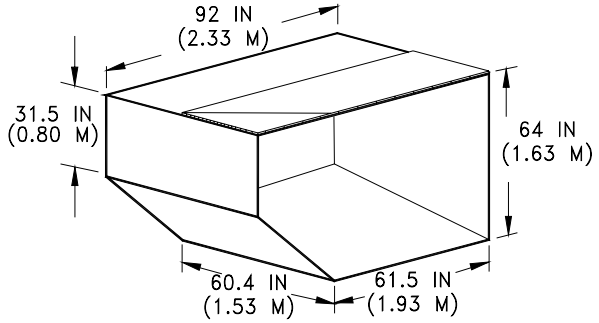
1. CONTAINER WEIGHT AND DATA ARE TYPICAL. CONSULT USING AIRLINE FOR SPECIFIC DATA.
2. OPTIONS ARE OFFERED FOR CARRIAGE OF CERTAIN STANDARD MILITARY AND COMMERCIAL PALLETS IN CONTAINER COMPARTMENTS.

2.6.2 LOWER CARGO COMPARTMENTS - CONTAINERS AND BULK CARGO

MODEL 747-400ER

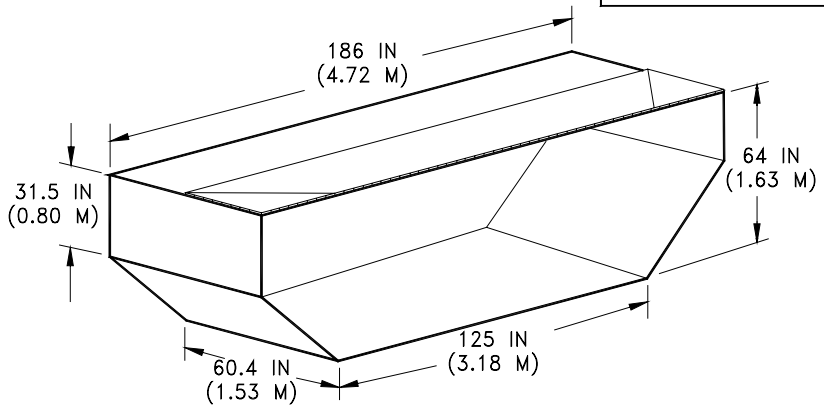






HALF-WIDTH CONTAINER (LD1)

CONTAINER DATA		
CONTAINER DATA	HALF-WIDTH	FULL-WIDTH
INTERNAL VOLUME PER CONTAINER	173 CU FT 4.9 CU M	350 CU FT 9.9 CU M
TARE WEIGHT	270 LB 123 KG	470 LB 213 KG
MAXIMUM CARGO WEIGHT PER CONTAINER	3,230 LB 1,467 KG	6,530 LB 2,965 KG
MAXIMUM GROSS WEIGHT PER CONTAINER	3,500 LB 1,590 KG	7,000 LB 3,180 KG
TOTAL VOLUME OF 16 FULL-WIDTH CONTAINERS IS 5,600 CU FT (158.6 CU M)		
GROSS WEIGHT FOR 16 FULL-WIDTH OR 32 HALF-WIDTH CONTAINERS IS 112,000 LB (50,802 KG)		



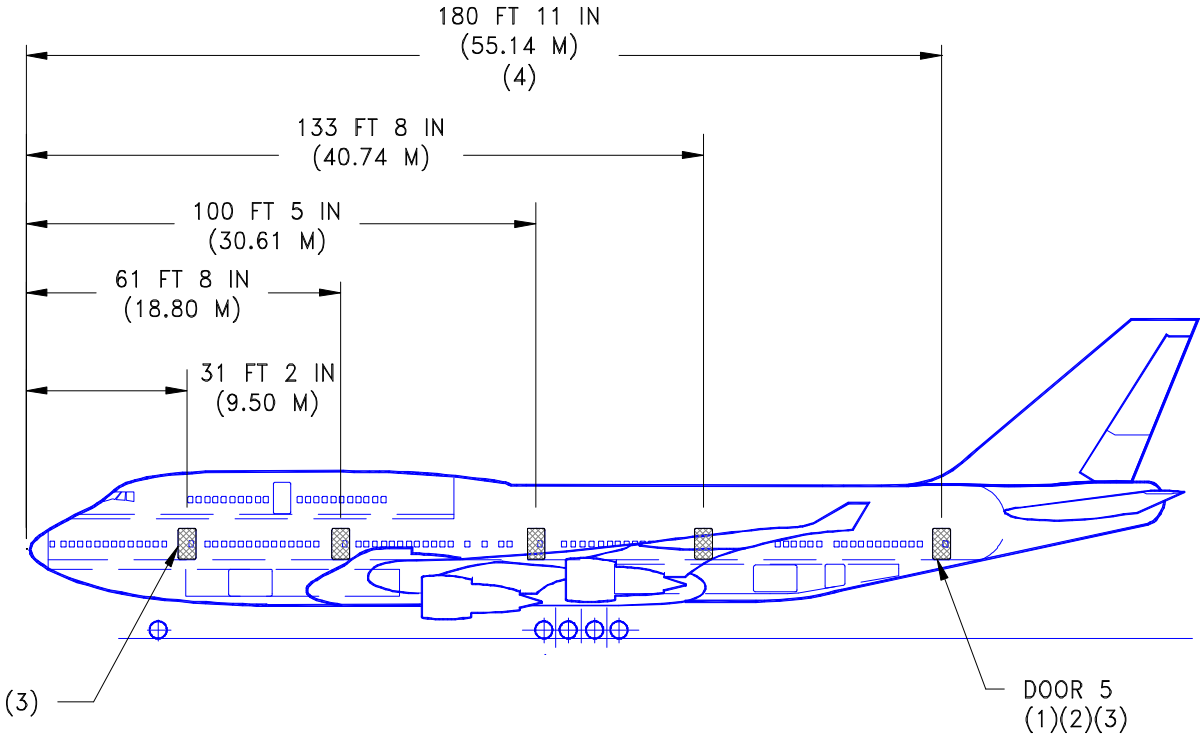
NOTES:

1. CONTAINER WEIGHT AND DATA ARE TYPICAL. CONSULT USING AIRLINE FOR SPECIFIC DATA.
2. OPTIONS ARE OFFERED FOR CARRIAGE OF CERTAIN STANDARD MILITARY AND COMMERCIAL PALLETS IN CONTAINER COMPARTMENTS.

FULL-WIDTH CONTAINER (LD2)

2.6.3 LOWER CARGO COMPARTMENTS - CONTAINERS AND BULK CARGO

MODEL 747-400 FREIGHTER, -400ER FREIGHTER



NOTES:

(1) 10 PASSENGER DOORS – 5 EACH SIDE
DOOR OPENING SIZE = 42 BY 76 IN (1.07 BY 1.93 M)
OVERALL DOOR SIZE = 47 BY 76 IN (1.19 BY 1.93 M)

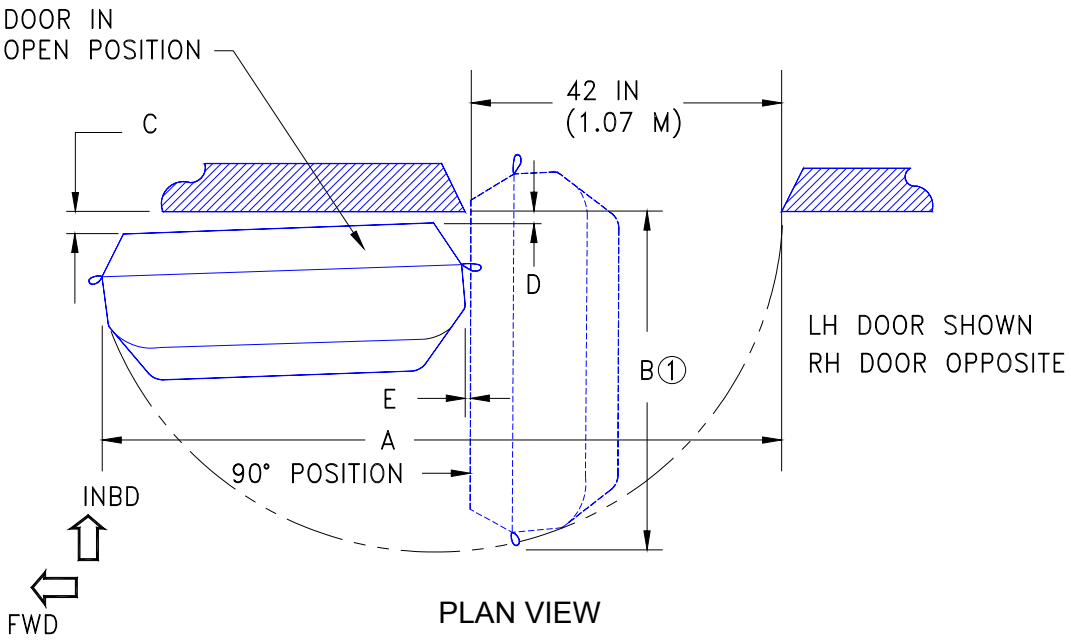
(2) SEE SECTION 2.3 FOR DOOR SILL HEIGHTS

(3) LH DOOR NO. 1 AND NO. 5 ON 747–400 FREIGHTER, –400ER FREIGHTER

(4) 180 FT 5 IN (55.00 M) ON 747–400 FREIGHTER, –400ER FREIGHTER

2.7.1 DOOR CLEARANCES - MAIN ENTRY DOOR LOCATIONS

MODEL 747-400



PLAN VIEW

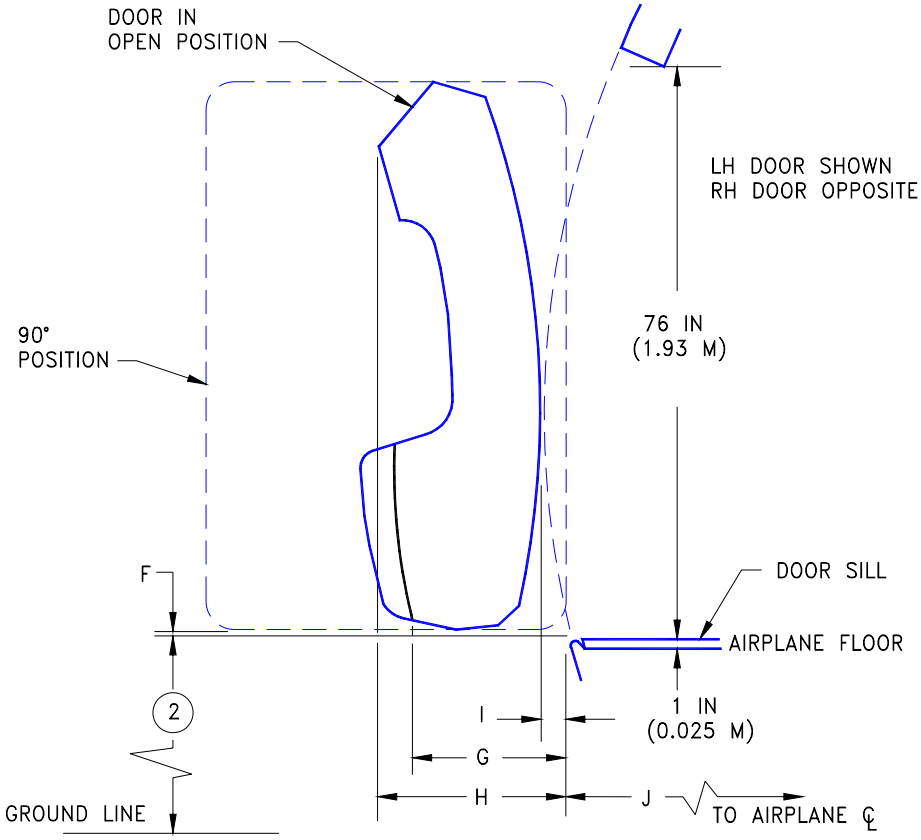
	DOOR NUMBER			
	1 ②	2	3	4
A	7 FT 6 IN	7 FT 6 IN	7 FT 6 IN	7 FT 6 IN
	2.29 M	2.29 M	2.29 M	2.29 M
B ①	3 FT 9 IN	3 FT 10 IN	3 FT 10 IN	3 FT 10 IN
	1.14 M	1.17 M	1.17 M	1.17 M
C	4 IN	3 IN	3 IN	3 IN
	0.102 M	0.076 M	0.076 M	0.076 M
D	1 IN	1 IN	1 IN	1 IN
	0.025 M	0.025 M	0.025 M	0.025 M
E	1 IN	1 IN	1 IN	1 IN
	0.025 M	0.025 M	0.025 M	0.025 M

① MEASURED AT DOOR OPENING CENTERLINE AT DOOR SILL LEVEL AT 90° FROM AIRPLANE CENTERLINE.

② LH SIDE ONLY ON 747−400 FREIGHTER, −400ER FREIGHTER.

2.7.2 DOOR CLEARANCES - MAIN ENTRY DOORS 1-4 (PLAN VIEW)

MODEL 747-400



VIEW LOOKING FORWARD

	DOOR NUMBER			
	1 (3)	2	3	4
F	2 IN (0.05 M)			
G (1)	1 FT 7 IN (0.48 M)	1 FT 10 IN (0.56 M)		
H (1)	1 FT 11 IN (0.58 M)	2 FT (0.61 M)	1 FT 9 IN (0.53 M)	2 FT (0.61 M)
I (1)	1 IN (0.025 M)	3 IN (0.076 M)	0	3 IN (0.076 M)
J (1)	9 FT 6 IN (2.90 M)	10 FT 5 IN (3.18 M)	10 FT 8 IN (3.25 M)	10 FT 5 IN (3.18 M)

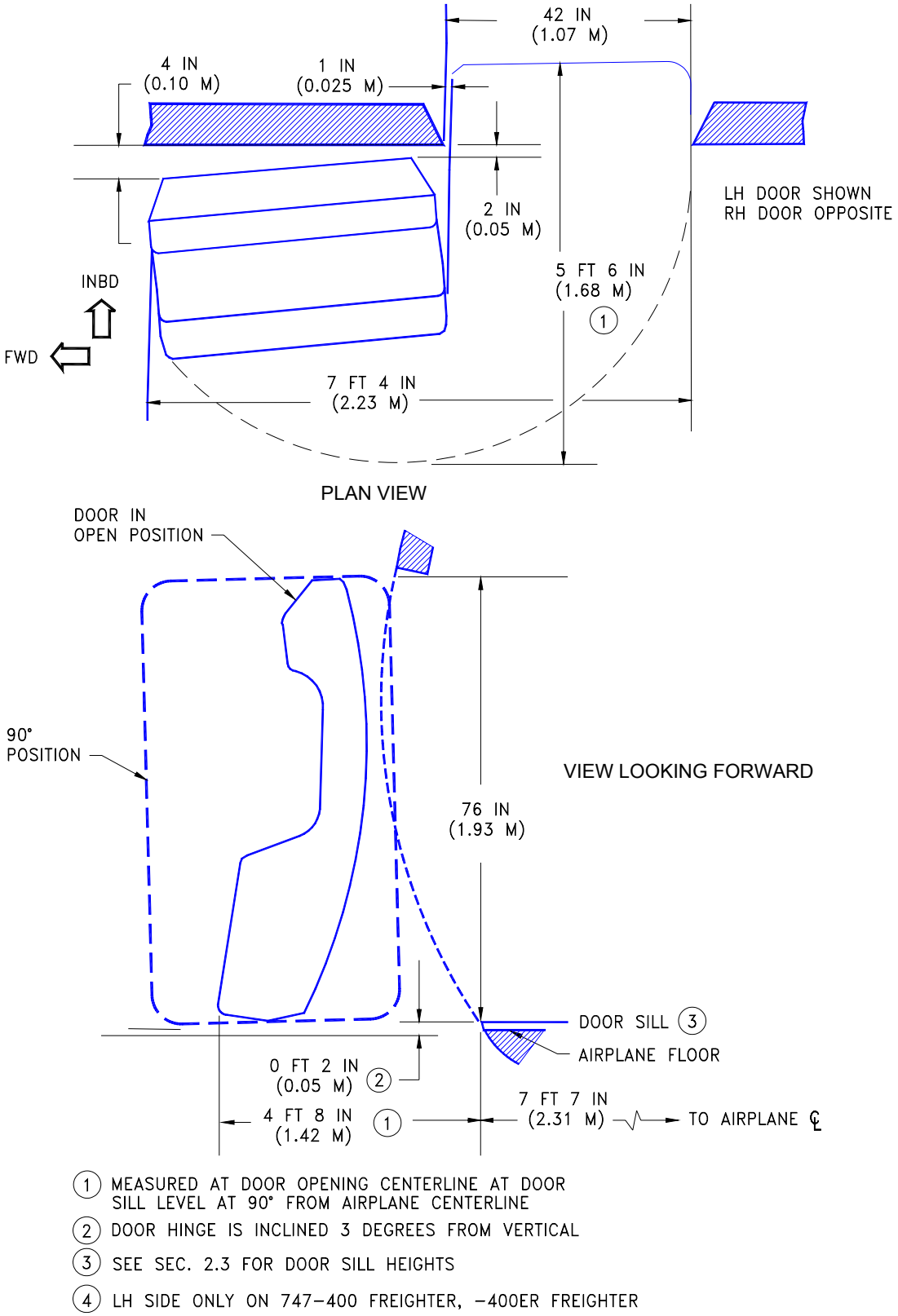
(1) MEASURED AT DOOR OPENING CENTERLINE AT DOOR SILL LEVEL AT 90° FROM AIRPLANE CENTERLINE

(2) SEE SEC. 2.3 FOR DOOR SILL HEIGHTS

(3) LH SIDE ONLY ON 747-400 FREIGHTER, -400ER FREIGHTER

2.7.3 DOOR CLEARANCES - MAIN ENTRY DOORS 1-4 (SIDE VIEW)

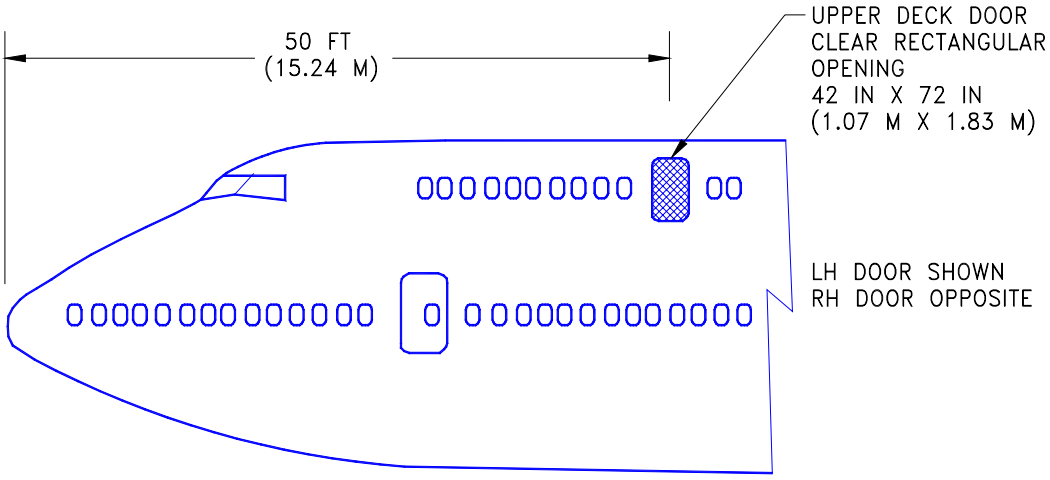
MODEL 747-400



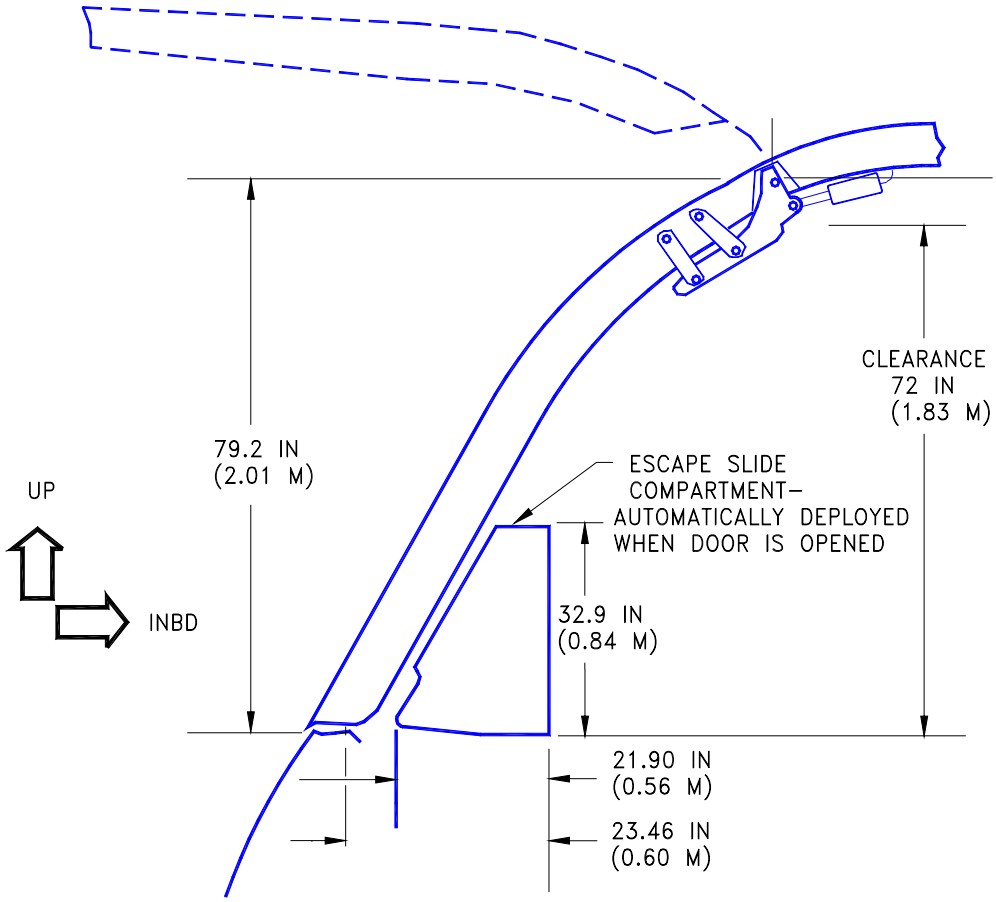
1. MEASURED AT DOOR OPENING CENTERLINE AT DOOR SILL LEVEL AT 90° FROM AIRPLANE CENTERLINE
2. DOOR HINGE IS INCLINED 3 DEGREES FROM VERTICAL
3. SEE SEC. 2.3 FOR DOOR SILL HEIGHTS
4. LH SIDE ONLY ON 747–400 FREIGHTER, –400ER FREIGHTER

2.7.4 DOOR CLEARANCES - MAIN ENTRY DOOR 5

MODEL 747-400



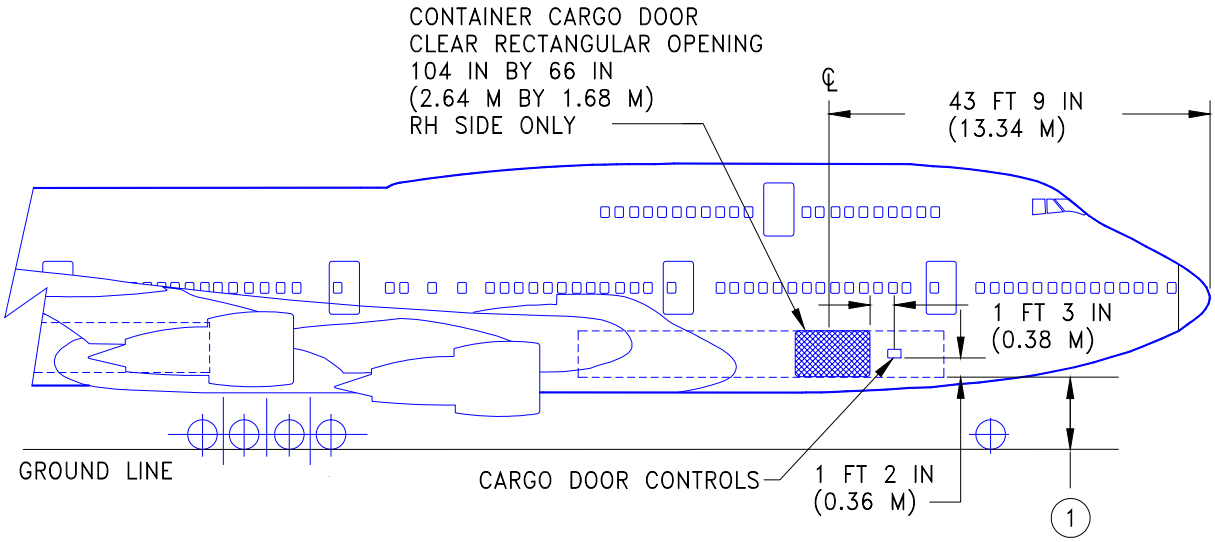
LEFT SIDE VIEW



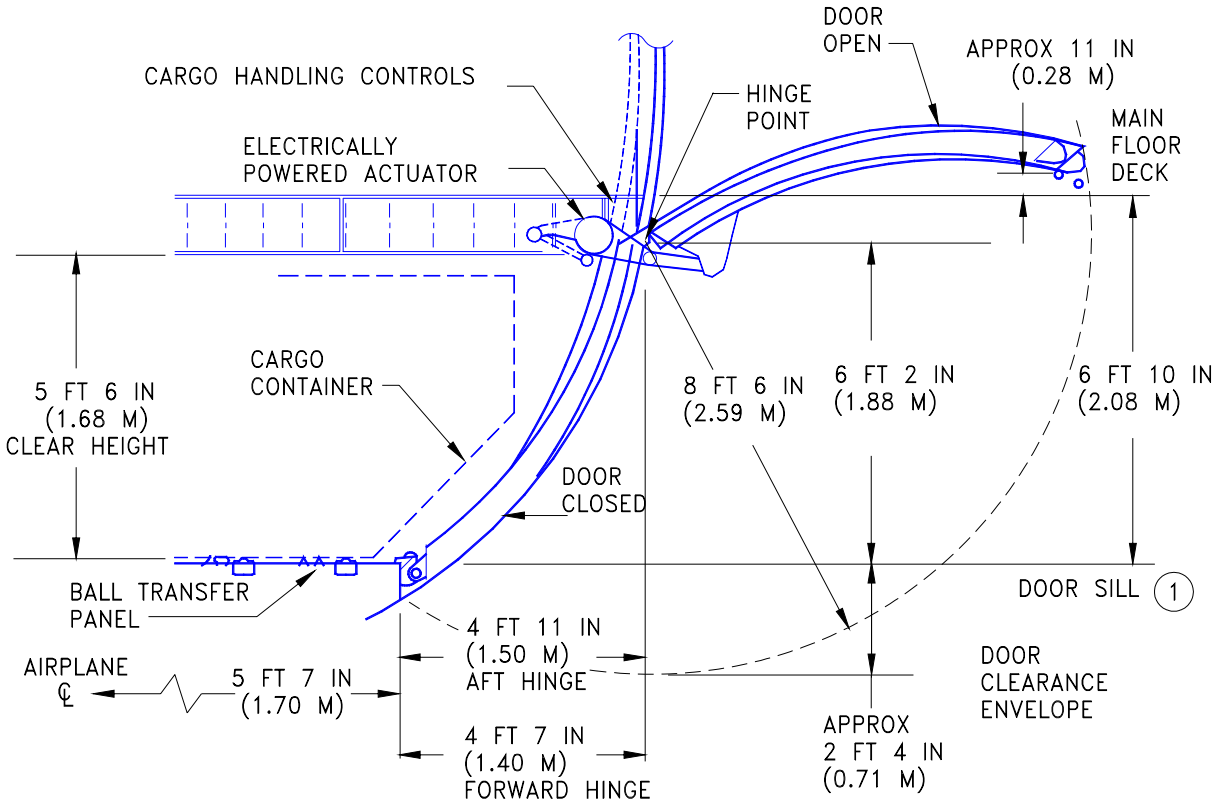
VIEW LOOKING FORWARD

2.7.5 DOOR CLEARANCES - UPPER DECK EMERGENCY EXIT DOOR

MODEL 747-400



RIGHT SIDE VIEW

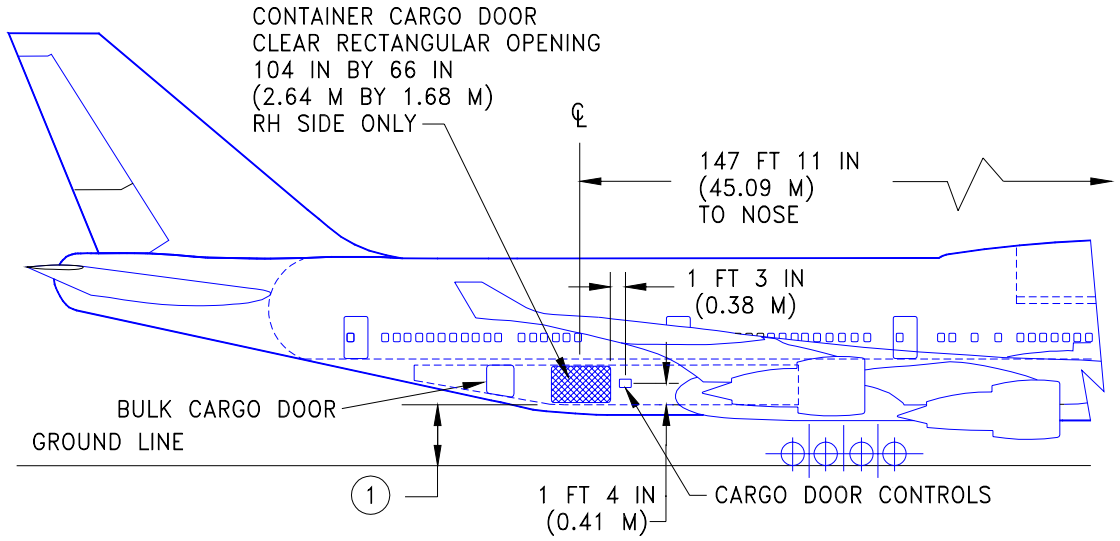


CONTAINER CARGO DOOR - VIEW LOOKING FORWARD

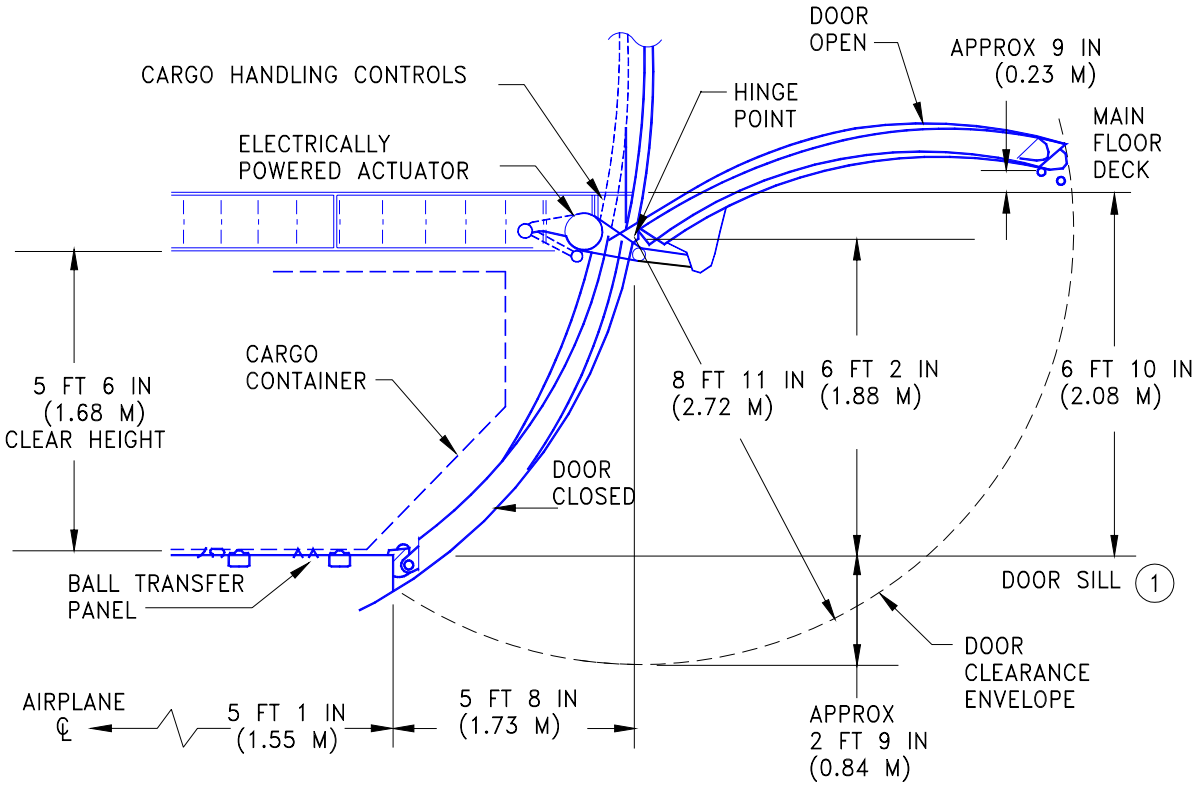
(1) SEE SECTION 2.3 FOR DOOR SILL HEIGHTS

2.7.6 DOOR CLEARANCES - LOWER FORWARD CARGO COMPARTMENT

MODEL 747-400



RIGHT SIDE VIEW

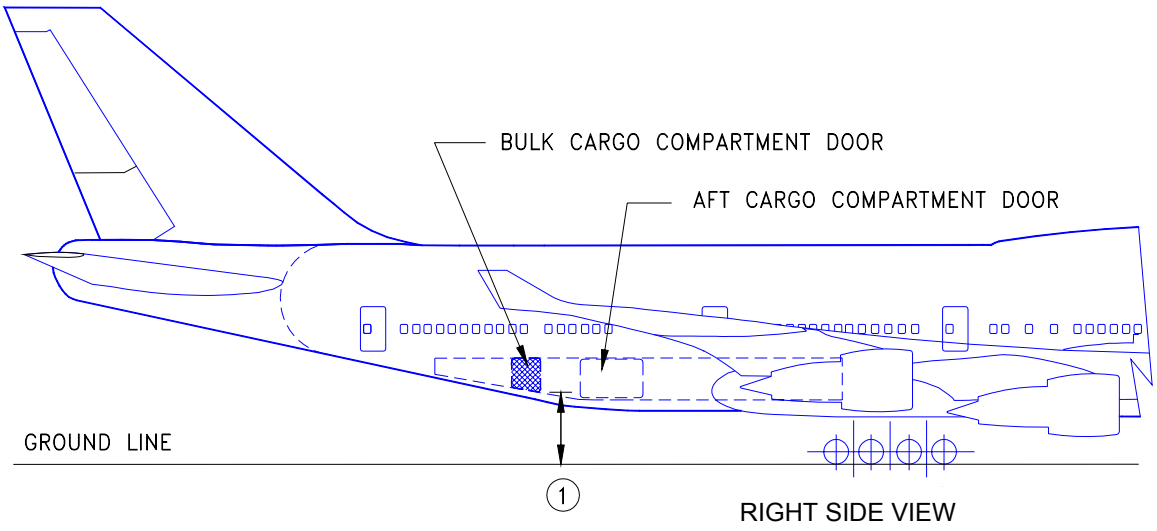


CONTAINER CARGO DOOR - VIEW LOOKING FORWARD

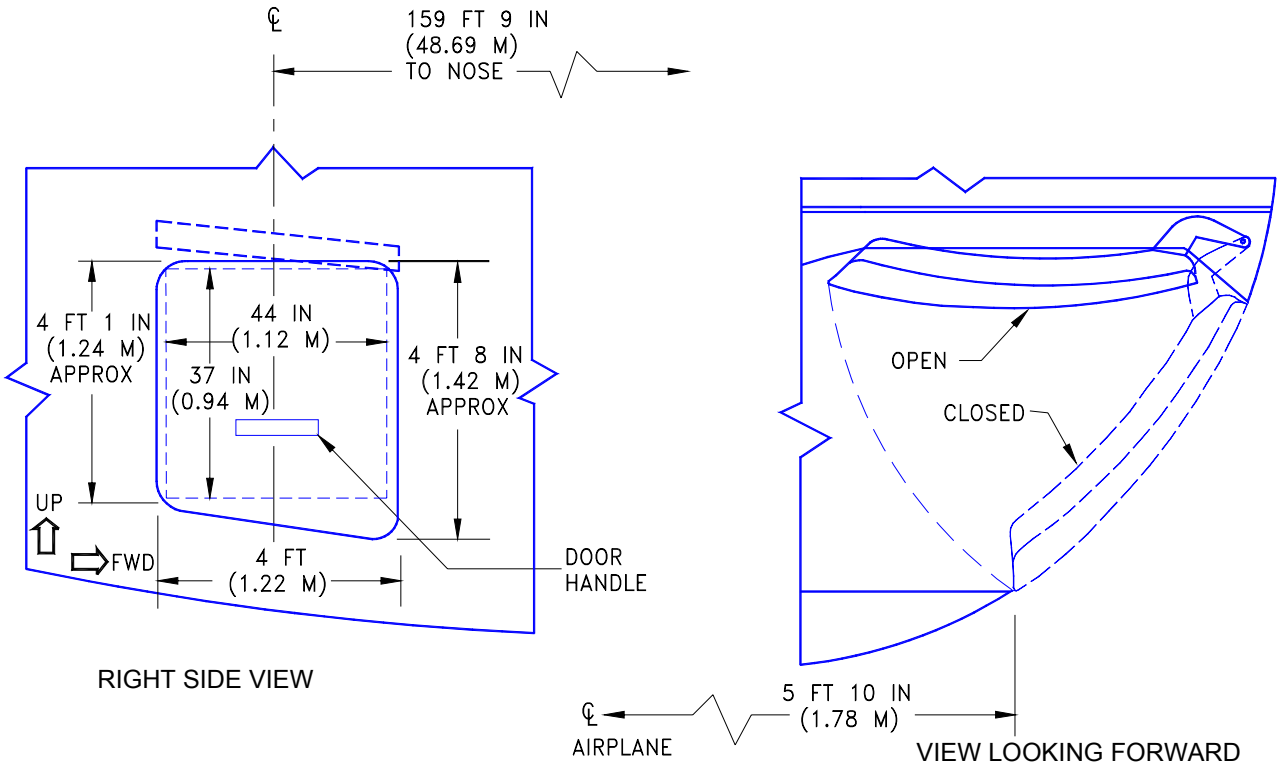
(1) SEE SECTION 2.3 FOR DOOR SILL HEIGHTS

2.7.7 DOOR CLEARANCES - LOWER AFT CARGO COMPARTMENT

MODEL 747-400

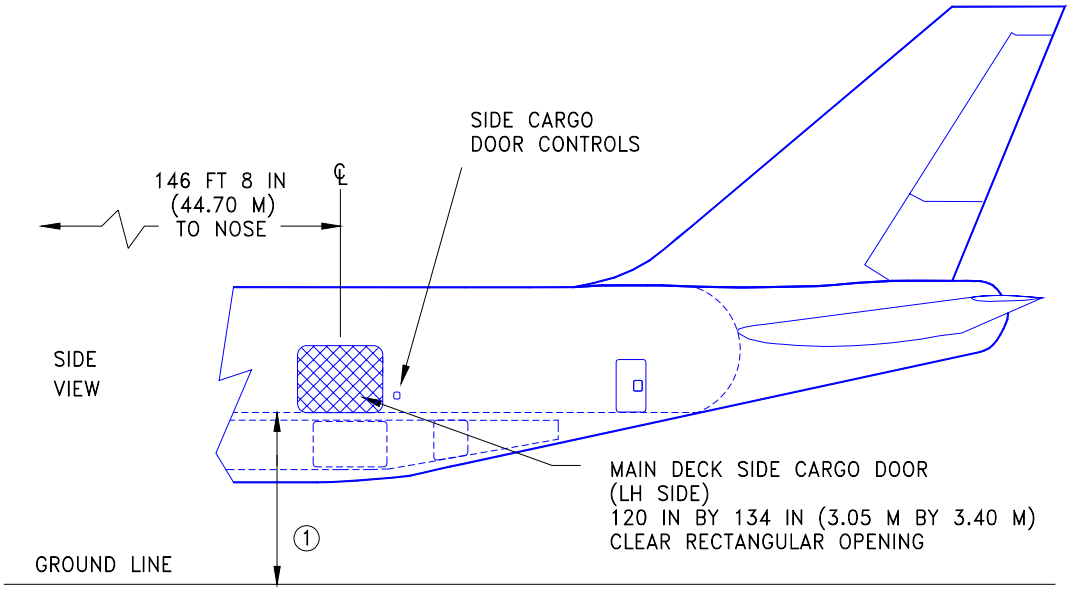


1 SEE SECTION 2.3 FOR DOOR SILL HEIGHTS

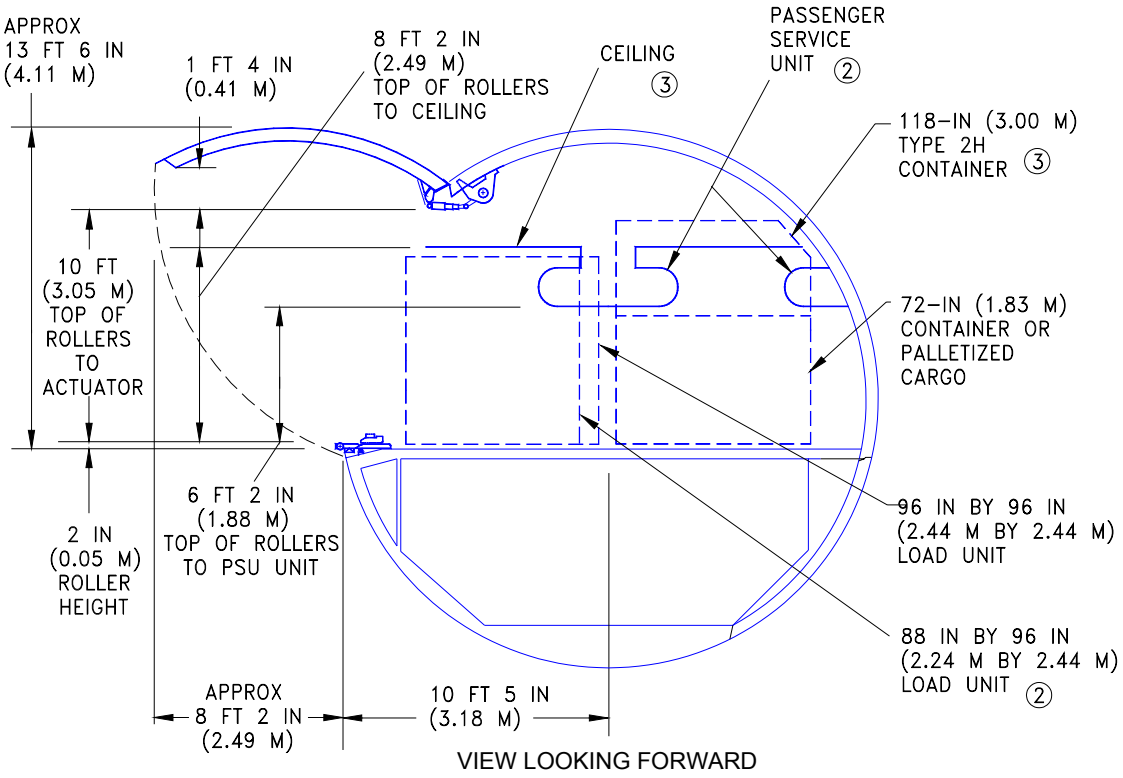


2.7.8 DOOR CLEARANCES - BULK CARGO COMPARTMENT

MODEL 747-400



LEFT SIDE VIEW



VIEW LOOKING FORWARD

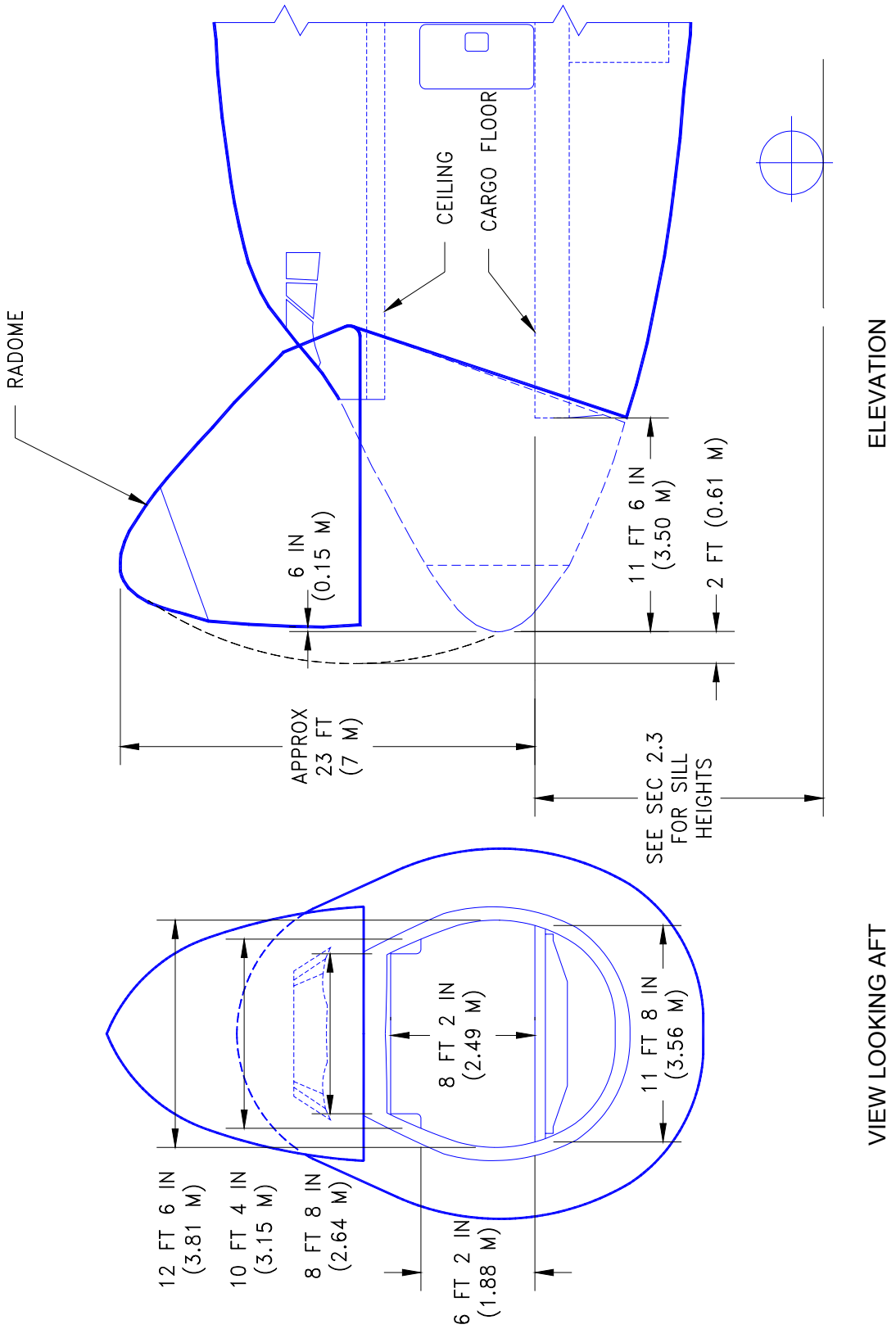
① SEE SECTION 2.3 FOR DOOR SILL HEIGHTS

② PSU'S ARE REMOVED WHEN 96–IN HIGH CONTAINER OR PALLET IS LOADED

③ CEILING IS REMOVED WHEN TYPE 2H CONTAINER IS LOADED

2.7.9 DOOR CLEARANCES - MAIN DECK CARGO DOOR

MODEL 747-400 COMBI, -400 FREIGHTER, -400ER FREIGHTER



2.7.10 DOOR CLEARANCES - NOSE CARGO DOOR

MODEL 747-400 FREIGHTER, -400ER FREIGHTER

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3.0 AIRPLANE PERFORMANCE

3.1 General Information

3.2 Payload/Range for 0.85 Mach Cruise

3.3 F.A.R. Takeoff Runway Length Requirements

3.4 F.A.R. Landing Runway Length Requirements

3.0 AIRPLANE PERFORMANCE

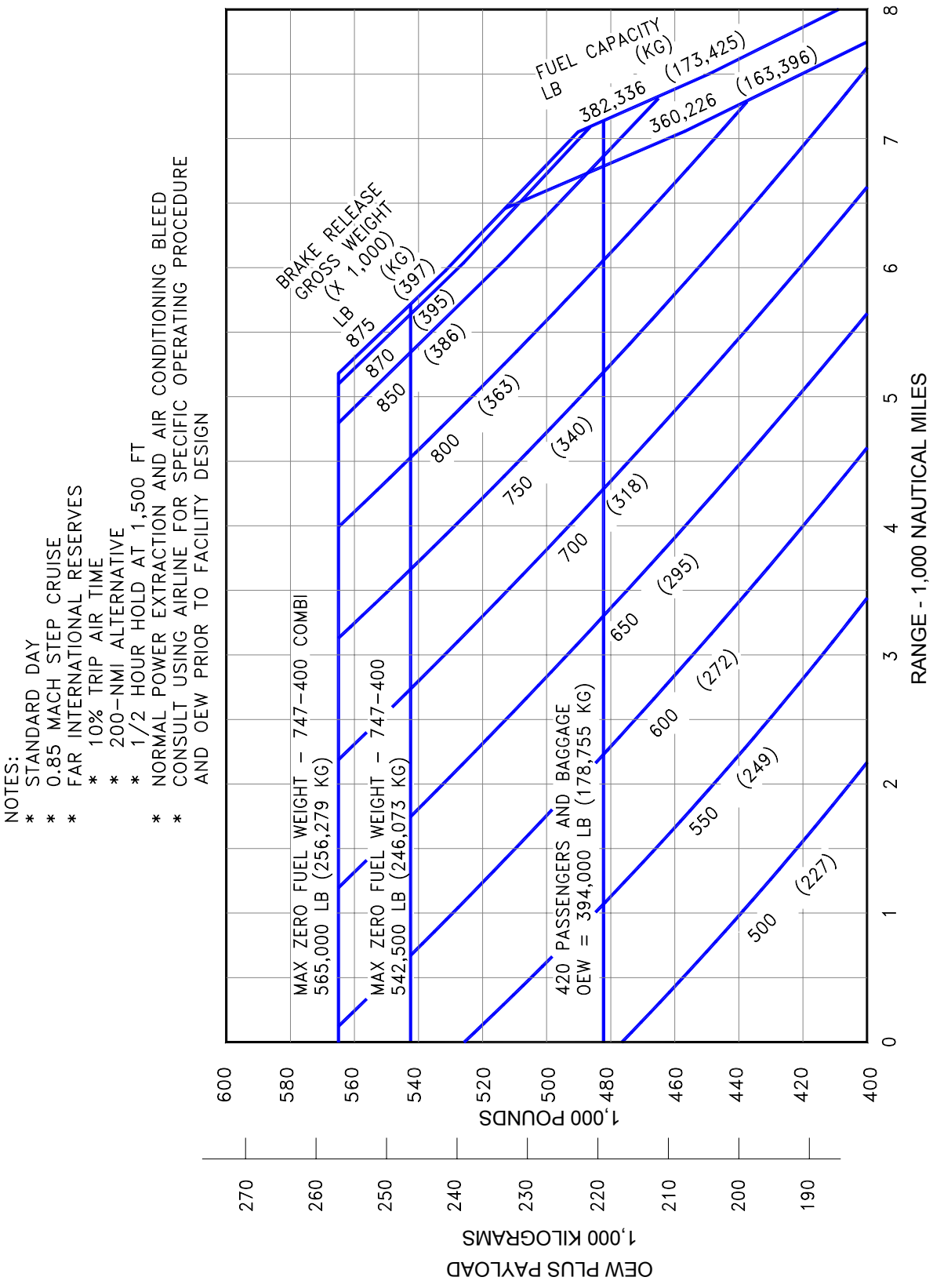
3.1 General Information

The graphs in Section 3.2 provide information on operational empty weight (OEW) and payload, trip range, brake release gross weight, and fuel limits for airplane models with the different engine options. To use these graphs, if the trip range and zero fuel weight (OEW + payload) are known, the approximate brake release weight can be found, limited by fuel quantity. Examples of loading conditions under certain OEW's are illustrated in each graph.

The graphs in Section 3.3 provide information on F.A.R. takeoff runway length requirements with the different engines at different pressure altitudes. Maximum takeoff weights shown on the graphs are the heaviest for the particular airplane models with the corresponding engines. Standard day temperatures for pressure altitudes shown on the F.A.R. takeoff graphs are given below:

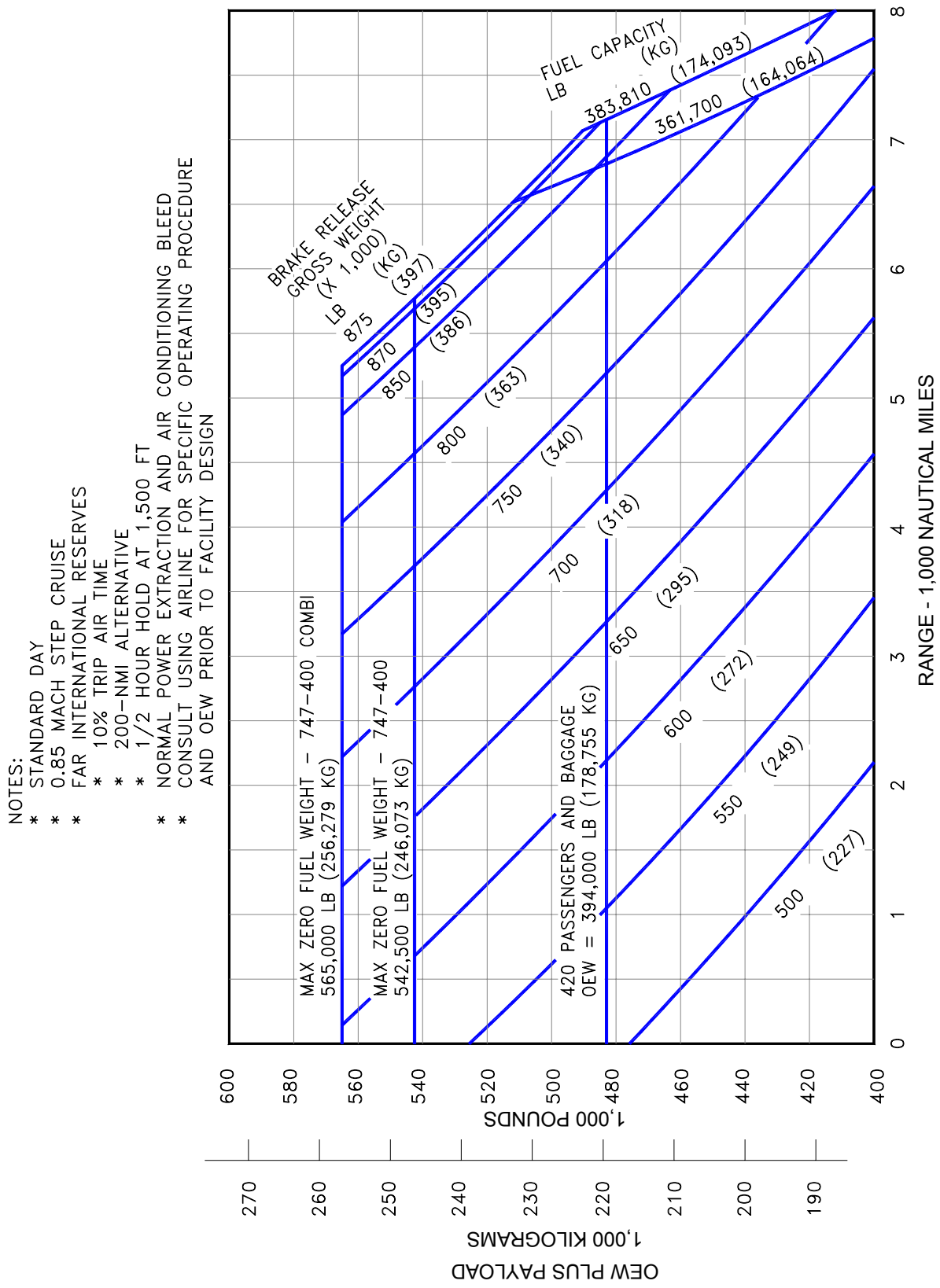
PRESSURE ALTITUDE		STANDARD DAY TEMP	
FEET	METERS	^{o}F	^{o}C
0	0	59.0	15.00
2,000	610	51.9	11.04
4,000	1,219	44.7	7.06
6,000	1,829	37.6	3.11
8,000	2,438	30.5	-0.85
10,000	3,048	23.3	-4.81

The graphs in Section 3.4 provide information on landing runway length requirements for different airplane weights and airport altitudes. The maximum landing weights shown are the heaviest for the particular airplane model.



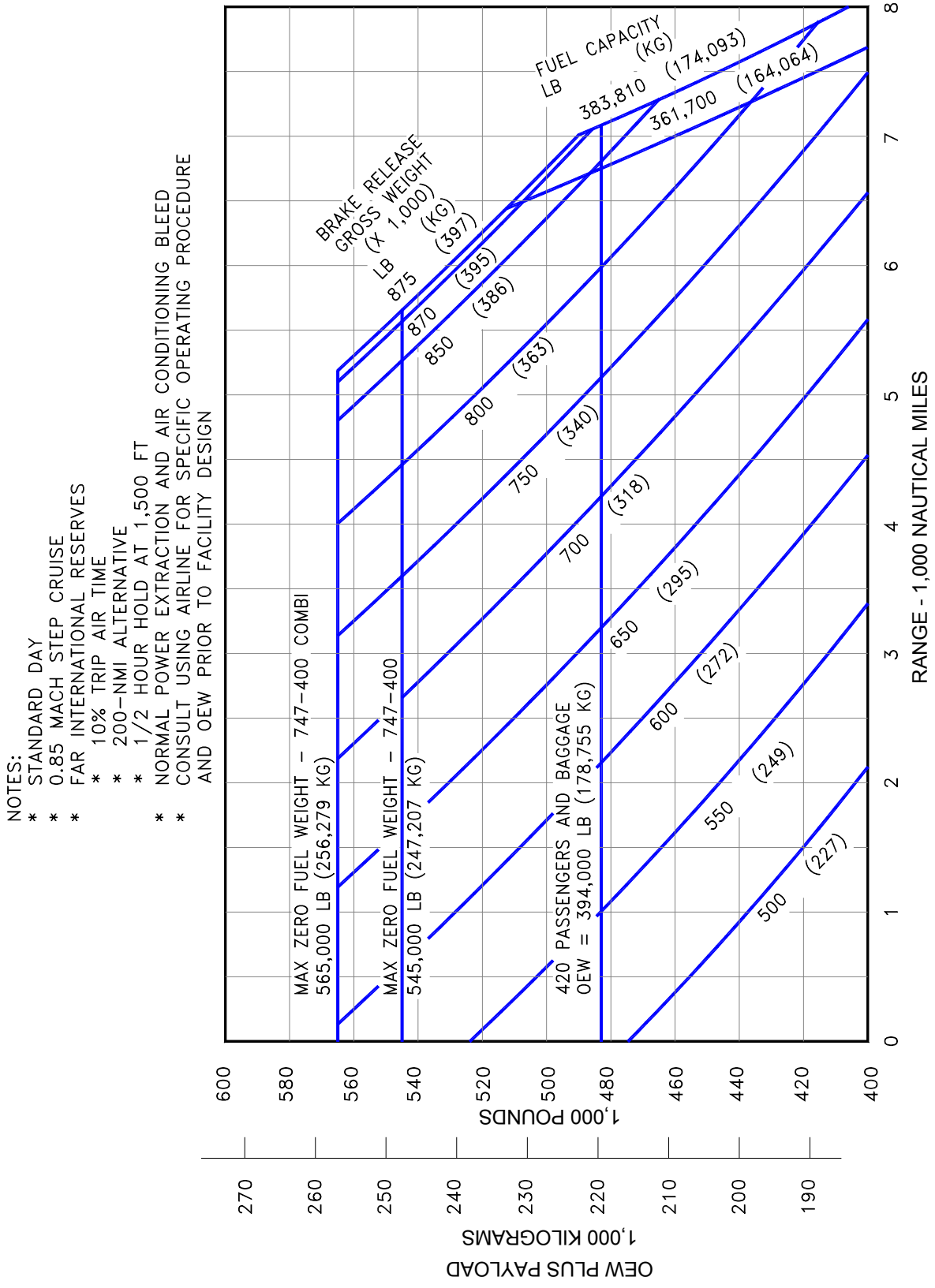
3.2.1 PAYLOAD/RANGE FOR 0.85 MACH CRUISE

MODEL 747-400, -400 COMBI (CF6-80C2B1F ENGINES)



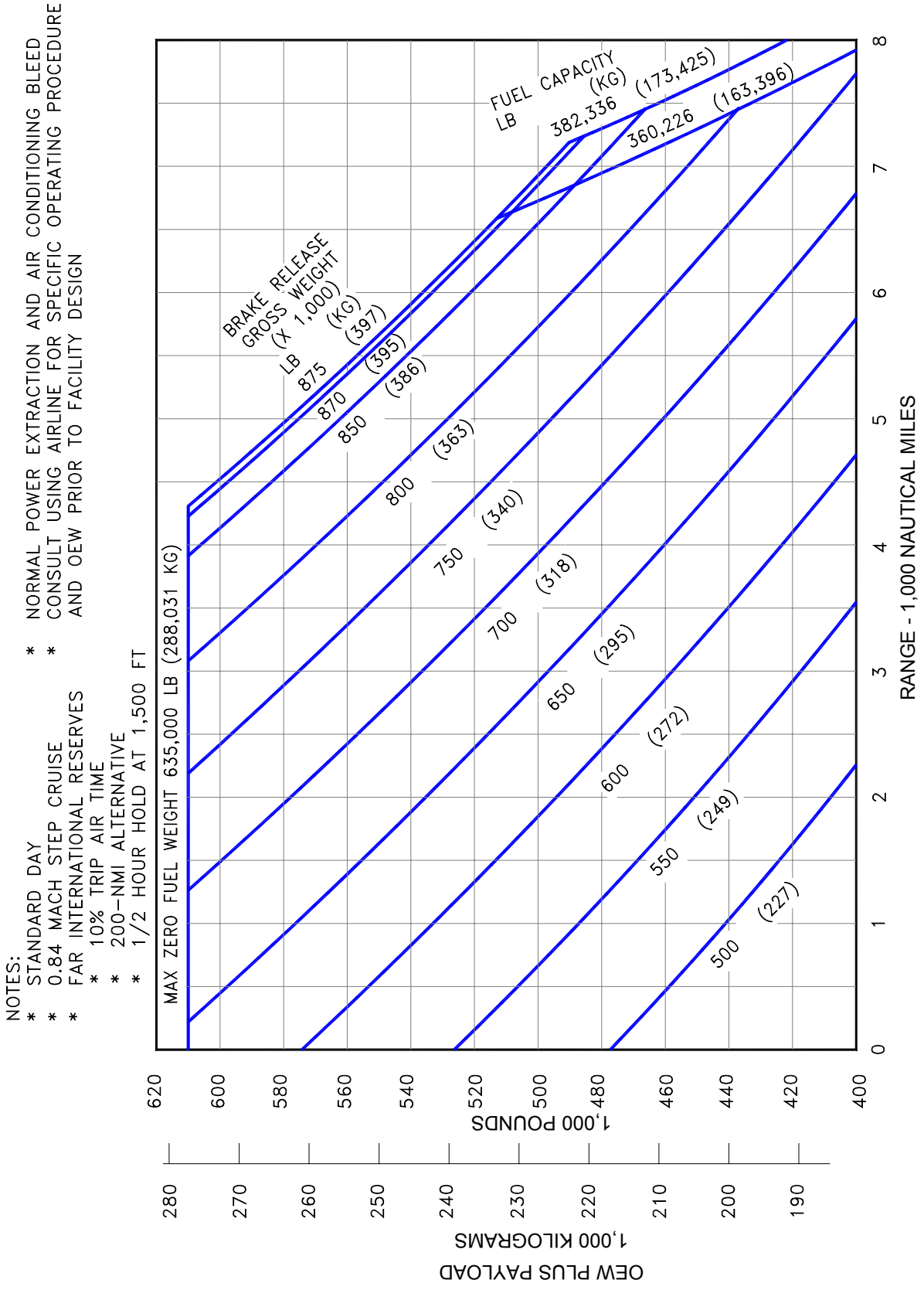
3.2.2 PAYLOAD/RANGE FOR 0.85 MACH CRUISE

MODEL 747-400, -400 COMBI (PW 4056ENGINES)



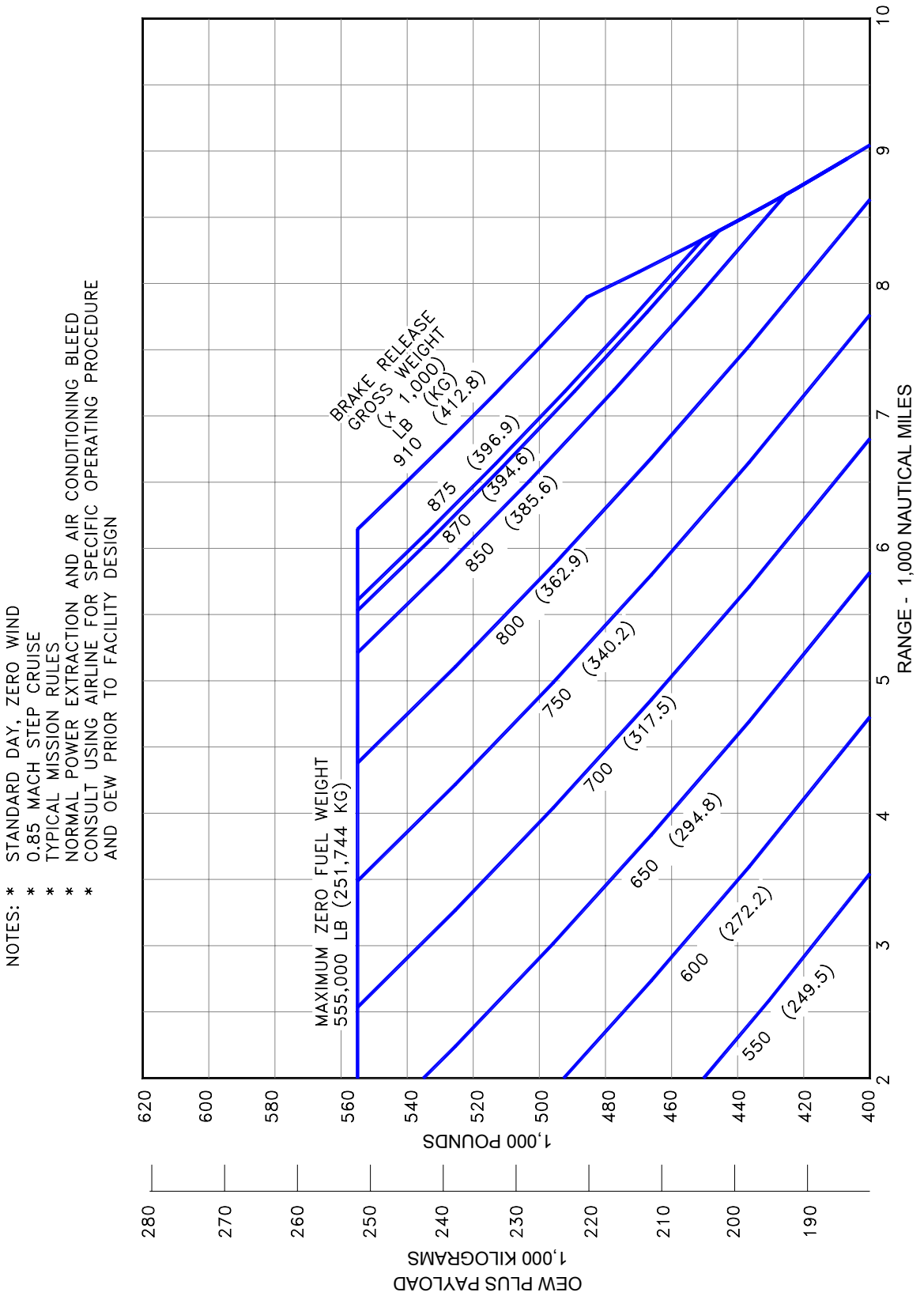
3.2.3 PAYLOAD/RANGE FOR 0.85 MACH CRUISE

MODEL 747-400, -400 COMBI (RB211-524G ENGINES)



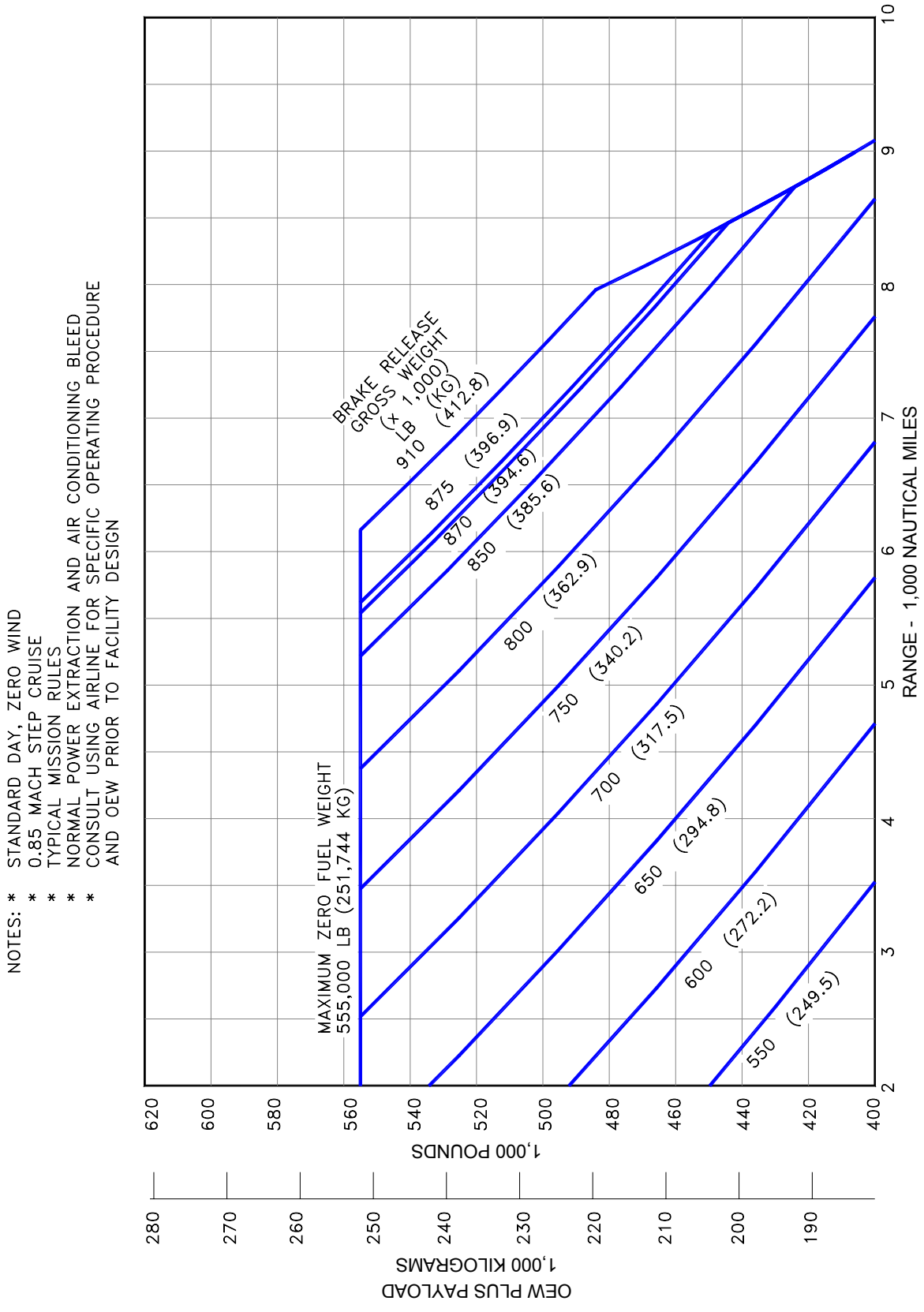
3.2.4 PAYLOAD/RANGE FOR 0.85 MACH CRUISE

MODEL 747-400 FREIGHTER (CF6-80C2B1F ENGINES)



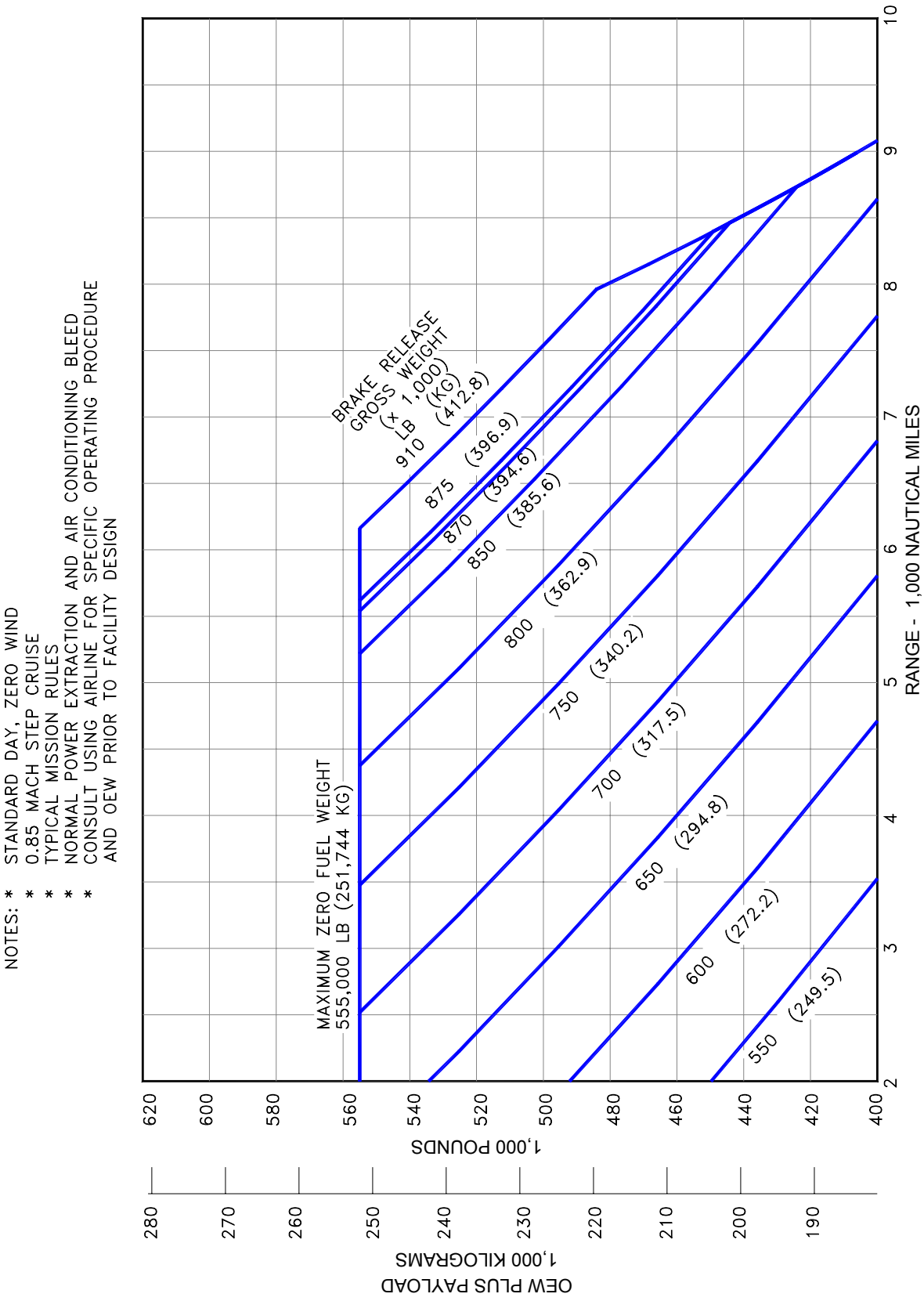
3.2.5 PAYLOAD/RANGE FOR 0.85 MACH CRUISE

MODEL 747-400ER (CF6-80C2B5F ENGINES)



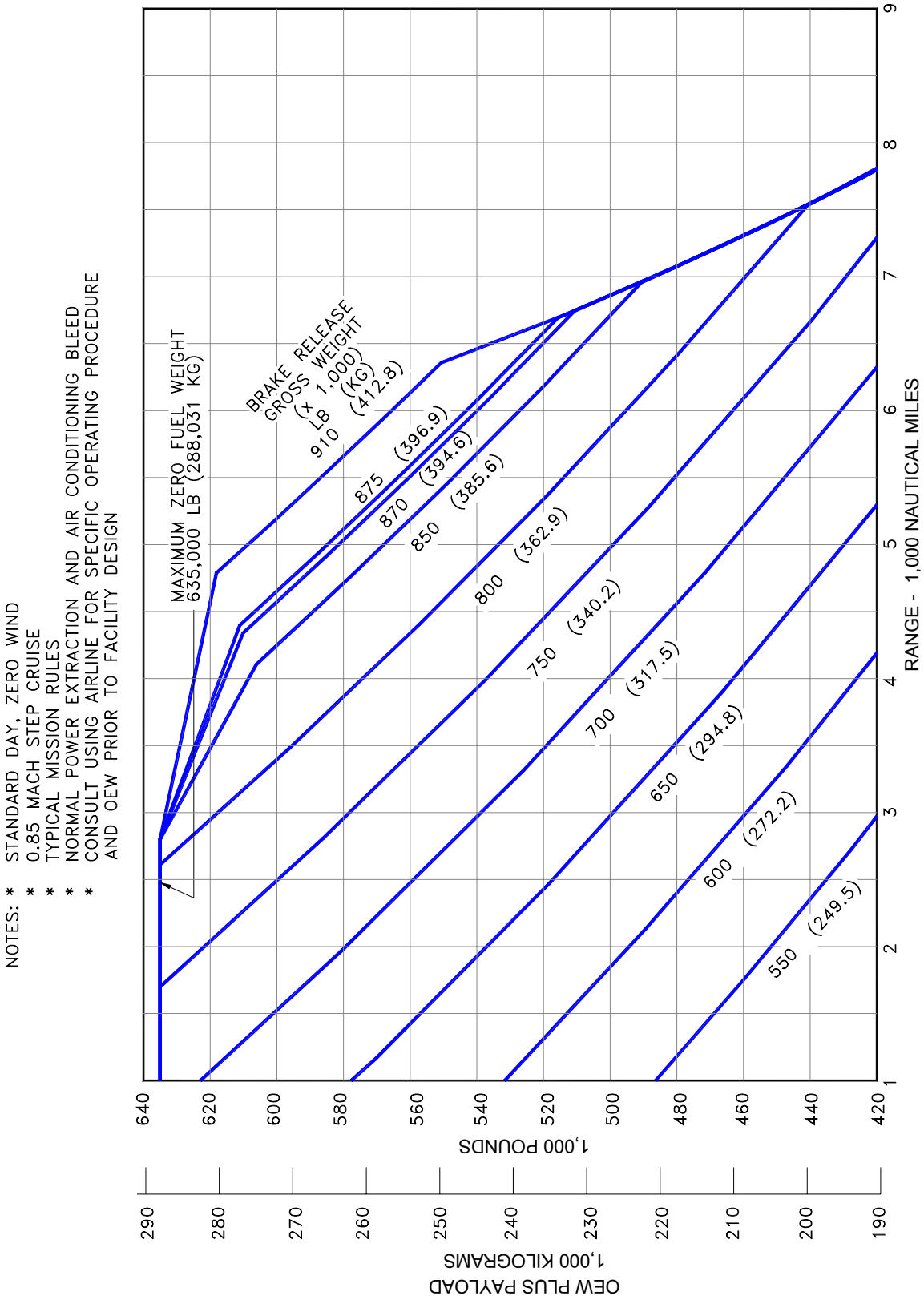
3.2.6 PAYLOAD/RANGE FOR 0.85 MACH CRUISE

MODEL 747-400ER (PW 4062 ENGINES)



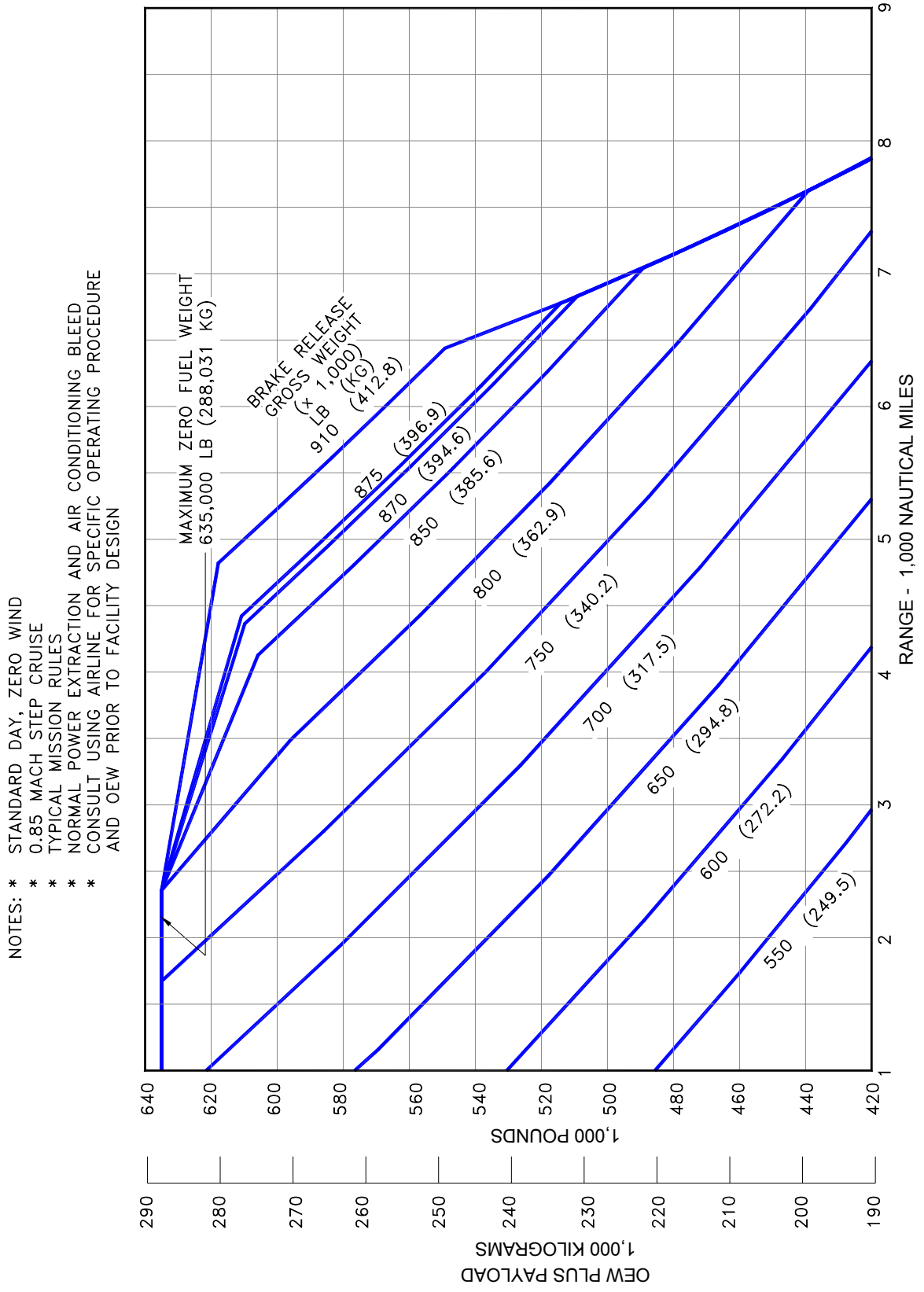
3.2.7 PAYLOAD/RANGE FOR 0.85 MACH CRUISE

MODEL 747-400ER (RB211-524H8-T ENGINES)



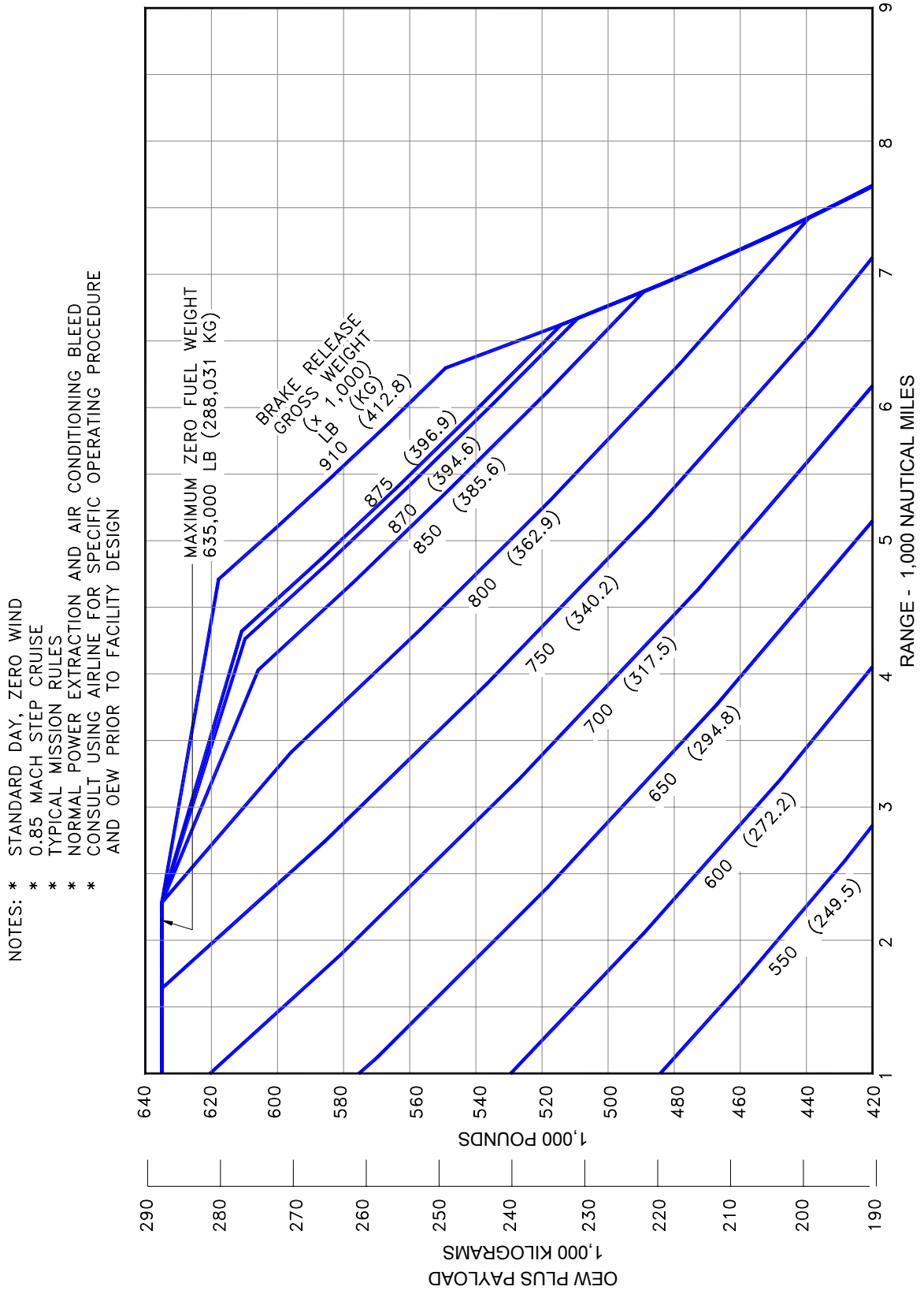
3.2.8 PAYLOAD/RANGE FOR 0.85 MACH CRUISE

MODEL 747-400ER FREIGHTER (CF6-80C2B5F ENGINES)



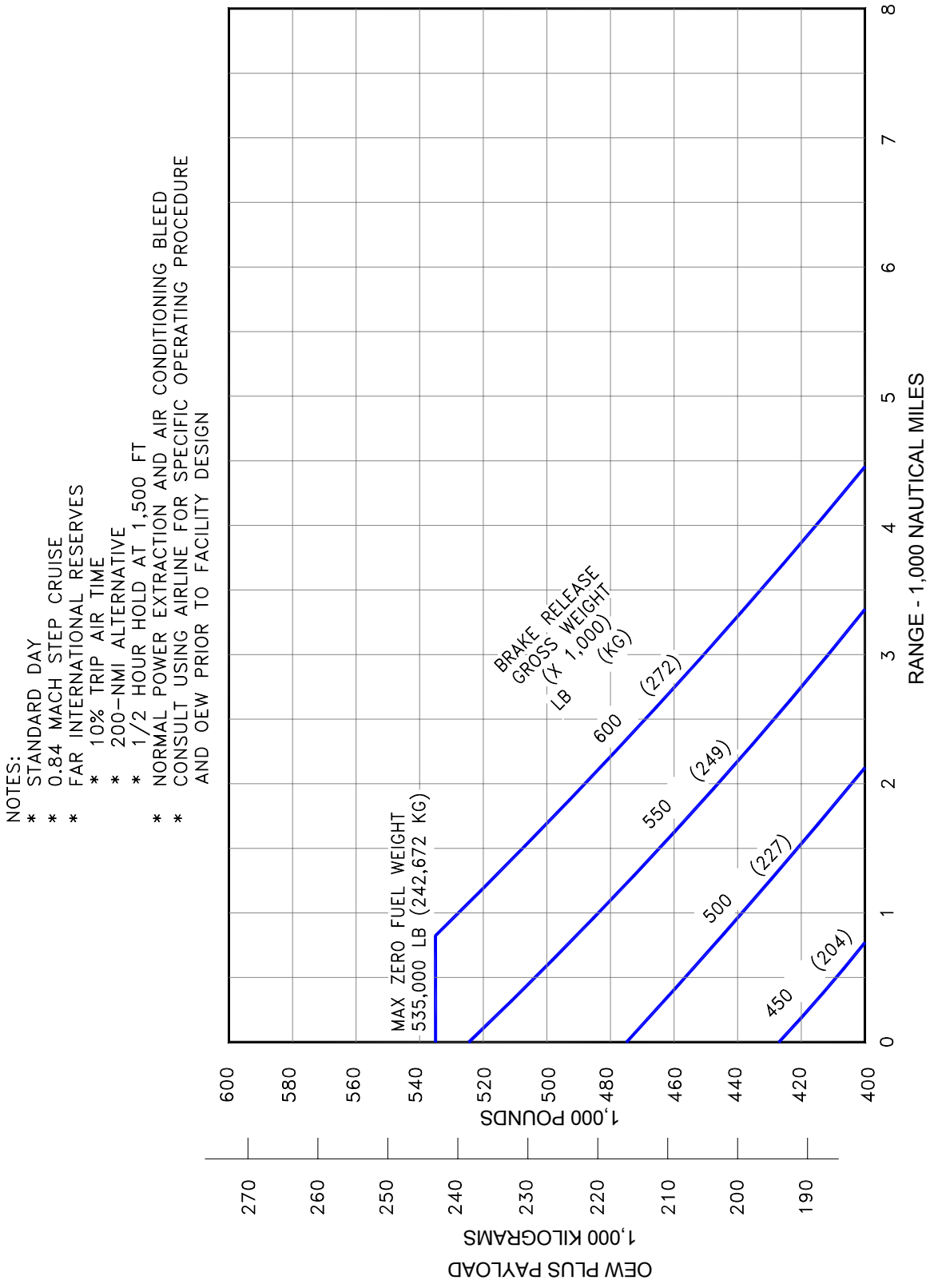
3.2.9 PAYLOAD/RANGE FOR 0.85 MACH CRUISE

MODEL 747-400ER FREIGHTER (PW4062 ENGINES)



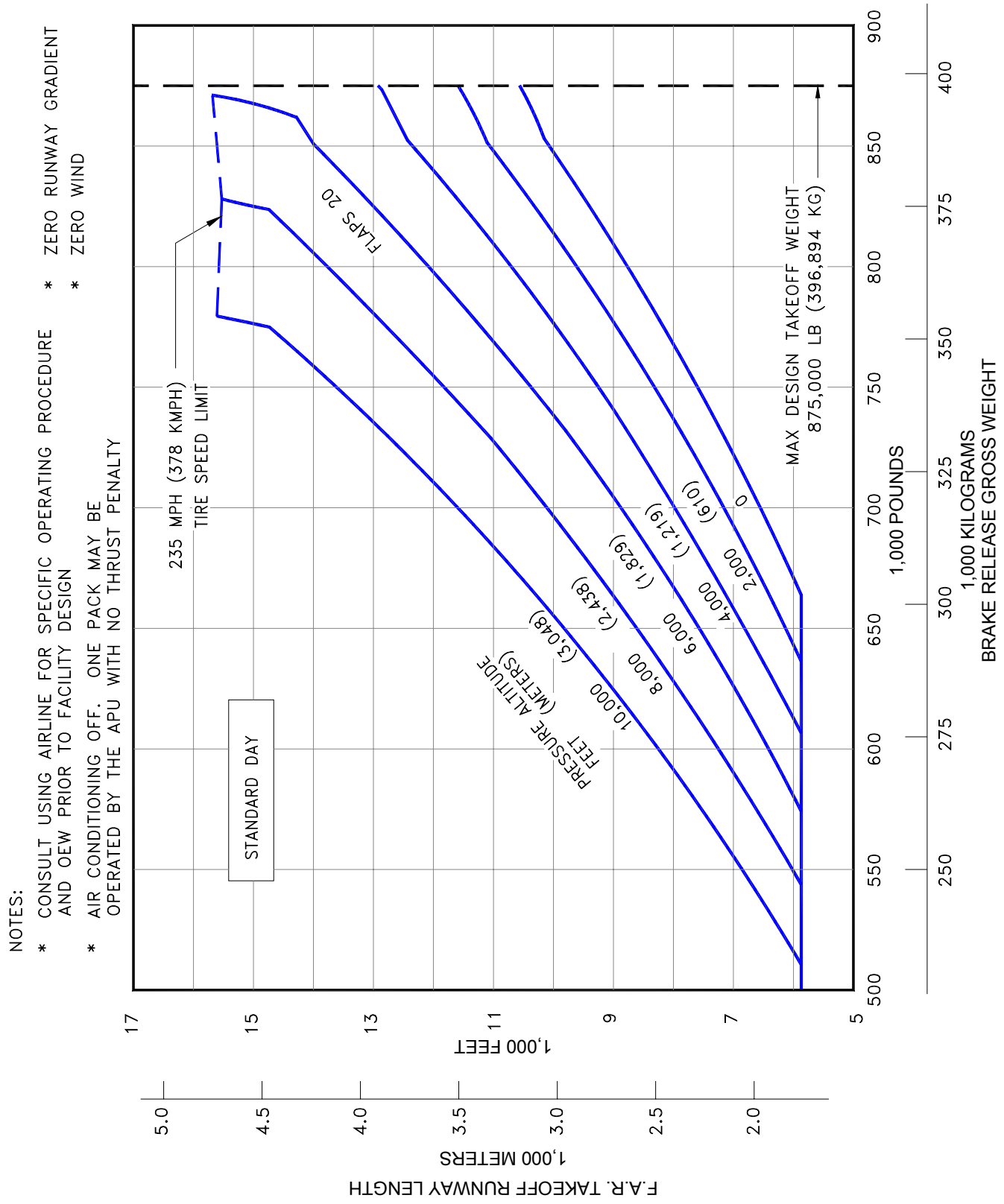
3.2.10 PAYLOAD/RANGE FOR 0.85 MACH CRUISE

MODEL 747-400ER FREIGHTER (RB211-524H8-T ENGINES)



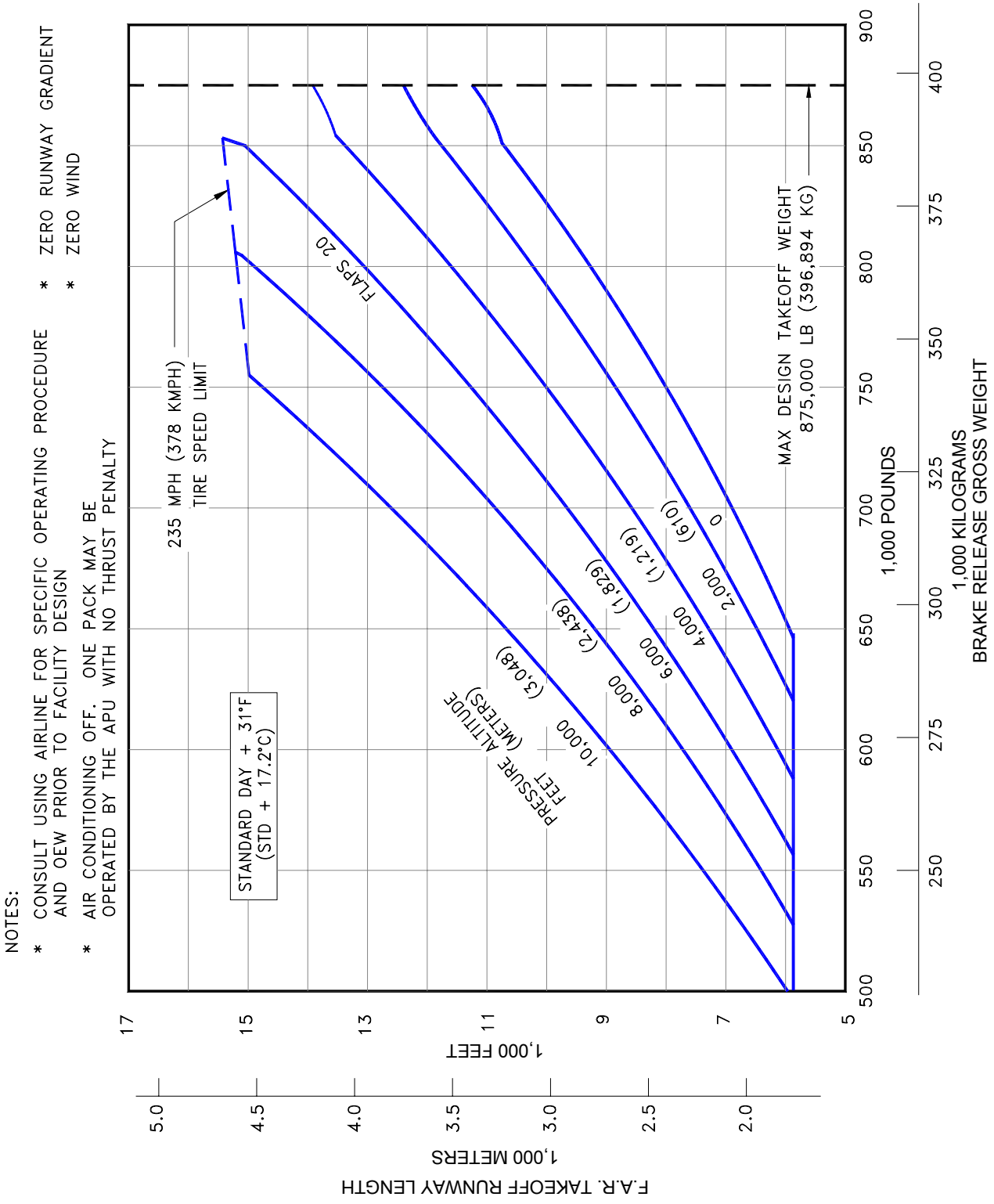
3.2.11 PAYLOAD/RANGE FOR 0.84 MACH CRUISE

MODEL 747-400 DOMESTIC (CF6-80C2B1F ENGINES)



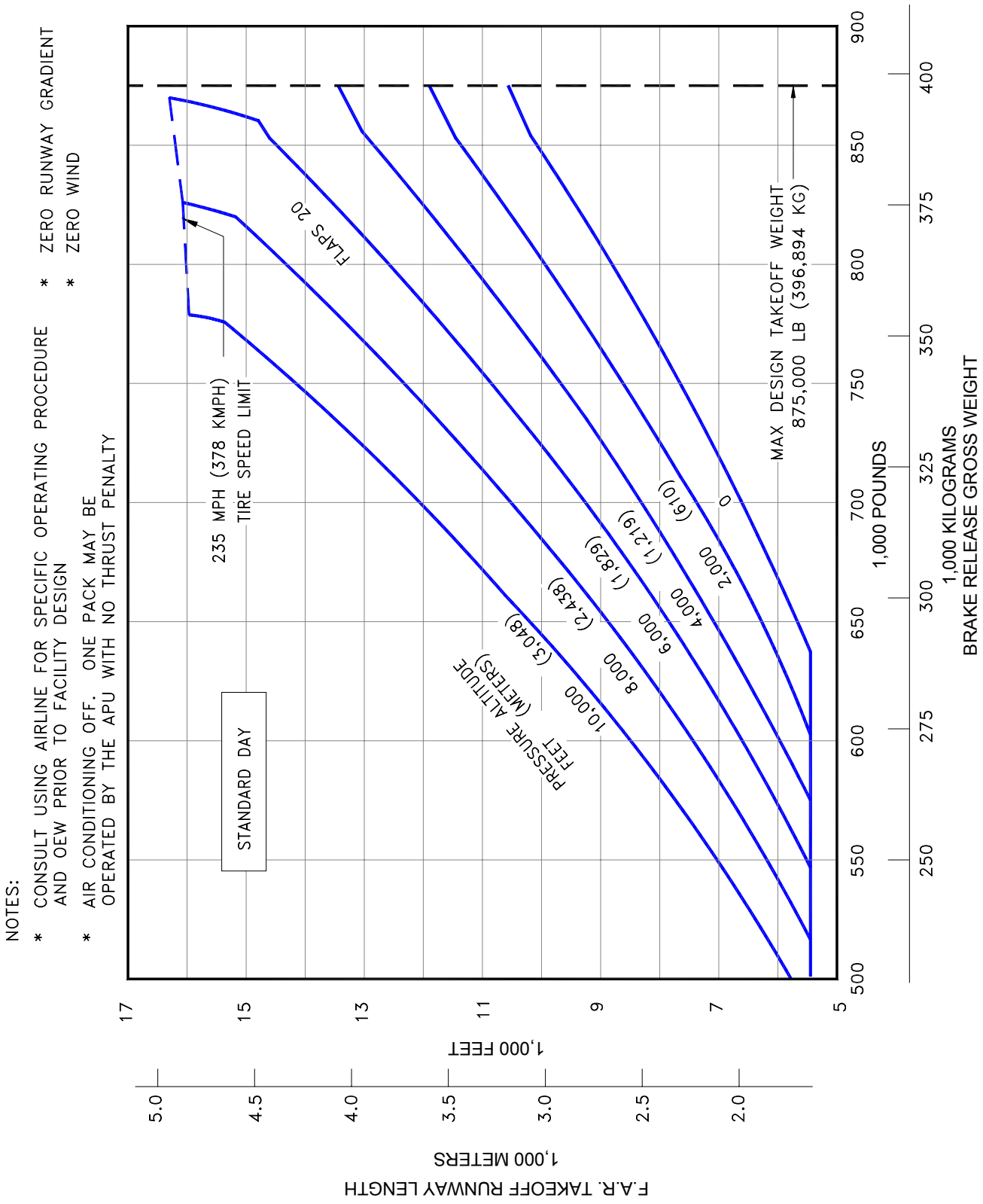
3.3.1 F.A.R. TAKEOFF RUNWAY LENGTH REQUIREMENTS - STANDARD DAY

MODEL 747-400 (CF6-80C2B1 ENGINES)



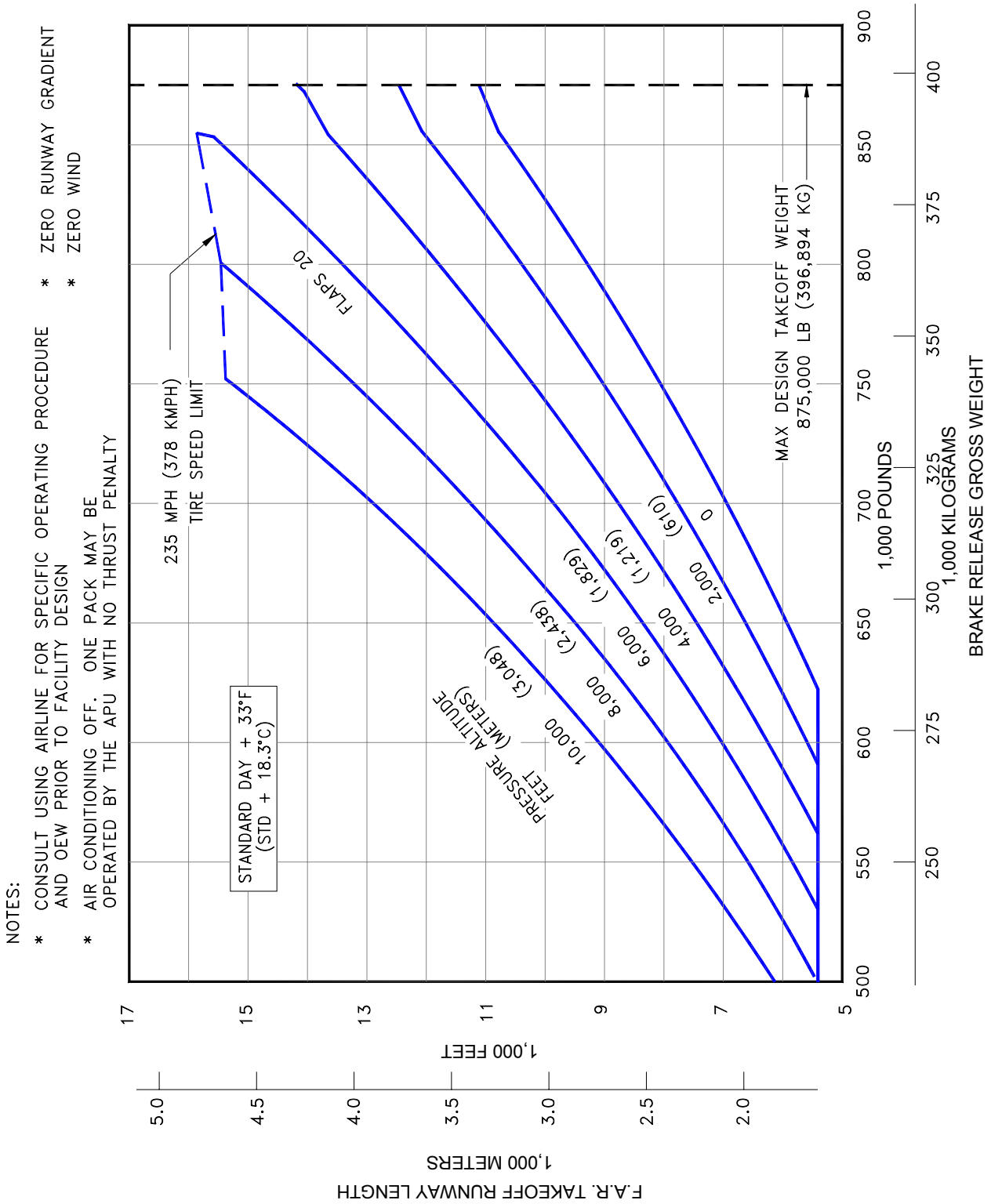
3.3.2 F.A.R. TAKEOFF RUNWAY LENGTH REQUIREMENTS - STANDARD DAY +31°F (STD + 17.2°C)

MODEL 747-400 (CF6-80C2B1 ENGINES)



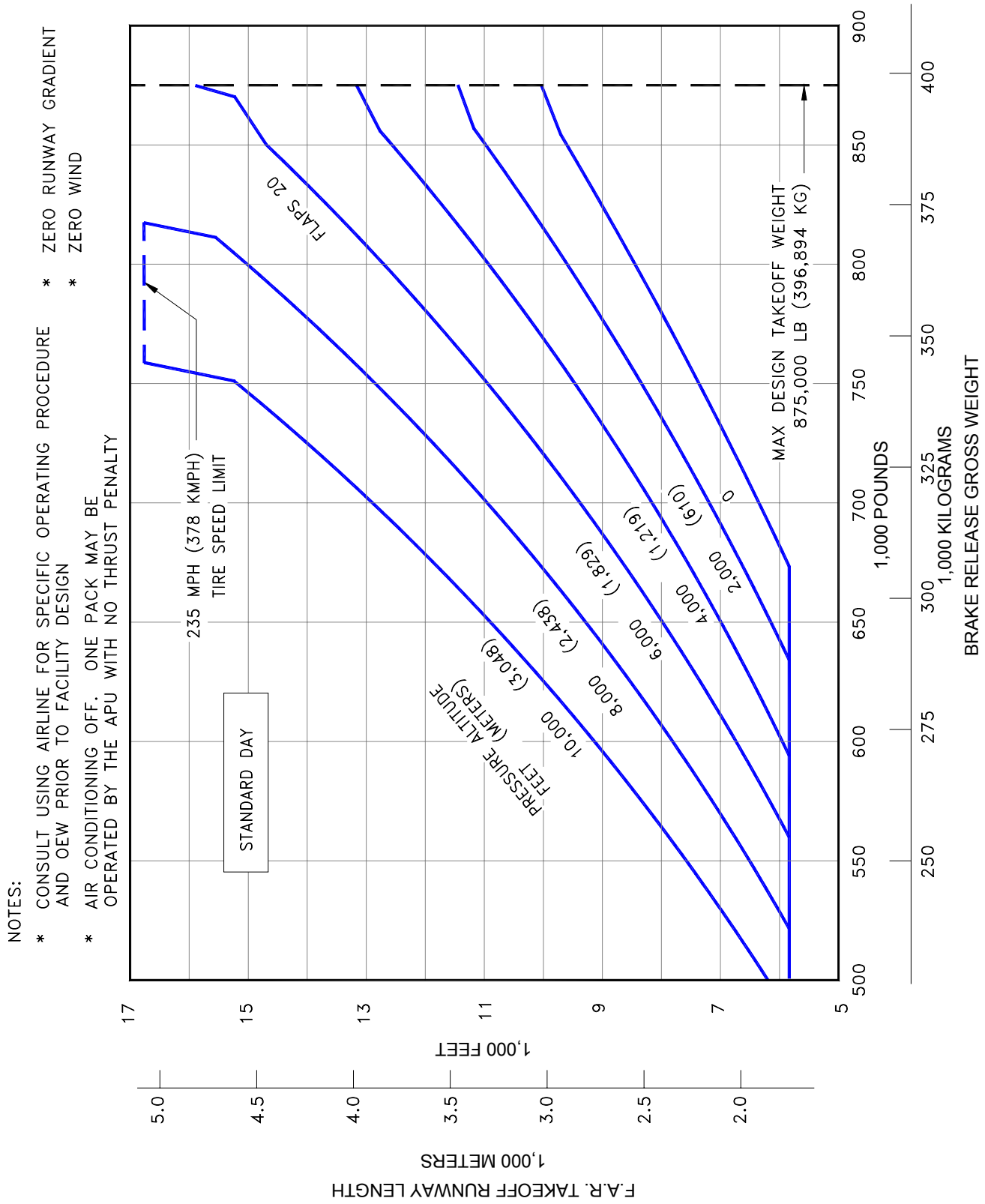
3.3.3 F.A.R. TAKEOFF RUNWAY LENGTH REQUIREMENTS - STANDARD DAY

MODEL 747-400 (PW-4056 ENGINES)



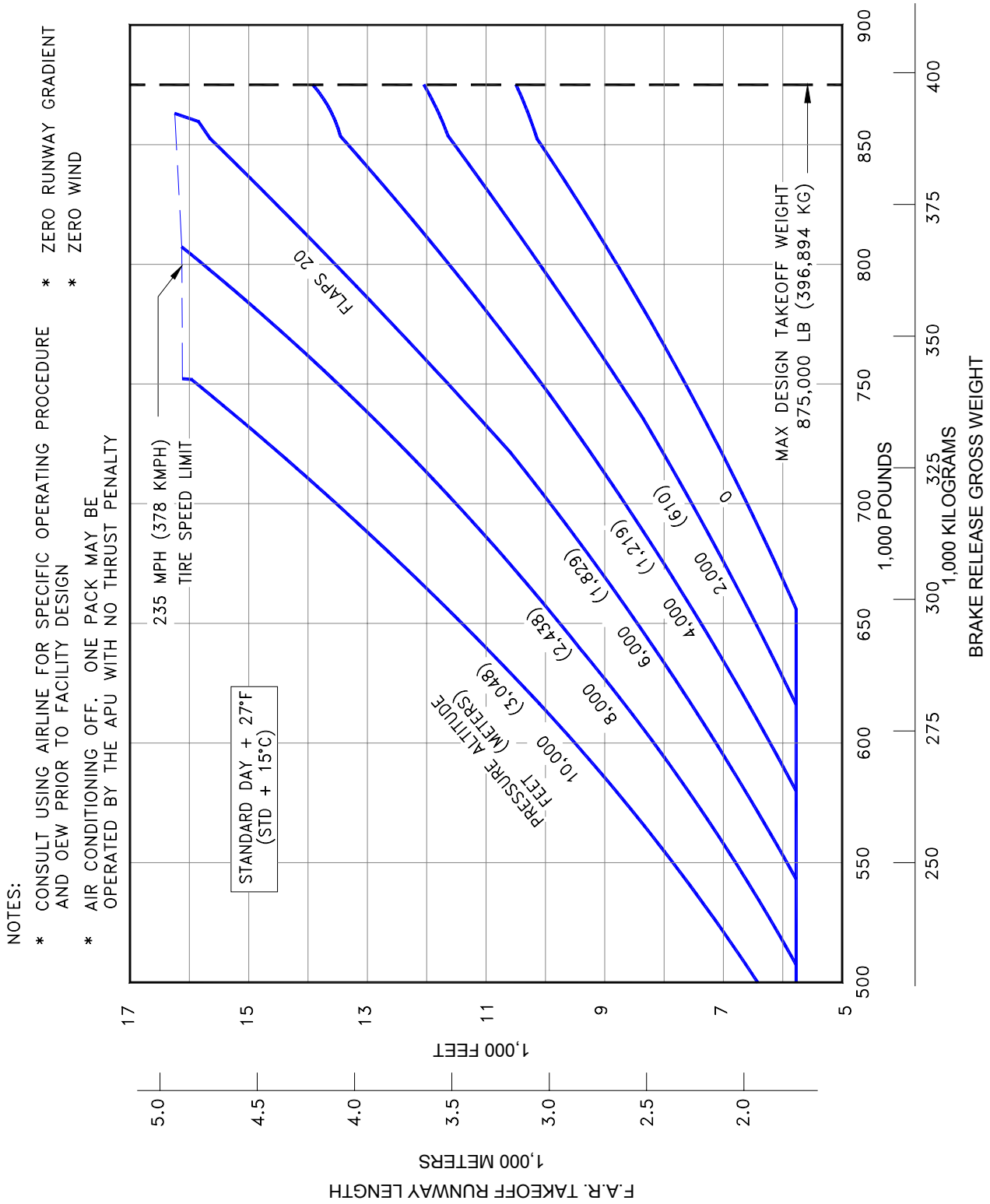
3.3.4 F.A.R. TAKEOFF RUNWAY LENGTH REQUIREMENTS - STANDARD DAY +33^{O}F (STD + 18.3^{O}C)

MODEL 747-400 (PW4056 ENGINES)



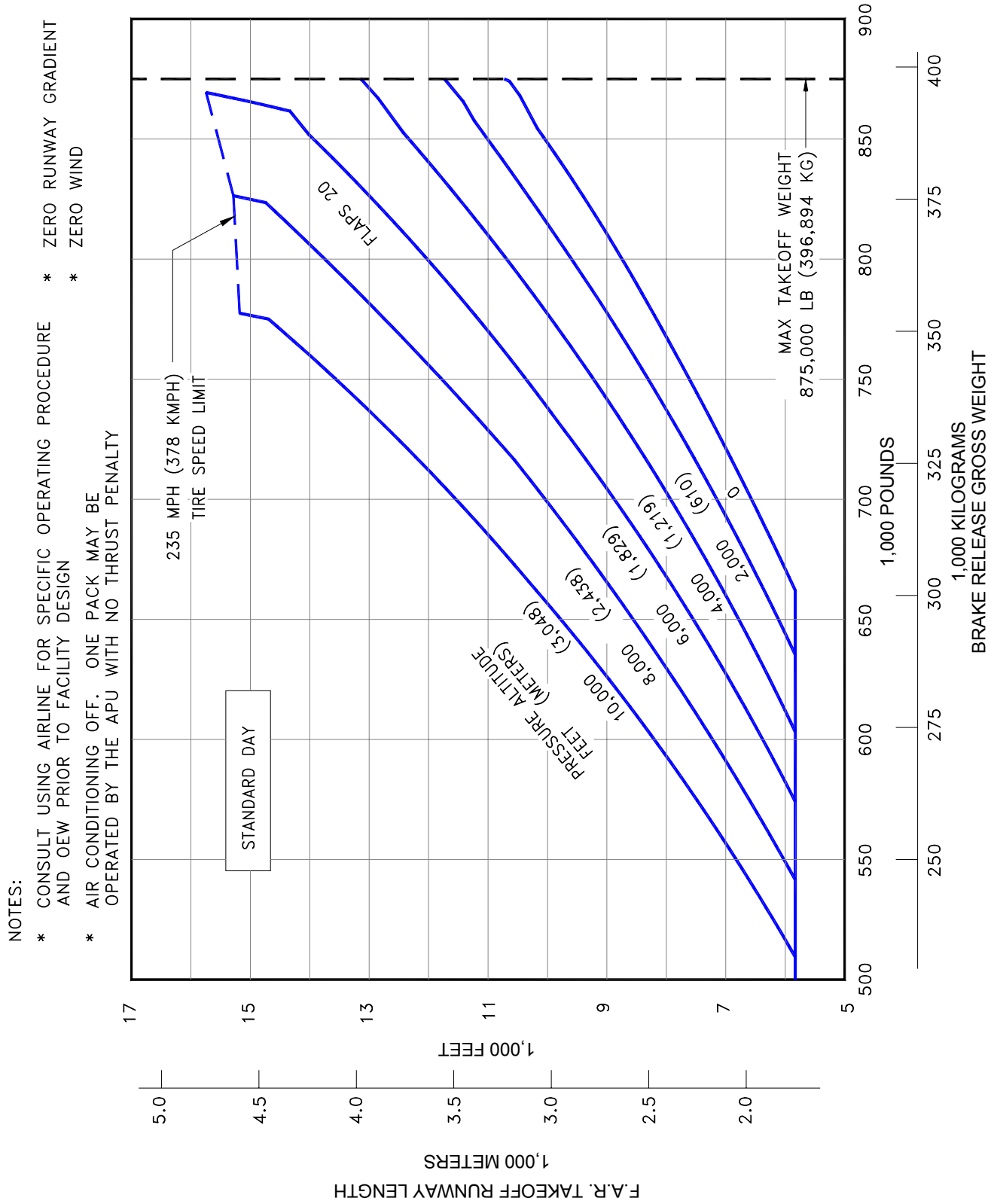
3.3.5 F.A.R. TAKEOFF RUNWAY LENGTH REQUIREMENTS - STANDARD DAY

MODEL 747-400 (RB211-524G2 ENGINES)



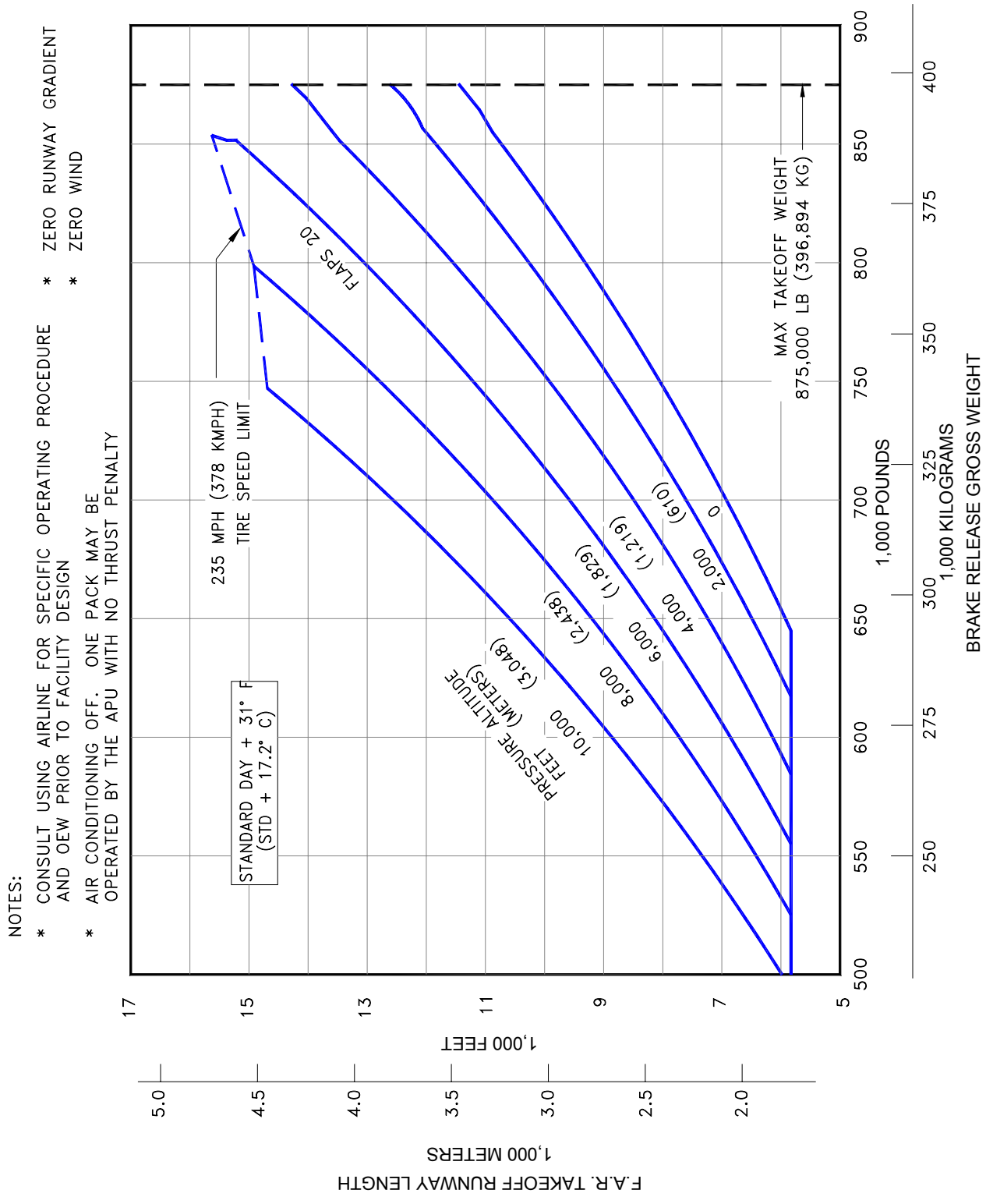
3.3.6 F.A.R. TAKEOFF RUNWAY LENGTH REQUIREMENTS - STANDARD DAY +27^{O}F (STD + 15^{O}C)

MODEL 747-400 (RB211-524G2 ENGINES)



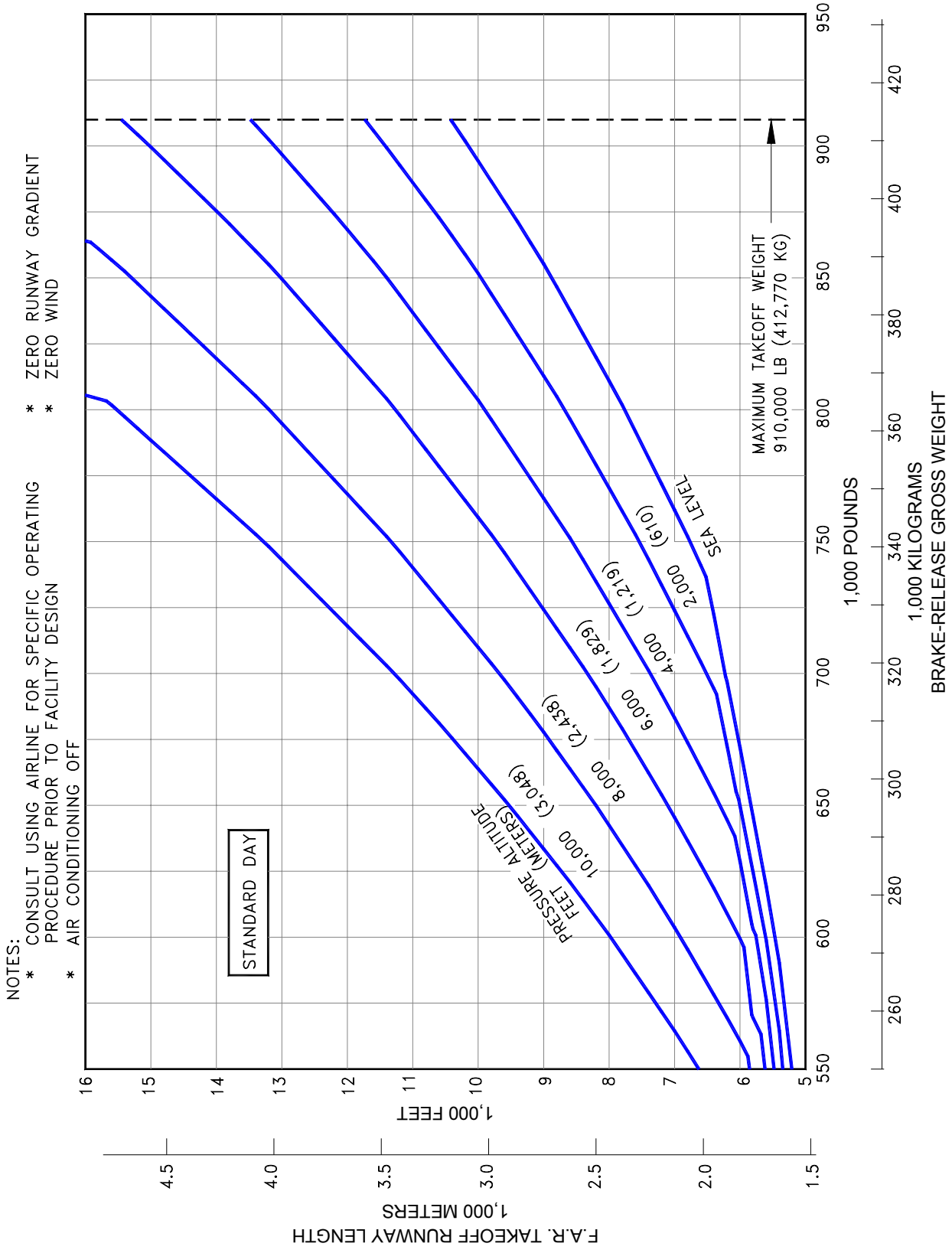
3.3.7 F.A.R. TAKEOFF RUNWAY LENGTH REQUIREMENTS - STANDARD DAY

MODEL 747-400 FREIGHTER (CF6-80C2B1 ENGINES)



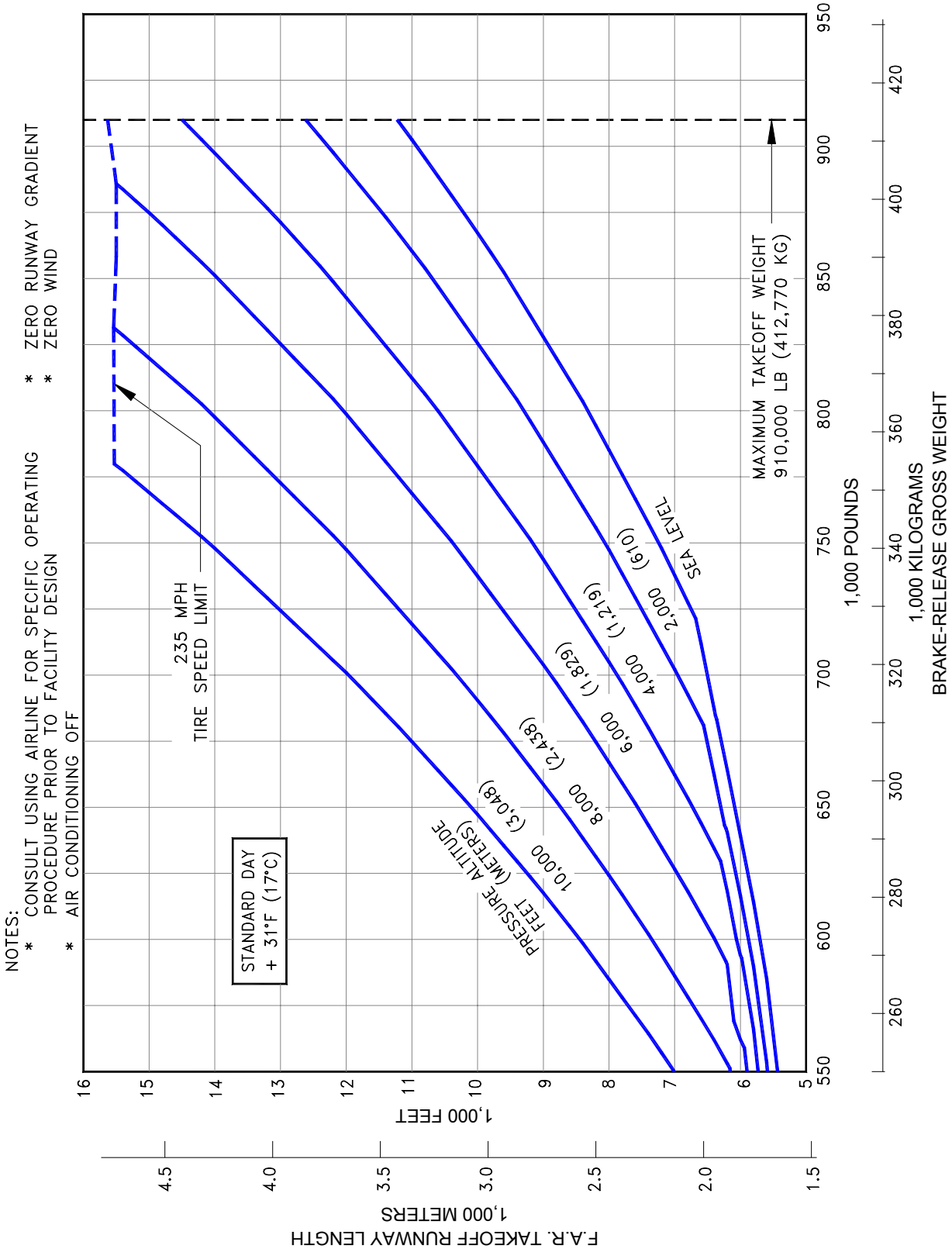
3.3.8 F.A.R. TAKEOFF RUNWAY LENGTH REQUIREMENTS - STANDARD DAY +31°F (STD + 17.2°C)

MODEL 747-400 FREIGHTER (CF6-80C2B1 ENGINES)



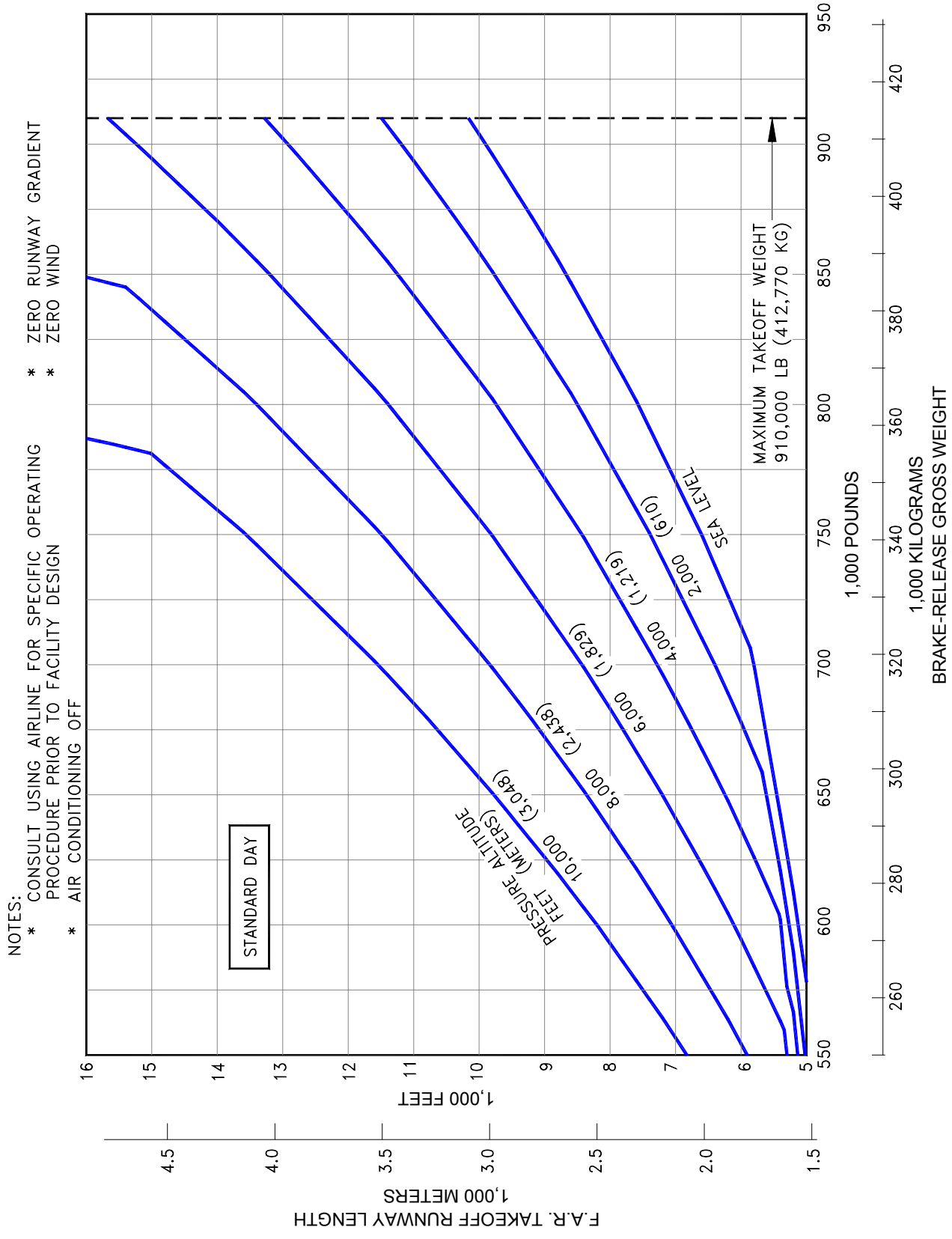
3.3.9 F.A.R. TAKEOFF RUNWAY LENGTH REQUIREMENTS - STANDARD DAY

MODEL 747-400ER (CF6-80C2B5F ENGINES)



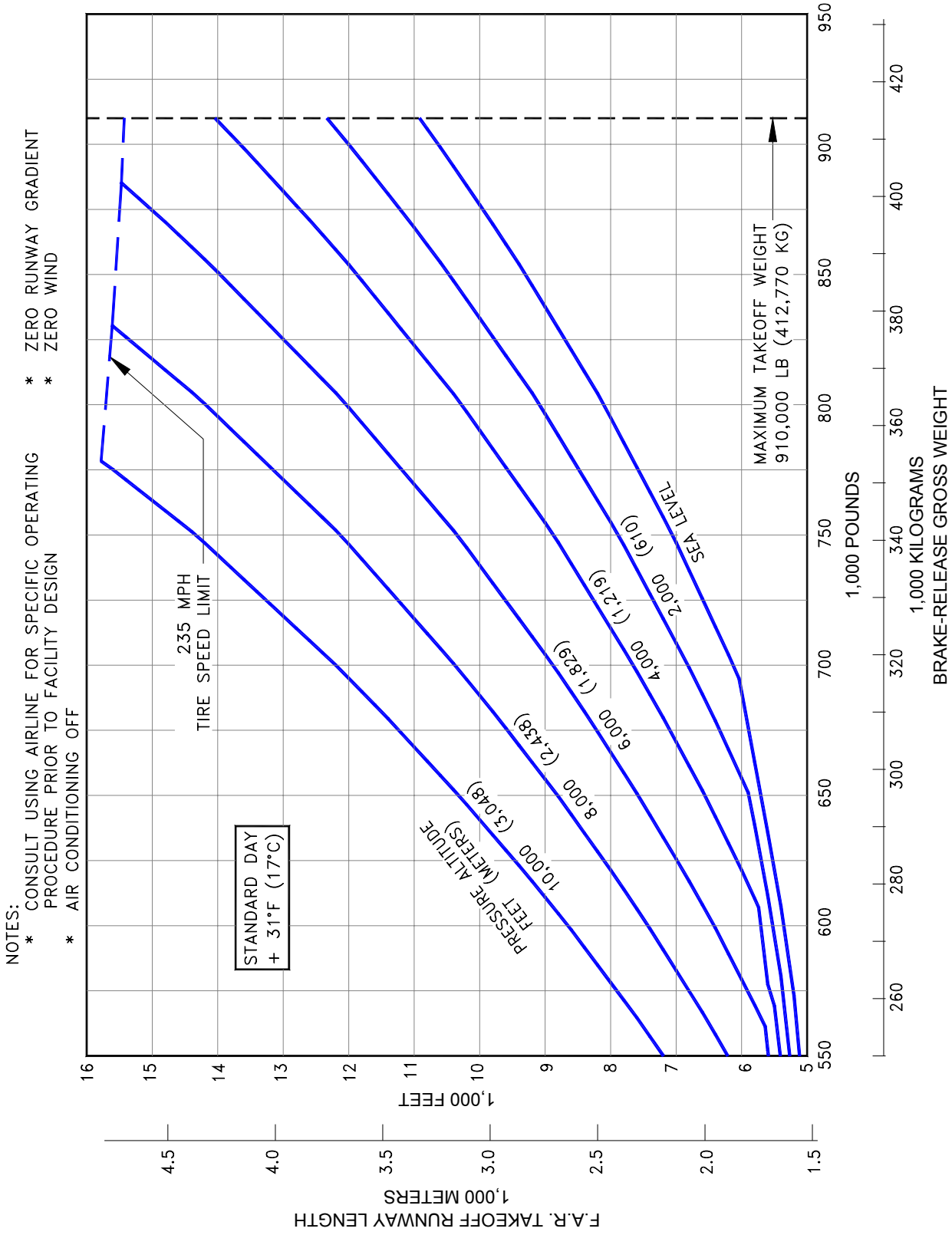
3.3.10 F.A.R. TAKEOFF RUNWAY LENGTH REQUIREMENTS - STANDARD DAY + 31°F (STD + 17°C)

MODEL 747-400ER (CF6-80C2B5F ENGINES)



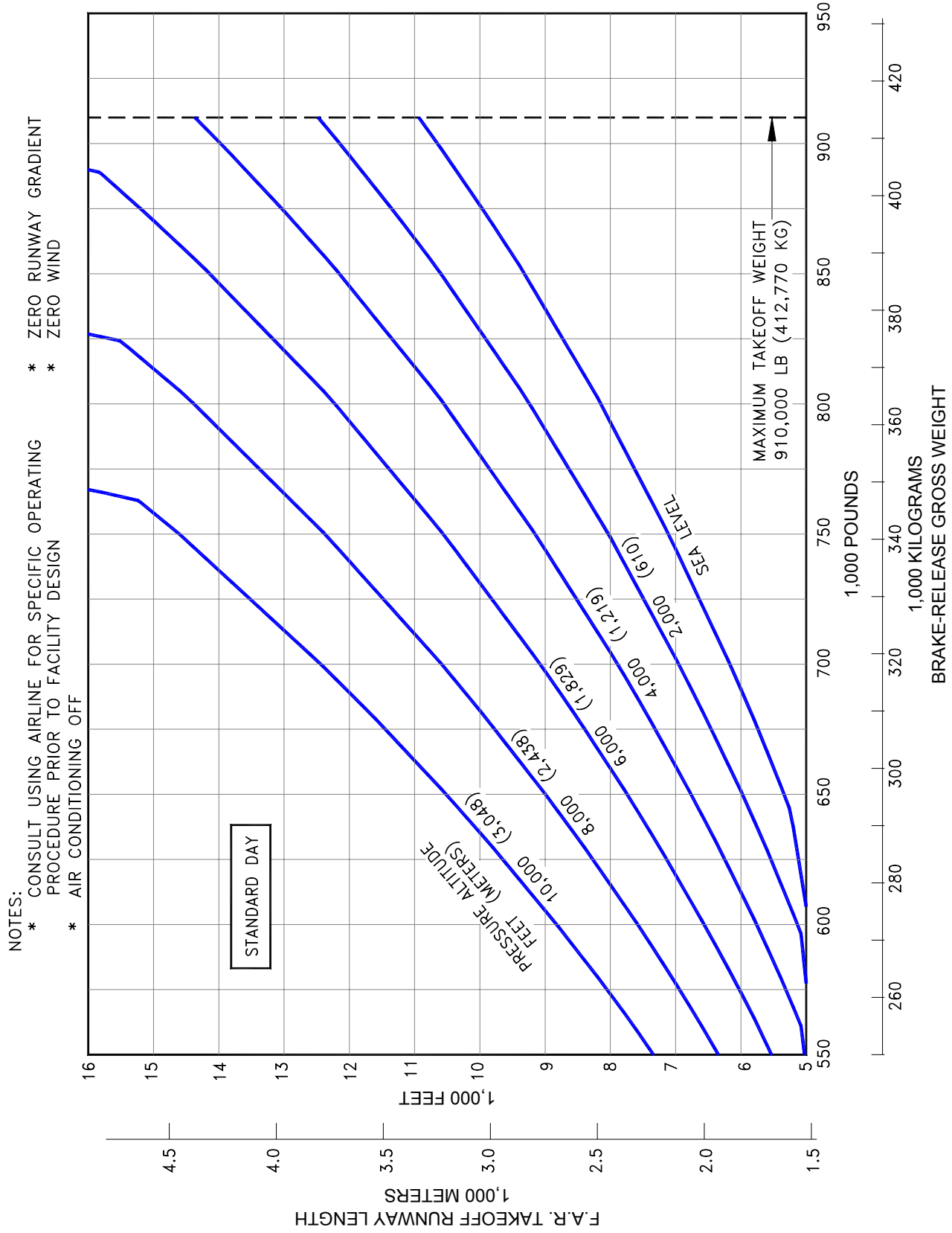
3.3.11 F.A.R. TAKEOFF RUNWAY LENGTH REQUIREMENTS - STANDARD DAY

MODEL 747-400ER (PW-4062 ENGINES)



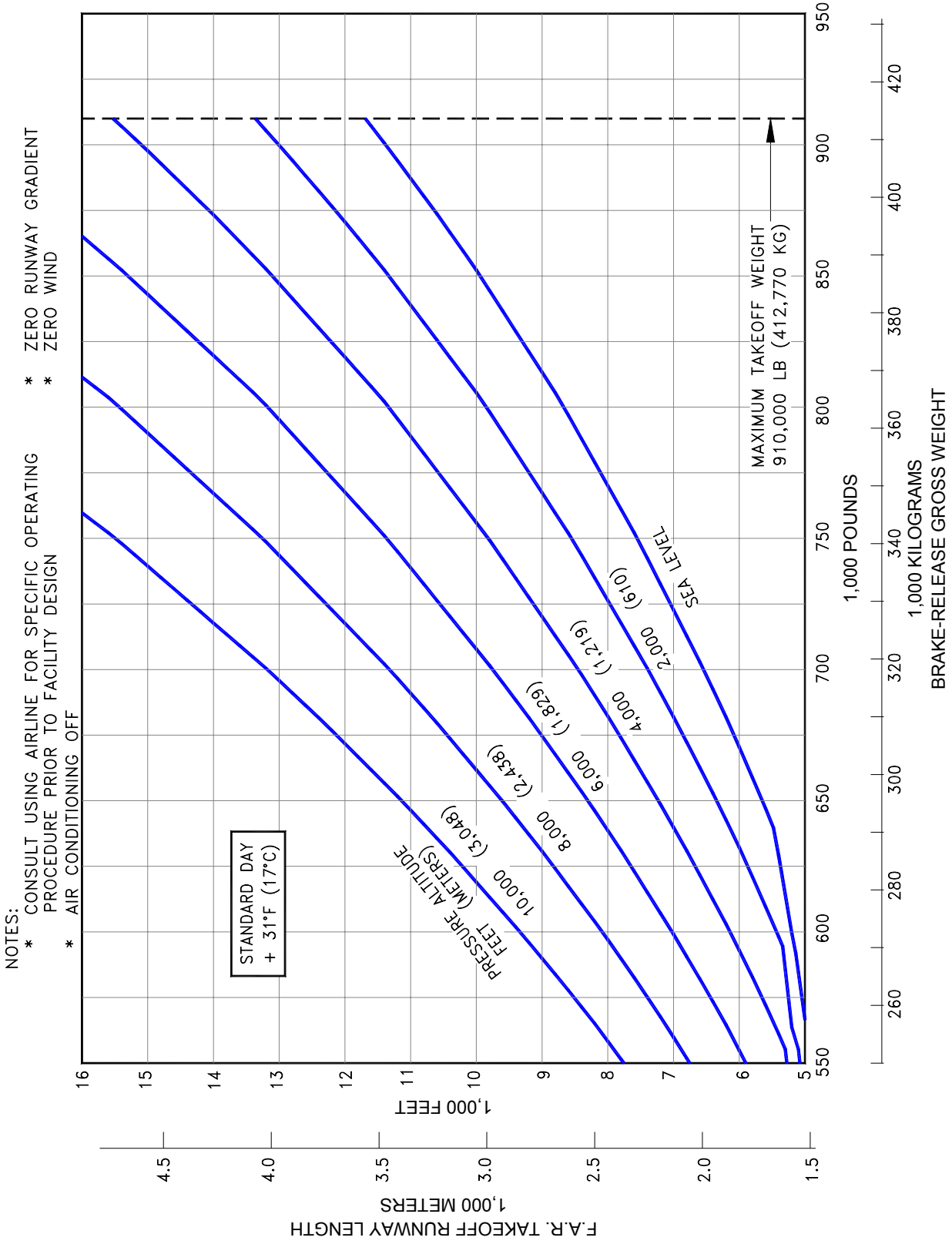
3.3.12 F.A.R. TAKEOFF RUNWAY LENGTH REQUIREMENTS - STANDARD DAY +31°F (STD + 17°C)

MODEL 747-400ER (PW4062 ENGINES)



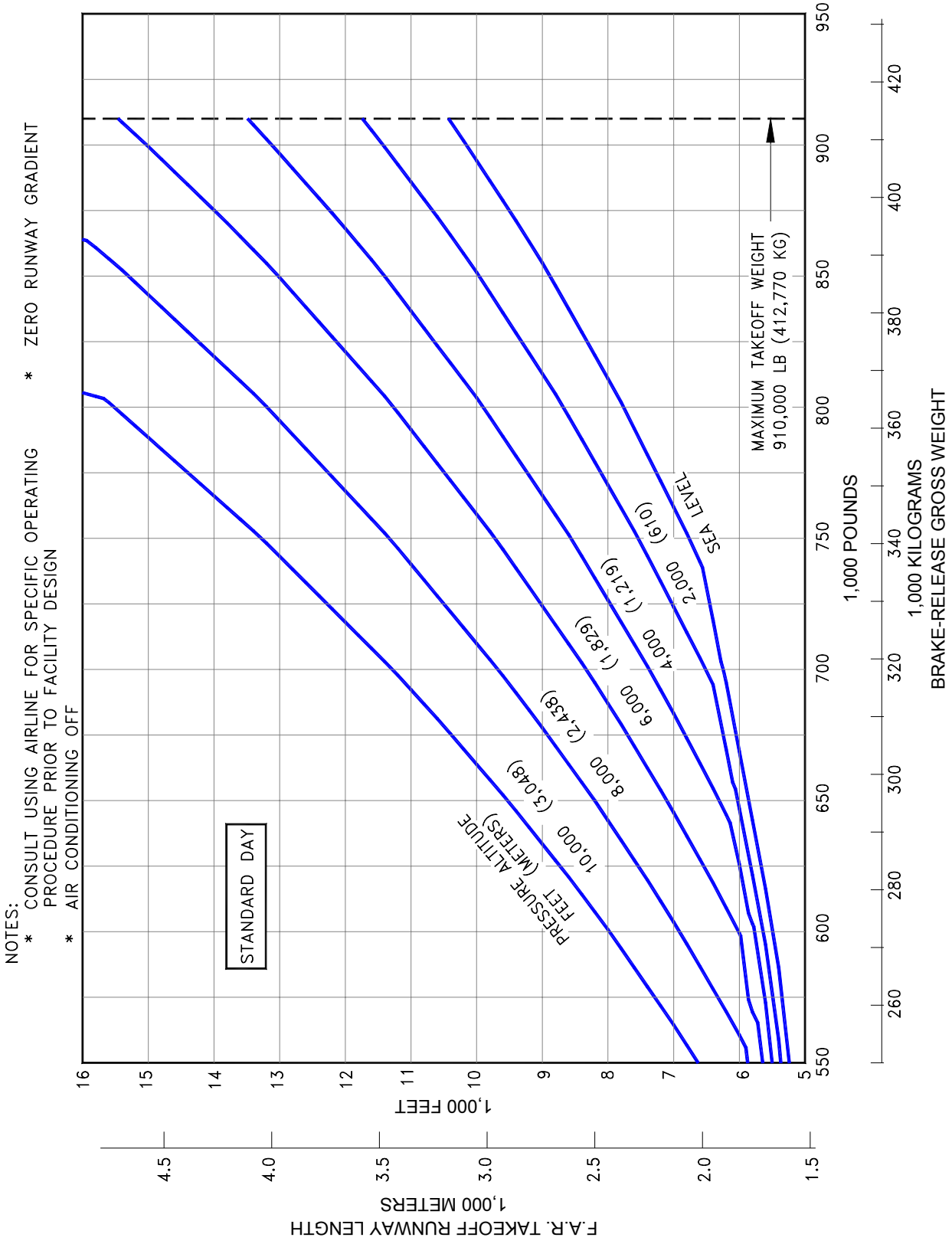
3.3.13 F.A.R. TAKEOFF RUNWAY LENGTH REQUIREMENTS - STANDARD DAY

MODEL 747-400ER (RB211-524H8-T ENGINES)



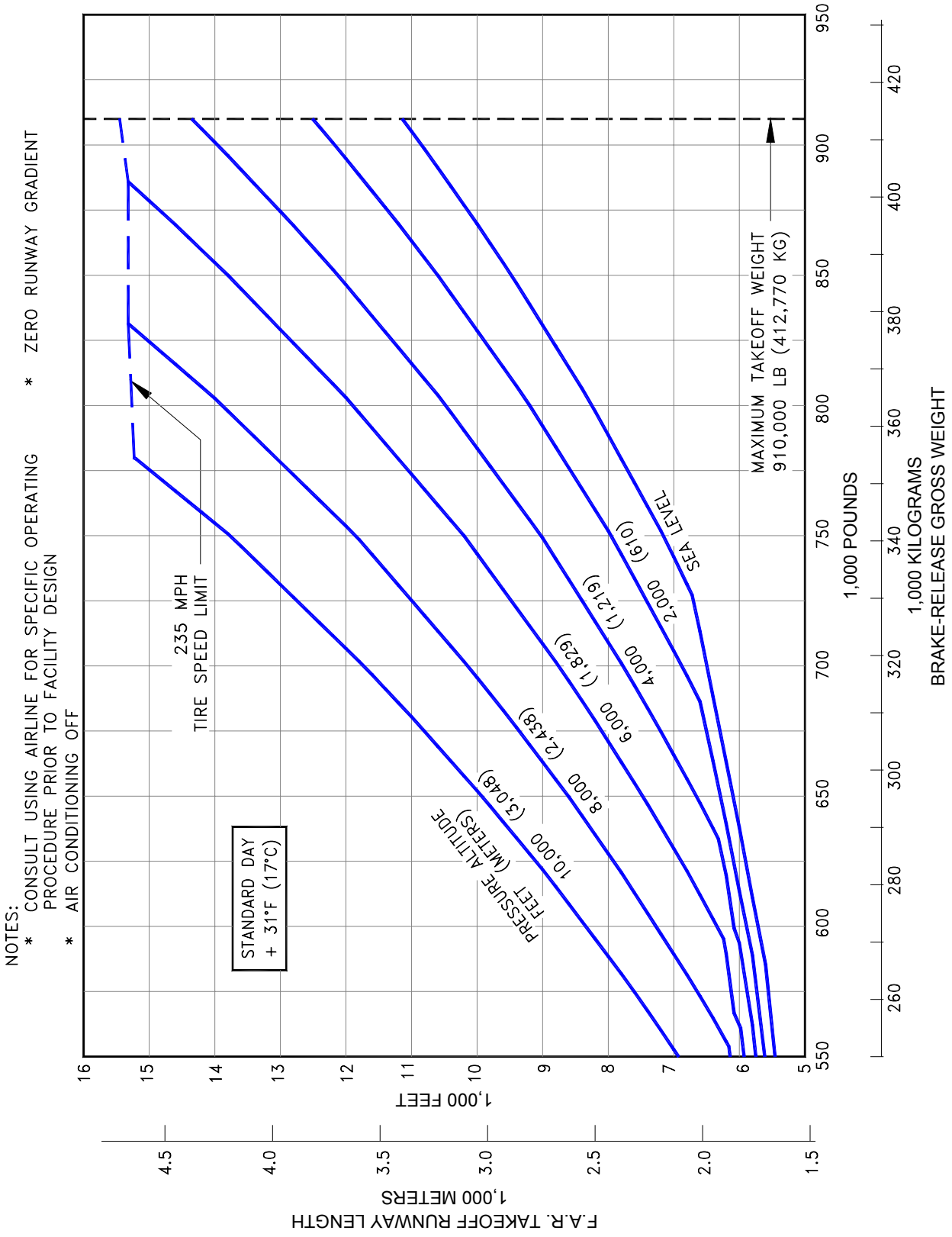
3.3.14 F.A.R. TAKEOFF RUNWAY LENGTH REQUIREMENTS - STANDARD DAY +31°F (STD + 17°C)

MODEL 747-400ER (RB211-524H8-T ENGINES)



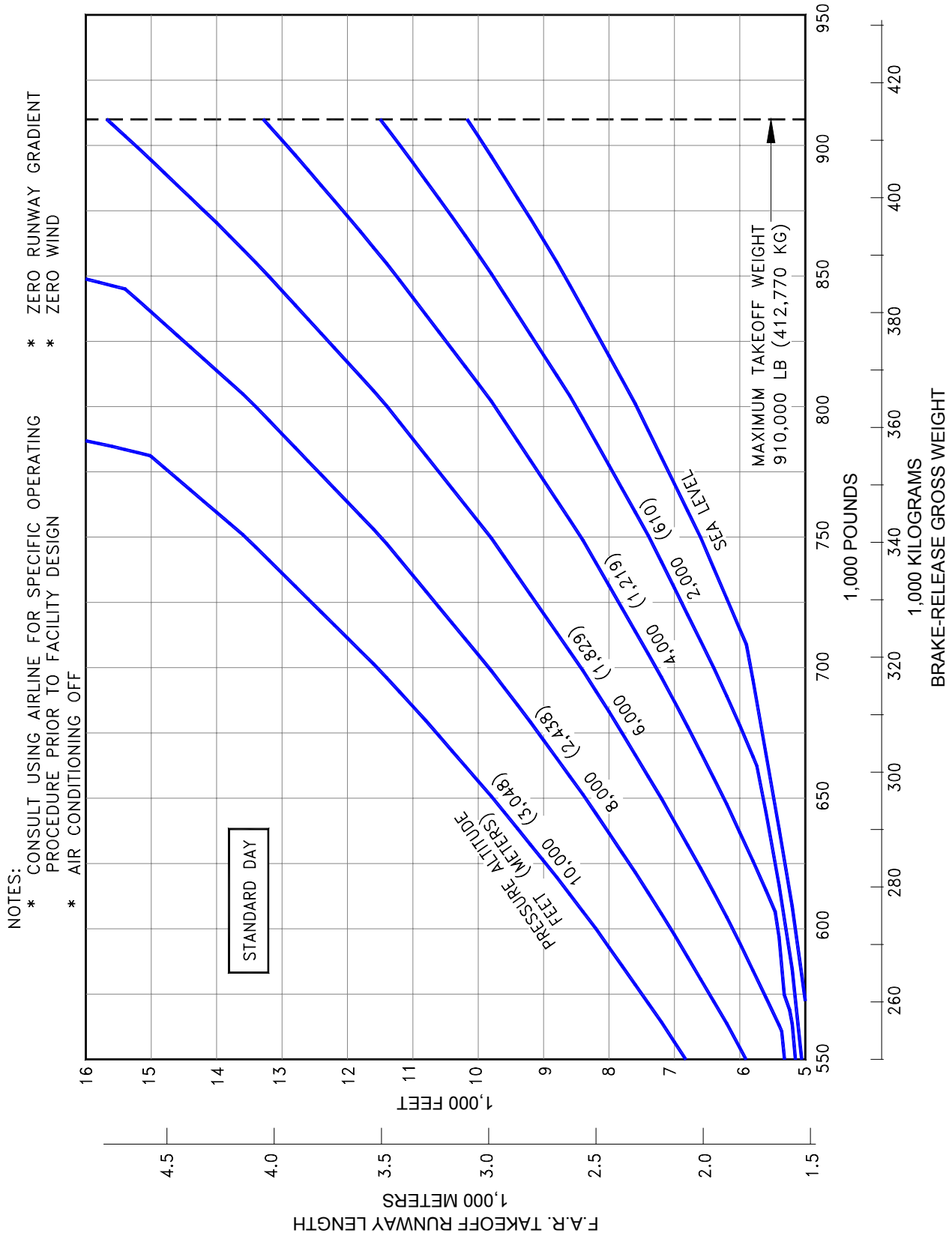
3.3.15 F.A.R. TAKEOFF RUNWAY LENGTH REQUIREMENTS - STANDARD DAY

MODEL 747-400ER FREIGHTER (CF6-80C2B5F ENGINES)



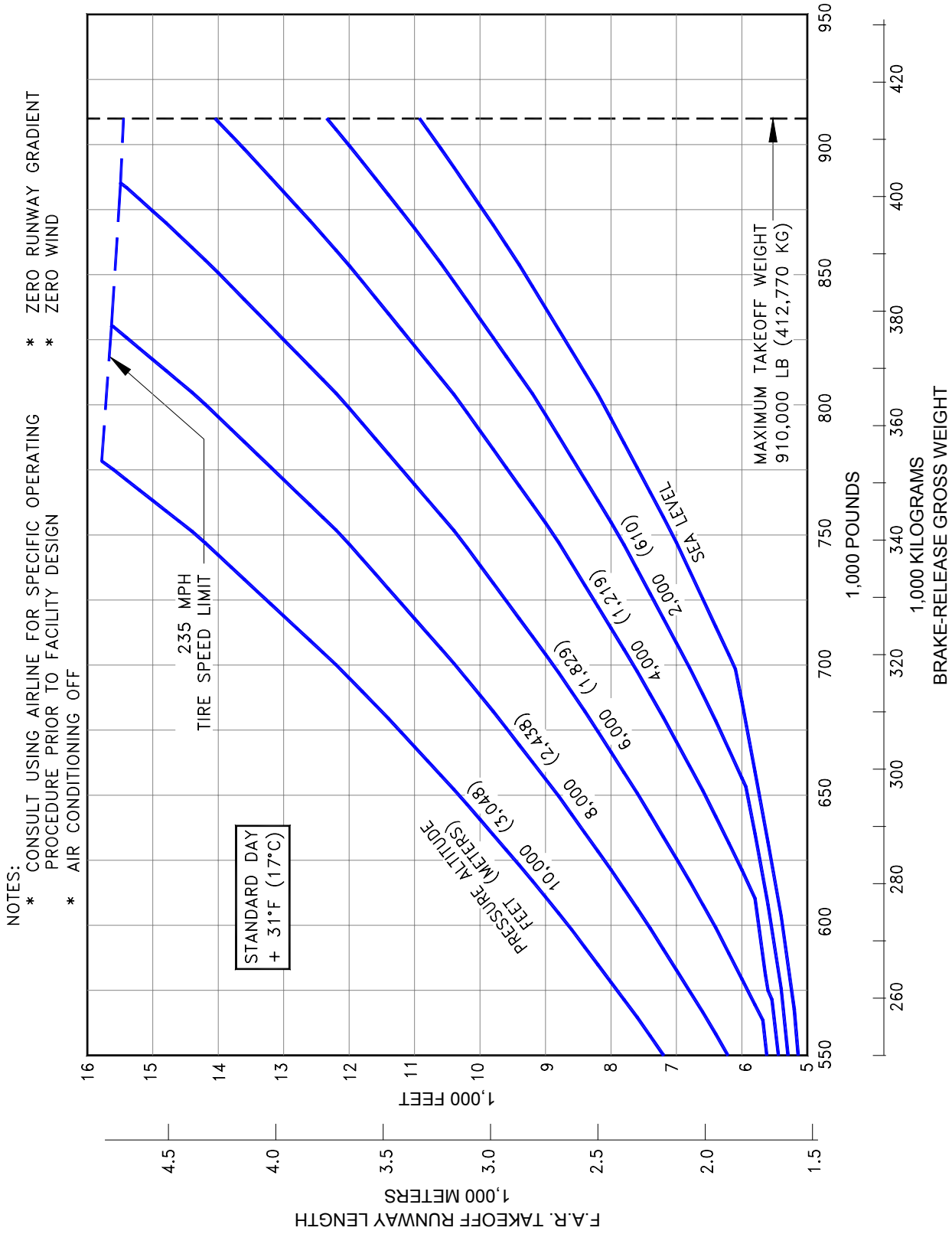
3.3.16 F.A.R. TAKEOFF RUNWAY LENGTH REQUIREMENTS - STANDARD DAY + 31°F (STD + 17°C)

MODEL 747-400ER FREIGHTER (CF6-80C2B5F ENGINES)



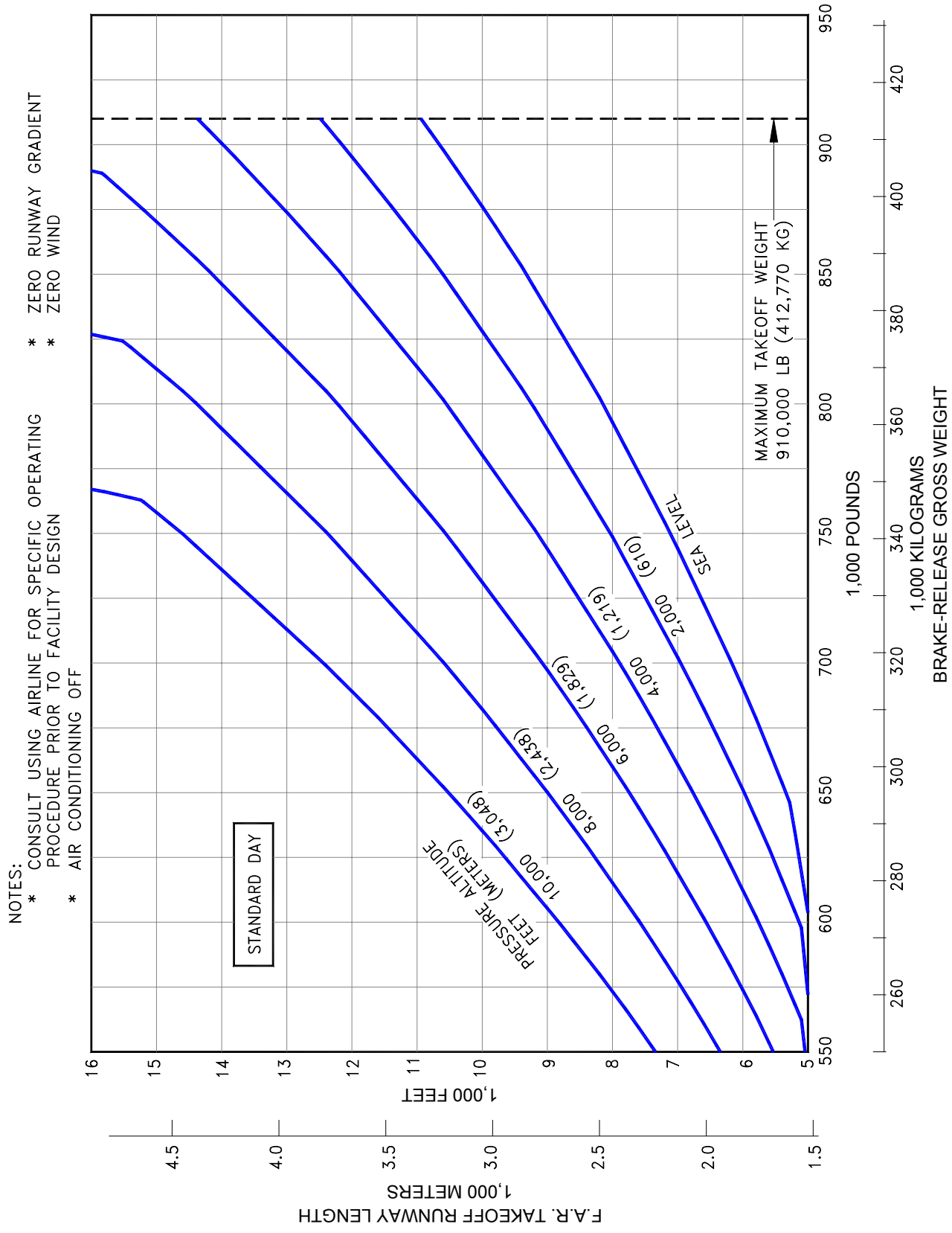
3.3.17 F.A.R. TAKEOFF RUNWAY LENGTH REQUIREMENTS - STANDARD DAY

MODEL 747-400ER FREIGHTER (PW4062 ENGINES)



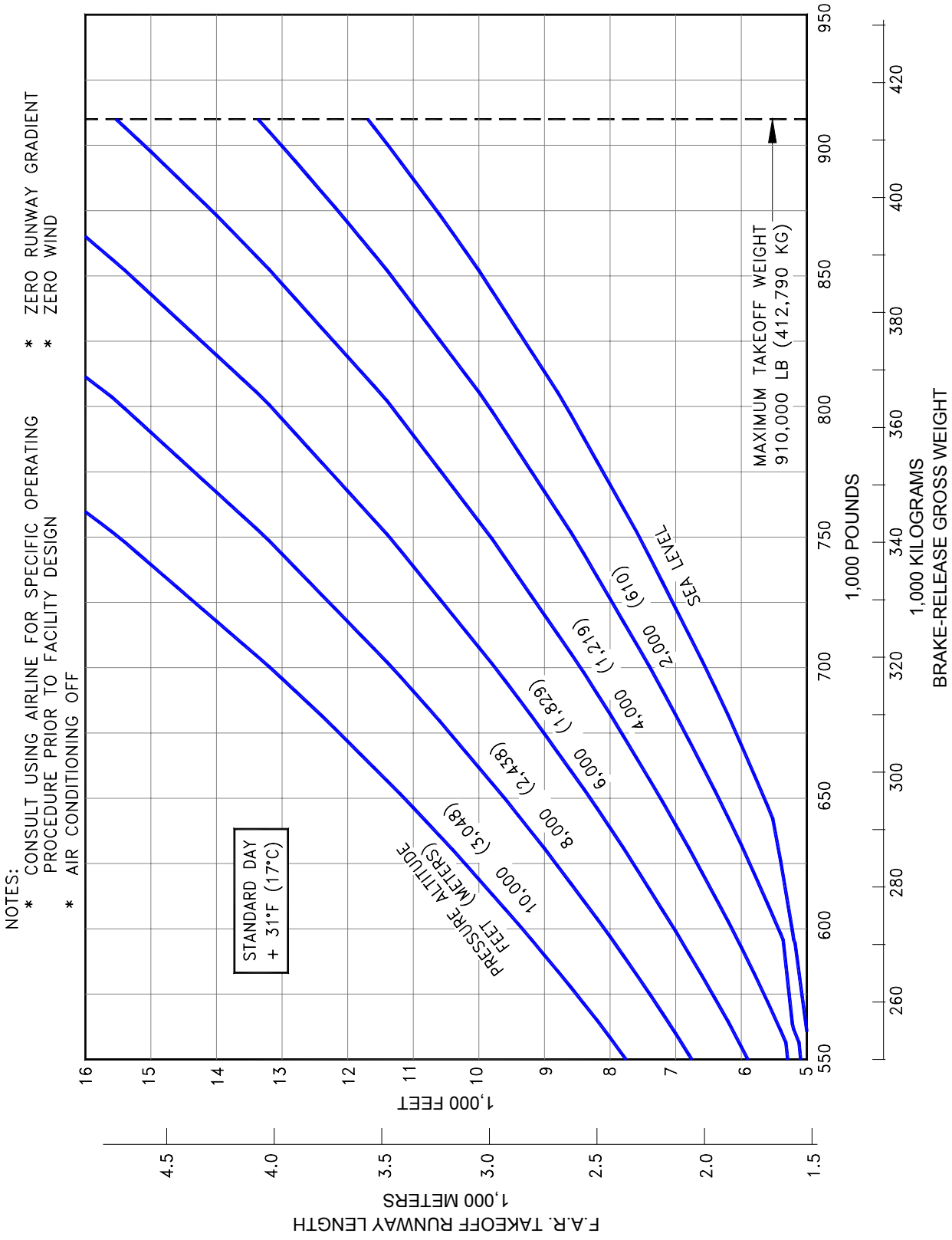
3.3.18 FA.R. TAKEOFF RUNWAY LENGTH REQUIREMENTS - STANDARD DAY + 31°F (STD + 17°C)

MODEL 747-400ER FREIGHTER (PW4062 ENGINES)



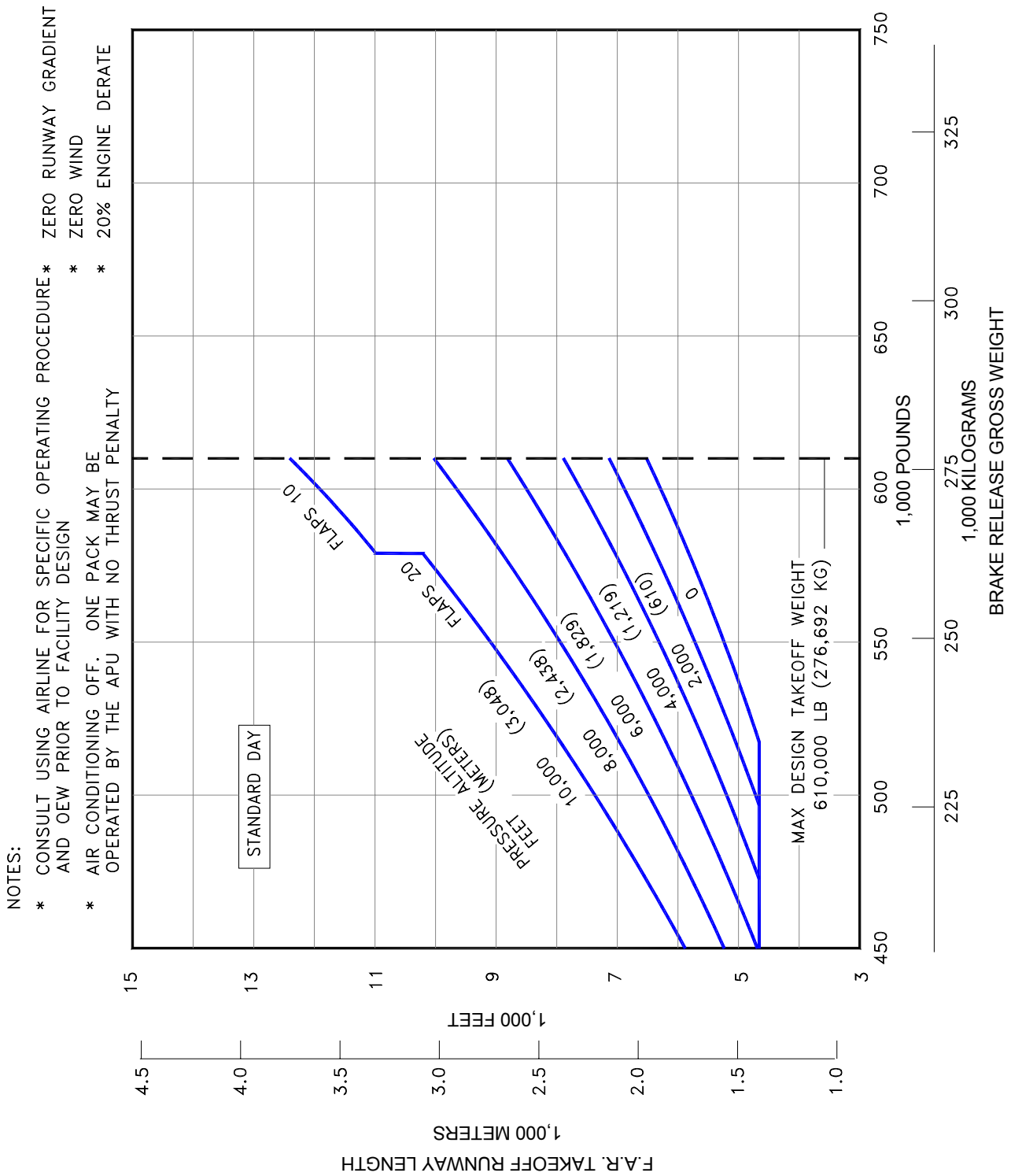
3.3.19 F.A.R. TAKEOFF RUNWAY LENGTH REQUIREMENTS - STANDARD DAY

MODEL 747-400ER FREIGHTER (RB211-524H8-T ENGINES)



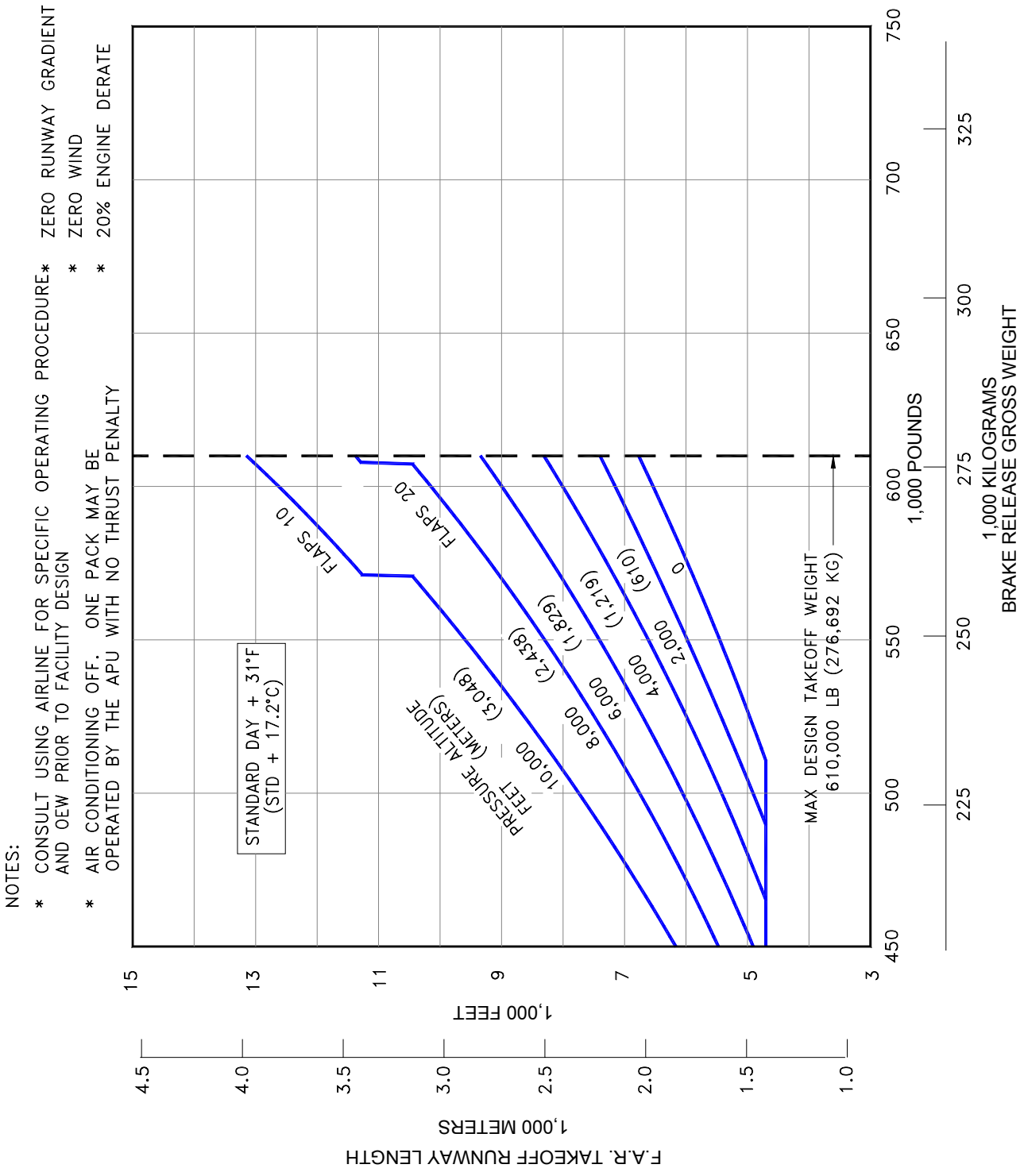
3.3.20 F.A.R. TAKEOFF RUNWAY LENGTH REQUIREMENTS - STANDARD DAY + 31°F (STD + 17°C)

MODEL 747-400ER FREIGHTER (RB211-524H8-T ENGINES)



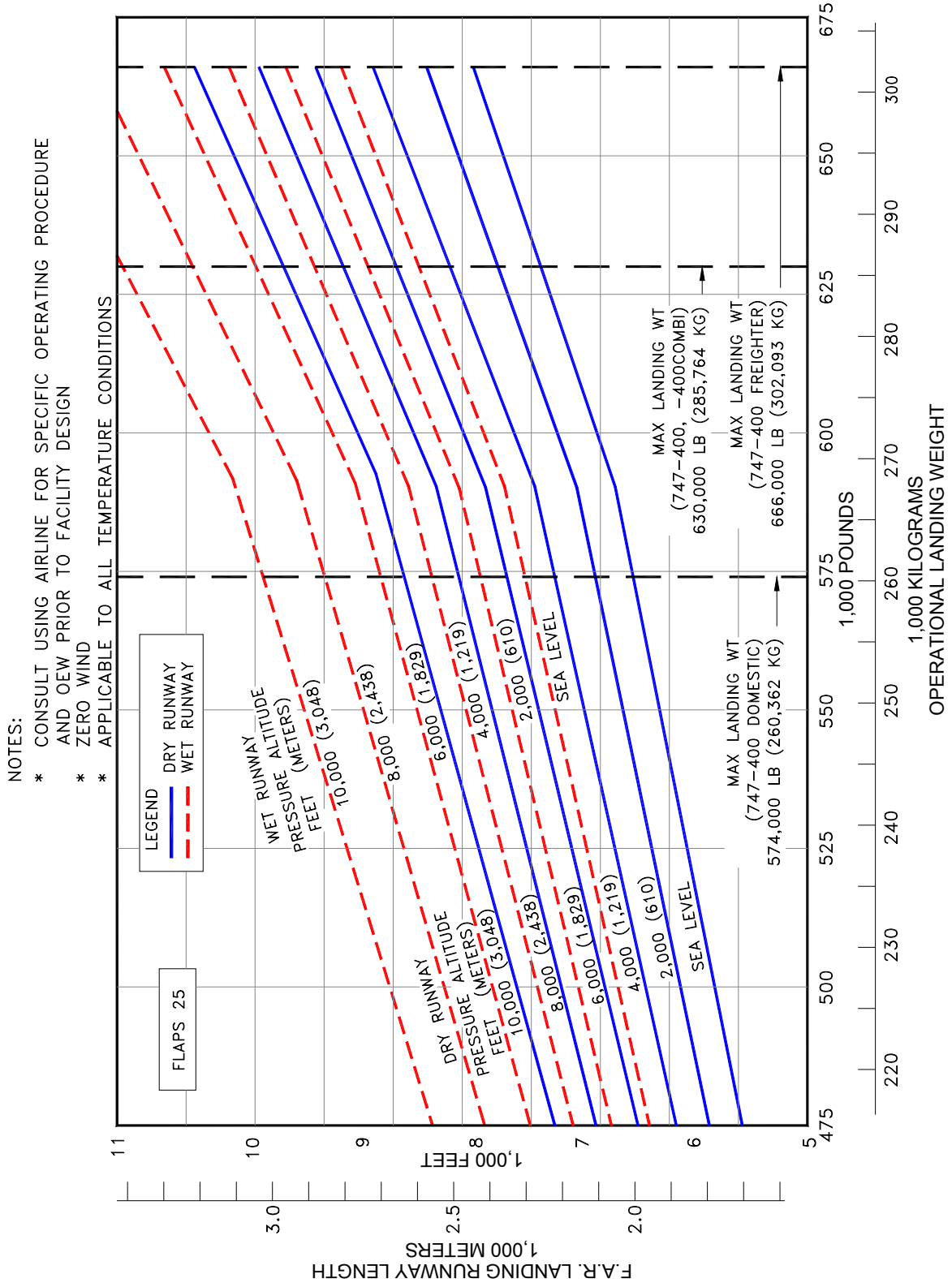
3.3.21 F.A.R. TAKEOFF RUNWAY LENGTH REQUIREMENTS - STANDARD DAY

MODEL 747-400 DOMESTIC (CF6-80C2B1 ENGINES)



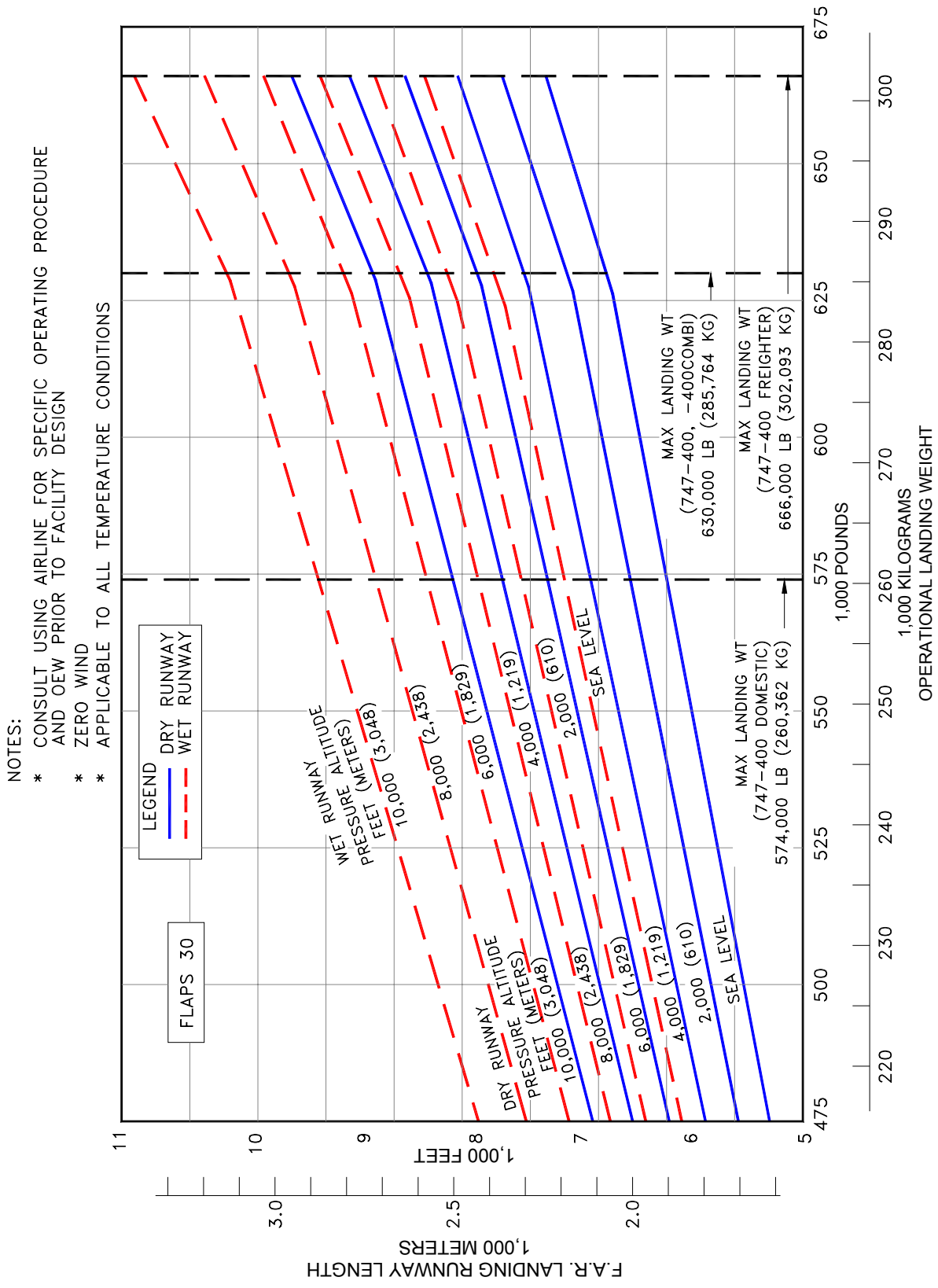
3.3.22 F.A.R. TAKEOFF RUNWAY LENGTH REQUIREMENTS - STANDARD DAY +31°F (STD + 17.2°C)

MODEL 747-400 DOMESTIC (CF6-80C2B1 ENGINES)



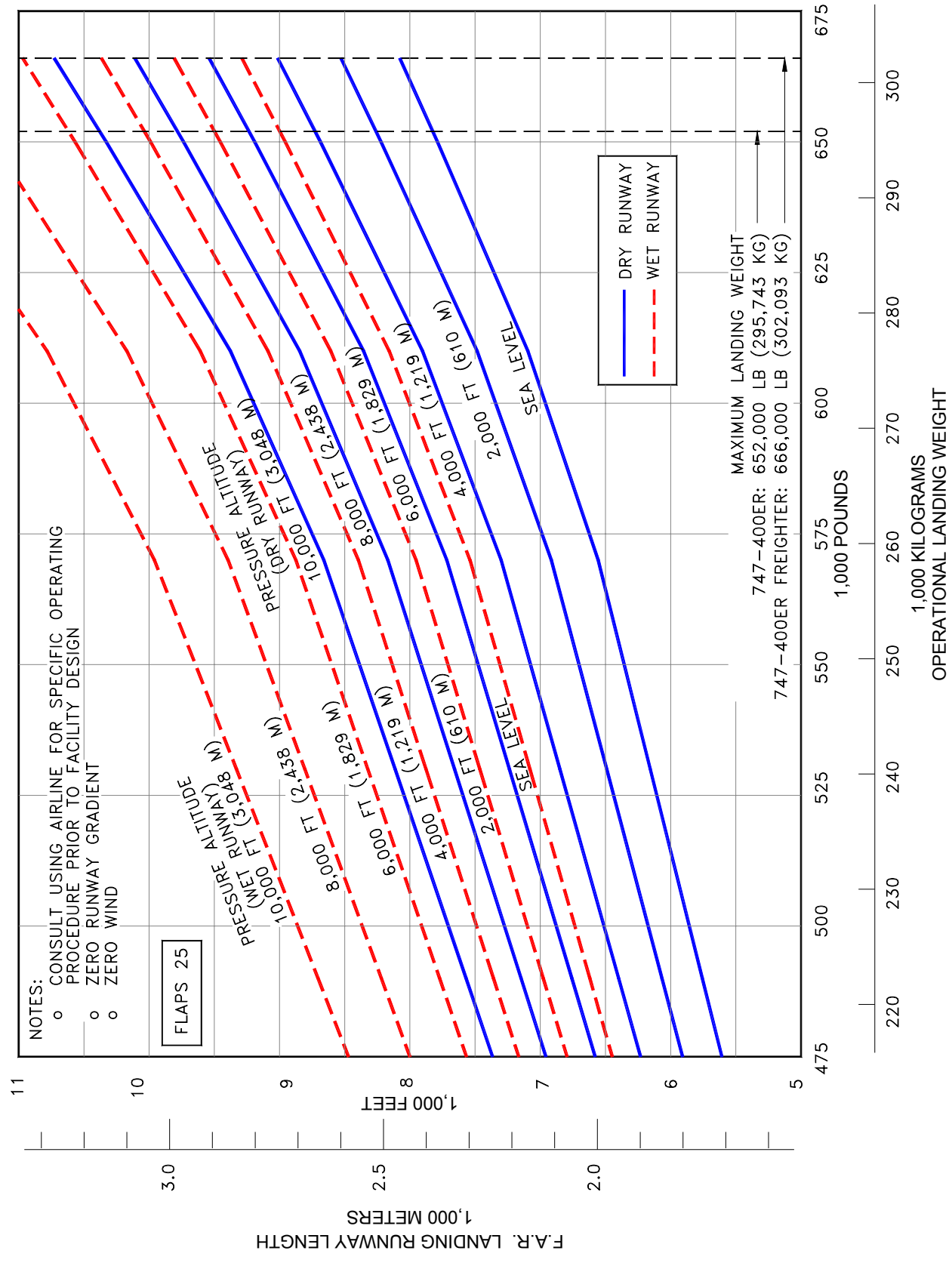
3.4.1 F.A.R. LANDING RUNWAY LENGTH REQUIREMENTS - FLAPS 25

MODEL 747-400, -400 COMBI, -400 DOMESTIC, -400 FREIGHTER



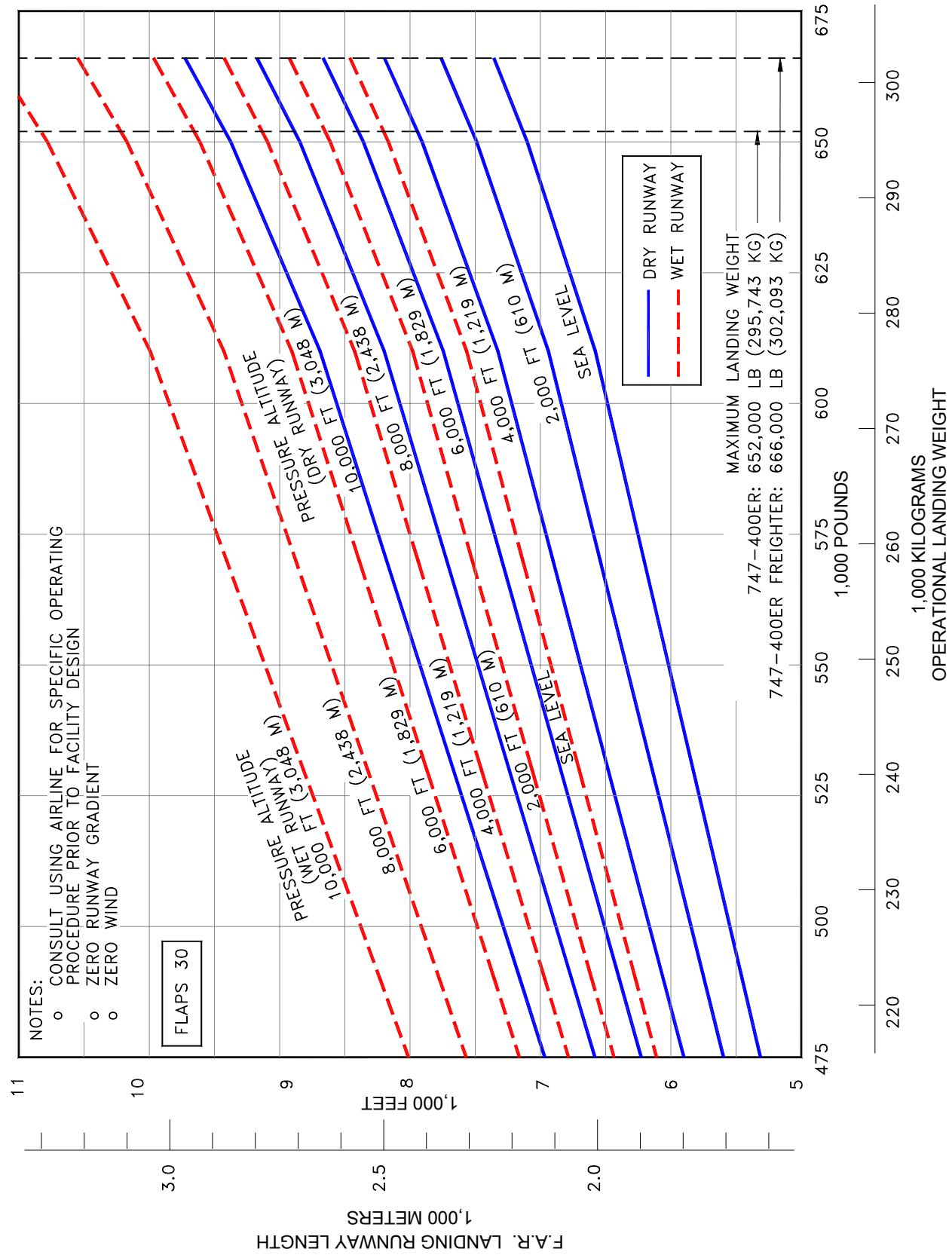
3.4.2 F.A.R. LANDING RUNWAY LENGTH REQUIREMENTS - FLAPS 30

MODEL 747-400, -400 COMBI, -400 DOMESTIC, -400 FREIGHTER



3.4.3 F.A.R. LANDING RUNWAY LENGTH REQUIREMENTS - FLAPS 25

MODEL 747-400ER, -400ER FREIGHTER



3.4.4 F.A.R. LANDING RUNWAY LENGTH REQUIREMENTS - FLAPS 30

MODEL 747-400ER, -400ER FREIGHTER

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4.0 GROUND MANEUVERING

4.1 General Information

4.2 Turning Radii

4.3 Clearance Radii

4.4 Visibility From Cockpit in Static Position

4.5 Runway and Taxiway Turn Paths

4.6 Runway Holding Bay

4.0 GROUND MANEUVERING

4.1 General Information

The 747 main landing gear consists of four main struts, each strut with four wheels. This geometric arrangement of the four main gears results in somewhat different ground maneuvering characteristics from those experienced with typical landing gear aircraft.

Basic factors that influence the geometry of the turn include:

1. Nose wheel steering angle

2. Engine power settings

3. Center of gravity location

4. Airplane weight

4. Pavement surface conditions

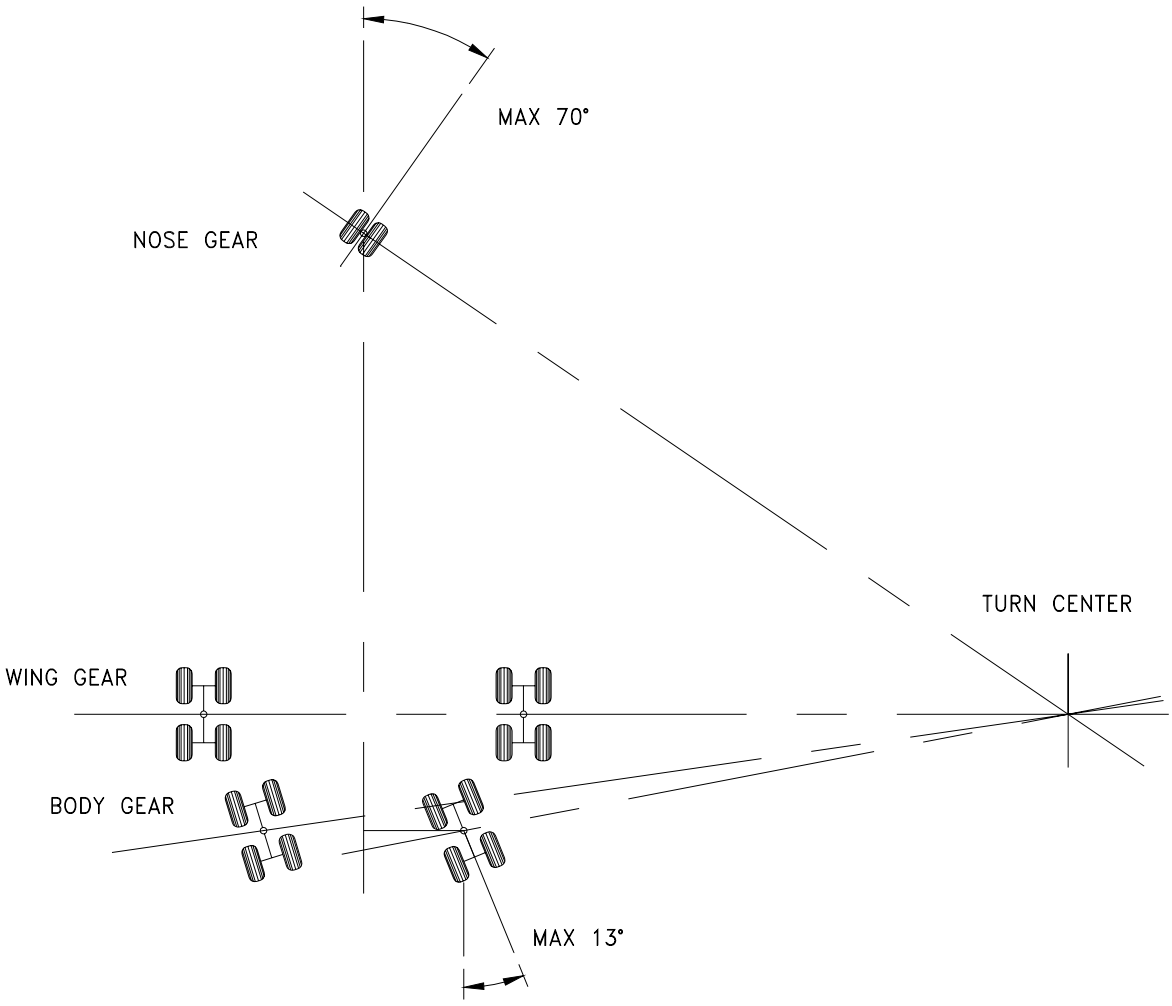
6. Amount of differential braking

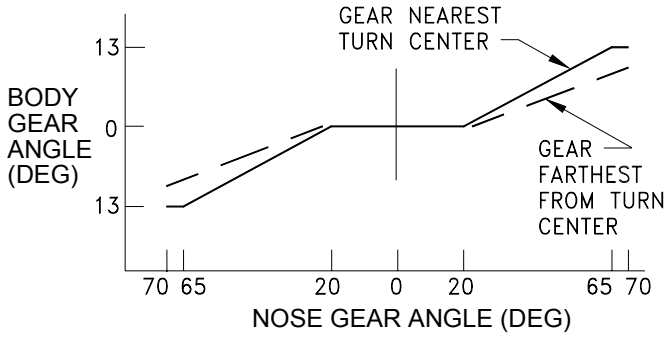
7. Ground speed

8. Main landing gear steering

The steering system of the 747 incorporates steering of the main body landing gear in addition to the nose gear steering. This body gear steering system is hydraulically actuated and is programmed electrically to provide steering ratios proportionate to the nose gear steering angles. During takeoff and landing, the body gear steering system is centered, mechanically locked, and depressurized.

Steering of the main body gear has the following advantages over ground maneuvering without this steering feature; overall improved maneuverability, including improved nose gear tracking; elimination of the need for differential braking during ground turns, with subsequent reduced brake wear; reduced thrust requirements; lower main gear stress levels; and reduced tire scrubbing. The turning radii shown in Section 4.2 are derived from a previous test involving a 747-200. The 747-400 is expected to follow the same maneuvering characteristics.



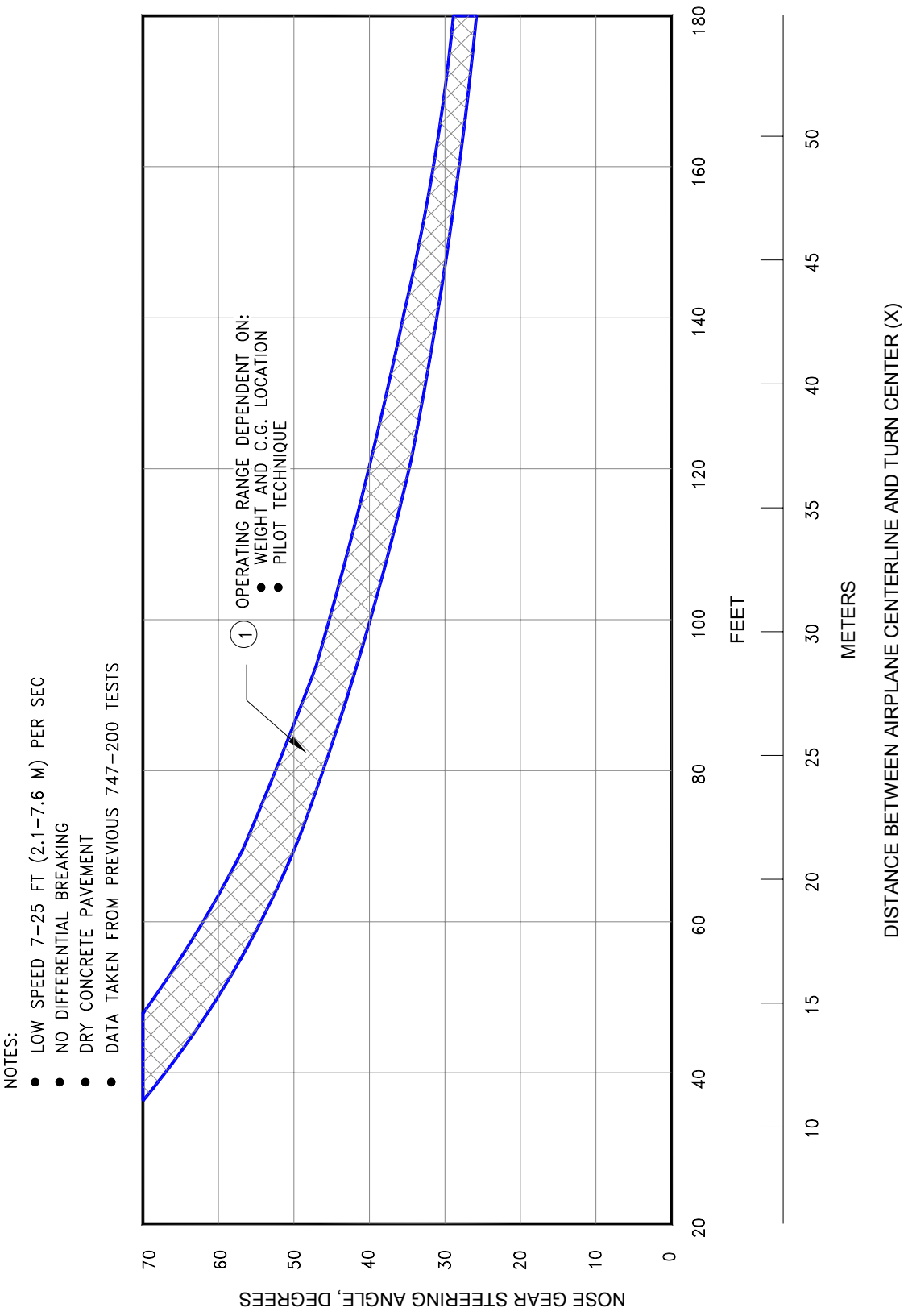


NOSE GEAR	BODY GEAR
0° TO 20°	0°
20° TO 70°	0° TO 13°

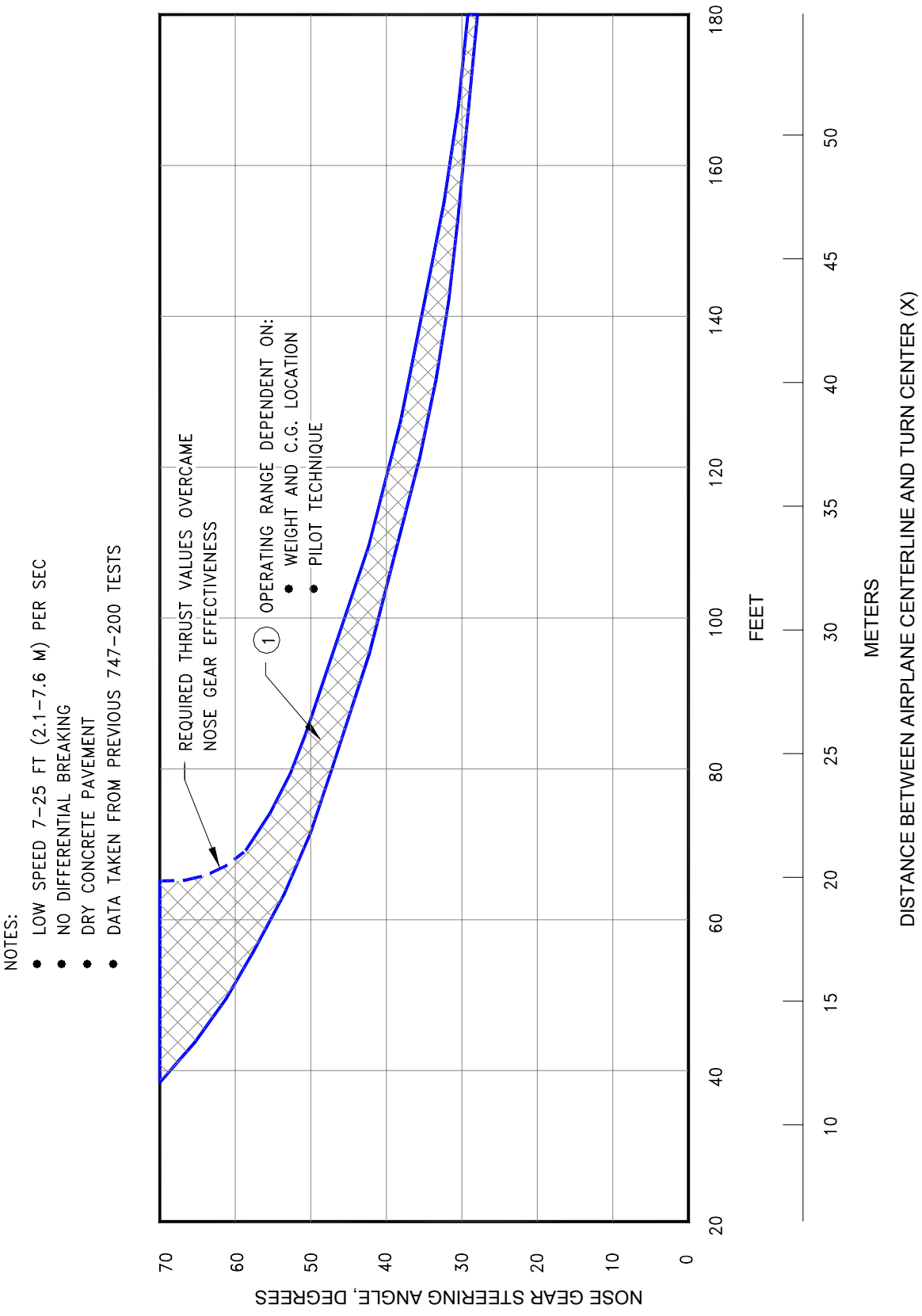
NOSEGEAR/BODY GEAR TURN RATIOS

4.1.1 GENERAL INFORMATION

MODEL 747

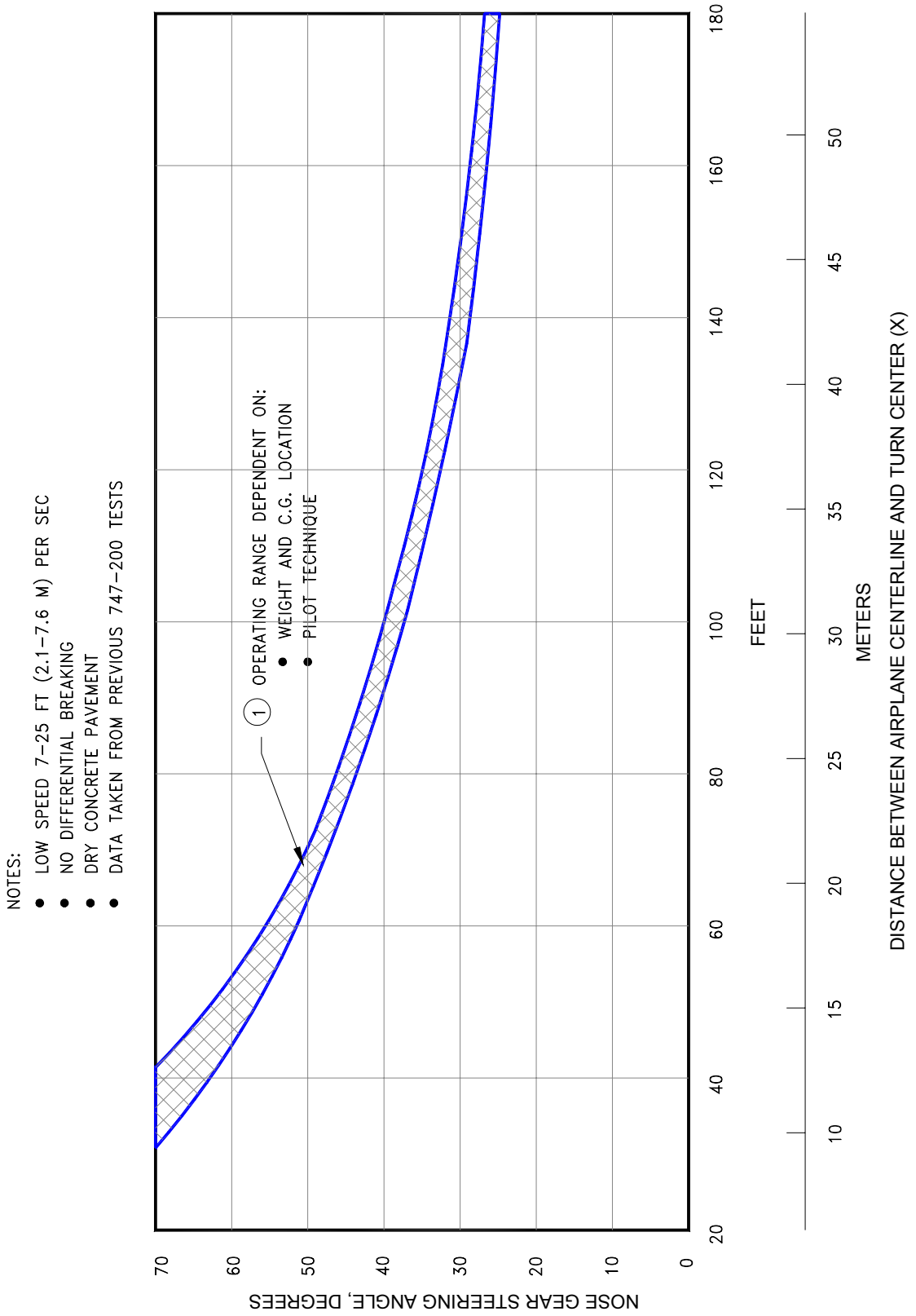


4.2.1 TURNING RADII - WITH BODY GEAR STEERING - SYMMETRICAL THRUST
MODEL 747



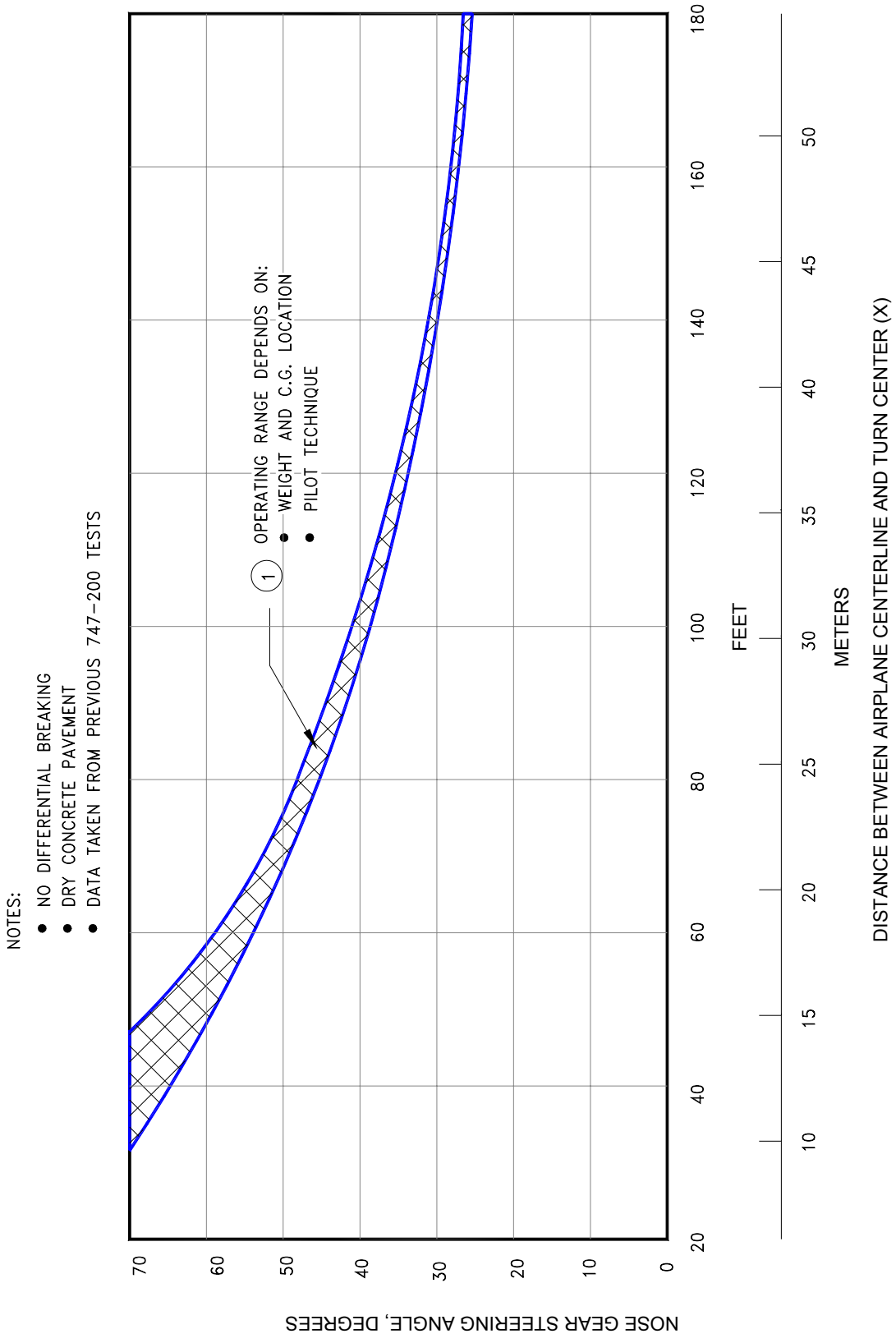
4.2.2 TURNING RADII - BODY GEAR STEERING INOPERATIVE - SYMMETRICAL THRUST

MODEL 747



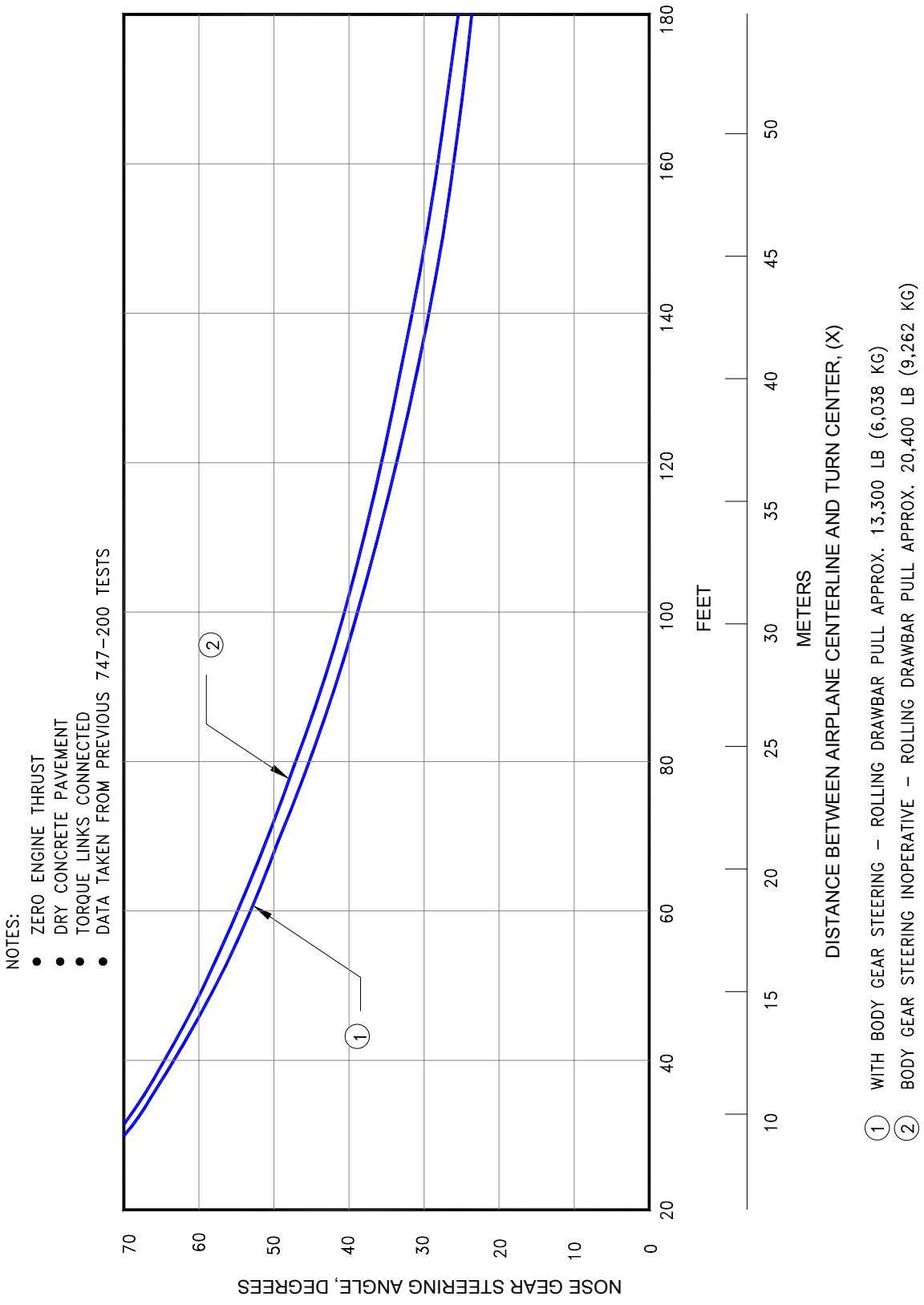
4.2.3 TURNING RADII - WITH BODY GEAR STEERING - UNSYMMETRICAL THRUST

MODEL 747



4.2.4 TURNING RADII - BODY GEAR STEERING INOPERATIVE- SYMMETRICAL THRUST

MODEL 747



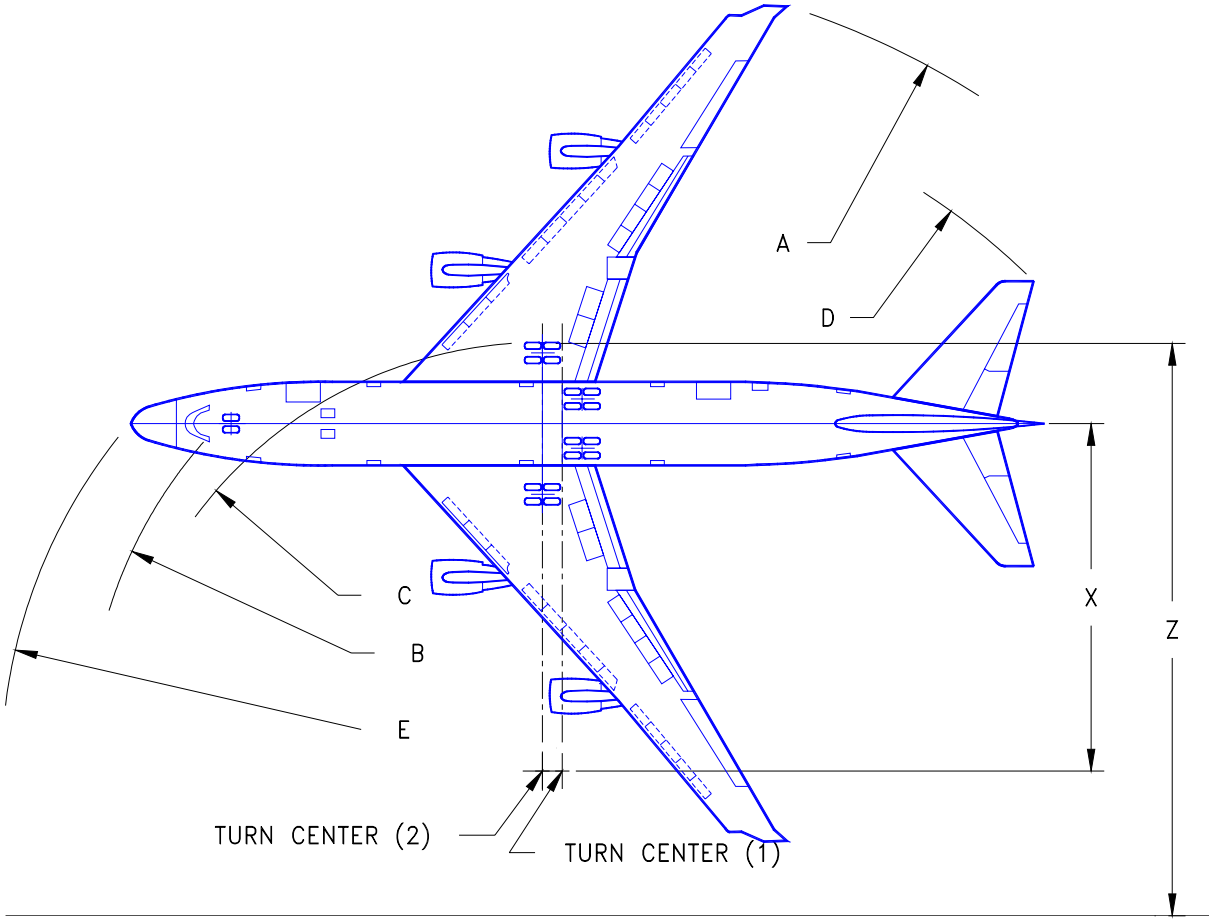
4.2.5 TURNING RADII - TOWED

MODEL 747

NOTES: 1. CONSULT AIRLINE FOR OPERATING PROCEDURES
2. VALUES ARE ROUNDED TO THE NEAREST FOOT

X * (FEET)	RADIUS (FEET)										Z (3) MINIMUM WIDTH FOR 180°TURN	
	A (4) WING TIP		B (3) NOSE GEAR		C (3) WING GEAR		D TAIL TIP		E NOSE			
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
40	157	159	96	91	61	61	142	146	117	112	156	152
60	176	177	106	102	81	81	154	158	125	120	187	183
80	195	196	119	115	101	101	167	171	136	132	219	216
100	214	215	133	130	121	121	182	185	148	145	254	251
120	233	234	149	146	141	141	197	200	162	159	290	287
140	253	254	166	163	161	161	213	216	178	175	327	324
160	272	273	183	181	181	181	230	233	194	191	364	362

* X = DISTANCE BETWEEN AIRPLANE CENTERLINE AND TURN CENTER
(1) BODY GEAR STEERING INOPERATIVE
(2) WITH BODY GEAR STEERING
(3) MEASURED TO OUTSIDE TIRE FACES
(4) WINGSPAN AT 213 FEET



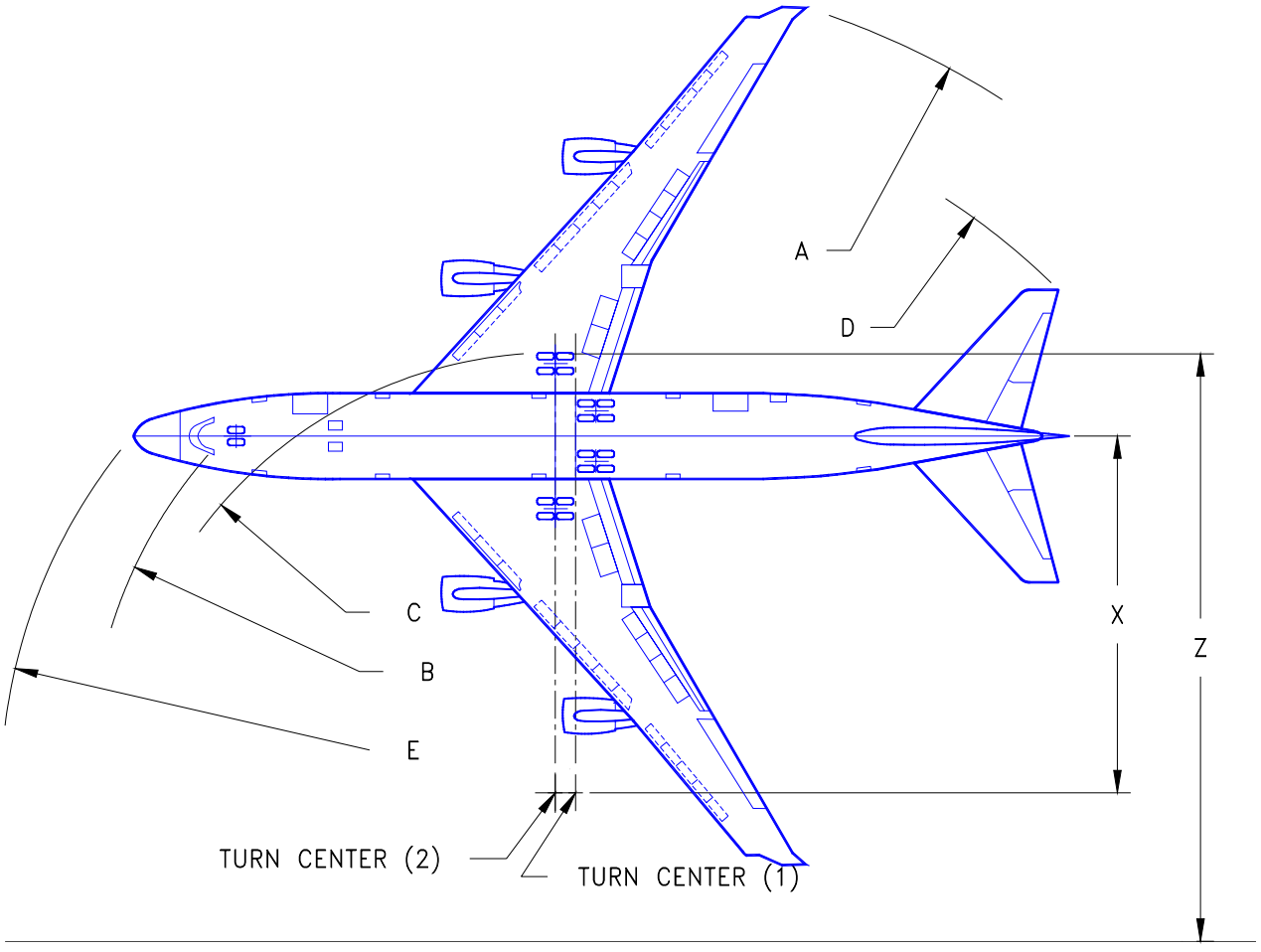
4.3.1 CLEARANCE RADII - ENGLISH UNITS

MODEL 747-400, -400 COMBI, -400 FREIGHTER, -400ER, -400ER FREIGHTER

NOTES: 1. CONSULT AIRLINE FOR OPERATING PROCEDURES
2. VALUES ARE ROUNDED TO THE NEAREST 0.1 METER

X * (METERS)	RADIUS (METERS)										Z (3) MINIMUM WIDTH FOR 180°TURN (METERS)	
	A (4) WING TIP		B (3) NOSE GEAR		C (3) WING GEAR		D TAIL TIP		E NOSE			
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
15	50.4	50.9	30.5	29.2	21.3	21.3	44.9	46.1	36.6	35.2	51.8	50.5
20	55.1	55.6	33.3	32.1	26.3	26.3	48.0	49.1	38.9	37.6	59.6	58.4
25	59.9	60.3	36.6	35.5	31.3	31.3	51.3	52.4	41.7	40.5	67.9	66.8
30	64.7	65.1	40.2	39.3	36.3	36.3	55.0	56.0	44.9	43.7	76.5	75.6
35	69.5	69.9	44.2	43.3	41.3	41.3	58.8	59.8	48.3	47.3	85.5	84.6
40	74.4	74.8	48.3	47.5	46.3	46.3	62.8	63.7	52.1	51.1	94.6	93.8
45	79.3	79.6	52.6	51.8	51.3	51.3	66.9	67.8	56.0	55.1	103.9	103.1

* X = DISTANCE BETWEEN AIRPLANE CENTERLINE AND TURN CENTER
(1) BODY GEAR STEERING INOPERATIVE
(2) WITH BODY GEAR STEERING
(3) MEASURED TO OUTSIDE TIRE FACES
(4) WINGSPAN AT 64.9 METERS



4.3.2 CLEARANCE RADII - METRIC UNITS

MODEL 747-400, -400 COMBI, -400 FREIGHTER, -400ER, -400ER FREIGHTER

NOTE: CONSULT AIRLINE FOR OPERATING PROCEDURES

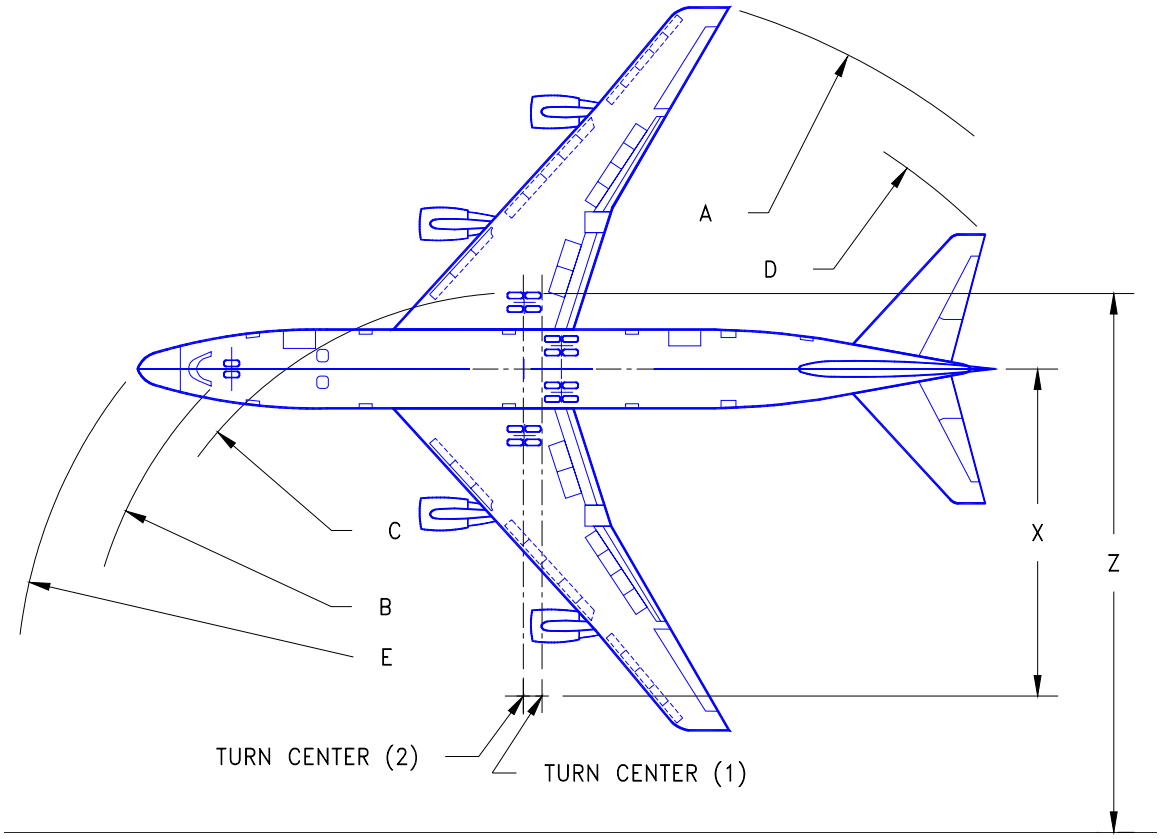
X * (FEET)	RADIUS (FEET)										Z (3) MINIMUM WIDTH FOR 180°TURN	
	A WING TIP		B (3) NOSE GEAR		C (3) WING GEAR		D TAIL TIP		E NOSE			
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
40	148	151	96	91	61	61	142	146	117	112	156	152
60	168	170	106	102	81	81	154	158	125	120	187	183
80	187	188	119	115	101	101	167	171	136	132	219	216
100	206	207	133	130	121	121	182	185	148	145	254	251
120	225	226	149	146	141	141	197	200	162	159	290	287
140	245	246	166	163	161	161	213	216	178	175	327	324
160	264	265	183	181	181	181	230	233	194	191	364	362

* X = DISTANCE BETWEEN AIRPLANE CENTERLINE AND TURN CENTER

(1) BODY GEAR STEERING INOPERATIVE

(2) WITH BODY GEAR STEERING

(3) MEASURED TO OUTSIDE TIRE FACES



4.3.3 CLEARANCE RADII - ENGLISH UNITS

MODEL 747-400 DOMESTIC

NOTE: CONSULT AIRLINE FOR OPERATING PROCEDURES

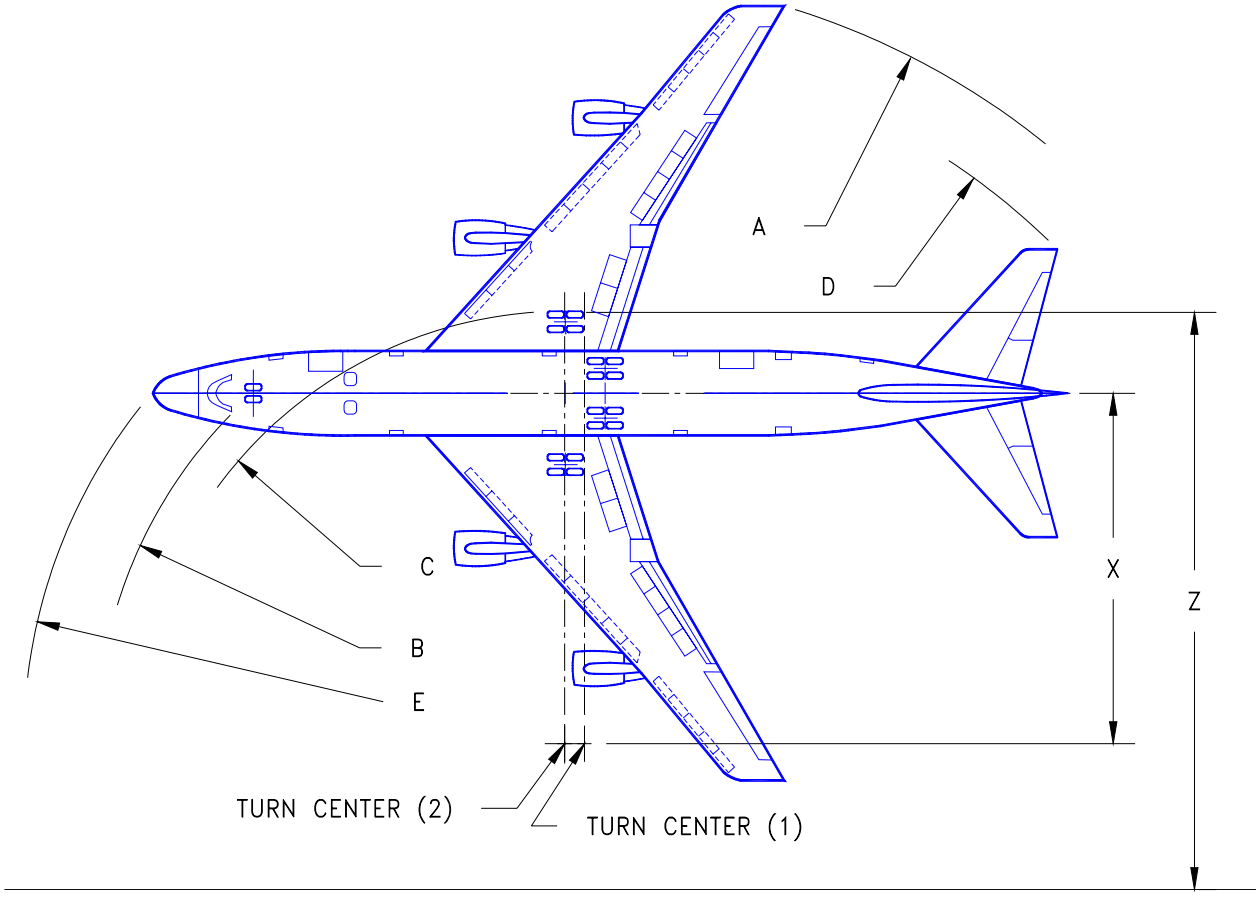
X * (METERS)	RADIUS (METERS)										Z (3) MINIMUM WIDTH FOR 180°TURN (METERS)	
	A WING TIP		B (3) NOSE GEAR		C (3) WING GEAR		D TAIL TIP		E NOSE			
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
15	48.2	48.8	30.5	29.2	21.3	21.3	44.9	46.1	36.6	35.2	51.8	50.5
20	52.7	53.3	33.3	32.1	26.3	26.3	48.0	49.1	38.9	37.6	59.6	58.4
25	57.6	59.7	36.6	35.5	31.3	31.3	51.3	52.4	41.7	40.5	67.9	66.8
30	62.2	62.8	40.2	39.3	36.3	36.3	55.0	56.0	44.9	43.7	76.5	75.6
35	67.1	67.7	44.2	43.3	41.3	41.3	58.8	59.8	48.3	47.3	85.5	84.6
40	71.9	72.2	48.3	47.5	46.3	46.3	62.8	63.7	52.1	51.1	94.6	93.8
45	76.8	77.1	52.6	51.8	51.3	51.3	66.9	67.8	56.0	55.1	103.9	103.1

* X = DISTANCE BETWEEN AIRPLANE CENTERLINE AND TURN CENTER

(1) BODY GEAR STEERING INOPERATIVE

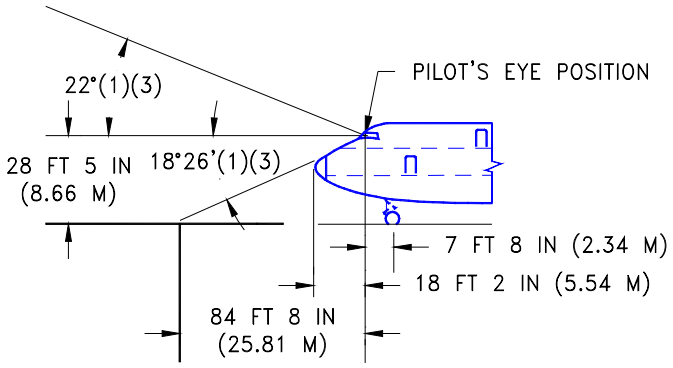
(2) WITH BODY GEAR STEERING

(3) MEASURED TO OUTSIDE TIRE FACES



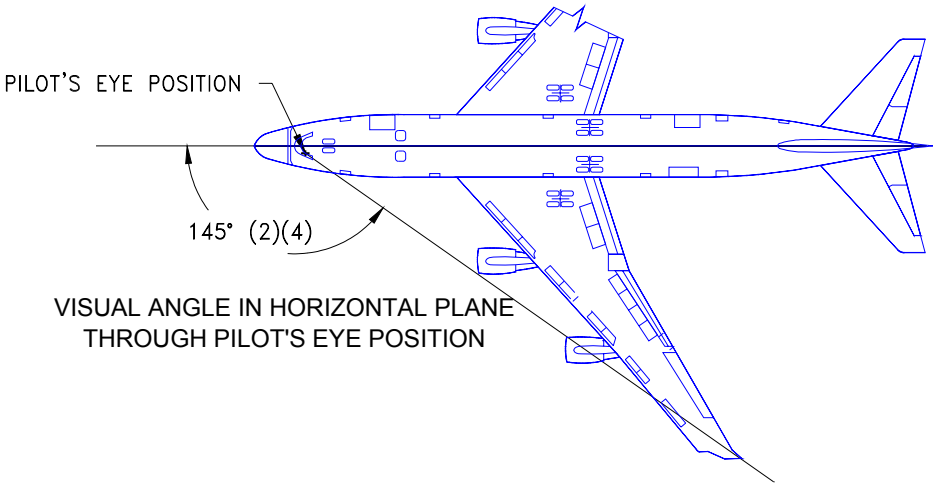
4.3.4 CLEARANCE RADII - METRIC UNITS

MODEL 747-400 DOMESTIC

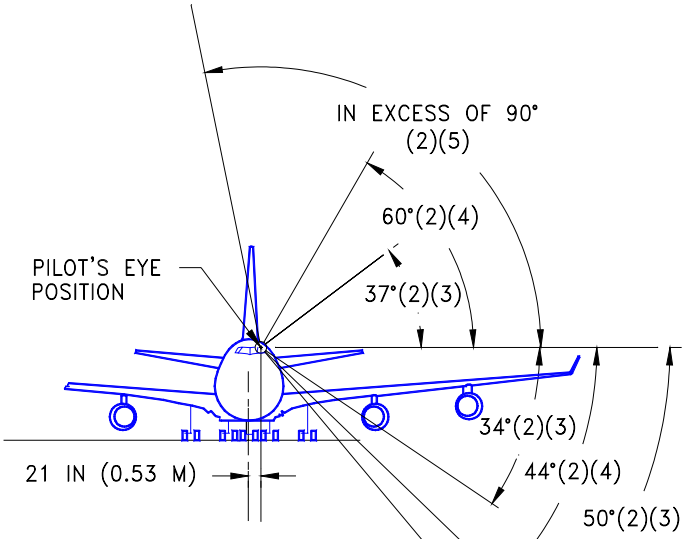


NOT TO BE USED FOR LANDING APPROACH VISIBILITY

VISUAL ANGLES IN VERTICAL PLANE THROUGH PILOT'S EYE POSITION



VISUAL ANGLE IN HORIZONTAL PLANE THROUGH PILOT'S EYE POSITION



VISUAL ANGLES IN PLANE PERPENDICULAR TO LONGITUDINAL AXIS THROUGH PILOT'S EYE POSITION

NOTES:

(1) VISUAL ANGLES THROUGH WINDSHIELD

(2) VISUAL ANGES THROUGH SIDE WINDOW

(3) VISUAL ANGLES FROM NORMAL POSITION

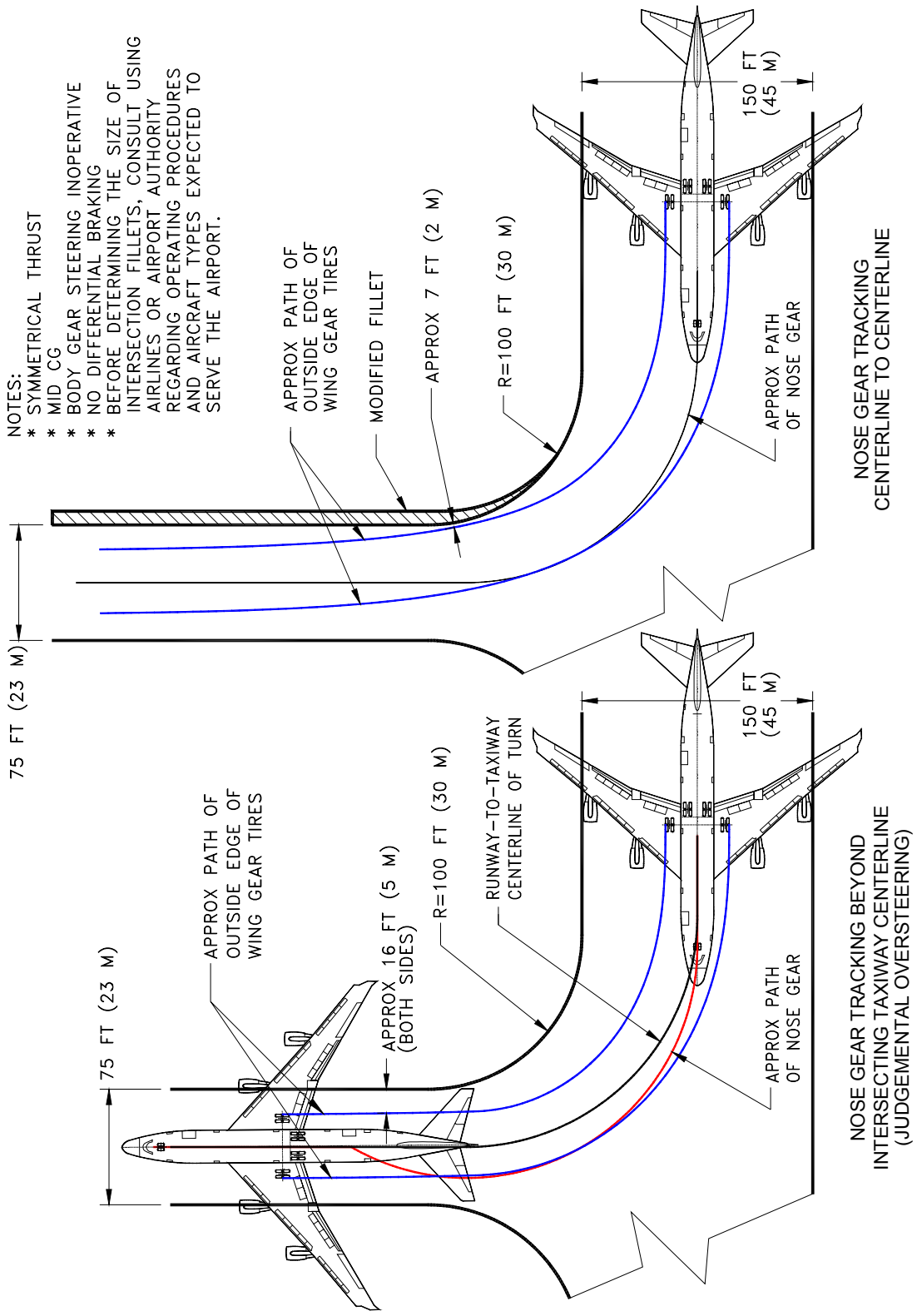
(4) VISUAL ANGLES FROM ALERT POSITION, HEAD MOVED OUTBOARD 5 IN (0.13 M)

(5) VISUAL ANGLES WITH HEAD MOVED 7 IN (0.18 M) OUTBOARD

* HEAD IS ROTATED ABOUT A POINT 3 IN (0.08 M) AFT OF PILOT'S EYE POSITION

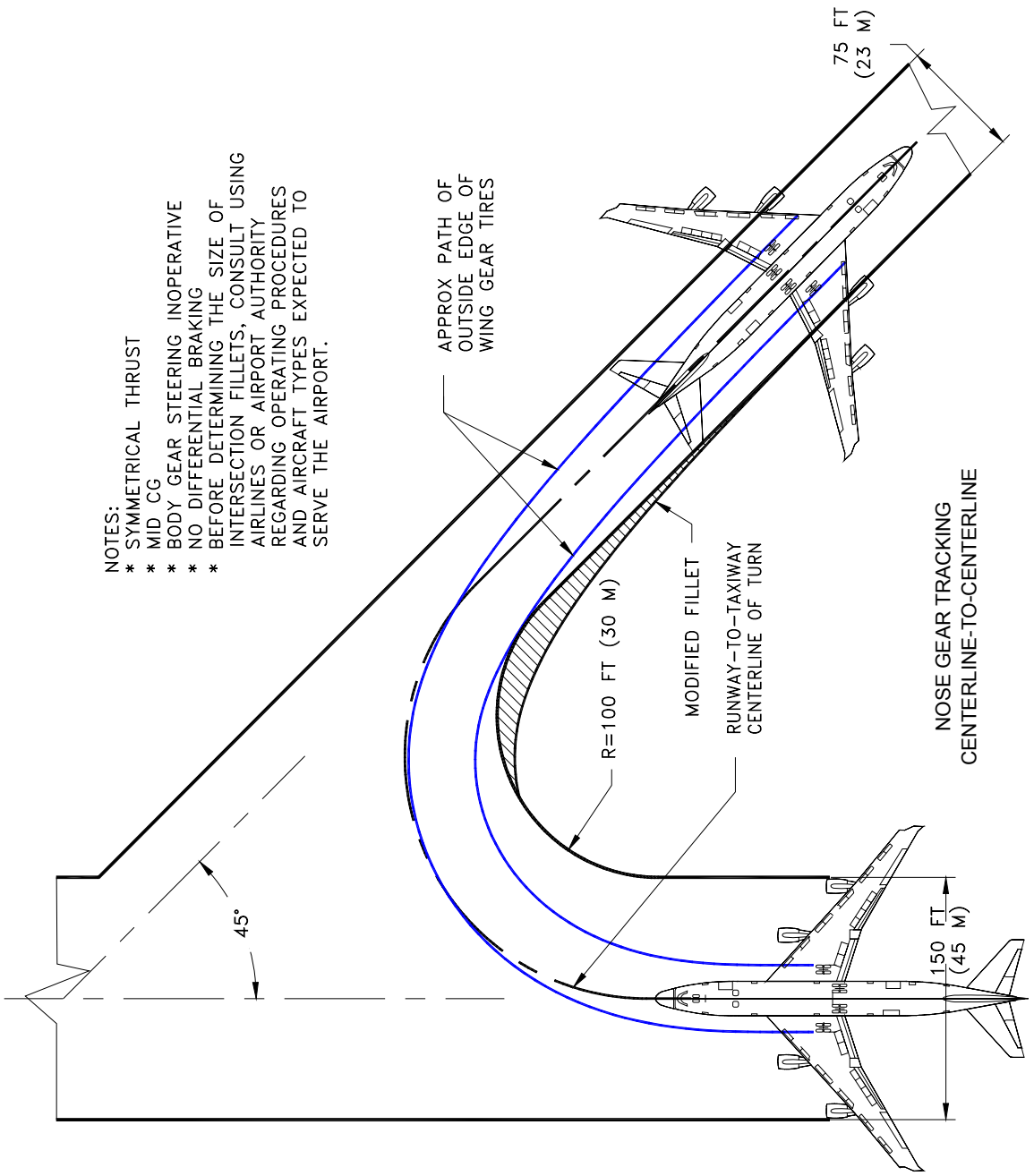
4.4 VISIBILITY FROM COCKPIT IN STATIC POSITION

MODEL 747-400



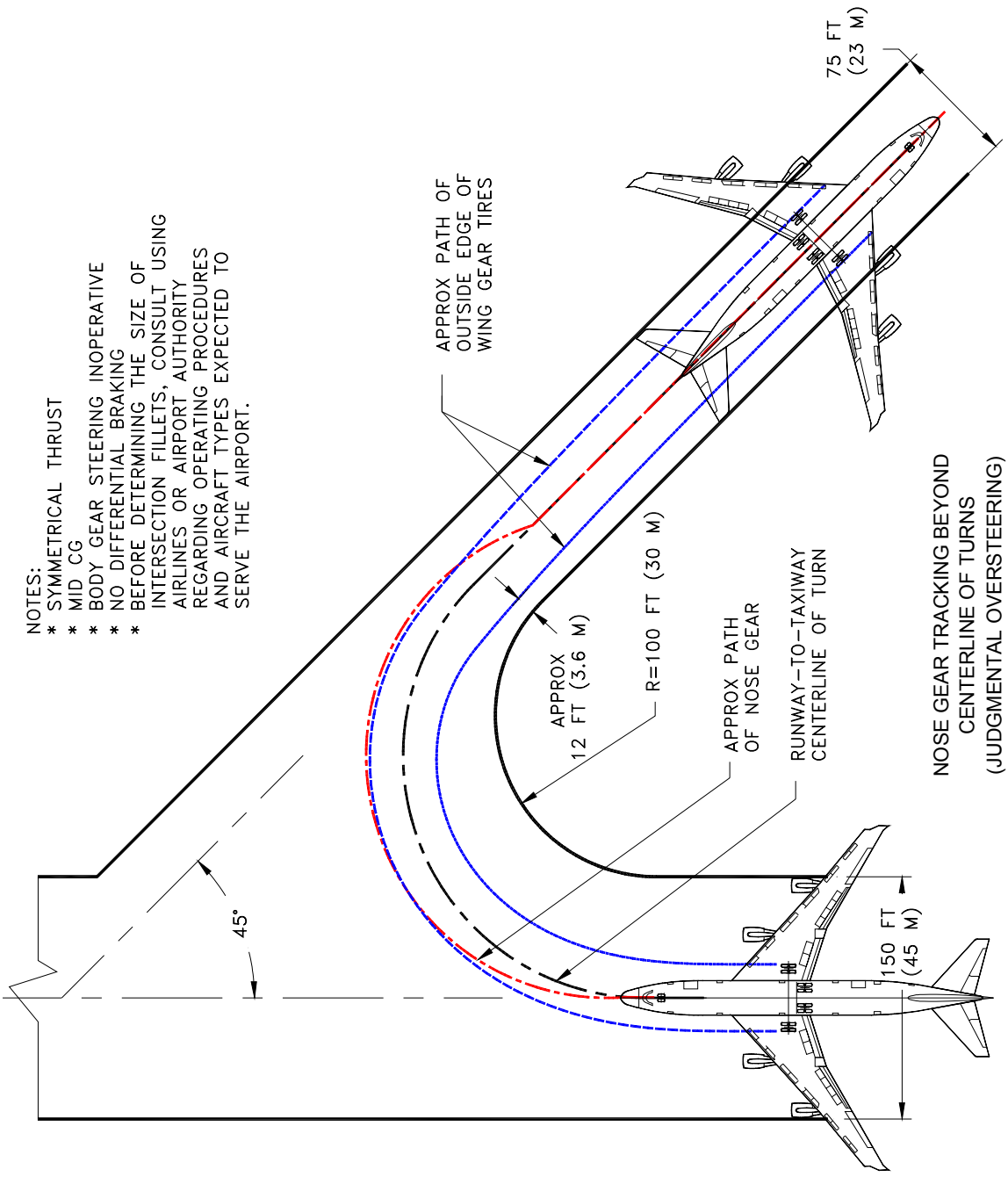
4.5.1 RUNWAY AND TAXIWAY TURN PATHS - RUNWAY-TO-TAXIWAY, 90 DEGREES

MODEL 747-400



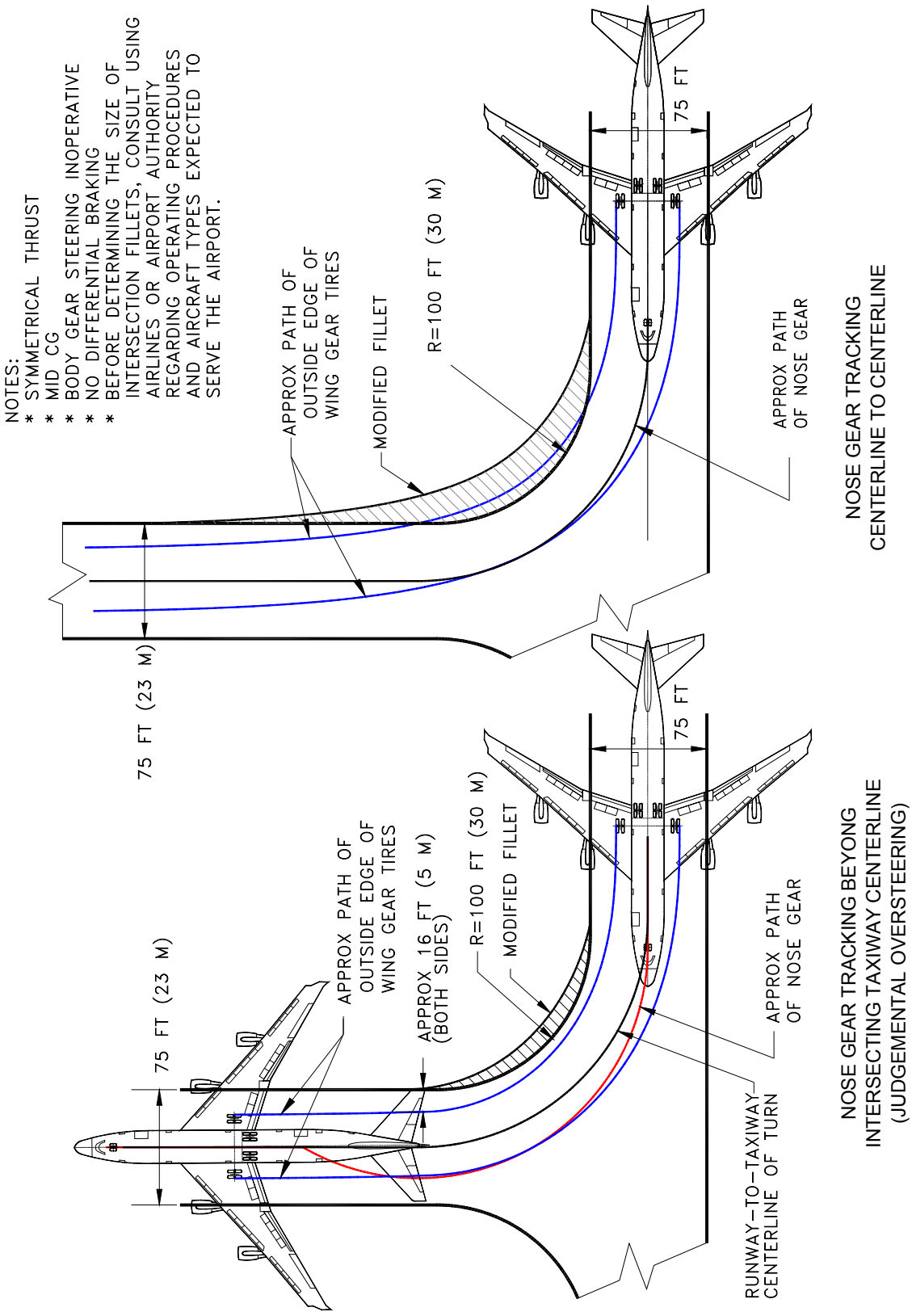
4.5.2 RUNWAY AND TAXIWAY TURN PATHS - RUNWAY-TO-TAXIWAY, MORE THAN 90 DEGREES, NOSE GEAR TRACKS CENTERLINE

MODEL 747-400



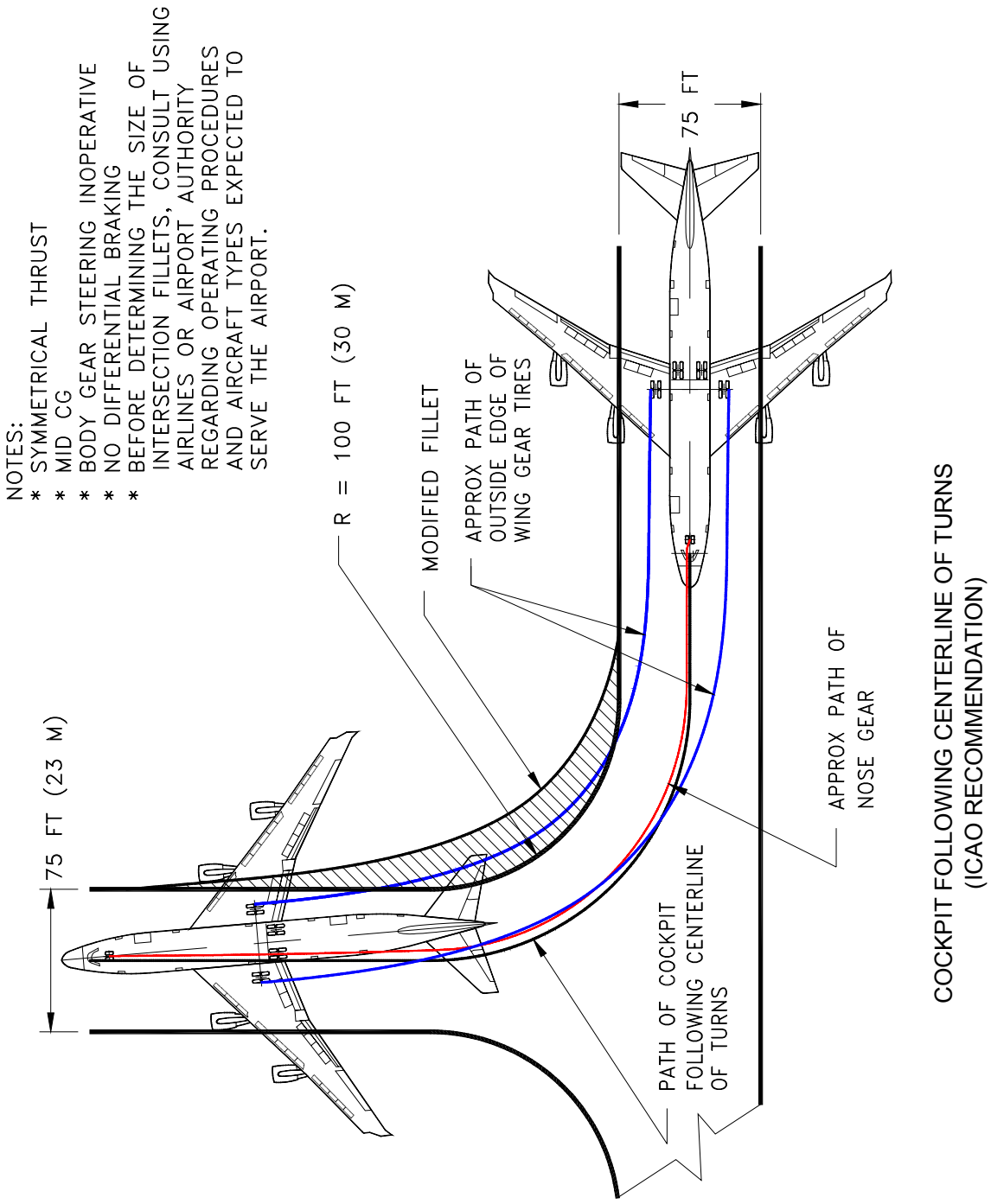
4.5.3 RUNWAY AND TAXIWAY TURN PATHS - RUNWAY-TO-TAXIWAY, MORE THAN 90 DEGREES, JUDGMENTAL OVERSTEERING

MODEL 747-400



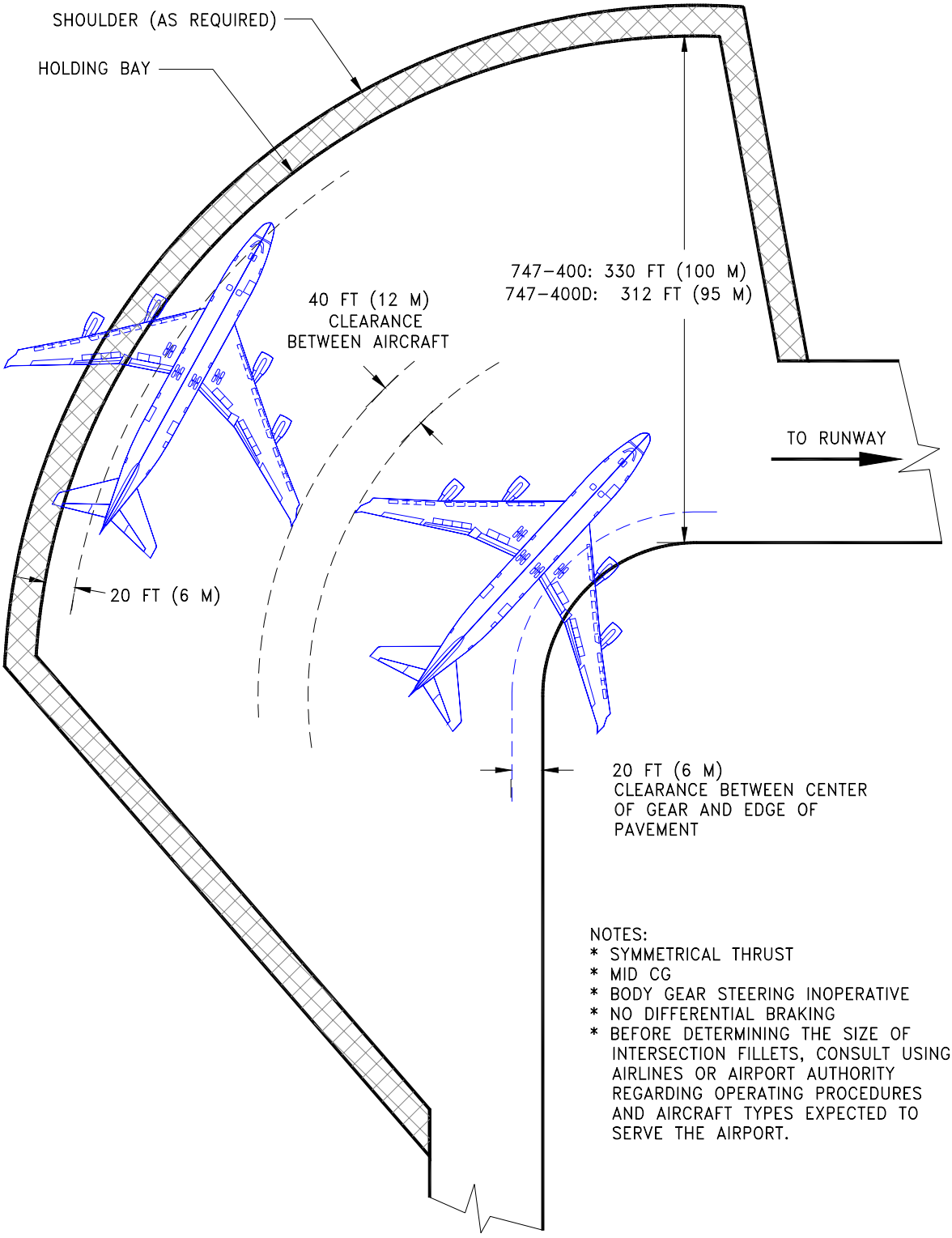
4.5.4 RUNWAY AND TAXIWAY TURN PATHS - TAXIWAY-TO-TAXIWAY, 90 DEGREES

MODEL 747-400



4.5.5 RUNWAY AND TAXIWAY TURN PATHS - TAXIWAY-TO-TAXIWAY, 90 DEGREES, ICAO RECOMMENDATION

MODEL 747-400



4.6 RUNWAY HOLDING BAY

MODEL 747-400

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5.0 TERMINAL SERVICING

5.1 Airplane Servicing Arrangement - Typical Turnaround

5.2 Terminal Operations - Turnaround Station

5.3 Terminal Operations - En Route Station

5.4 Ground Servicing Connections

5.5 Engine Starting Pneumatic Requirements

5.6 Ground Pneumatic Power Requirements

5.7 Conditioned Air Requirements

5.8 Ground Towing Requirements

5.0 TERMINAL SERVICING

During turnaround at the terminal, certain services must be performed on the aircraft, usually within a given time, to meet flight schedules. This section shows service vehicle arrangements, schedules, locations of service points, and typical service requirements. The data presented in this section reflect ideal conditions for a single airplane. Service requirements may very according to airplane condition and airline procedure.

Section 5.1 shows typical arrangements of ground support equipment during turnaround. As noted, if the auxiliary power unit (APU) is used, the electrical, air start, and air-conditioning service vehicles would not be required. Passenger loading bridges or portable passenger stairs could be used to load or unload passengers.

Sections 5.2 and 5.3 show typical service times at the terminal. These charts give typical schedules for performing service on the airplane within a given time. Service times could be rearranged to suit availability of personnel, airplane configuration, and degree of service required.

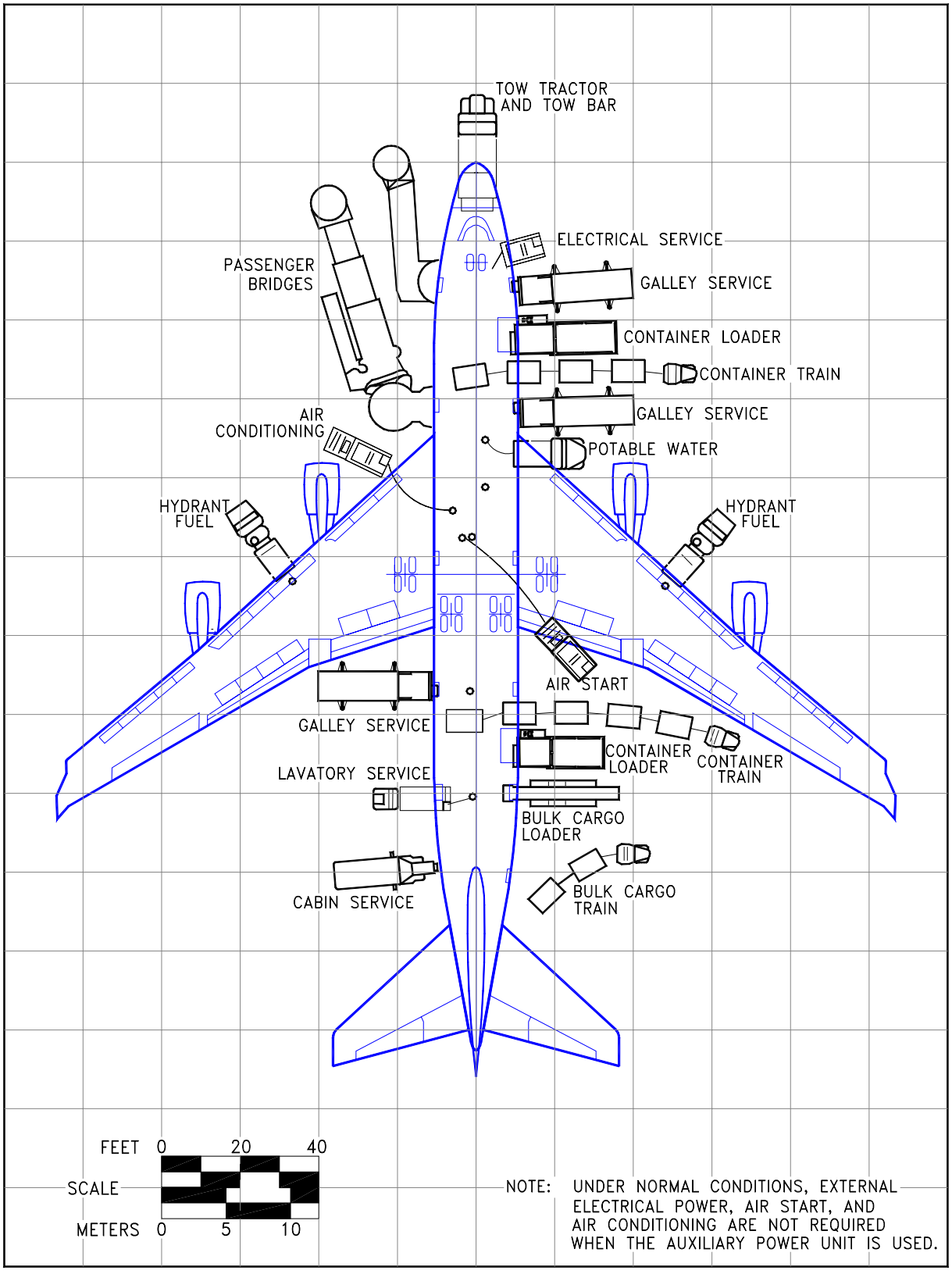
Section 5.4 shows the locations of ground service connections in graphic and in tabular forms. Typical capacities and service requirements are shown in the tables. Services with requirements that vary with conditions are described in subsequent sections.

Section 5.5 shows typical sea level air pressure and flow requirements for starting different engines. The curves are based on an engine start time of 90 seconds.

Section 5.6 shows pneumatic requirements for heating and cooling (air conditioning) using high pressure air to run the air cycle machine. The curves show airflow requirements to heat or cool the airplane within a given time and ambient conditions. Maximum allowable pressure and temperature for air cycle machine operation are 60 psia and 450^{O}F, respectively.

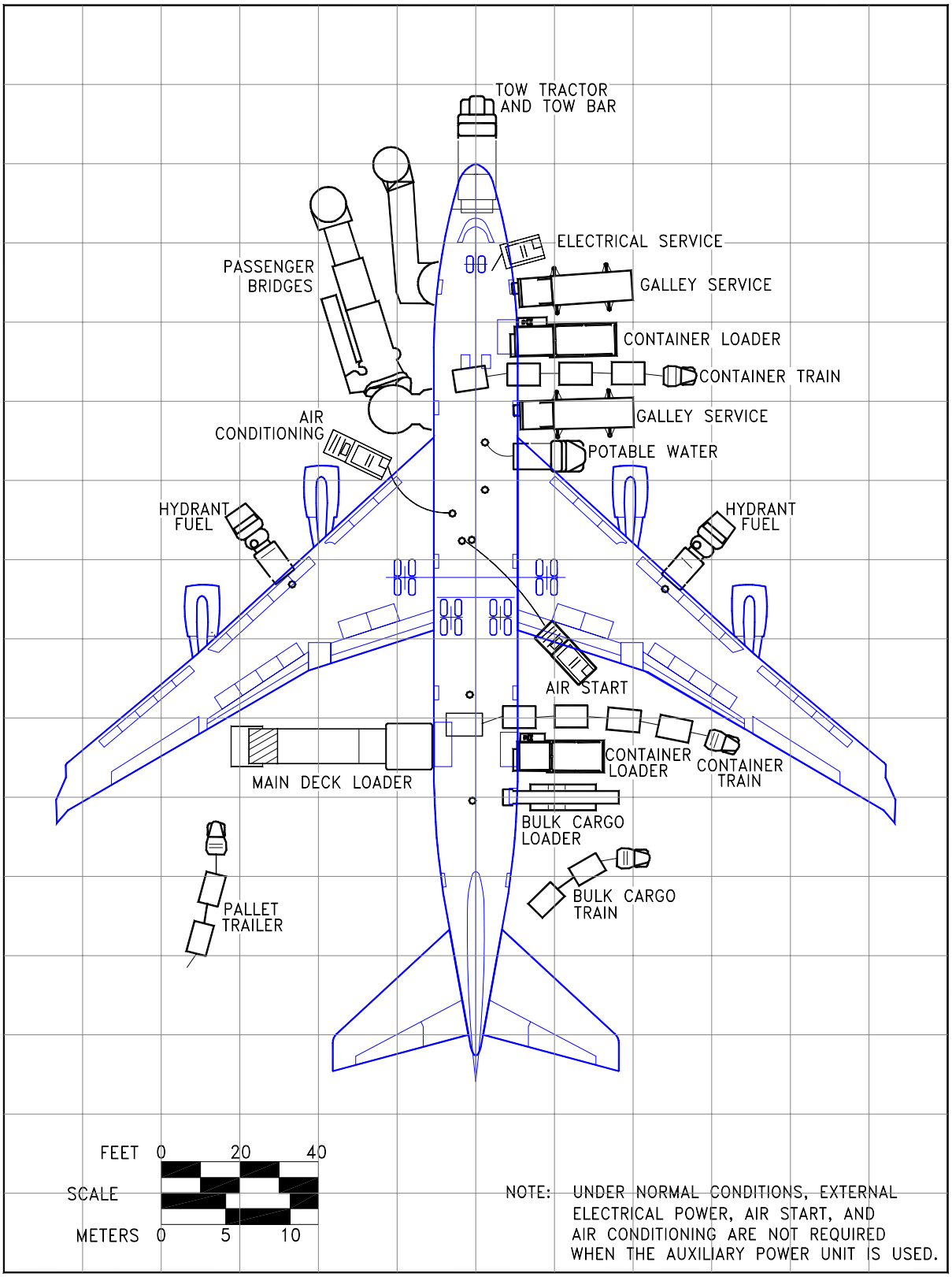
Section 5.7 shows pneumatic requirements for heating and cooling the airplane, using low pressure conditioned air. This conditioned air is supplied through an 8-in ground air connection (GAC) directly to the passenger cabin, bypassing the air cycle machines.

Section 5.8 shows ground towing requirements for various ground surface conditions.



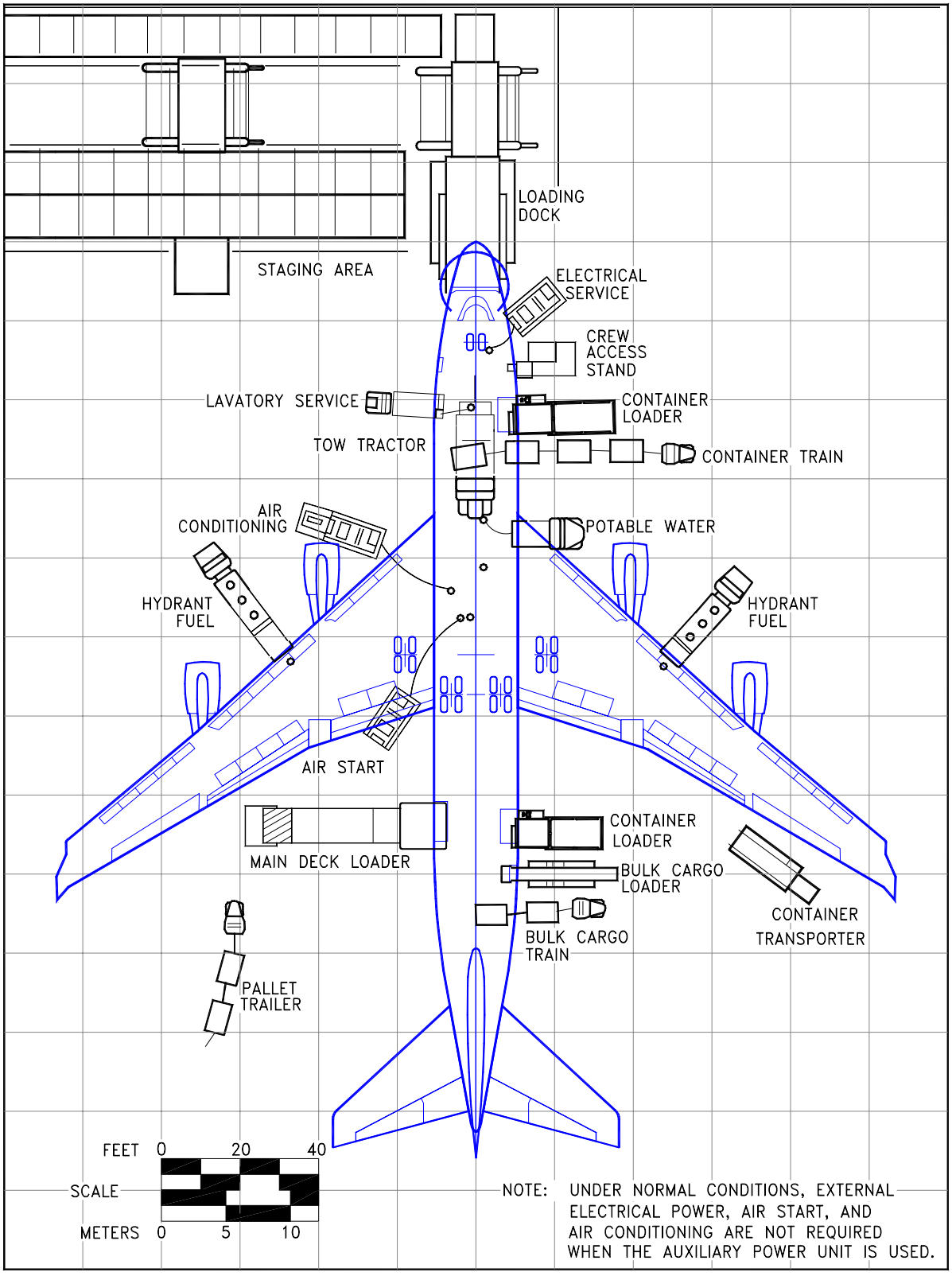
5.1.1 AIRPLANE SERVICING ARRANGEMENT - TYPICAL TURNAROUND

MODEL 747-400, -400 DOMESTIC, -400ER



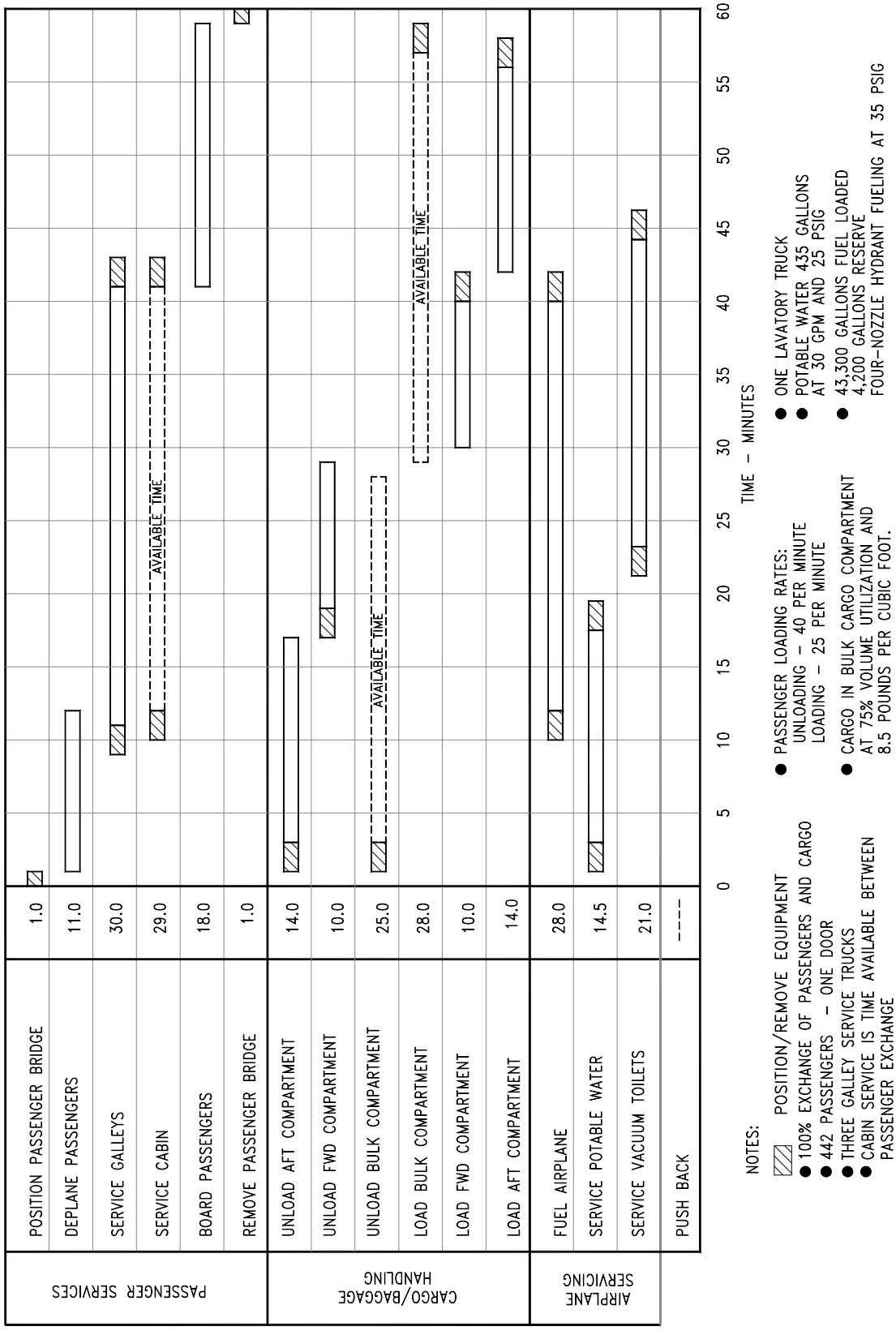
5.1.2 AIRPLANE SERVICING ARRANGEMENT - TYPICAL TURNAROUND

MODEL 747-400 COMBI



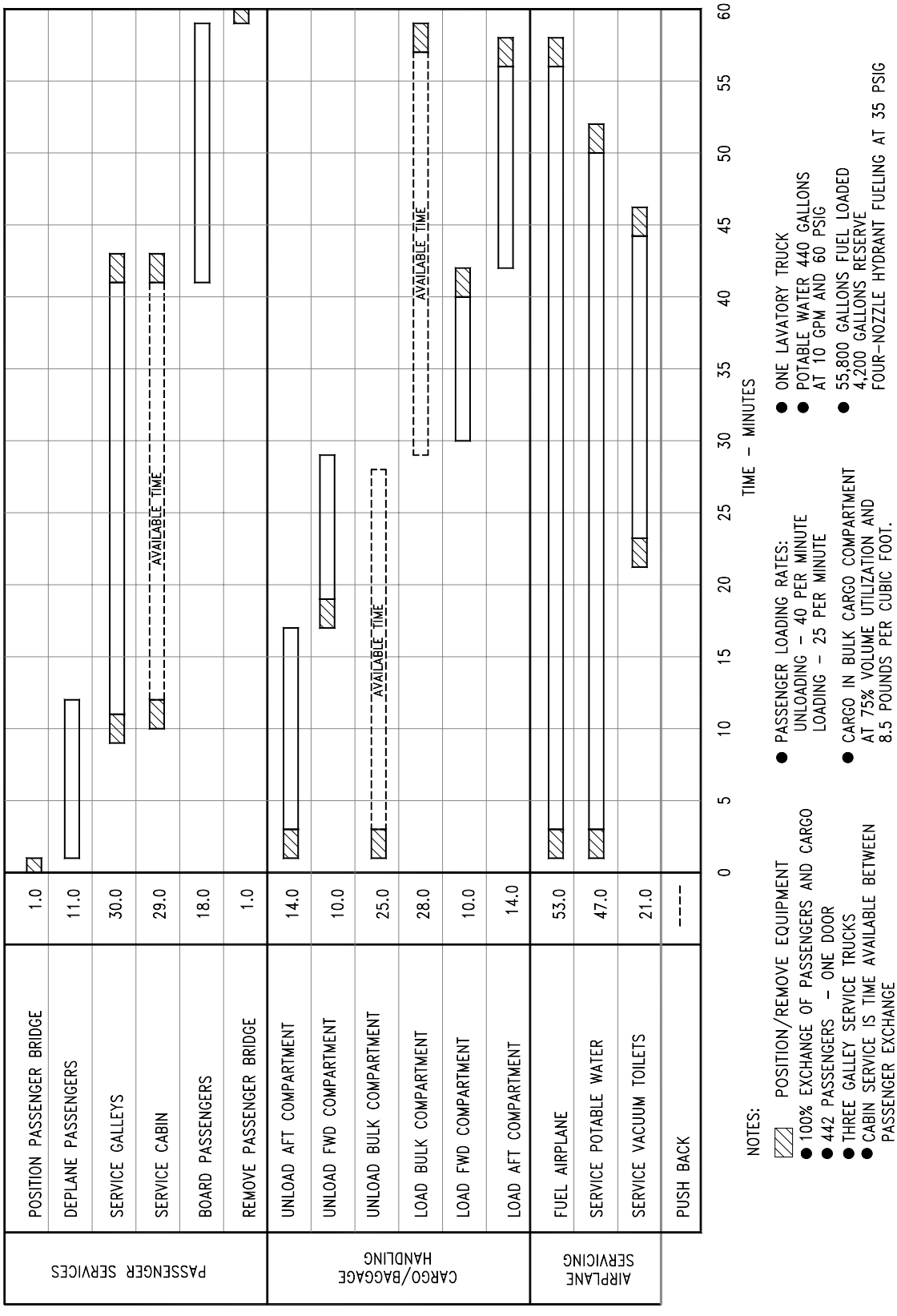
5.1.3 AIRPLANE SERVICING ARRANGEMENT - TYPICAL TURNAROUND

MODEL 747-400 FREIGHTER, -400ER FREIGHTER



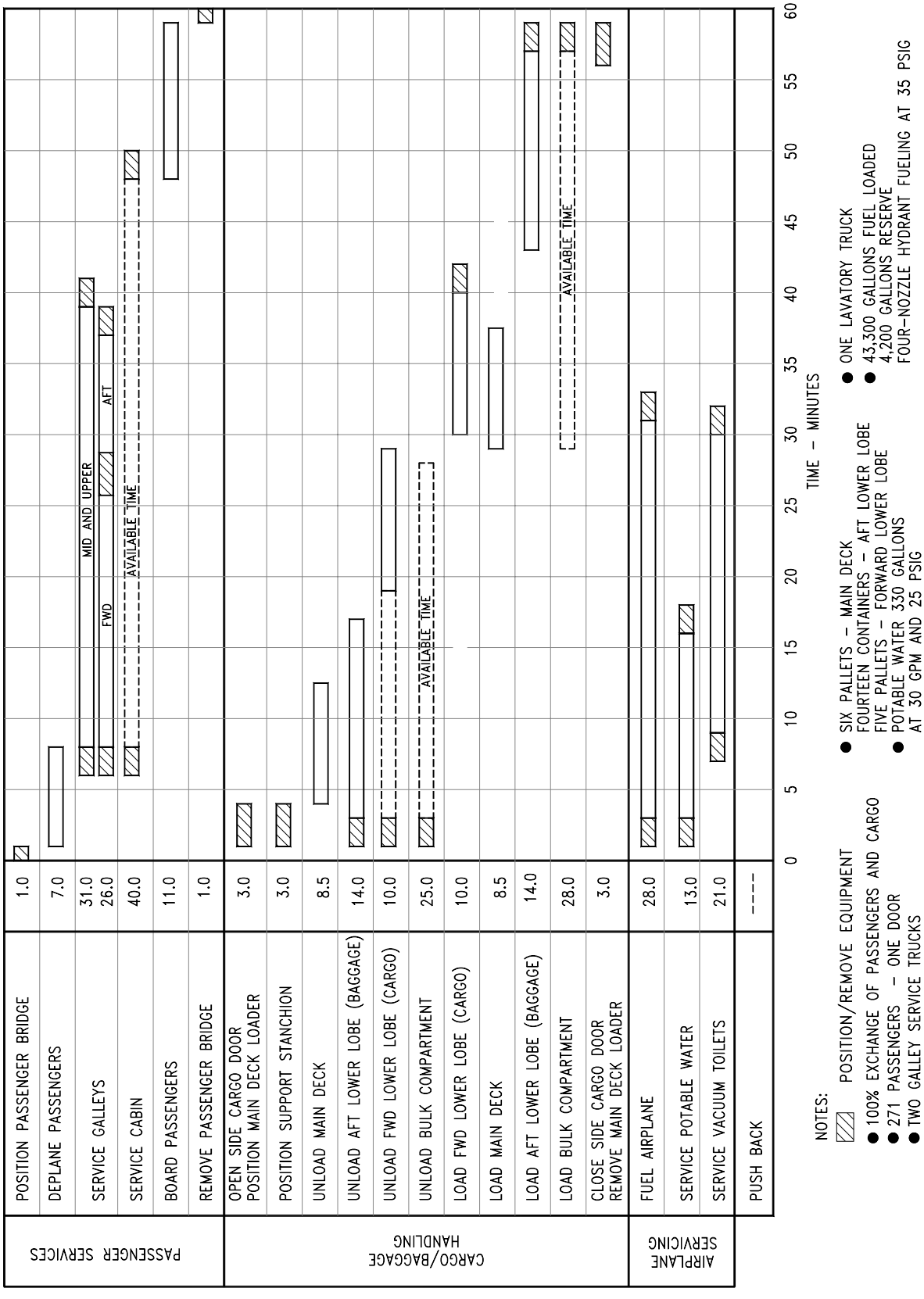
5.2.1 TERMINAL OPERATIONS - TURNAROUND STATION – ALL PASSENGER

MODEL 747-400, -400 C0MBI, -400 DOMESTIC



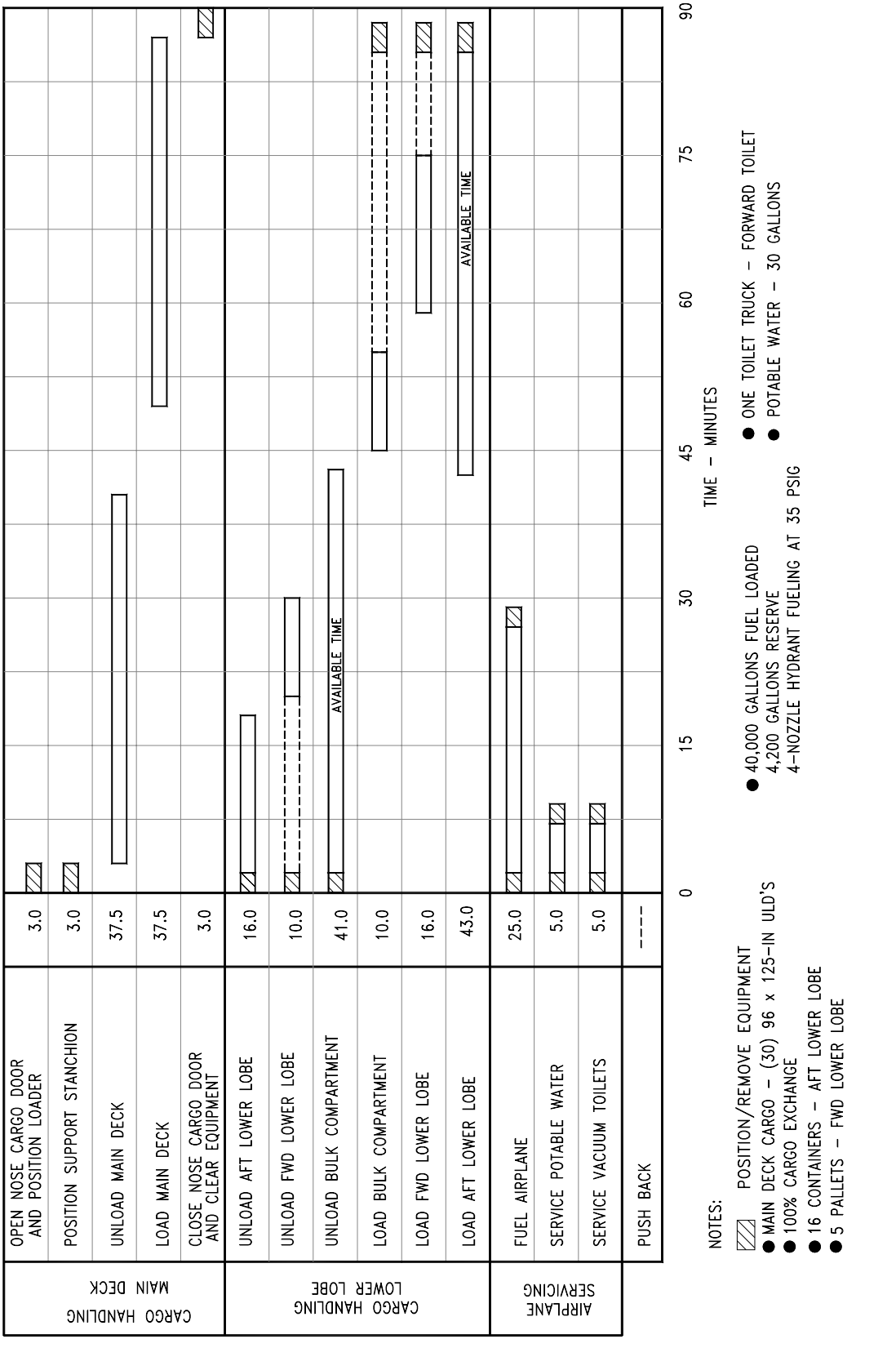
5.2.2 TERMINAL OPERATIONS - TURNAROUND STATION – ALL PASSENGER

MODEL 747-400ER



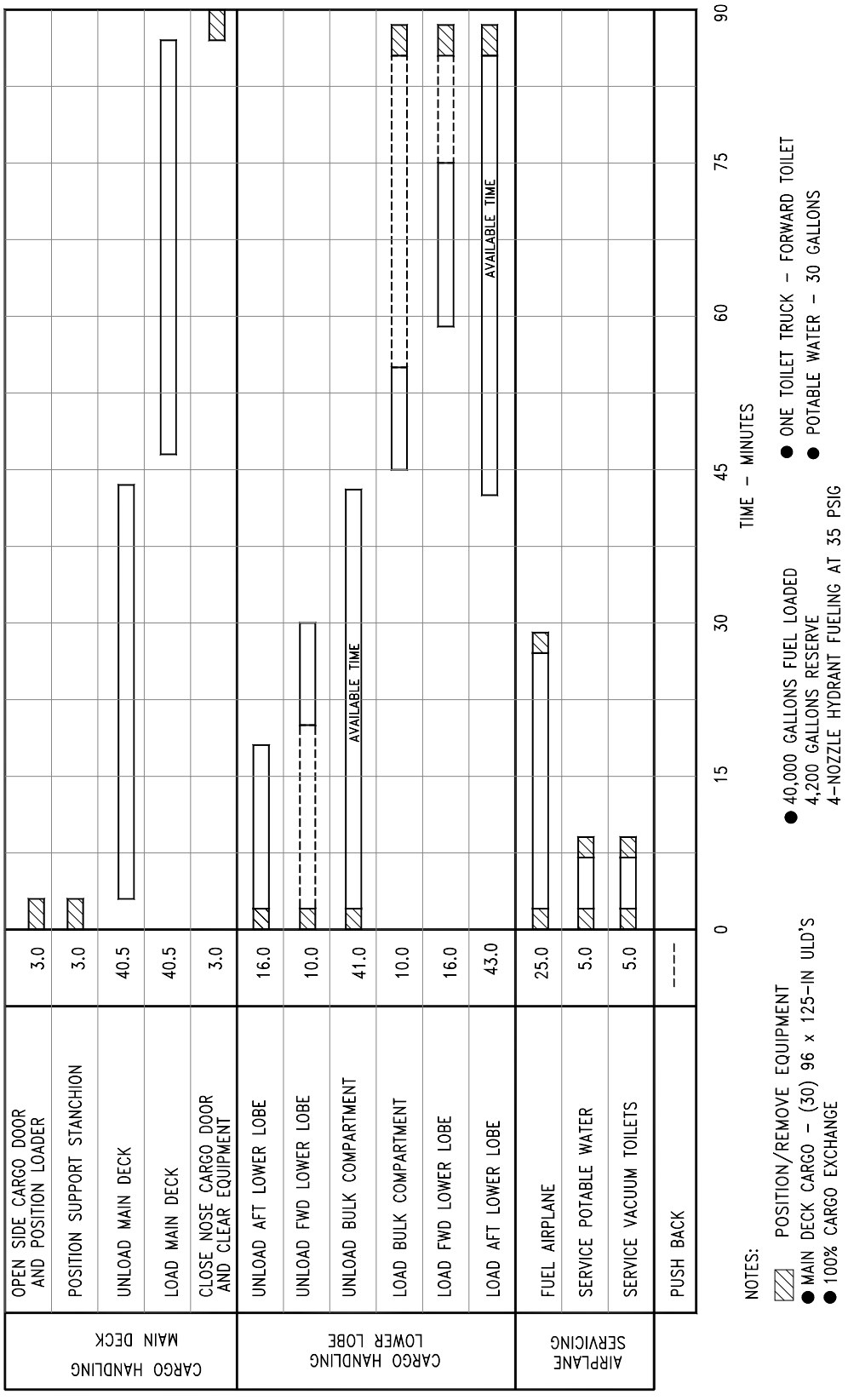
5.2.3 TERMINAL OPERATIONS - TURNAROUND STATION – PASSENGER/CARGO

MODEL 747-400 COMBI



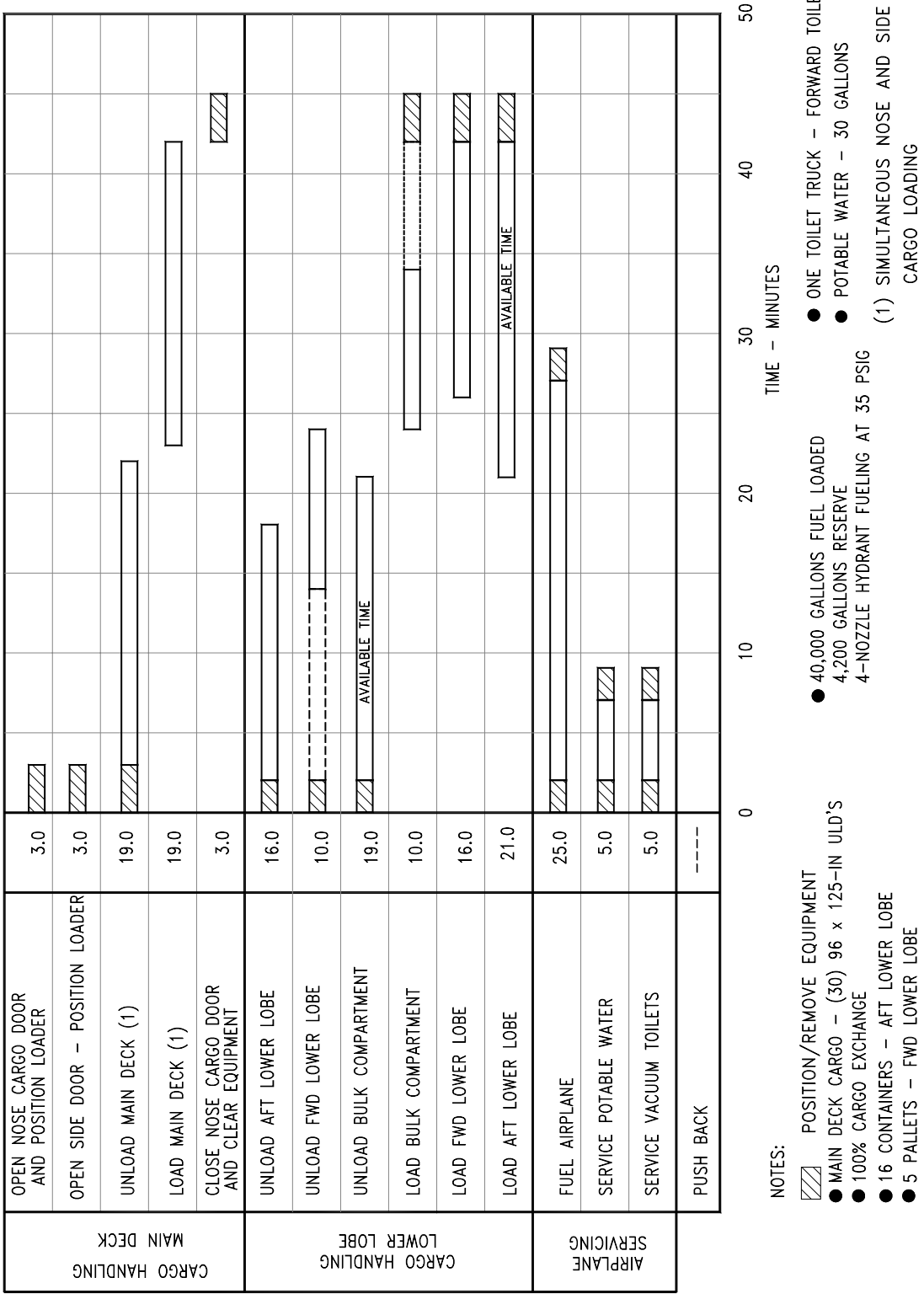
5.2.4 TERMINAL OPERATIONS - TURNAROUND STATION – ALL CARGO, NOSE DOOR LOADING

MODEL 747-400 FREIGHTER, -400ER FREIGHTER



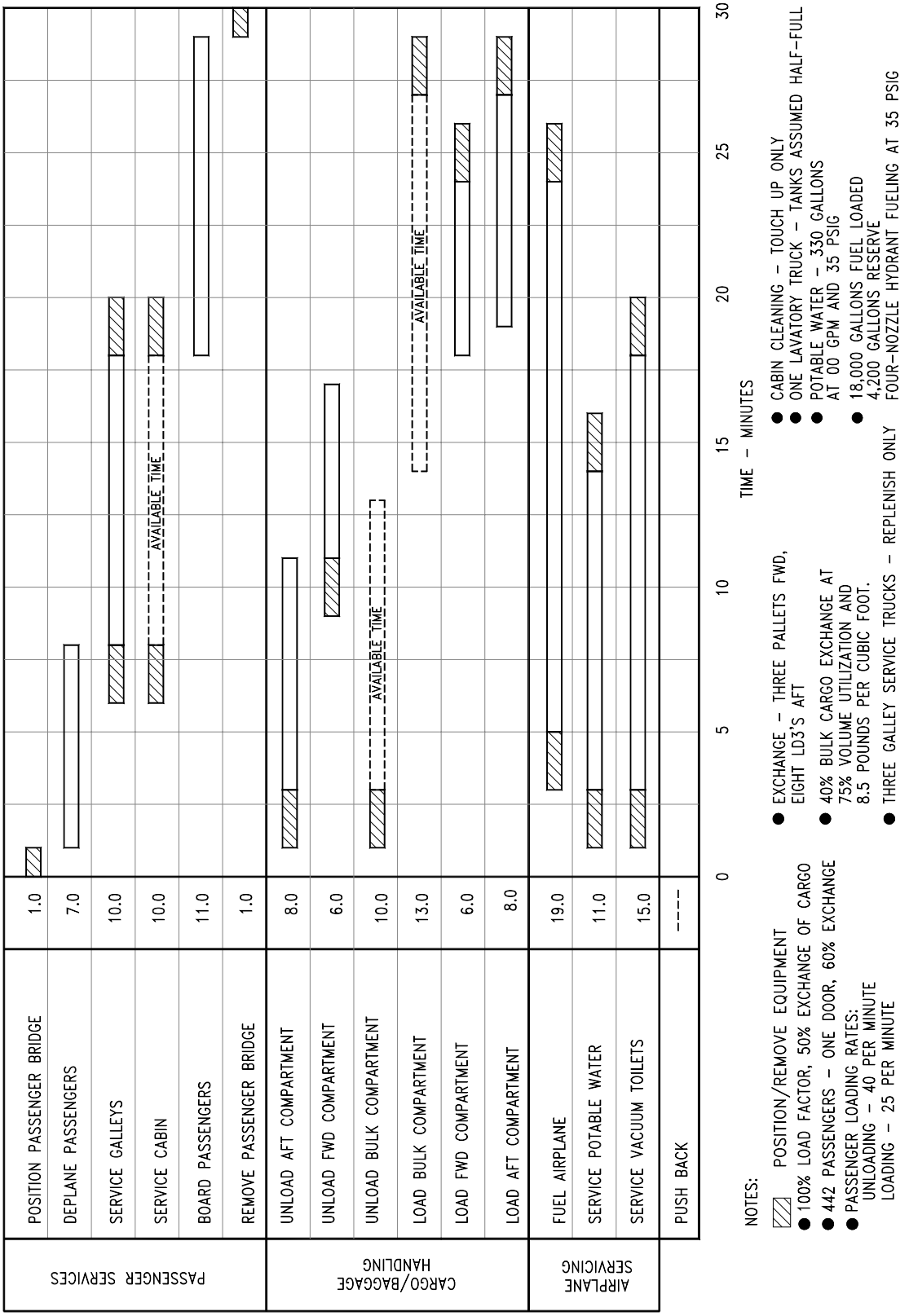
5.2.5 TERMINAL OPERATIONS - TURNAROUND STATION – ALL CARGO, SIDE DOOR LOADING

MODEL 747-400 FREIGHTER, -400ER FREIGHTER



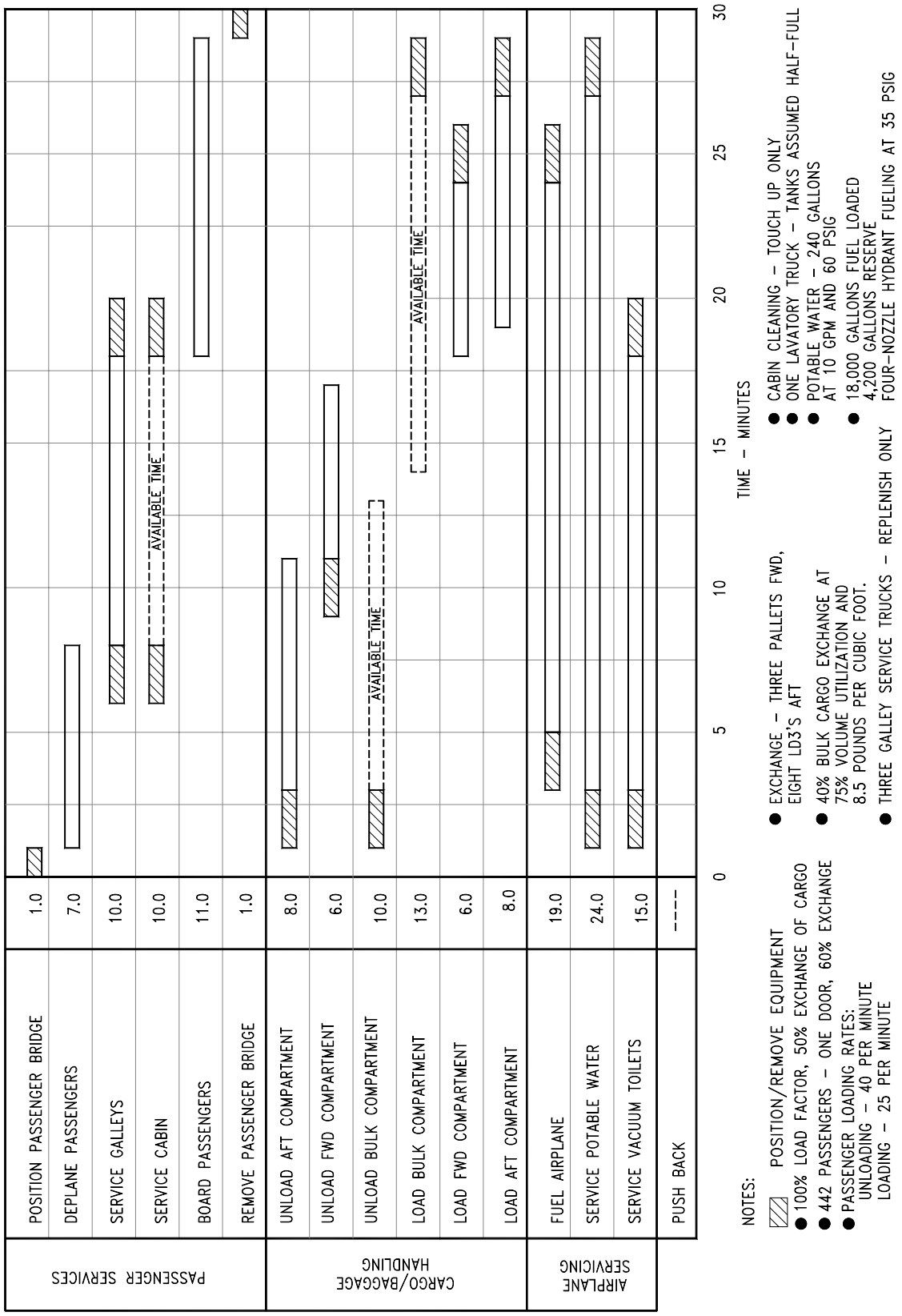
5.2.6 TERMINAL OPERATIONS - TURNAROUND STATION – ALL CARGO, NOSE AND SIDE CARGO DOOR LOADING

MODEL 747-400 FREIGHTER, -400ER FREIGHTER



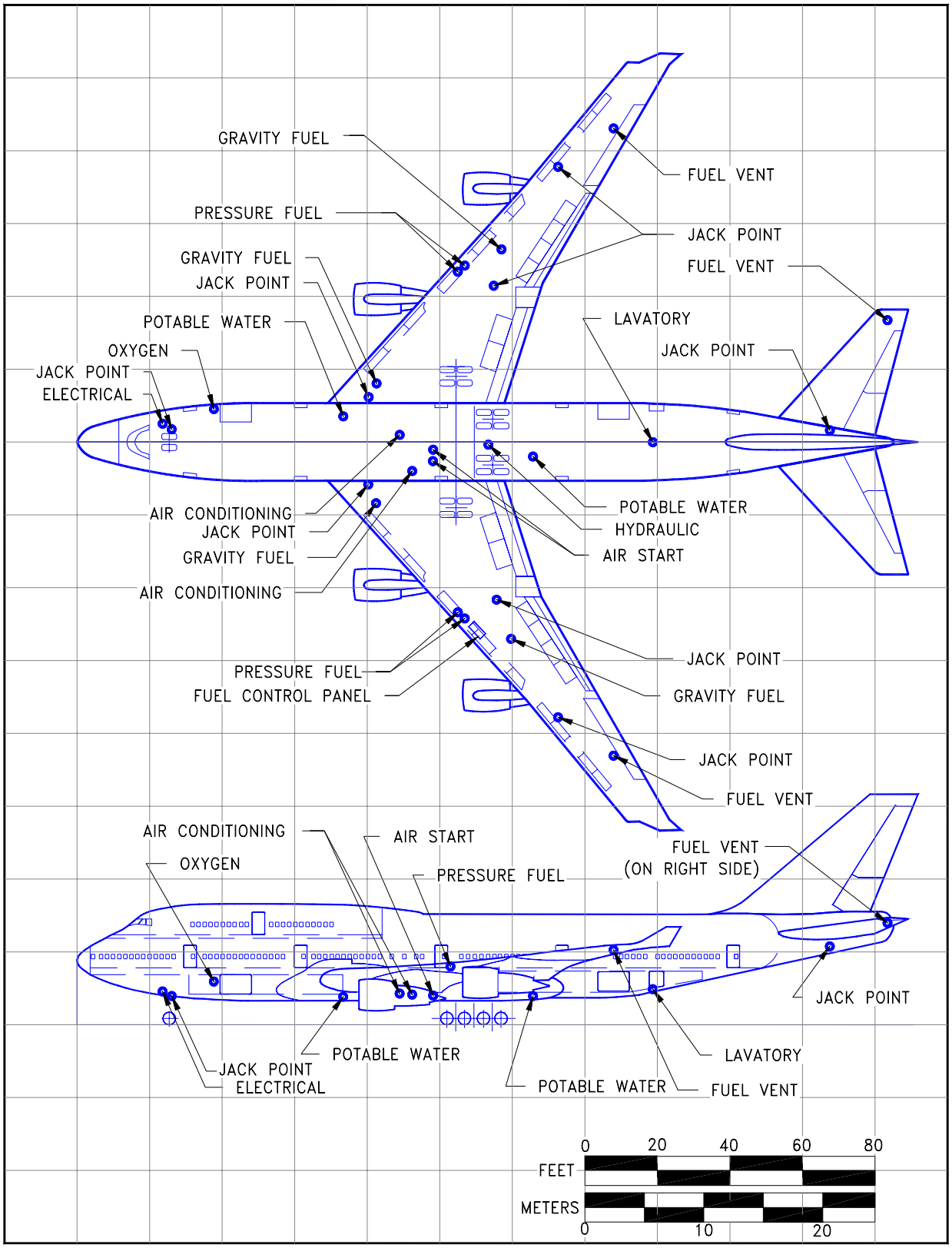
5.3.1 TERMINAL OPERATIONS - EN ROUTE STATION - ALL PASSENGER

MODEL 747-400, -400 C0MBI, -400 DOMESTIC



5.3.2 TERMINAL OPERATIONS - EN ROUTE STATION - ALL PASSENGER

MODEL 747-400ER



5.4.1 GROUND SERVICE CONNECTIONS

MODEL 747-400

SYSTEM	DISTANCE AFT OF NOSE		DISTANCE FROM AIRPLANE CENTERLINE				HEIGHT ABOVE GROUND			
			LH SIDE		RH SIDE		MINIMUM		MAXIMUM	
	FT-IN	M	FT-IN	M	FT-IN	M	FT-IN	M	FT-IN	M
ELECTRICAL										
TWO COLLOCATED CONNECTORS 90 KVA , 200/115 V AC 400 HZ, 3-PHASE EACH	26 - 9	8.15	-	-	3 - 4	1.02	7 - 10	2.39	9 - 4	2.85
FUEL										
FOUR UNDERWING PRESSURE CONNECTORS (2 ON EACH WING) MAX FUELING RATE 500 US GPM (1890 LPM) PER NOZZLE OR 2000 US GPM (7570 LPM) TOTAL MAX FUEL PRESSURE 50 PSIG (3.52 KG/CM^2)	104 - 7 105 - 7	31.89 32.18	45 - 8 46 - 9	13.91 14.26	45 - 8 46 - 9	13.91 14.26	14 - 9 14 - 9	4.50 4.50	15 - 10 15 - 10	4.84 4.84
OVERWING GRAVITY FUEL CONNECTIONS	82 - 10 116 - 7	25.25 35.53	16 - 7 53 - 9	5.06 16.39	16 - 7 53 - 9	5.06 16.39	15 - 3 16 - 11	4.65 5.14	16 - 3 18 - 2	4.96 5.54
WING FUEL VENT	146 - 9	44.73	89 - 4	27.23	89 - 4	27.23	16 - 10	5.12	19 - 3	5.86
TAIL FUEL VENT	221 - 3	67.44	-	-	29 - 10	9.09	27 - 1	8.24	28 - 9	8.75
TANK CAPACITIES:										

TANK	VOLUME	RB211-524G, RB211-524H PW 4058, PW 4062	CF6-80C2B1 CF6-80C2B5F
RESERVE NO 2 & 3	U.S. GALLONS	1,298 EACH	1,322 EACH
	LITERS	4,913 EACH	5,004 EACH
MAIN NO 1 & 2	U.S. GALLONS	4,506 EACH	4,372 EACH
	LITERS	17,055 EACH	16,548 EACH
MAIN NO 2 & 3	U.S. GALLONS	12,546 EACH	12,546 EACH
	LITERS	47,486 EACH	47,486 EACH
CENTER WING	U.S. GALLONS	17,164	17,164
	LITERS	64,960	64,960
HORIZONTAL STABILIZER	U.S. GALLONS	3,300	3,300
	LITERS	12,490	12,490
BODY FUEL TANKS (747-400ER ONLY)	U.S. GALLONS	3,060 EACH	3,060 EACH
	LITERS	11,582 EACH	11,582 EACH
MANIFOLD, LINES, & MISC	U.S. GALLONS	121 (-400), 176 (-400ER)	121 (-400), 176 (-400ER)
	LITERS	458 (-400), 666 (–400ER)	458 (-400), 666 (–400ER)
TOTAL USABLE (747-400 ONLY)	U.S. GALLONS	57,340	57,120
	LITERS	217,032	216,199
TOTAL USABLE (747-400ER ONLY)	U.S. GALLONS	63,460	63,240
	LITERS	240,196	239,363

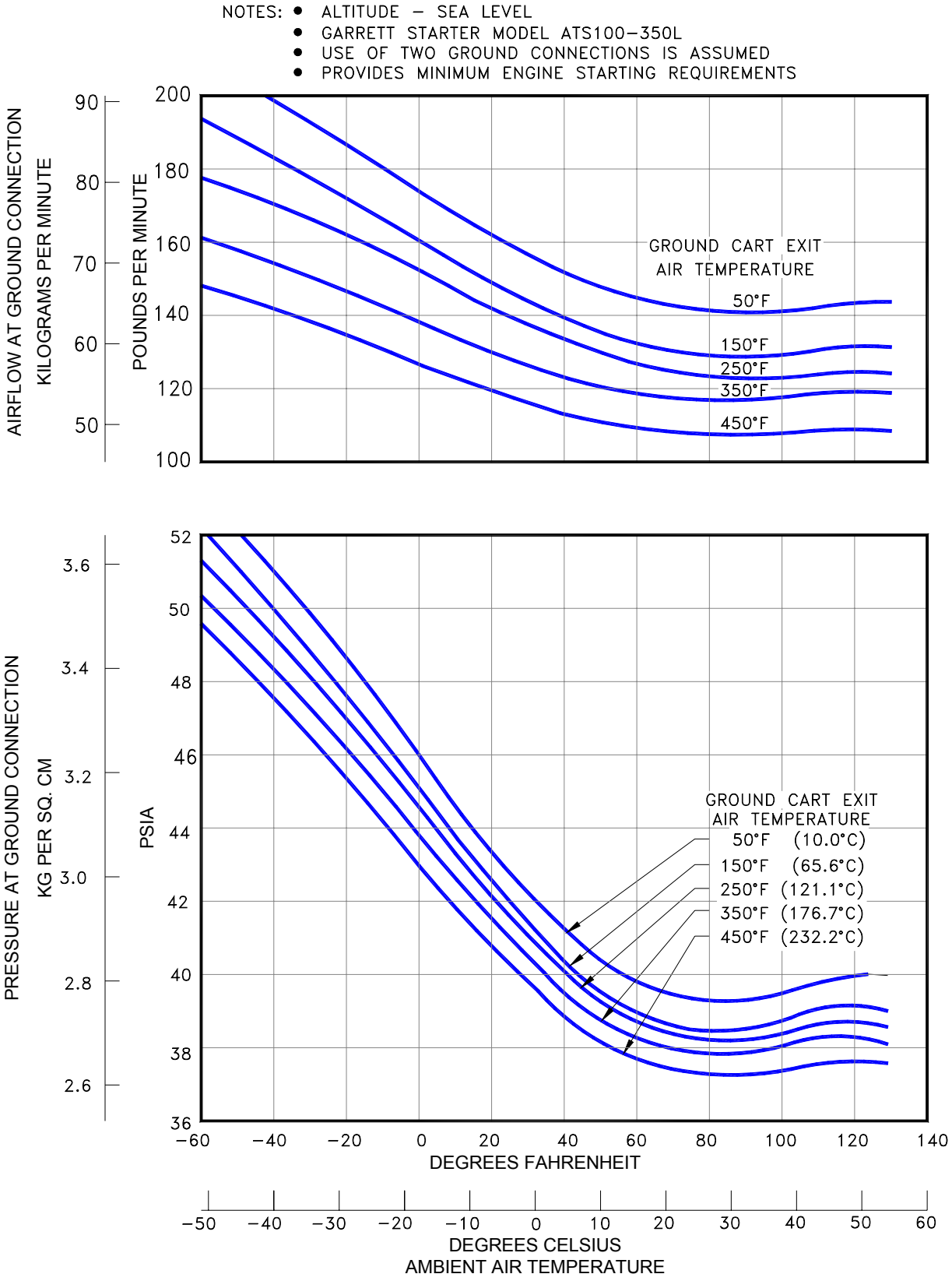
5.4.2 GROUND SERVICE CONNECTIONS

MODEL 747-400

SYSTEM	DISTANCE AFT OF NOSE		DISTANCE FROM AIRPLANE CENTERLINE				HEIGHT ABOVE GROUND			
			LH SIDE		RH SIDE		MINIMUM		MAXIMUM	
	FT-IN	M	FT-IN	M	FT-IN	M	FT-IN	M	FT-IN	M
LAVATORY ONE SERVICE PANEL THREE SERVICE CONNECTIONS DRAIN: ONE 4-IN (10.2 CM) FLUSH: TWO 1-IN (2.5 CM) FLUSH REQUIREMENTS FLOW: 10 GPM (38 LPM) PRESSURE: 30 PSIG (2.11 KG/CM^2) TOTAL CAPACITY, 4 TANKS 300 US GAL (1140 L)	160 - 0	48.77	0	0	0	0	8 - 9	2.67	9 - 11	3.03
PNEUMATIC TWO 3-IN(7.6CM) HIGH-PRESSURE PORTS	96 - 6 96 - 6	29.42 29.42	2 - 0 3 - 0	0.61 0.91	- -	- -	6 - 7 6 - 7	2.01 2.01	7 - 5 7 - 5	2.27 2.27
TWO 8-IN (0.20 M) GROUND CONDITIONED AIR CONNECTIONS	89 - 0 93 - 4	27.13 28.45	- 7 - 11	- 2.40	1 - 10 -	0.55 -	7 - 4 7 - 0	2.24 2.13	8 - 3 7 - 11	2.52 2.40
POTABLE WATER ONE SERVICE CONNECTION CONNECTOR SIZE 3/4 IN (1.95 CM) TANK CAPACITY - 330 U.S GAL (1,250 L) FILL PRESSURE - 30 PSIG (2.11 KG/SQ CM) FILL RATE - 30 GPM (113.5 LPM)	74 - 4	22.66	-	-	1 - 5	0.6	7 - 2	2.18	8 - 3	2.50
DRAIN SIZE 1 IN (2.54 CM) SECOND CONNECTION (ON 747-400ER ONLY)	127 - 2	38.76	2 - 10	0.87	-	-	7 - 3	2.20	8 - 2	2.48
HYDRAULIC ONE SERVICE PANEL 4 RESERVOIRS ENG 1 - 9.5 U.S. GAL (35.9 L) ENG 2 - 5,5 U.S. GAL (20.8 L) ENG 3 - 5.5 U.S. GAL (20.8 L) ENG 4 - 9.5 U.S. GAL (35.9 L) 150 PSI (10.6 KG/CM^2) MAX	114 - 0	34.75	0 - 10	0.25	-	-	7 - 0	2.13	7 - 0	2.13
OXYGEN ONE SERVICE CONNECTION - SIZE 3/16 IN (0.48 CM) 1850 PSIG (130 KG/CM^2) MAX	39 - 2	11.94	-	-	8 - 5	2.55	13 - 5	4.09	14 - 10	4.51

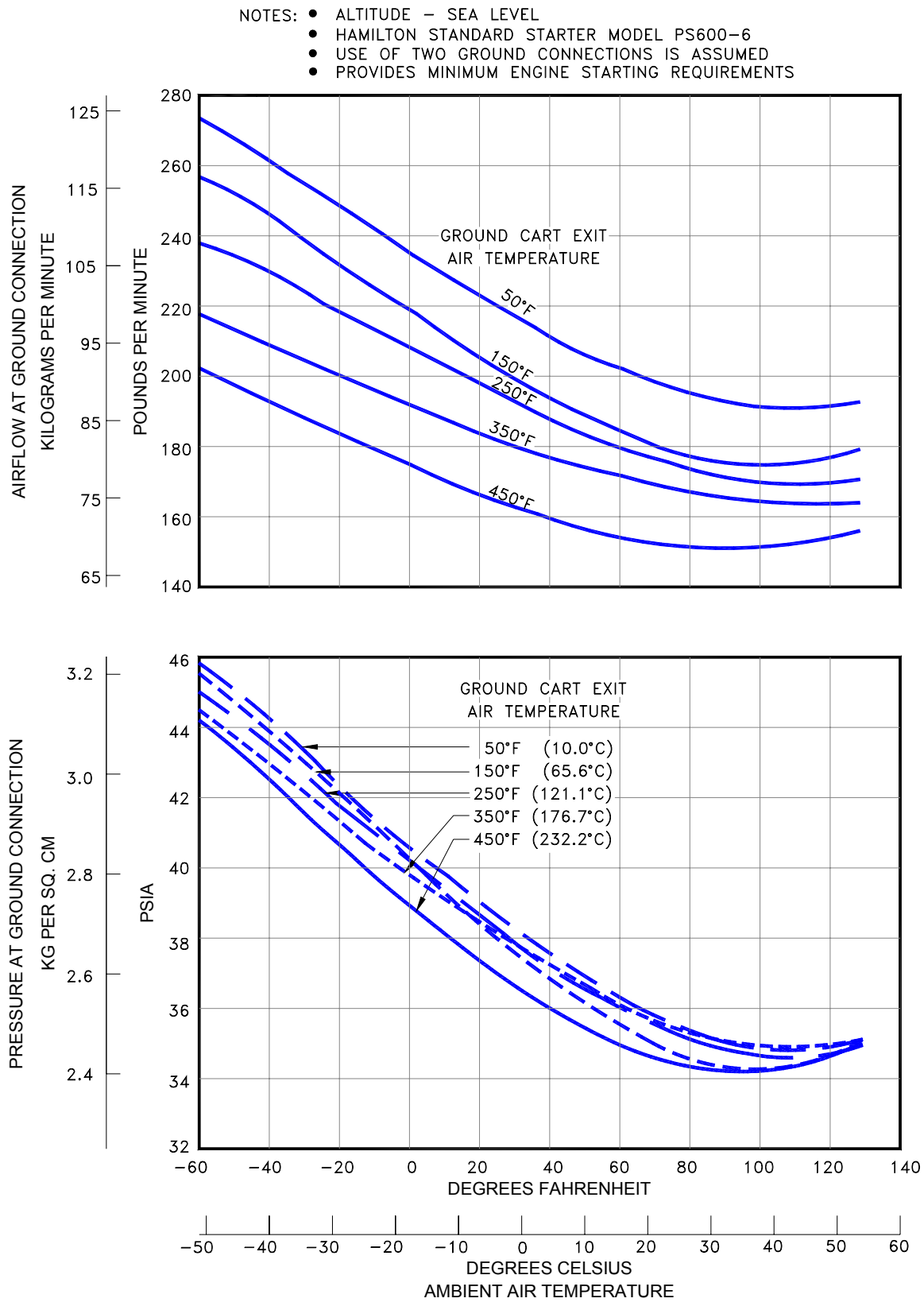
5.4.3 GROUND SERVICE CONNECTIONS

MODEL 747-400



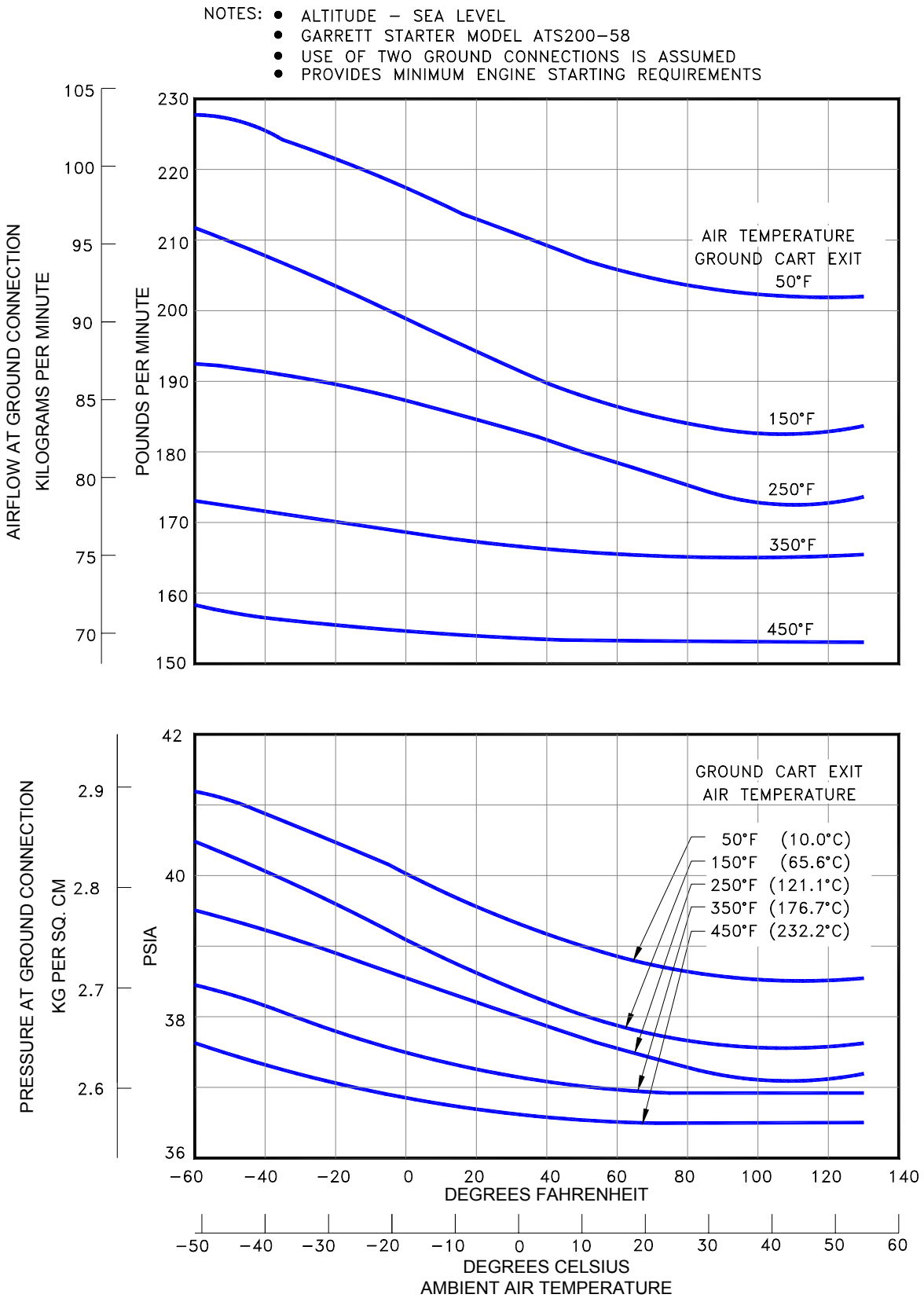
5.5.1 ENGINE START PNEUMATIC REQUIREMENTS - SEA LEVEL

MODEL 747-400 (CF6-80C2B1 ENGINES, GARRETT STARTER)



5.5.2 ENGINE START PNEUMATIC REQUIREMENTS - SEA LEVEL

MODEL 747-400 (CF6-80C2B1 ENGINES, HAMILTON STANDARD STARTER)

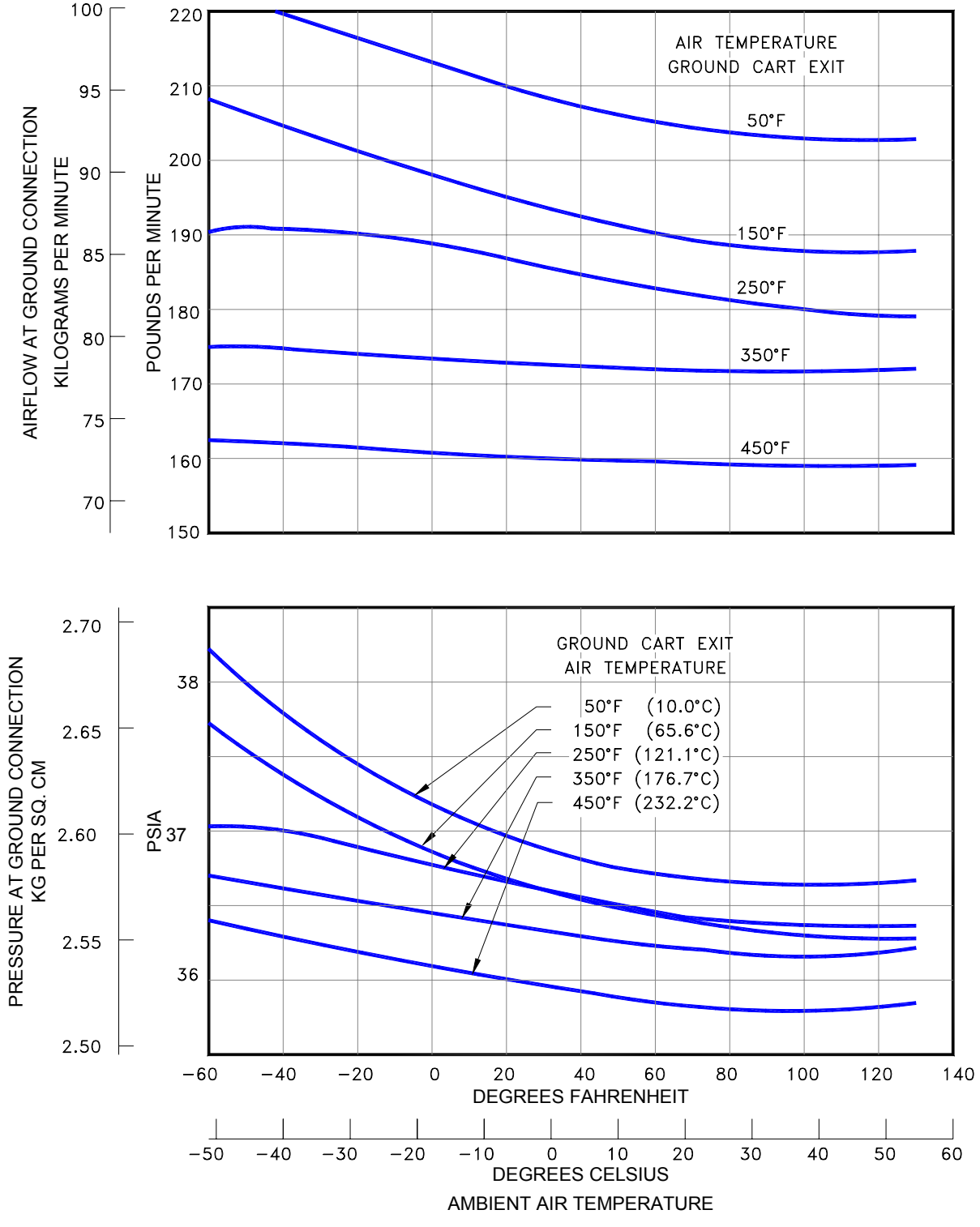


5.5.3 ENGINE START PNEUMATIC REQUIREMENTS - SEA LEVEL

MODEL 747-400 (PW 4056 ENGINES, GARRETT STARTER)

NOTES:

- ALTITUDE – SEA LEVEL
- HAMILTON STANDARD STARTER MODEL PS700–5
- USE OF TWO GROUND CONNECTIONS IS ASSUMED
- PROVIDES MINIMUM ENGINE STARTING REQUIREMENTS

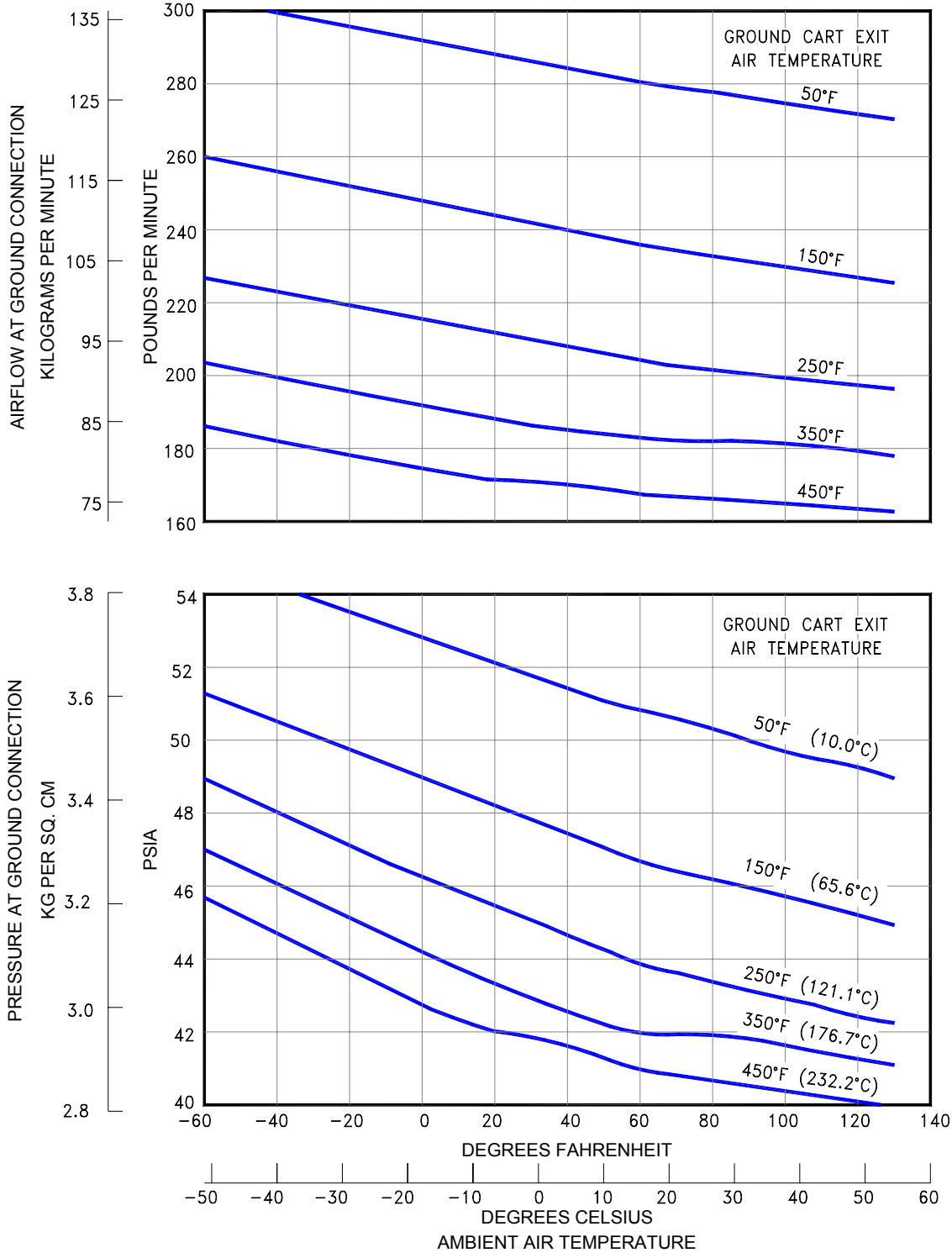


5.5.4 ENGINE START PNEUMATIC REQUIREMENTS - SEA LEVEL

MODEL 747-400 (PW 4056 ENGINES, HAMILTON STANDARD STARTER)

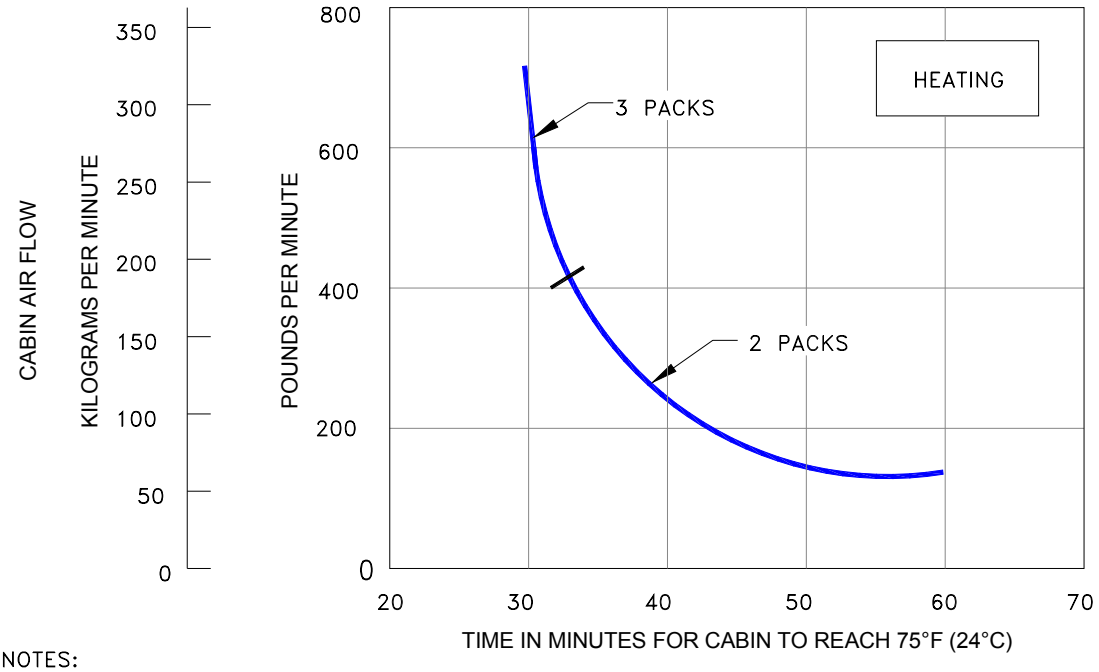
NOTES:

- ALTITUDE – SEA LEVEL
- HAMILTON STANDARD STARTER MODEL PS600–6
- USE OF TWO GROUND CONNECTIONS IS ASSUMED
- PROVIDES MINIMUM ENGINE STARTING REQUIREMENTS



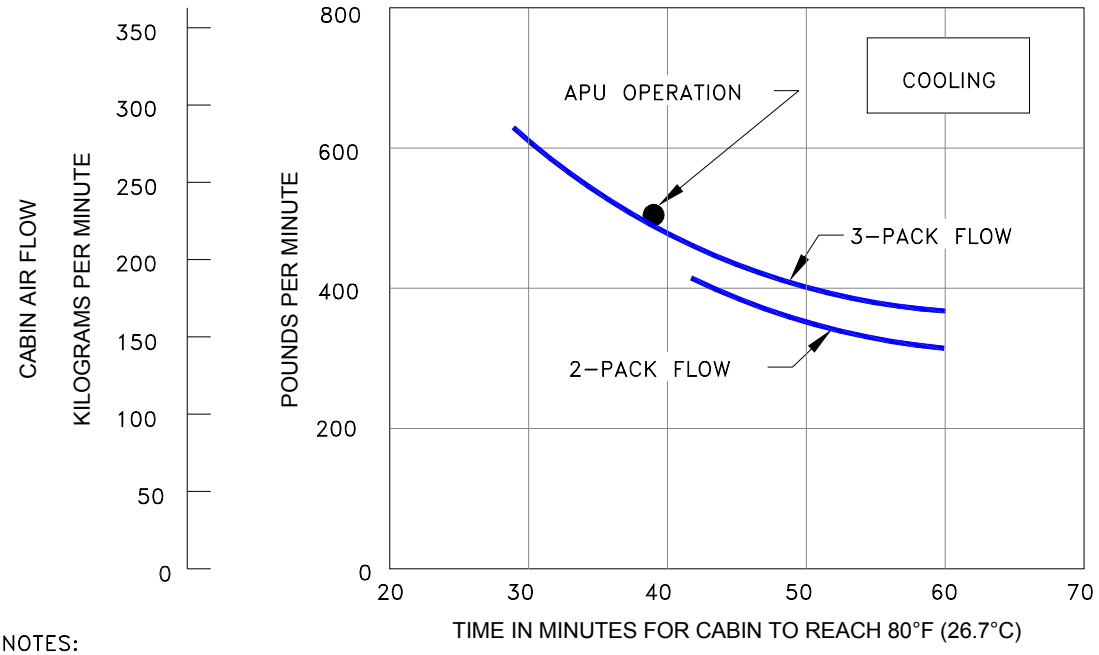
5.5.5 ENGINE START PNEUMATIC REQUIREMENTS - SEA LEVEL

MODEL 747-400 (RB211-524G ENGINES)



NOTES:

- AMBIENT AND INITIAL CABIN TEMP. −25°F (−32°C)
- PACK OUTLET TEMP. 160°F (71°C)
- RECIRCULATING FANS OFF
- NO PASSENGERS
- DOORS CLOSED
- NO GALLEY LOAD
- NO LIGHTING LOAD



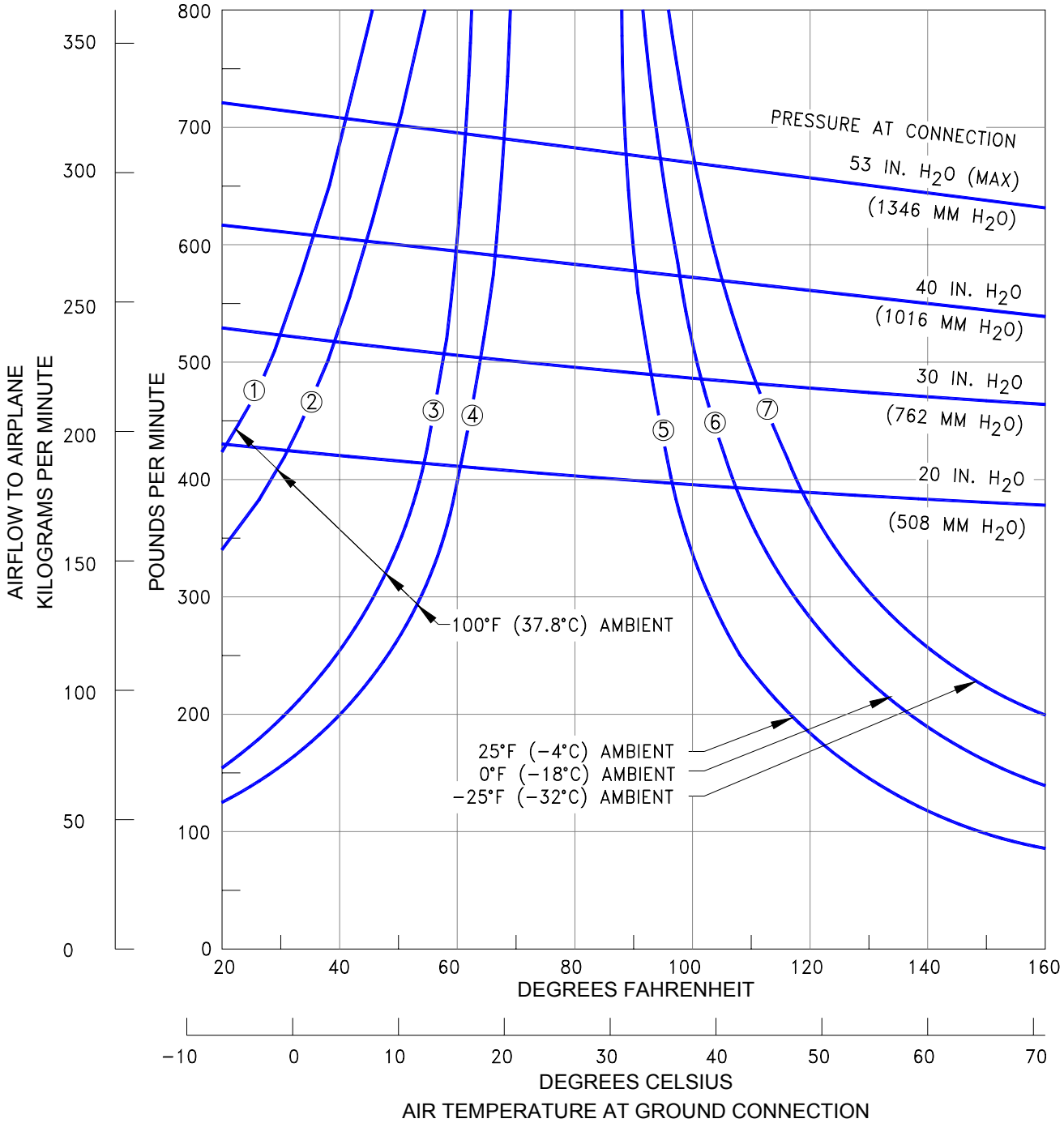
NOTES:

- INITIAL CABIN TEMP. AT 115°F (46.1°C)
- OUTSIDE AIR TEMP. AT 100°F (37.8°C)
- TEMP. AT GROUND CONNECTION 400°F (204.4°C)
- NO PASSENGERS
- DOORS CLOSED
- NO GALLEY LOAD
- NO LIGHTING LOAD

5.6 GROUND PNEUMATIC POWER REQUIREMENTS - HEATING/COOLING

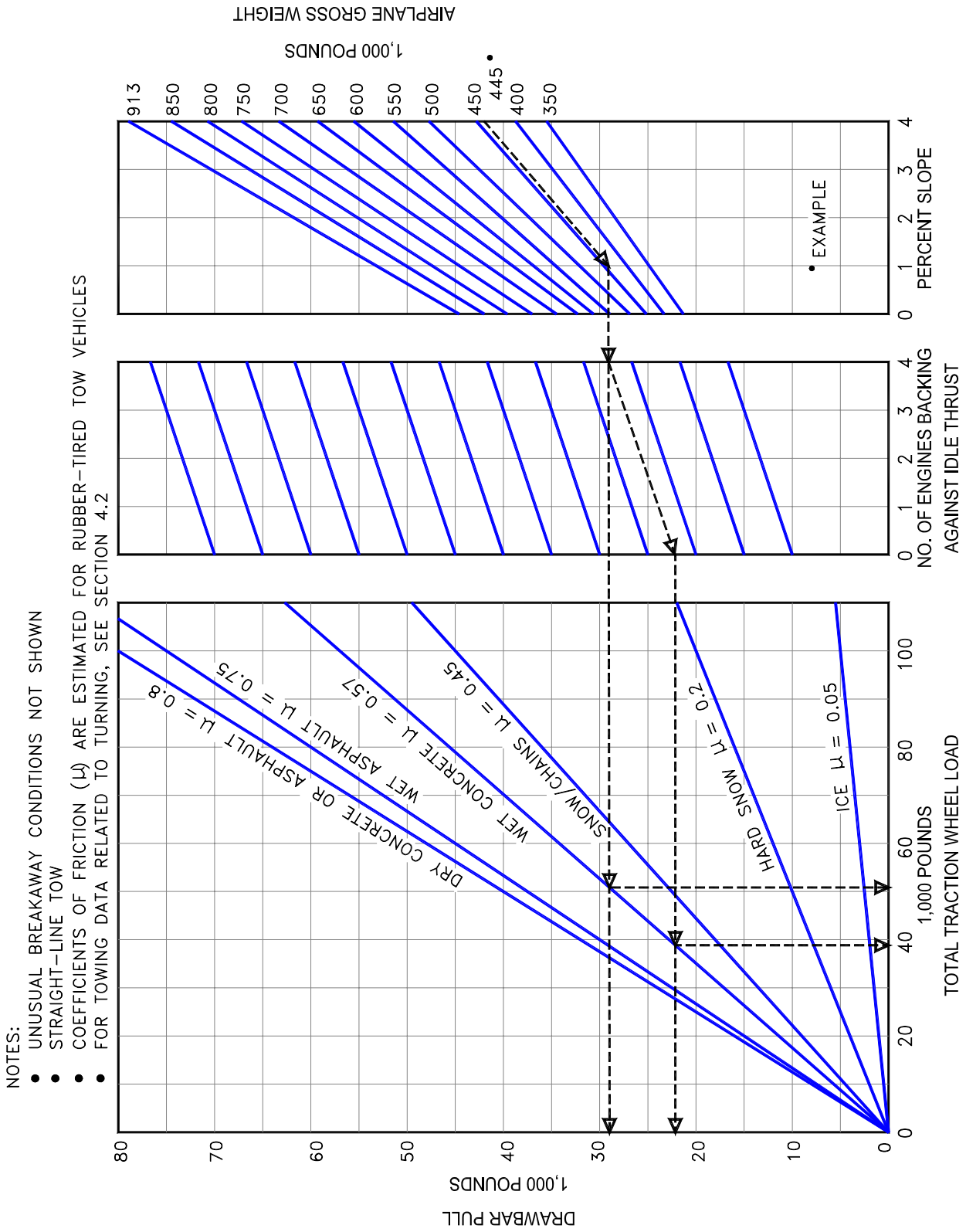
MODEL 747-400

CONDITIONS:
ALL DOORS AND HATCHES CLOSED
① 75°F (23.9°C) CABIN TEMP. 590 OCCUPANTS: 28,000 BTU/HR (7,050 KCAL/HR) SOLAR LOAD AND 75,000 BTU/HR (18,900 KCAL/HR) ELECTRICAL LOAD
② 80°F (26.7°C) CABIN TEMP. HEAT LOADS SAME AS ① , ABOVE
③ 75°F (23.9°C) CABIN TEMP. 3 OCCUPANTS 28,000 BTU/HR (7,050 KCAL/HR) SOLAR LOAD
④ 80°F (26.7°C) CABIN TEMP. HEAT LOADS SAME AS ③ , ABOVE
⑤⑥⑦ 75°F (23.9°C) CABIN TEMP. NO OCUPANTS OR HEAT LOADS



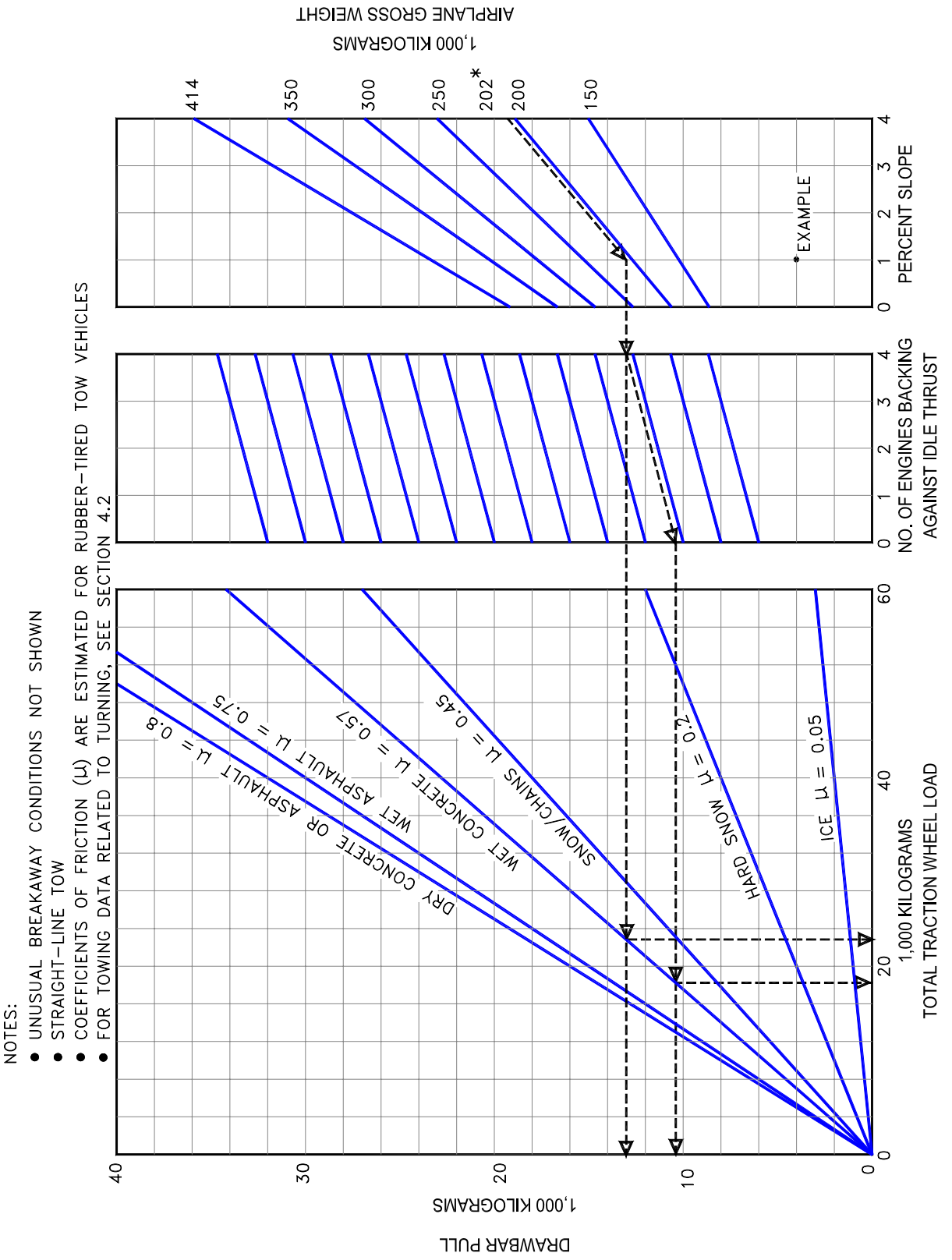
5.7 CONDITIONED AIR FLOW REQUIREMENTS

MODEL 747-400



5.8.1 GROUND TOWING REQUIREMENTS - ENGLISH UNITS

MODEL 747-400



5.8.2 GROUND TOWING REQUIREMENTS - METRIC UNITS

MODEL 747-400

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6.0 JET ENGINE WAKE AND NOISE DATA

6.1 Jet Engine Exhaust Velocities and Temperatures

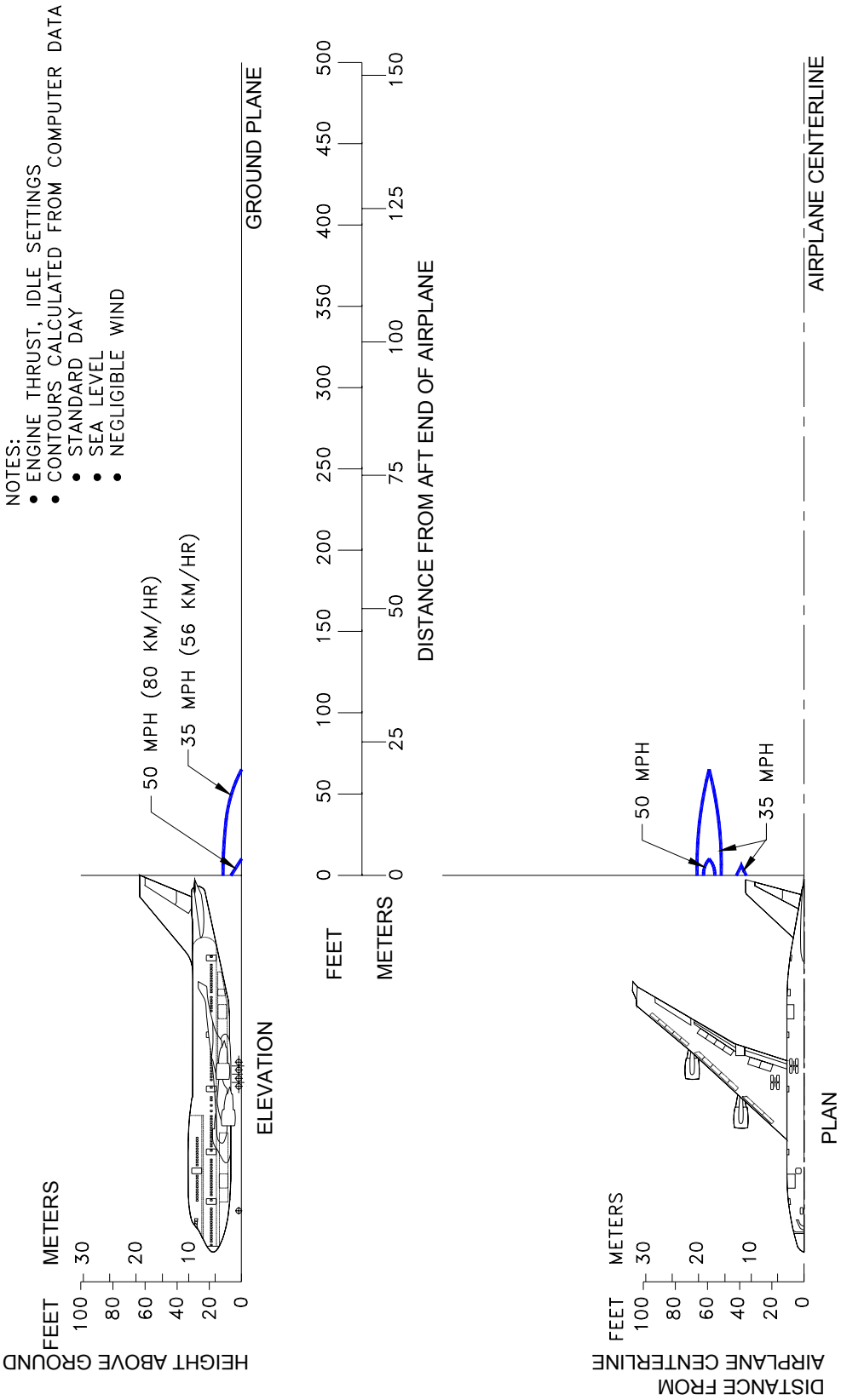
6.2 Airport and Community Noise

6.0 JET ENGINE WAKE AND NOISE DATA

6.1 Jet Engine Exhaust Velocities and Temperatures

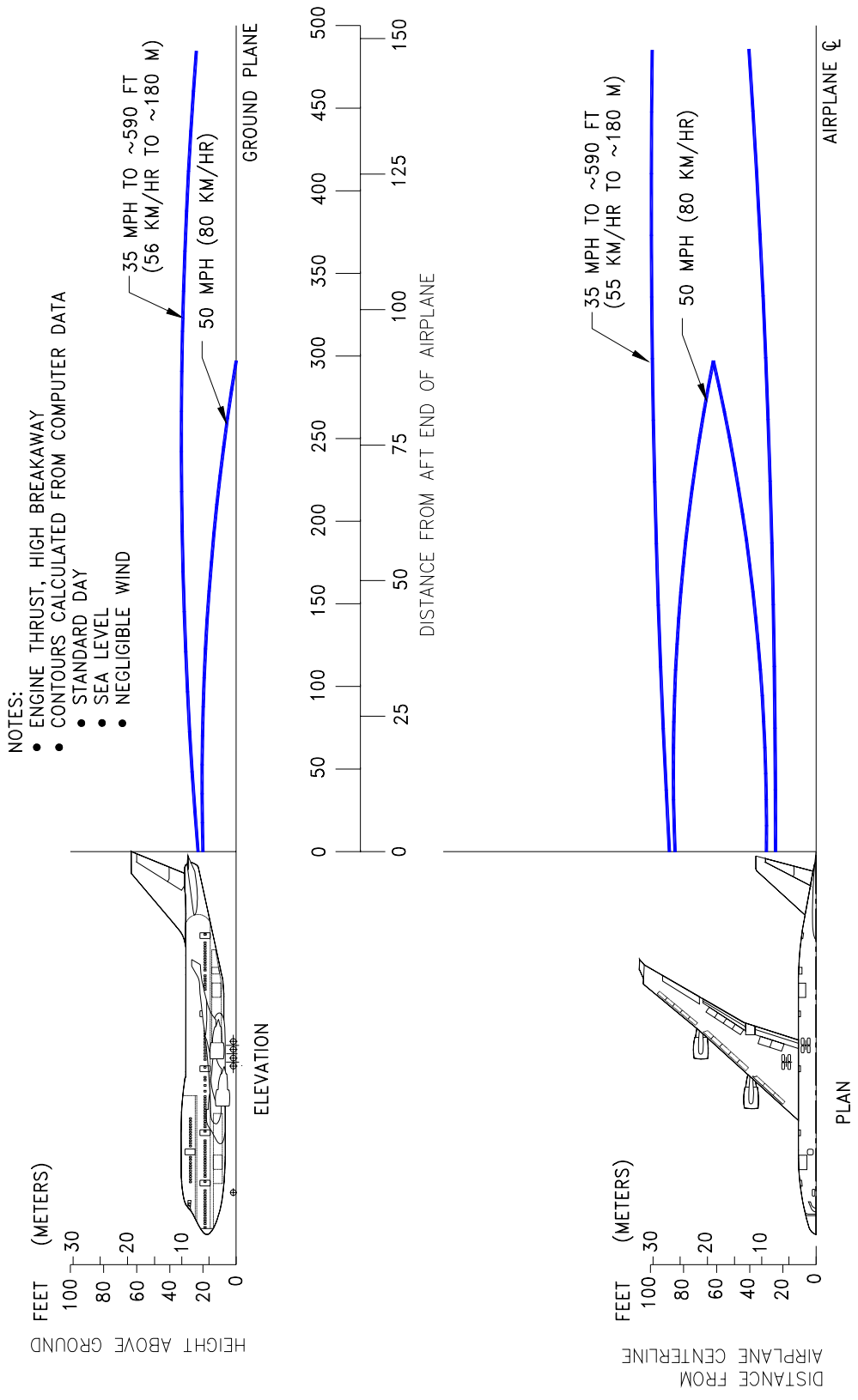
This section shows exhaust velocity and temperature contours aft of the 747-400 airplane. The contours were calculated from a standard computer analysis using three-dimensional viscous flow equations with mixing of primary, fan, and free-stream flow. The presence of the ground plane is included in the calculations as well as engine tilt and toe-in. Mixing of flows from the engines is also calculated. The analysis does not include thermal buoyancy effects which tend to elevate the jet wake above the ground plane. The buoyancy effects are considered to be small relative to the exhaust velocity and therefore are not included.

The graphs show jet wake velocity and temperature contours for a representative engine . The results are valid for sea level, static, standard day conditions. The effect of wind on jet wakes was not included. There is evidence to show that a downwind or an upwind component does not simply add or subtract from the jet wake velocity, but rather carries the whole envelope in the direction of the wind. Crosswinds may carry the jet wake contour far to the side at large distances behind the airplane.



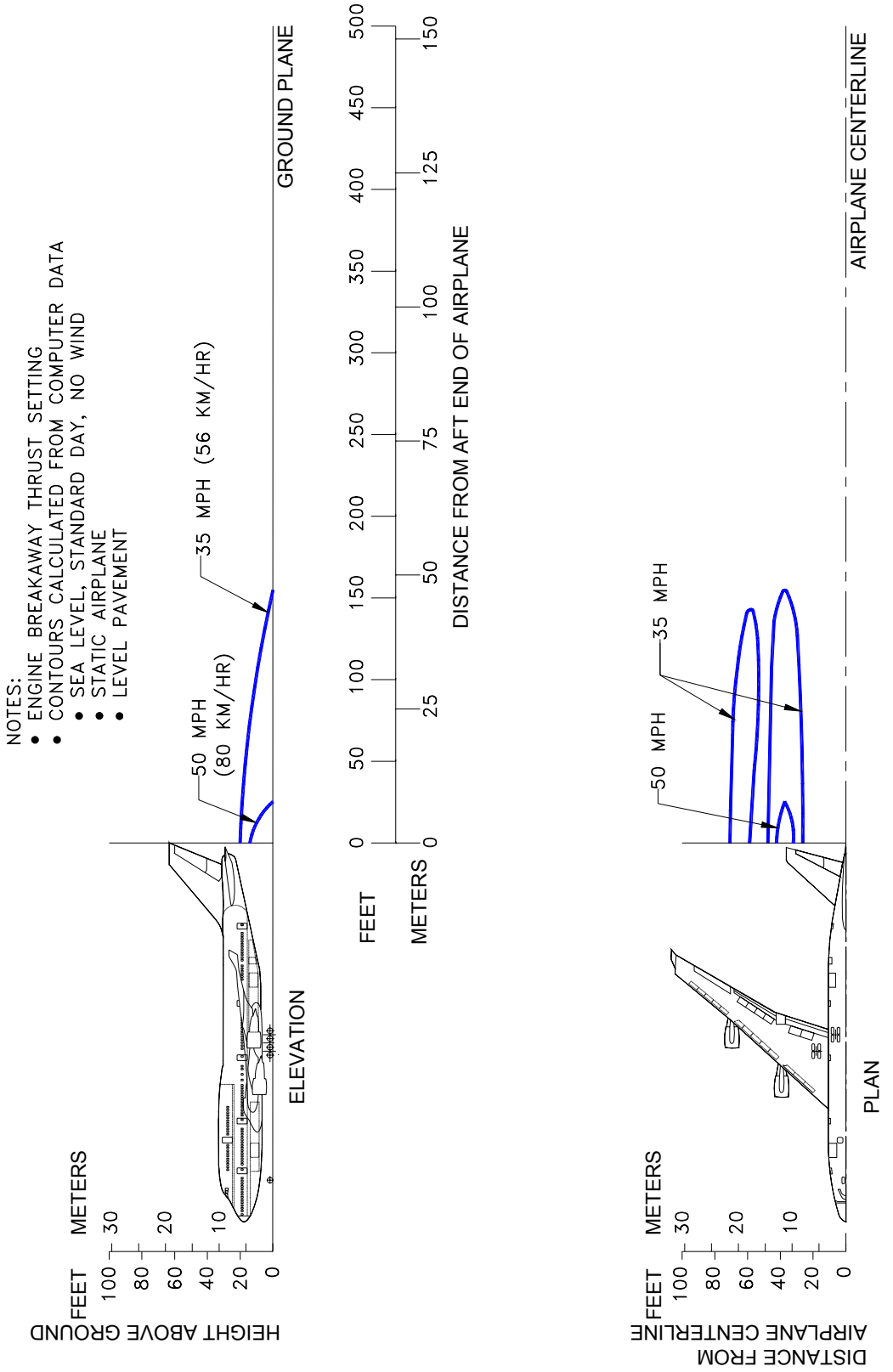
6.1.1 JET ENGINE EXHAUST VELOCITY CONTOURS - IDLE THRUST

MODEL 747-400



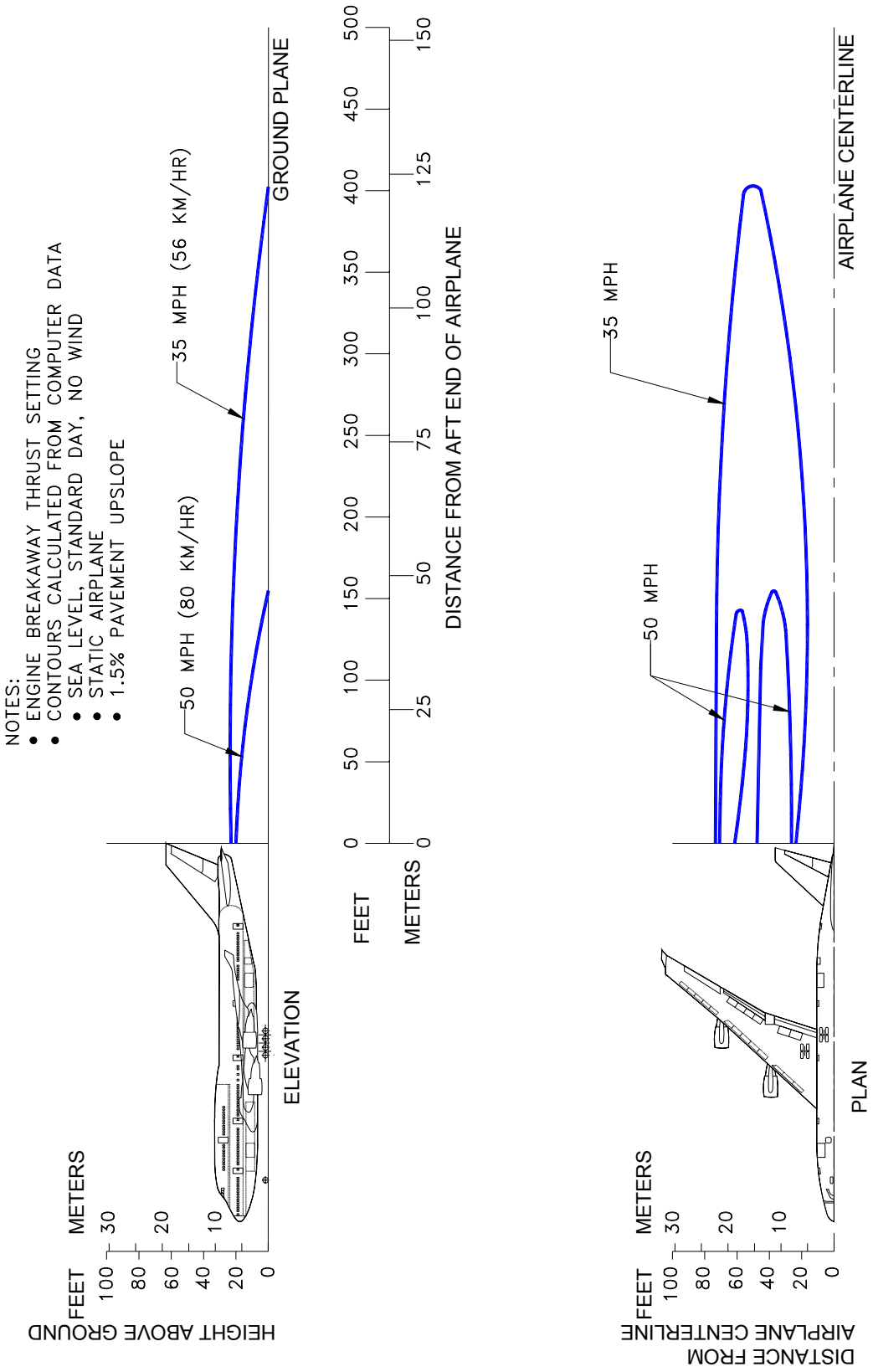
6.1.2 JET ENGINE EXHAUST VELOCITY CONTOURS - BREAKAWAY THRUST – LEVEL PAVEMENT

MODEL 747-400, -400 COMBI, -400 DOMESTIC, - 400 FREIGHTER



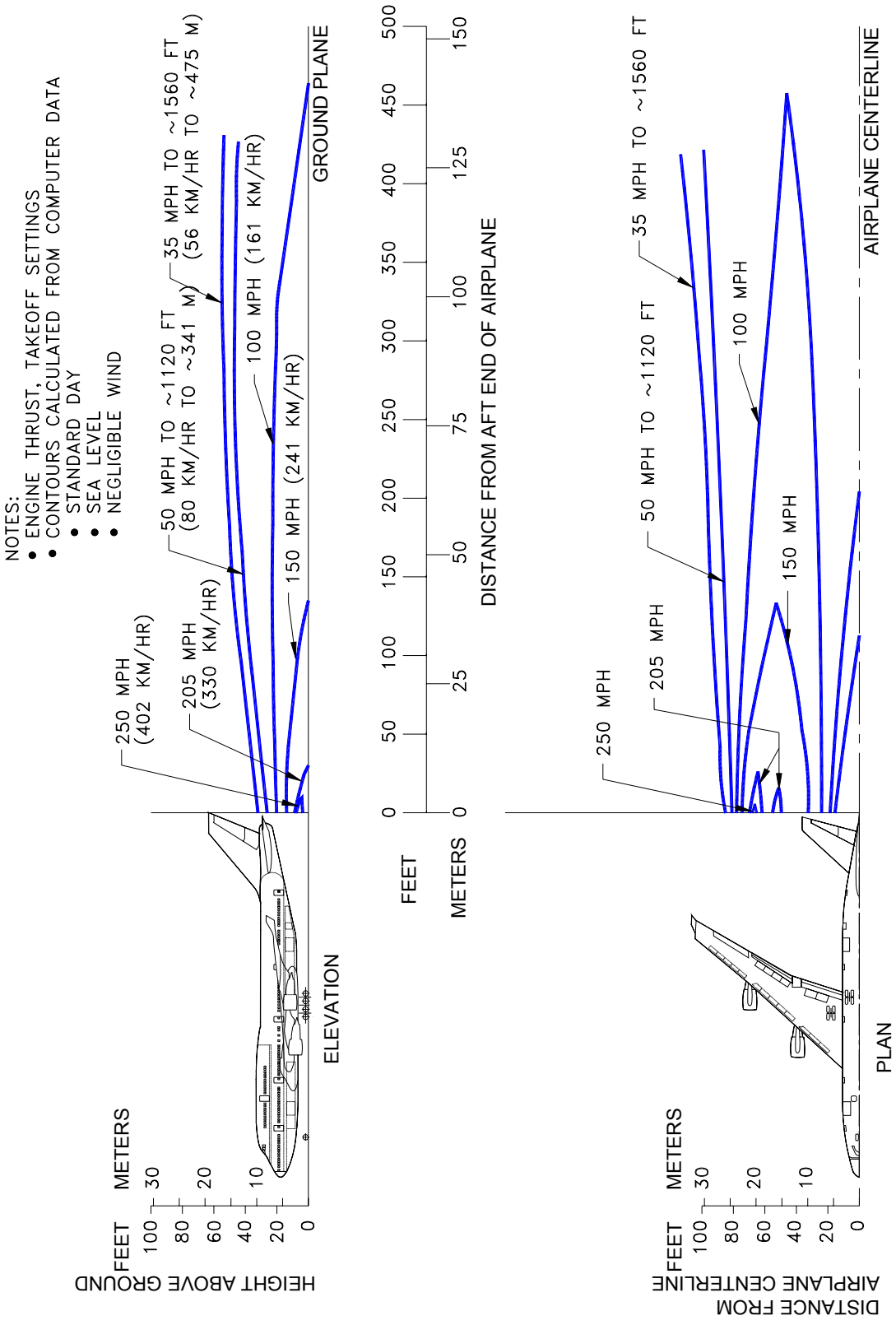
6.1.3 JET ENGINE EXHAUST VELOCITY CONTOURS - BREAKAWAY THRUST – LEVEL PAVEMENT

MODEL 747-400ER, -400ER FREIGHTER



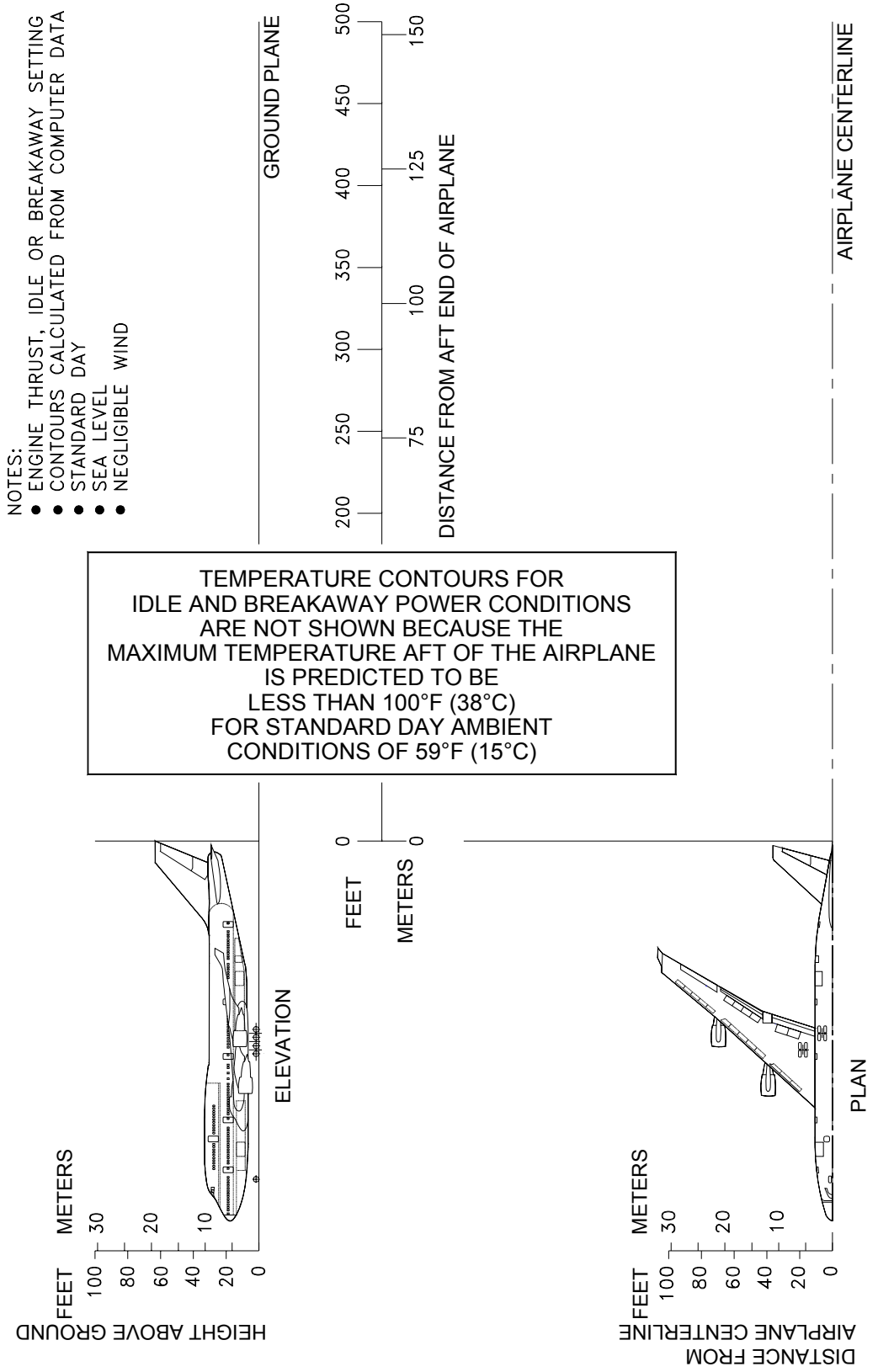
6.1.4 JET ENGINE EXHAUST VELOCITY CONTOURS - BREAKAWAY THRUST - 1.5% PAVEMENT UPSLOPE

MODEL 747-400ER, -400ER FREIGHTER



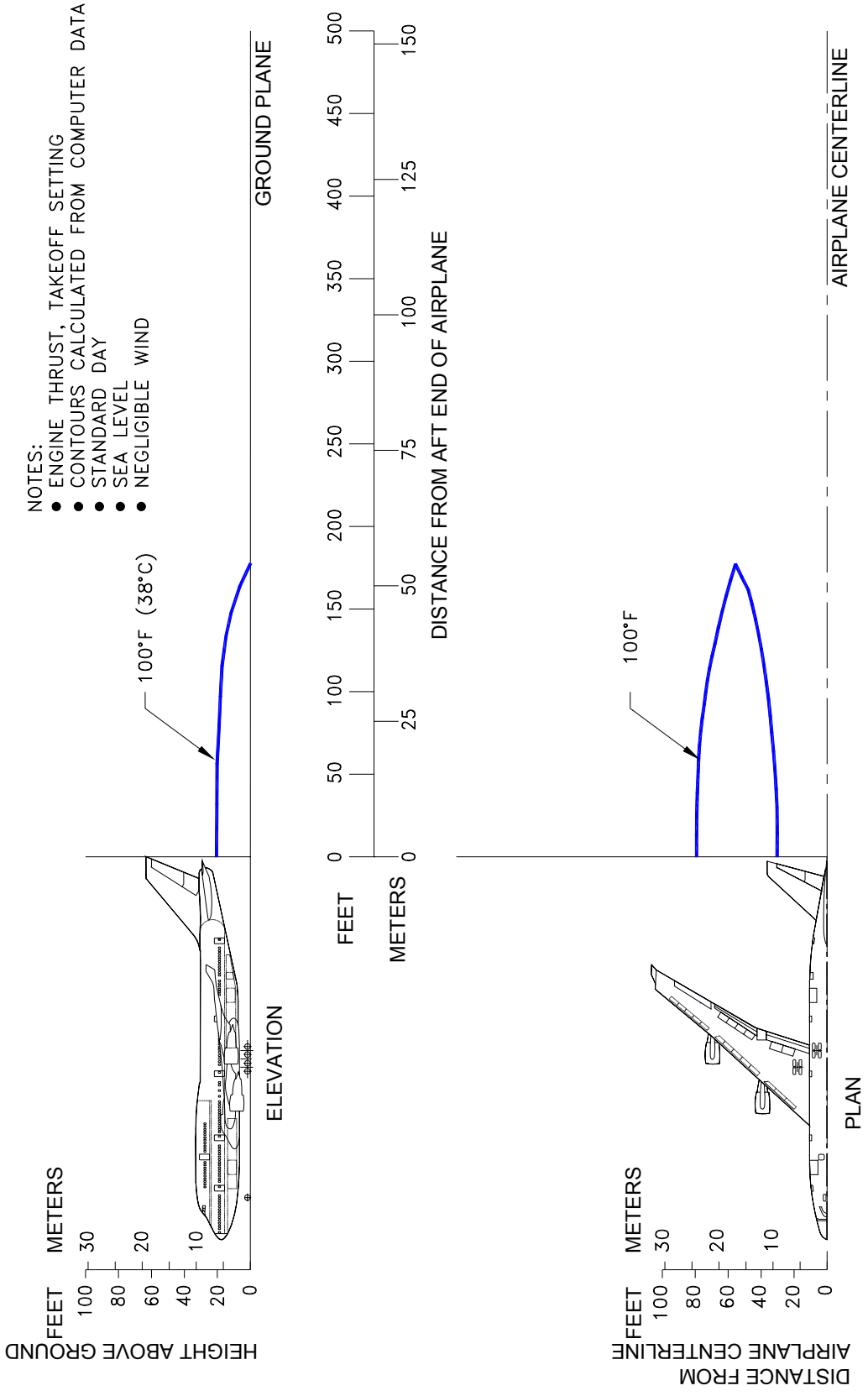
6.1.5 JET ENGINE EXHAUST VELOCITY CONTOURS - TAKEOFF THRUST

MODEL 747-400



6.1.6 JET ENGINE EXHAUST TEMPERATURE CONTOURS – IDLE AND BREAKAWAY THRUSTS

MODEL 747-400



6.1.7 JET ENGINE EXHAUST TEMPERATURE CONTOURS - TAKEOFF THRUST

MODEL 747-400

6.2 Airport and Community Noise

Airport noise is of major concern to the airport and community planner. The airport is a major element in the community's transportation system and, as such, is vital to its growth. However, the airport must also be a good neighbor, and this can be accomplished only with proper planning. Since aircraft noise extends beyond the boundaries of the airport, it is vital to consider the impact on surrounding communities. Many means have been devised to provide the planner with a tool to estimate the impact of airport operations. Too often they oversimplify noise to the point where the results become erroneous. Noise is not a simple subject; therefore, there are no simple answers.

The cumulative noise contour is an effective tool. However, care must be exercised to ensure that the contours, used correctly, estimate the noise resulting from aircraft operations conducted at an airport.

The size and shape of the single-event contours, which are inputs into the cumulative noise contours, are dependent upon numerous factors. They include the following:

1. Operational Factors

   (a) Aircraft Weight-Aircraft weight is dependent on distance to be traveled, en route winds, payload, and anticipated aircraft delay upon reaching the destination.

   (b) Engine Power Settings-The rates of ascent and descent and the noise levels emitted at the source are influenced by the power setting used.

   (c) Airport Altitude-Higher airport altitude will affect engine performance and thus can influence noise.

2. Atmospheric Conditions-Sound Propagation

   (a) Wind-With stronger headwinds, the aircraft can take off and climb more rapidly relative to the ground. Also, winds can influence the distribution of noise in surrounding communities.

   (b) Temperature and Relative Humidity-The absorption of noise in the atmosphere along the transmission path between the aircraft and the ground observer varies with both temperature and relative humidity.

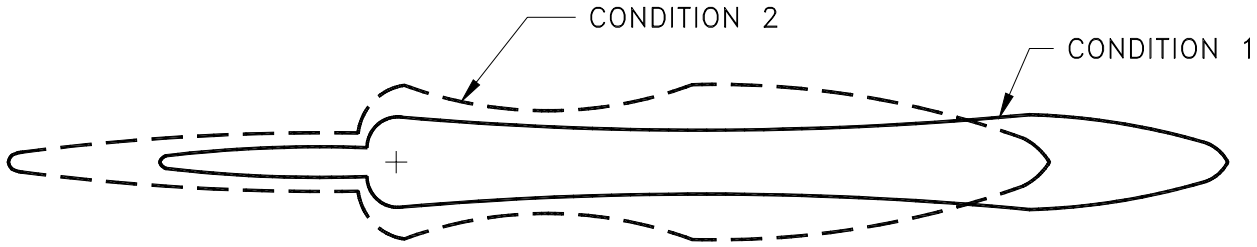
3. Surface Condition-Shielding, Extra Ground Attenuation (EGA)

(a) Terrain-If the ground slopes down after takeoff or up before landing, noise will be reduced since the aircraft will be at a higher altitude above ground. Additionally, hills, shrubs, trees, and large buildings can act as sound buffers.

All these factors can alter the shape and size of the contours appreciable. To demonstrate the effect of some of these factors, estimated noise level contours for two different operating conditions are shown below. These contours reflect a given noise level upon a ground level plane at runway elevation.

Condition 1

Landing	Takeoff
Maximum Structural Landing Weight	Maximum Gross Takeoff Weight
10-knot Headwind	Zero Wind
3° Approach	84 °F
84 °F	Humidity 15%
Humidity 15%	



Condition 2

Landing:	Takeoff:
85% of Maximum Structural Landing Weight	80% of Maximum Gross Takeoff Weight
10-knot Headwind	10-knot Headwind
3° Approach	59 °F
59 °F	Humidity 70%
Humidity 70%	

As indicated from these data, the contour size varies substantially with operating and atmospheric conditions. Most aircraft operations are, of course, conducted at less than maximum gross weights because average flight distances are much shorter than maximum aircraft range capability and average load factors are less than 100%. Therefore, in developing cumulative contours for planning purposes, it is recommended that the airlines serving a particular city be contacted to provide operational information.

In addition, there are no universally accepted methods for developing aircraft noise contours or for relating the acceptability of specific zones to specific land uses. It is therefore expected that noise contour data for particular aircraft and the impact assessment methodology will be changing. To ensure that the best currently available information of this type is used in any planning study, it is recommended that it be obtained directly from the Office of Environmental Quality in the Federal Aviation Administration in Washington, D.C.

It should be noted that the contours shown herein are only for illustrating the impact of operating and atmospheric conditions and do not represent the single-event contour of the family of aircraft described in this document. It is expected that the cumulative contours will be developed as required by planners using the data and methodology applicable to their specific study.

7.0 PAVEMENT DATA

7.1 General Information

7.2 Landing Gear Footprint

7.3 Maximum Pavement Loads

7.4 Landing Gear Loading on Pavement

7.5 Flexible Pavement Requirements - U.S. Army Corps of Engineers Method S-77-1 and FAA Design Method

7.6 Flexible Pavement Requirements - LCN Conversion

7.7 Rigid Pavement Requirements - Portland Cement Association Design Method

7.8 Rigid Pavement Requirements - LCN Conversion

7.9 Rigid Pavement Requirements - FAA Design Method

7.10 ACN/PCN Reporting System - Flexible and Rigid Pavements

7.0 PAVEMENT DATA

7.1 General Information

A brief description of the pavement charts that follow will help in their use for airport planning. Each airplane configuration is depicted with a minimum range of six loads imposed on the main landing gear to aid in interpolation between the discrete values shown. All curves for any single chart represent data based on rated loads and tire pressures considered normal and acceptable by current aircraft tire manufacturer's standards. Tire pressures, where specifically designated on tables and charts, are at values obtained under loaded conditions as certificated for commercial use.

Section 7.2 presents basic data on the landing gear footprint configuration, maximum design taxi loads, and tire sizes and pressures.

Maximum pavement loads for certain critical conditions at the tire-to-ground interface are shown in Section 7.3, with the tires having equal loads on the struts.

Pavement requirements for commercial airplanes are customarily derived from the static analysis of loads imposed on the main landing gear struts. The chart in Section 7.4 is provided in order to determine these loads throughout the stability limits of the airplane at rest on the pavement. These main landing gear loads are used as the point of entry to the pavement design charts, interpolating load values where necessary.

The flexible pavement design curves (Section 7.5) are based on procedures set forth in Instruction Report No. S-77-1, "Procedures for Development of CBR Design Curves," dated June 1977, and as modified according to the methods described in ICAO Aerodrome Design Manual, Part 3, Pavements, 2nd Edition, 1983, Section 1.1 (The ACN-PCN Method), and utilizing the alpha factors approved by ICAO in October 2007. Instruction Report No. S-77-1 was prepared by the U.S. Army Corps of Engineers Waterways Experiment Station, Soils and Pavements Laboratory, Vicksburg, Mississippi. The line showing 10,000 coverages is used to calculate Aircraft Classification Number (ACN).

The following procedure is used to develop the curves, such as shown in Section 7.5:

1. Having established the scale for pavement depth at the bottom and the scale for CBR at the top, an arbitrary line is drawn representing 6,000 annual departures.

2. Values of the aircraft gross weight are then plotted.

3. Additional annual departure lines are drawn based on the load lines of the aircraft gross weights already established.

4. An additional line representing 10,000 coverages (used to calculate the flexible pavement Aircraft Classification Number) is also placed.

All Load Classification Number (LCN) curves (Sections 7.6 and 7.8) have been developed from a computer program based on data provided in International Civil Aviation Organization (ICAO) document 9157-AN/901, Aerodrome Design Manual,
Part 3, "Pavements," First Edition, 1977. LCN values are shown directly for parameters of weight on main landing gear, tire pressure, and radius of relative stiffness (ℓ) for rigid pavement or pavement thickness or depth factor (h) for flexible pavement.

Rigid pavement design curves (Section 7.7) have been prepared with the Westergaard equation in general accordance with the procedures outlined in the Design of Concrete Airport Pavement (1955 edition) by Robert G. Packard, published by the Portland Cement Association, 5420 Old Orchard Road, Skokie, Illinois 60077-1083. These curves are modified to the format described in the Portland Cement Association publication XP6705-2, Computer Program for Airport Pavement Design (Program PDILB), 1968, by Robert G. Packard.

The following procedure is used to develop the rigid pavement design curves shown in Section 7.7:

1. Having established the scale for pavement thickness to the left and the scale for allowable working stress to the right, an arbitrary load line is drawn representing the main landing gear maximum weight to be shown.

2. Values of the subgrade modulus (k) are then plotted.

3. Additional load lines for the incremental values of weight on the main landing gear are drawn on the basis of the curve for k = 300, already established.

The rigid pavement design curves (Section 7.9) have been developed based on methods used in the FAA Advisory Circular AC 150/5320-6C, September 14, 1988. The following procedure is used to develop the curves, such as shown in Section 7.9:

1. Having established the scale for pavement flexure strength on the left and temporary scale for pavement thickness on the right, an arbitrary load line is drawn representing the main landing gear maximum weight to be shown at 5,000 coverages.

2. Values of the subgrade modulus (k) are then plotted.

3. Additional load lines for the incremental values of weight are then drawn on the basis of the subgrade modulus curves already established.

4. The permanent scale for the rigid-pavement thickness is then placed. Lines for other than 5,000 coverages are established based on the aircraft pass-to-coverage ratio.

The ACN/PCN system (Section 7.10) as referenced in ICAO document 9157-AN/901, Aerodrome Design Manual, Part 3, Pavements, Second Edition 1983, provides a standardized international airplane/pavement rating system replacing the various S, T, TT, LCN, AUW, ISWL, etc., rating systems used throughout the world. ACN is the Aircraft Classification Number and PCN is the Pavement Classification Number. An aircraft having an ACN equal to or less than the PCN can operate on the pavement subject to any limitation on the tire pressure. Numerically, the ACN is two times the derived single-wheel load expressed in thousands of kilograms, where the derived single wheel load is defined as the load on a single tire inflated to 181 psi (1.25 MPa) that would have the same pavement requirements as the aircraft. Computationally, the ACN/PCN system uses the PCA program PDILB for rigid pavements and S-77-1 for flexible pavements to calculate ACN values. The method of pavement evaluation is left up to the airport with the results of their evaluation presented as follows:

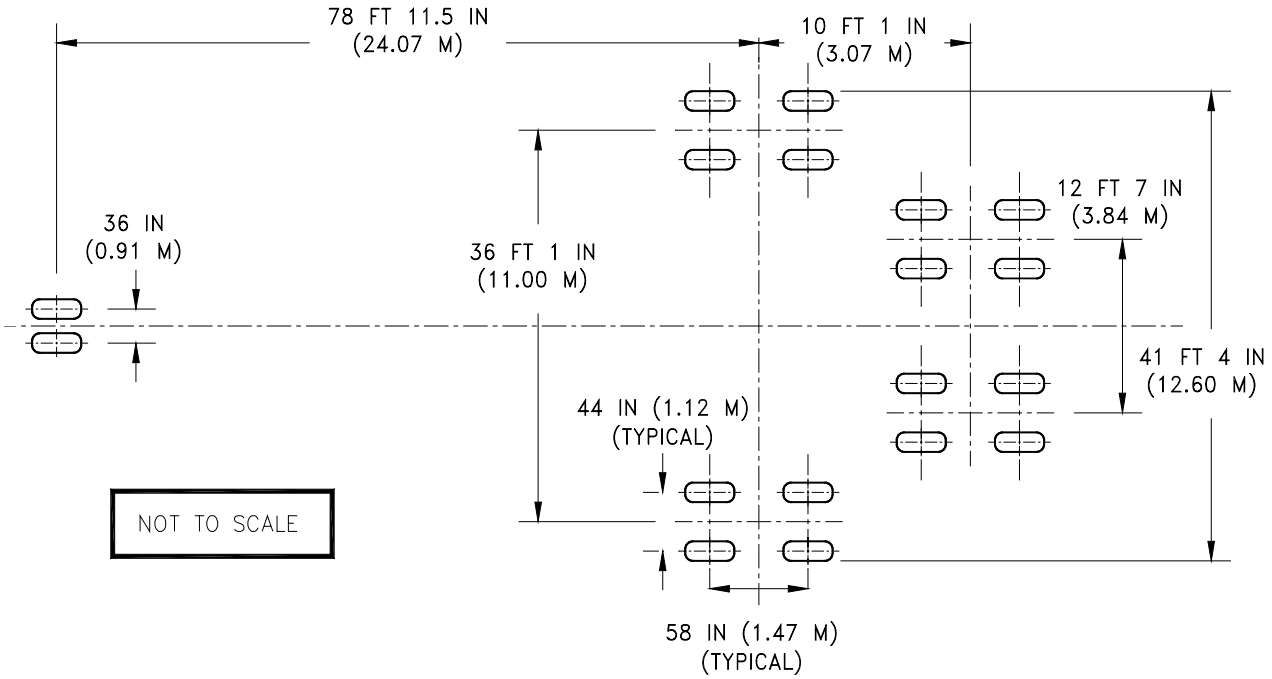
PCN	PAVEMENT TYPE	SUBGRADE CATEGORY	TIRE PRESSURE CATEGORY	EVALUATION METHOD
	R = Rigid	A = High	W = No Limit	T = Technical
	F = Flexible	B = Medium	X = To 254 psi (1.75 MPa)	U = Using Aircraft
		C = Low	Y = To 181 psi (1.25 MPa)	
		D = Ultra Low	Z = To 73 psi (0.5 MPa)	

Section 7.10.1 shows the aircraft ACN values for flexible pavements. The four subgrade categories are:

Code A - High Strength - CBR 15
Code B - Medium Strength - CBR 10
Code C - Low Strength - CBR 6
Code D - Ultra Low Strength - CBR 3

Section 7.10.2 shows the aircraft ACN values for rigid pavements. The four subgrade categories are:

Code A - High Strength, k = 550 pci (150 MN/m^3)
Code B - Medium Strength, k = 300 pci (80 MN/m^3)
Code C - Low Strength, k = 150 pci (40 MN/m^3)
Code D - Ultra Low Strength, k = 75 pci (20 MN/m^3)



	UNITS	747-400D	747-400, 747-400COMBI		
MAXIMUM DESIGN TAXI WEIGHT	LB KG	603,000 TO 613,500 273,517 TO 278,279	803,000 364,235	836,000 TO 853,000 379,204 TO 386,915	873,000 TO 877,000 395,987 TO 397,801
PERCENT OF WEIGHT ON MAIN GEAR	%	SEE SECTION 7.4			
NOSE GEAR TIRE SIZE	IN.	49X17, 32 PR (1)	49X17, 32 PR (2)		
NOSE GEAR TIRE PRESSURE	PSI KG/CM^2	150 10.55 (1)	200 14.06 (2)		
MAIN GEAR TIRE SIZE	IN.	H49 X 19.0 - 22, 24 PR	H49 X 19.0 - 22, 32 PR		
MAIN GEAR TIRE PRESSURE (3)	PSI KG/CM^2	150 10.55	190 13.36	195 13.71	200 14.06

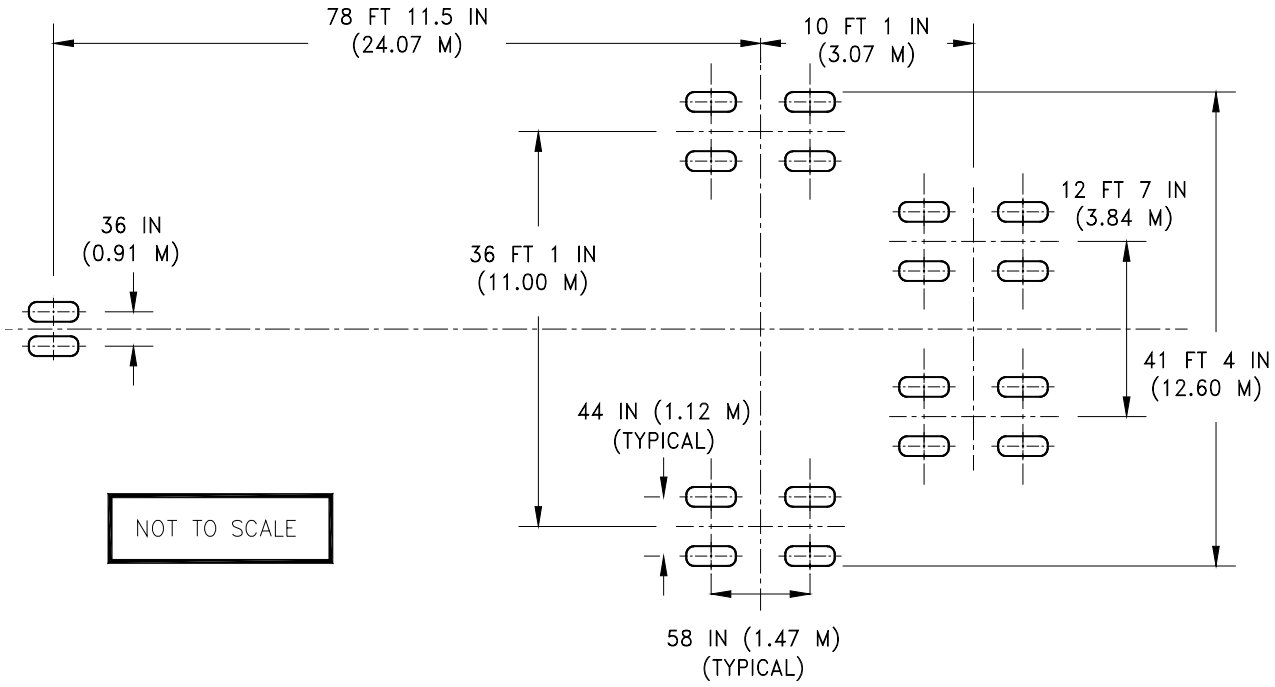
(1) OPTION: 49X19.0-20 32PR OR 34PR AT 150 PSI (10.55 KG/CM^2) OR H49X19.0-22, 24PR AT 150 PSI (10.55 KG/CM^2).

(2) OPTION: 49X19.0-20, 32PR OR 34PR AT 185 PSI (13.01 KG/CM2) OR H49X19.0-22, 32PR AT 175 PSI (12.30 KG/CM^2)

(3) COLD, LOADED PRESSURES SHOWN. TOLERANCE = +5/-0 PSI.

7.2.1 LANDING GEAR FOOTPRINT

MODEL 747-400, -400 COMBI, -400 DOMESTIC

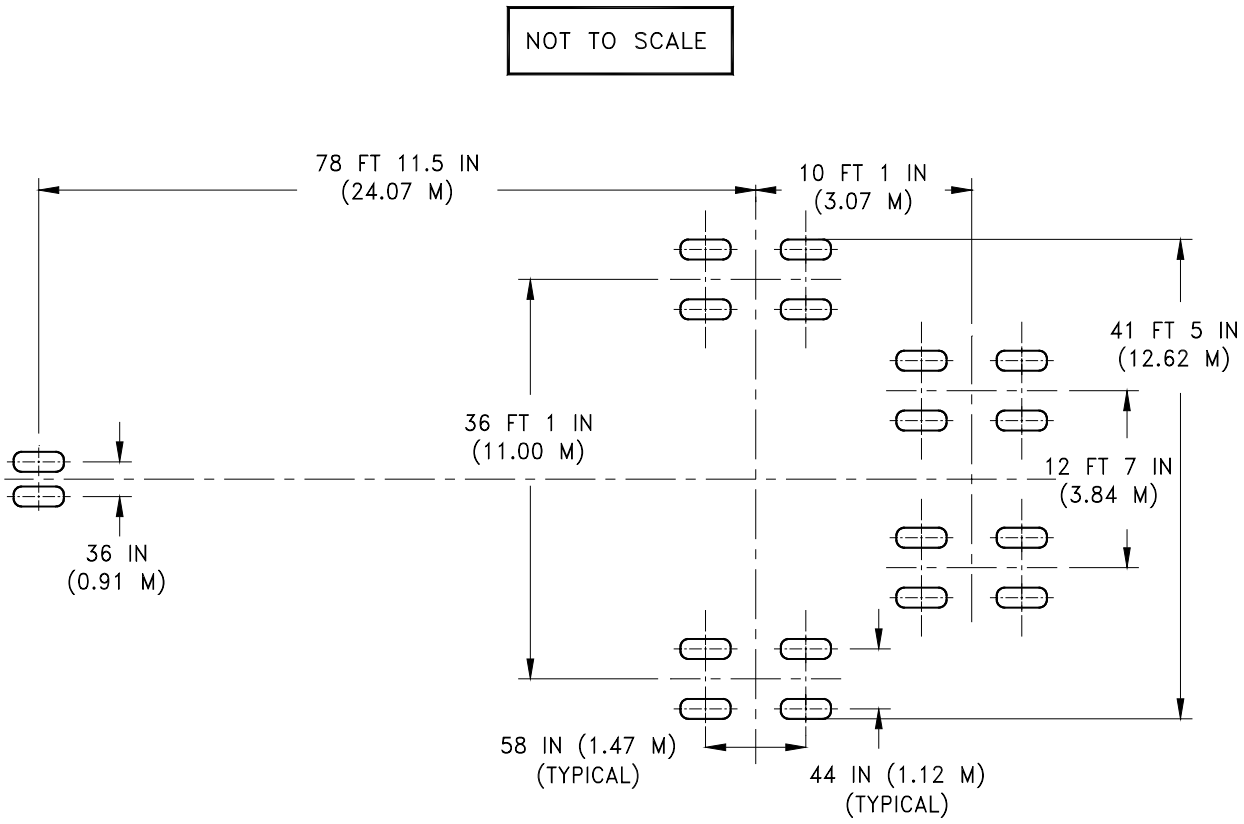


	UNITS	747-400F		
MAXIMUM DESIGN TAXI WEIGHT	LB KG	803,000 364,235	836,000 TO 853,000 379,204 TO 386,915	873,000 TO 877,000 375,987 TO 397,801
PERCENT OF WEIGHT ON MAIN GEAR	%	SEE SECTION 7.4		
NOSE GEAR TIRE SIZE	IN.	H49 X 19.0 - 22 32PR		
NOSE GEAR TIRE PRESSURE	PSI KG/CM^2	175 12.30		
MAIN GEAR TIRE SIZE	IN.	H49 X 19.0 - 22, 32 PR		
MAIN GEAR TIRE PRESSURE (1)	PSI KG/CM^2	190 13.36	195 13.71	200 14.06

(1) COLD, LOADED PRESSURES SHOWN. TOLERANCE = +5/-0 PSI.

7.2.2 LANDING GEAR FOOTPRINT

MODEL 747-400 FREIGHTER



	UNITS	747-400ER	747-400ER FREIGHTER
MAXIMUM DESIGN TAXI WEIGHT	LB KG	913,000 414,130	913,000 414,130
PERCENT OF WEIGHT ON MAIN GEAR	%	SEE SECTION 7.4	
NOSE GEAR TIRE SIZE	IN.	50 X 20.0 R 22, 34 PR	50 X 20.0 R22, 34 PR
NOSE GEAR TIRE PRESSURE	PSI KG/CM^2	190 13.36	190 13.36
MAIN GEAR TIRE SIZE	IN.	50 X 20.0 R 22, 34 PR	50 X 20.0 R, 34 PR
MAIN GEAR TIRE PRESSURE	PSI KG/CM^2	230 16.17	230 16.17

7.2.3 LANDING GEAR FOOTPRINT

MODEL 747-400ER, -400ER FREIGHTER

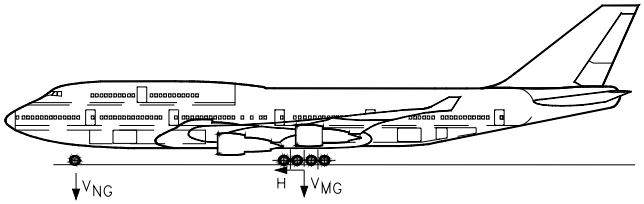
V_{NG} = MAXIMUM VERTICAL NOSE GEAR GROUND LOAD AT MOST FORWARD CENTER OF GRAVITY

V_{MG} = MAXIMUM VERTICAL MAIN GEAR GROUND LOAD AT MOST AFT CENTER OF GRAVITY

H = MAXIMUM HORIZONTAL GROUND LOAD FROM BRAKING

NOTES: 1. ALL LOADS CALCULATED USING AIRPLANE MAXIMUM DESIGN TAXI WEIGHT

2. ALL CALCULATED VALUES AND CONVERSIONS ROUNDED TO NEAREST 100 LB AND 50 KG.

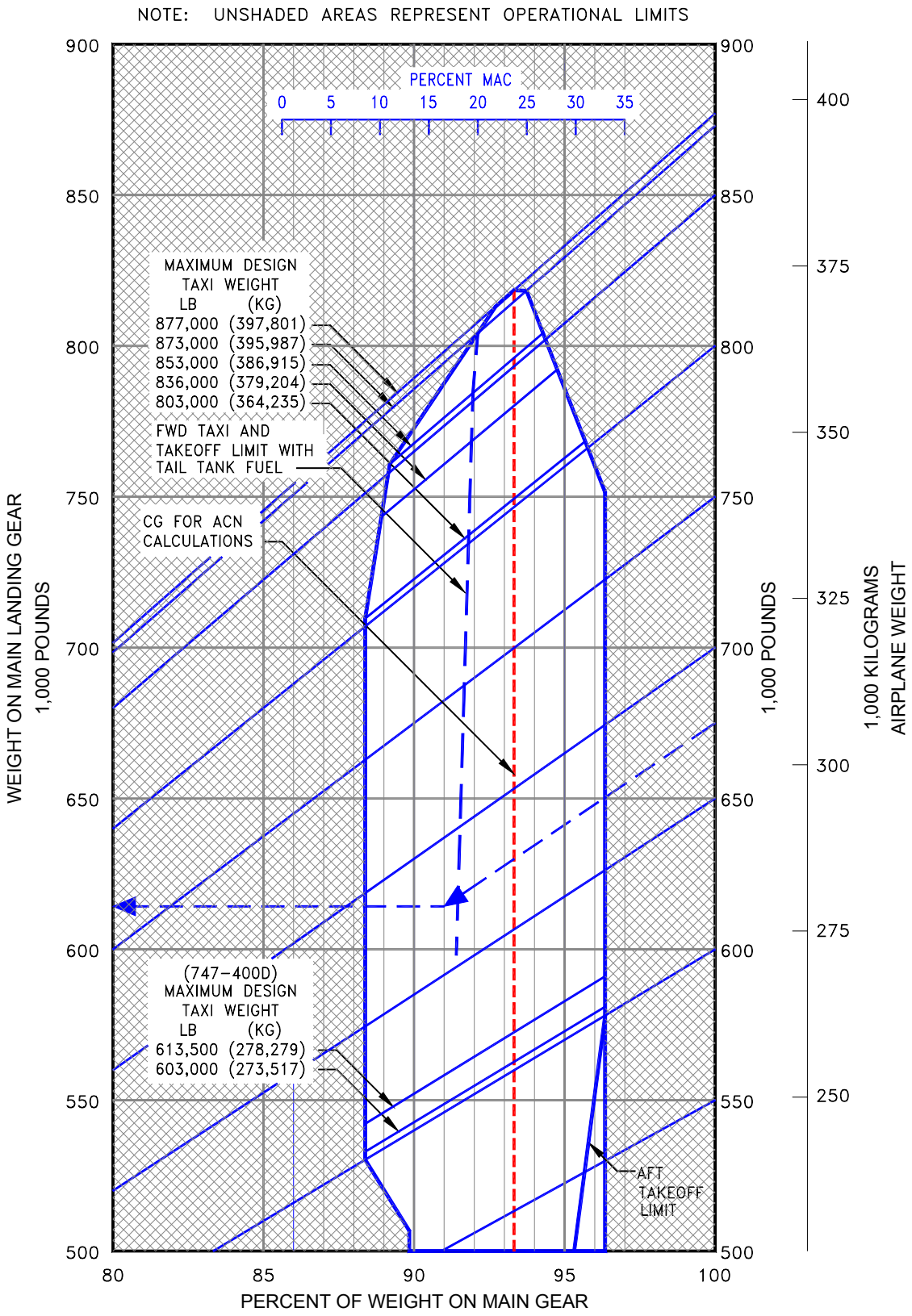


AIRPLANE MODEL	UNITS	MAX DESIGN TAXI WEIGHT	V_{NG}		V_{MG} PER STRUT (4)	H PER STRUT (4)	
			STATIC AT MOST FWD C.G.	STATIC + BRAKING 10 FT/SEC^2 DECEL	MAX LOAD AT STATIC AFT C.G.	STEADY BRAKING 10 FT/SEC^2 DECEL	AT INSTANTANEOUS BRAKING (μ = 0.8)
747-400	LB	803,000	93,300	138,200	191,500	62,300	153,200
	KG	364,250	42,350	62,700	86,850	28,300	69,500
747-400*	LB	803,000	65,900	110,800	191,500	62,300	153,200
	KG	364,250	29,900	50,250	86,850	28,300	69,500
747-400	LB	836,000	93,000	139,900	197,300	64,900	157,800
	KG	379,200	42,200	63,450	89,500	29,450	71,600
747-400*	LB	836,000	68,100	114,800	197,300	64,900	157,800
	KG	379,200	30,850	52,100	89,500	29,450	71,600
747-400	LB	853,000	92,200	139,900	200,300	66,200	160,200
	KG	386,900	41,800	63,450	90,850	30,050	72,650
747-400*	LB	853,000	68,600	116,300	200,300	66,200	160,200
	KG	386,900	31,100	52,750	90,850	30,050	72,650
747-400	LB	873,000	68,800	117,700	204,500	67,800	163,600
	KG	396,000	31,200	53,400	92,750	30,750	74,200
747-400	LB	877,000	64,000	114,000	204,600	68,100	163,700
	KG	397,800	29,000	51,700	92,800	30,900	74,250
747-400F	LB	873,000	80,100	116,200	204,500	67,800	163,600
	KG	396,000	36,350	52,700	92,750	30,750	74,200
747-400F*	LB	873,000	67,400	116,200	204,500	67,800	163,600
	KG	396,000	30,550	52,700	92,750	30,750	74,200
747-400F	LB	877,000	76,500	127,900	204,600	68,100	163,700
	KG	397,800	34,700	58,000	92,800	30,900	74,250
747-400F*	LB	877,000	67,400	118,800	204,600	68,100	163,700
	KG	397,800	30,550	53,900	92,800	30,900	74,250
747-400D	LB	603,000	70,100	103,800	145,200	46,800	116,200
	KG	273,500	31,800	47,100	65,900	21,250	52,700
747-400D	LB	613,500	71,300	105,600	147,800	47,600	118,200
	KG	278,300	32,350	47,900	67,050	21,600	53,600
747-400ER	LB	913,000	71,950	122,400	213,600	70,900	170,900
	KG	414,150	32,650	55,550	96,900	32,150	77,500
747-400ER FREIGHTER	LB	913,000	77,300	130,950	213,600	70,900	170,900
	KG	414,150	35,050	59,400	96,900	32,150	77,500

* AIRPLANE WITH TAIL TANK FUEL

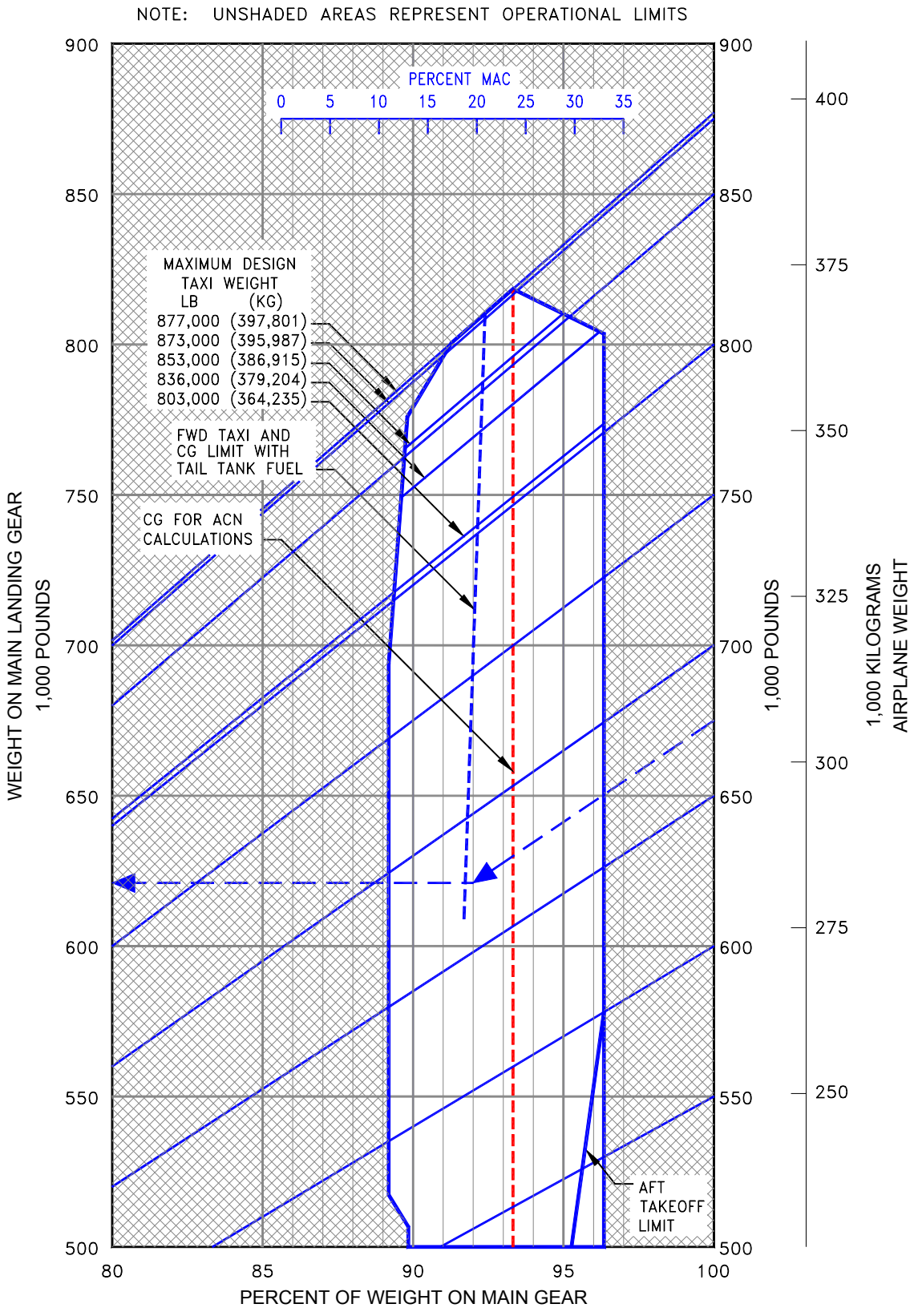
7.3. MAXIMUM PAVEMENT LOADS

MODEL 747-400



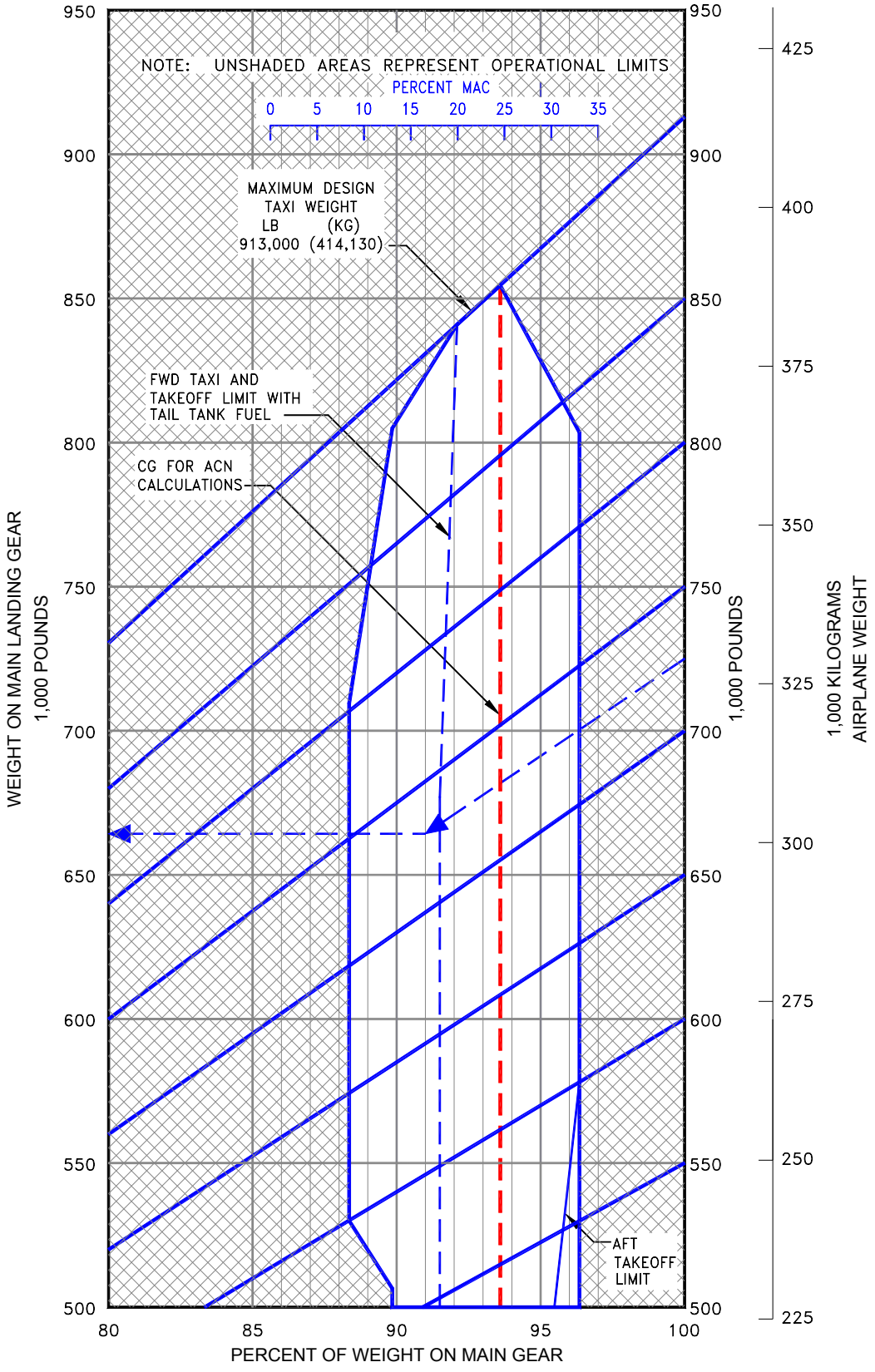
7.4.1 LANDING GEAR LOADING ON PAVEMENT

MODEL 747-400, -400 COMBI, -400 DOMESTIC



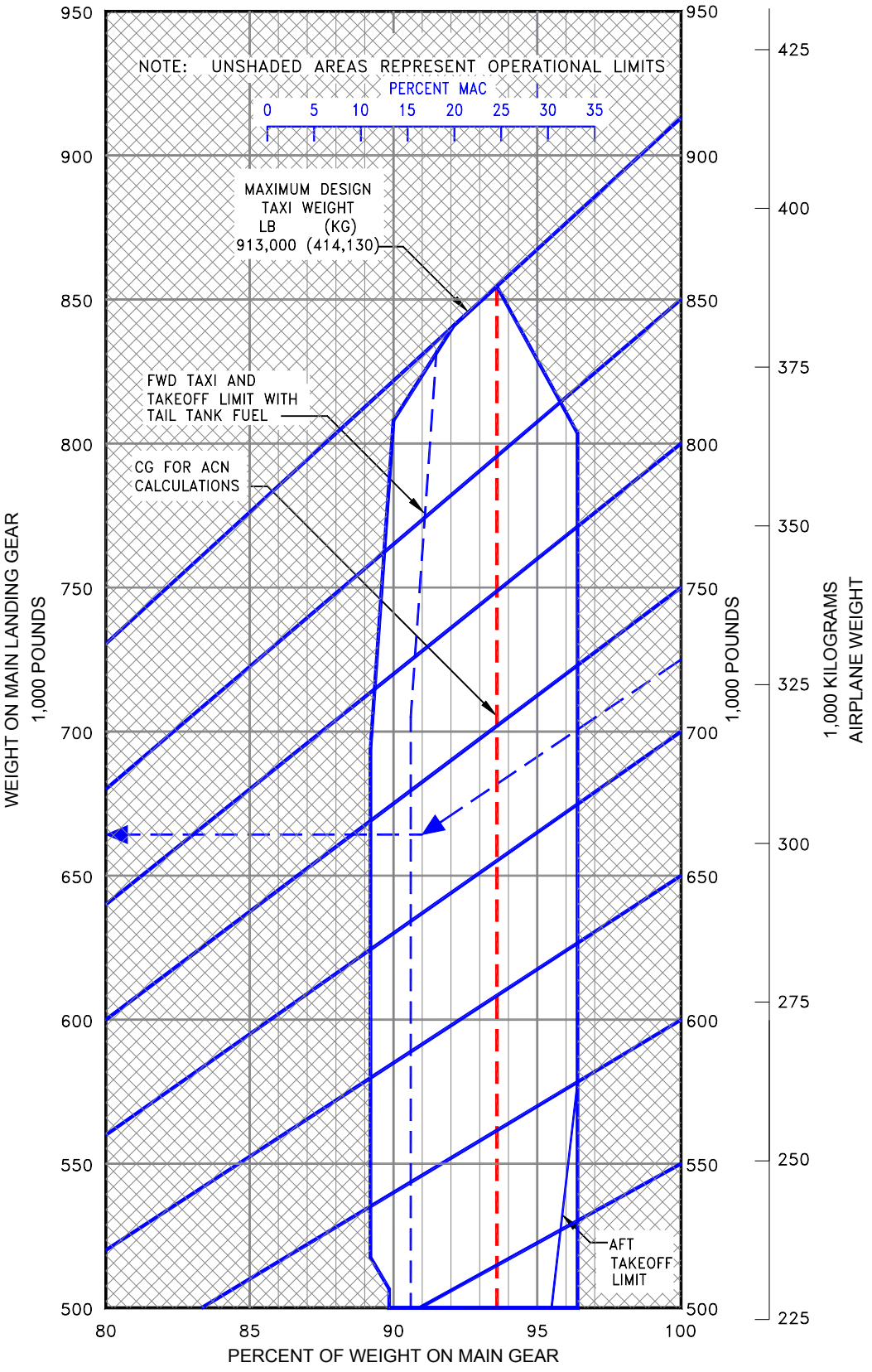
7.4.2 LANDING GEAR LOADING ON PAVEMENT

MODEL 747-400 FREIGHTER



7.4.3 LANDING GEAR LOADING ON PAVEMENT

MODEL 747-400ER



7.4.4 LANDING GEAR LOADING ON PAVEMENT

MODEL 747-400ER FREIGHTER

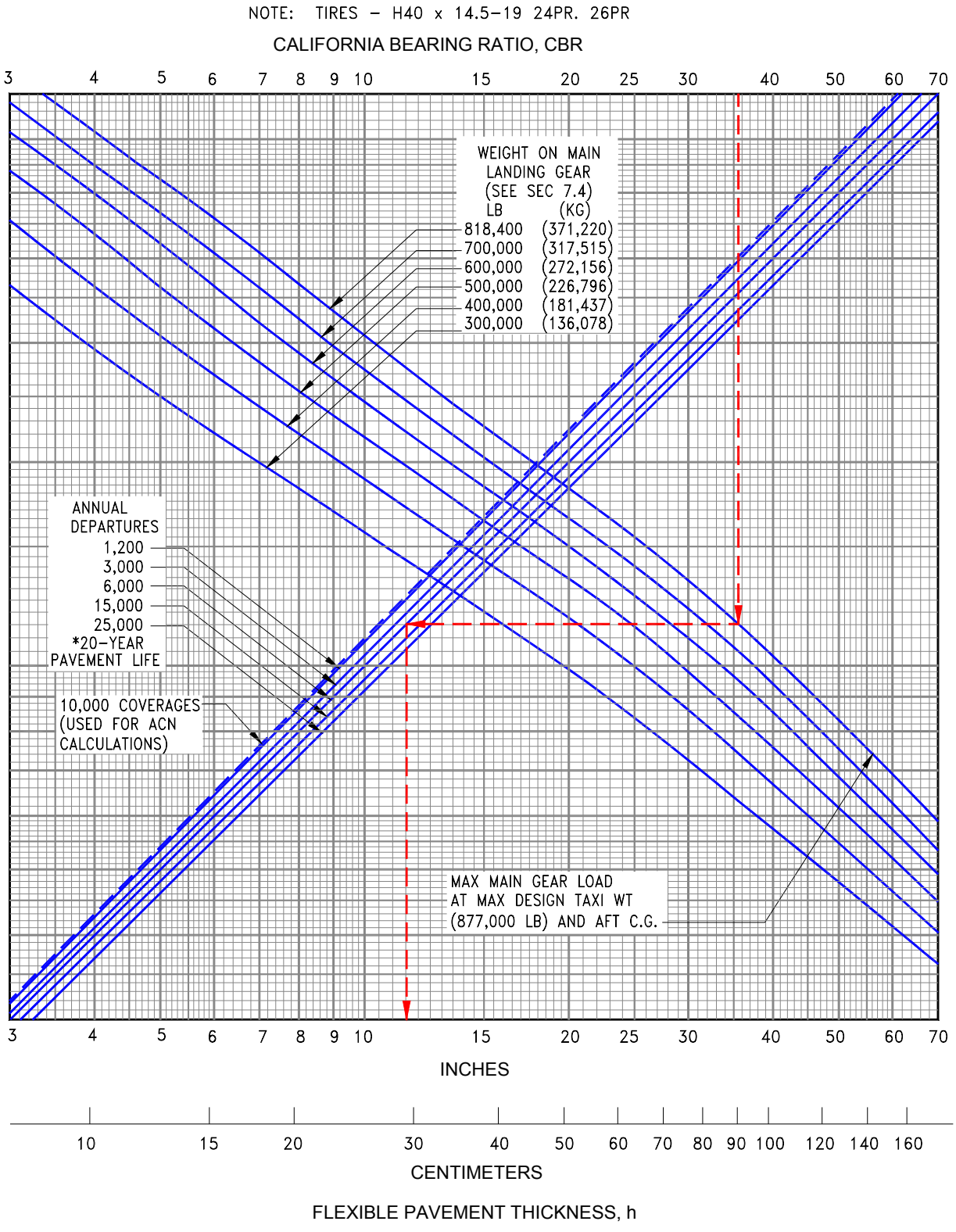
7.5 Flexible Pavement Requirements - U.S. Army Corps of Engineers Method (S-77-1) and FAA Design Method

The following flexible-pavement design chart presents the data of six incremental main-gear loads at the minimum tire pressure required at the maximum design taxi weight.

In the example shown in Section 7.5.1, for a CBR of 35.5 and an annual departure level of 6,000, the required flexible pavement thickness for a 747-400 airplane with a main gear loading of 818,400 pounds is 13.1 inches. In Section 7.5.2, for the same CBR and departure levels, the required flexible pavement thickness for a 747-400ER airplane with a main gear loading of 854,408 pounds is 14.2 inches.

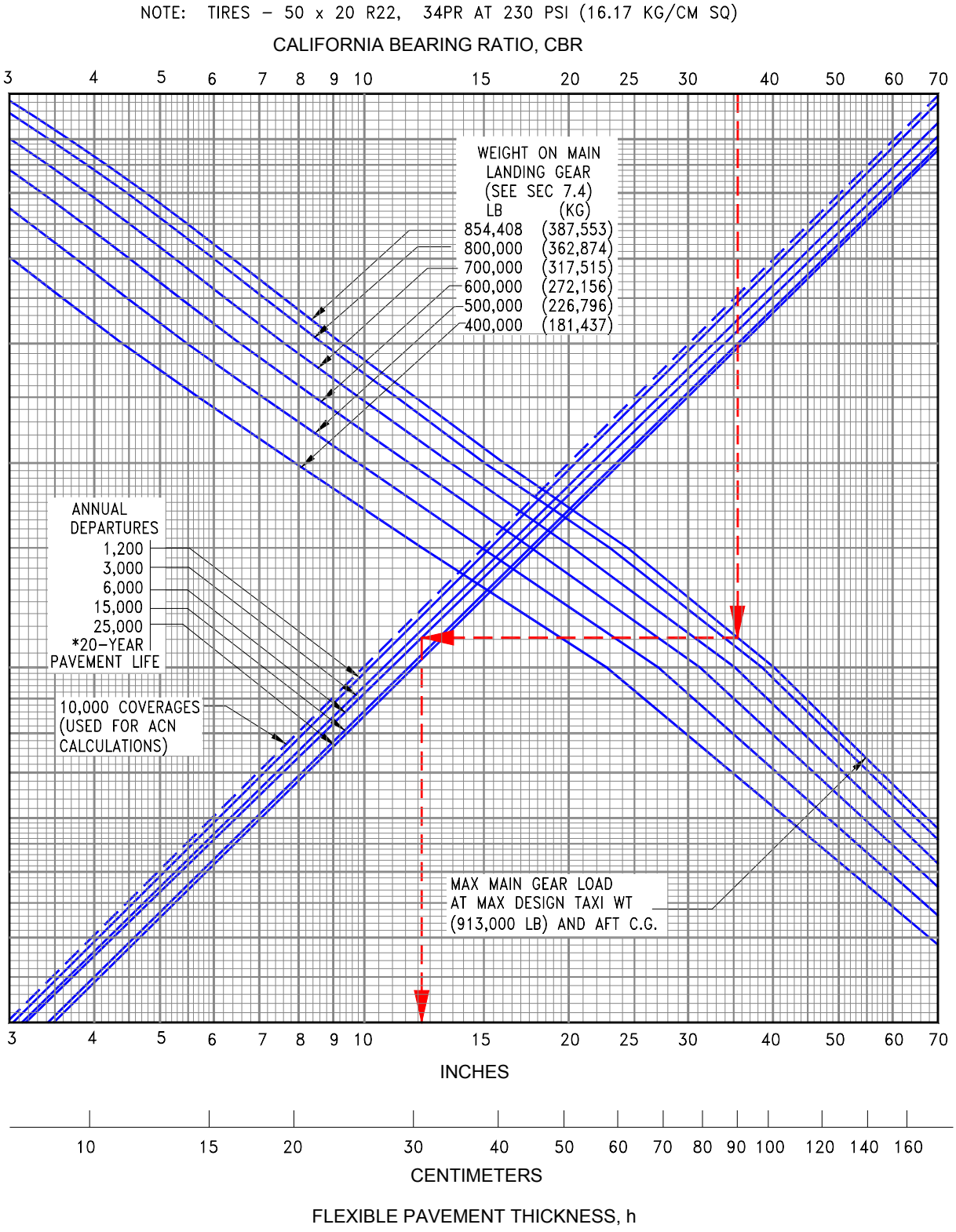
The line showing 10,000 coverages is used for ACN calculations (see Section 7.10).

The FAA design method uses a similar procedure using total airplane weight instead of weight on the main landing gears. The equivalent main gear loads for a given airplane weight could be calculated from Section 7.4.



7.5.1 FLEXIBLE PAVEMENT REQUIREMENTS - U.S. ARMY CORPS OF ENGINEERS DESIGN METHOD (S-77-1) AND FAA DESIGN METHOD

MODEL 747-400, -400 COMBI, -400 DOMESTIC, - 400 FREIGHTER



7.5.2 FLEXIBLE PAVEMENT REQUIREMENTS - U.S. ARMY CORPS OF ENGINEERS DESIGN METHOD (S-77-1)

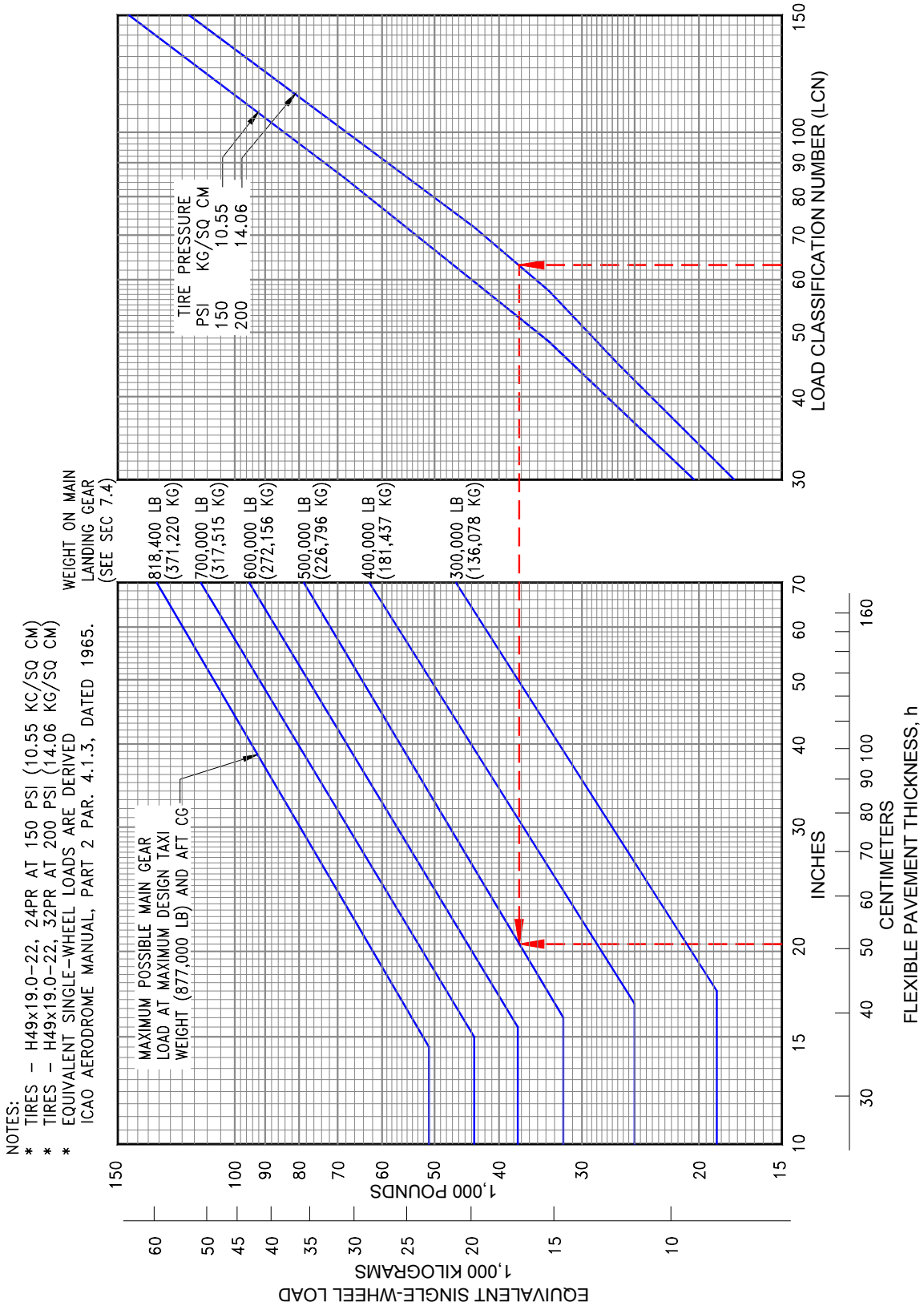
MODEL 747-400ER, -400ER FREIGHTER

7.6 Flexible Pavement Requirements - LCN Method

To determine the airplane weight that can be accommodated on a particular flexible pavement, both the Load Classification Number (LCN) of the pavement and the thickness must be known.

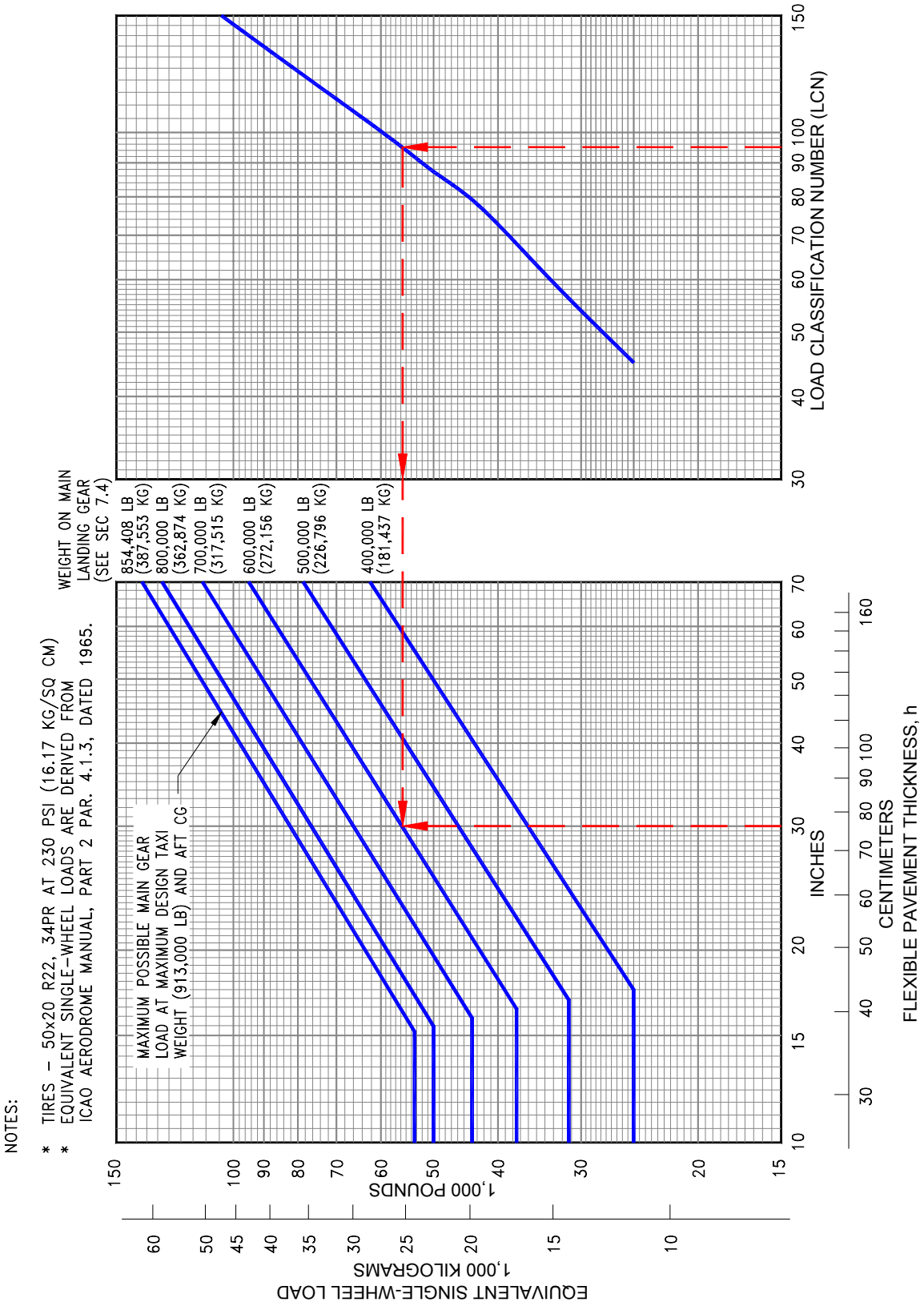
In the example shown in Section 7.6.1, flexible pavement thickness is shown at 21 inches with an LCN of 63. For these conditions, the apparent maximum allowable weight permissible on the main landing gear is 500,000 pounds for a 747-400 airplane with 200-psi main gear tires. In Section 7.6.2, for a flexible pavement thickness of 30 inches with an LCN of 95, the apparent maximum allowable weight permissible on the main landing gear is 600,000 pounds for a 747-400ER airplane with 230-psi main gear tires

Note: If the resultant aircraft LCN is not more that 10% above the published pavement LCN, the bearing strength of the pavement can be considered sufficient for unlimited use by the airplane. The figure 10% has been chosen as representing the lowest degree of variation in LCN that is significant (reference: ICAO Aerodrome Design Manual, Part 3, "Pavements,", First Edition dated 1977.)



7.6.1 FLEXIBLE PAVEMENT REQUIREMENTS - LCN METHOD

MODEL 747-400, -400 COMBI, -400 DOMESTIC, - 400 FREIGHTER



7.6.2 FLEXIBLE PAVEMENT REQUIREMENTS - LCN METHOD

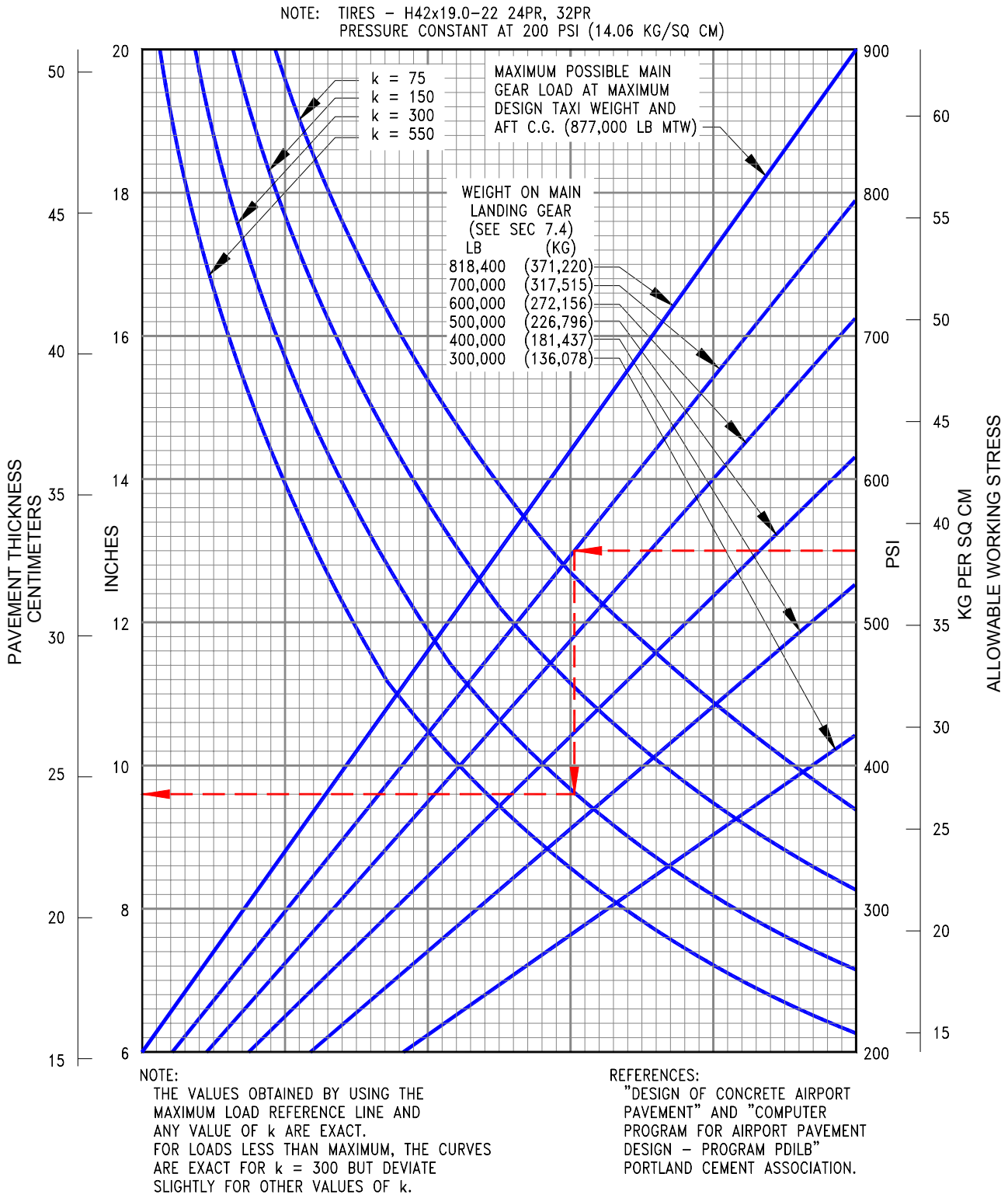
MODEL 747-400ER, -400ER FREIGHTER

7.7 Rigid Pavement Requirements - Portland Cement Association Design Method

The Portland Cement Association method of calculating rigid pavement requirements is based on the computerized version of "Design of Concrete Airport Pavement" (Portland Cement Association, 1965) as described in XP6705-2, "Computer Program for Airport Pavement Design" by Robert G. Packard, Portland Cement Association, 1968.

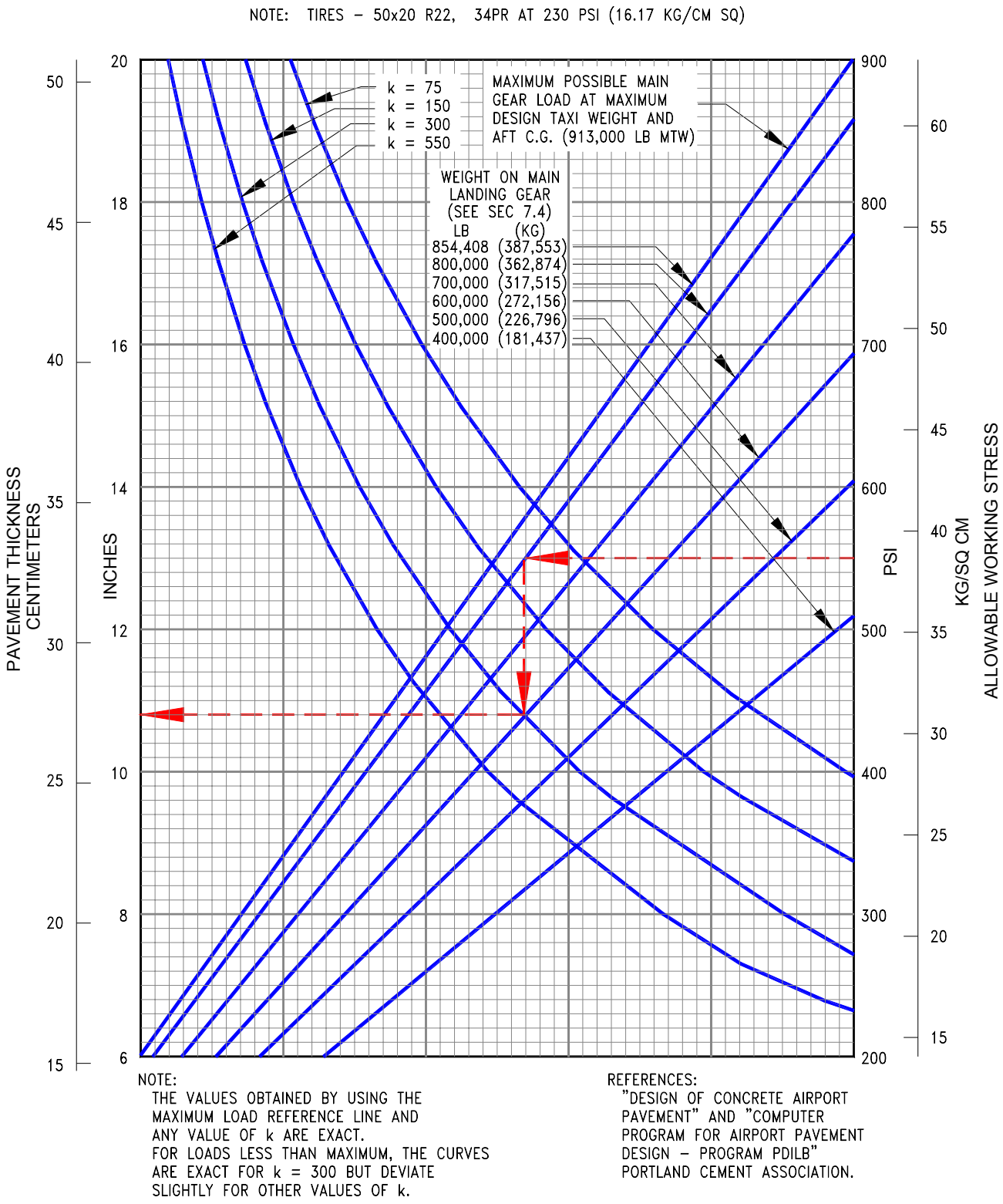
The rigid pavement design charts in Section 7.7.1 and Section 7.7.2 present data for six incremental main gear loads at the minimum tire pressure required at the maximum design taxi weight.

In the example shown in Section 7.7.1, for an allowable working stress of 550 psi, a main gear load on a 747-400 airplane of 700,000 pounds, and a subgrade strength (k) of 300, the required rigid pavement thickness is 9.6 inches. In Section 7.7.2, for an allowable working stress of 550 psi, a main gear load on a 747-400ER airplane of 800,000 pounds, and a subgrade strength (k) of 300, the required rigid pavement thickness is 10.8 inches.



7.7.1 RIGID PAVEMENT REQUIREMENTS - PORTLAND CEMENT ASSOCIATION DESIGN METHOD

MODEL 747-400, -400 COMBI, -400 DOMESTIC, - 400 FREIGHTER



7.7.2 RIGID PAVEMENT REQUIREMENTS - PORTLAND CEMENT ASSOCIATION DESIGN METHOD

MODEL 747-400ER, -400ER FREIGHTER

7.8 Rigid Pavement Requirements - LCN Conversion

To determine the airplane weight that can be accommodated on a particular rigid pavement, both the LCN of the pavement and the radius of relative stiffness (ℓ) of the pavement must be known.

In the example shown in Section 7.8.2, for a rigid pavement with a radius of relative stiffness of 48 with an LCN of 58, the apparent maximum allowable weight permissible on the main landing gear is 400,000 pounds for a 747-400 airplane with 200-psi main tires. In Section 7.8.3, for a rigid pavement with a radius of relative stiffness of 47 with an LCN of 91, the apparent maximum allowable weight permissible on the main landing gear is 600,000 pounds for a 747-400ER airplane with 230-psi main tires.

Note: If the resultant aircraft LCN is not more that 10% above the published pavement LCN, the bearing strength of the pavement can be considered sufficient for unlimited use by the airplane. The figure 10% has been chosen as representing the lowest degree of variation in LCN that is significant (reference: ICAO Aerodrome Design Manual, Part 3, "Pavements," First Edition dated 1977).

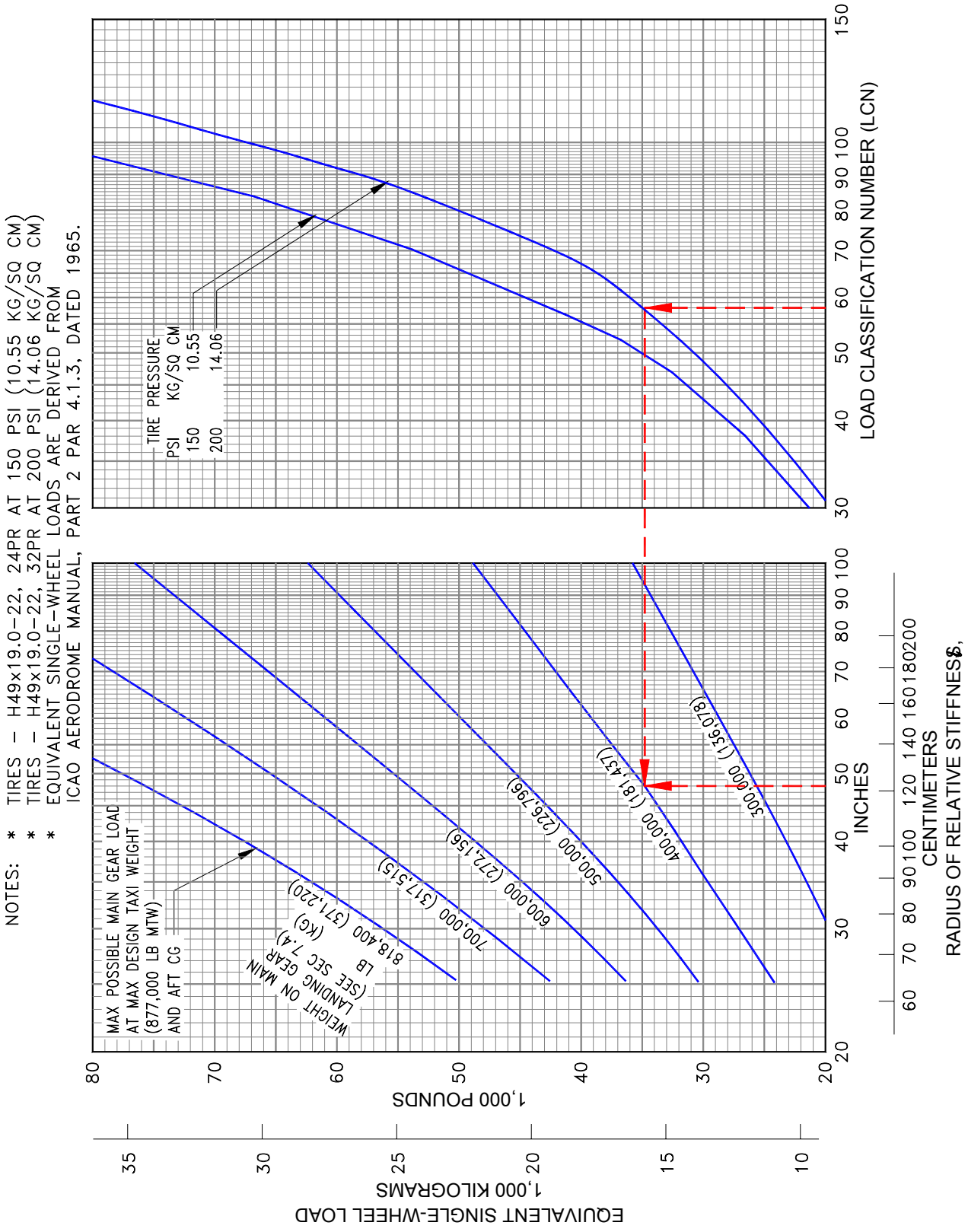
RADIUS OF RELATIVE STIFFNESS (ℓ)
VALUES IN INCHES

$$\ell = \sqrt[4]{\frac{Ed^3}{12(1-\mu^2)k}} = 24.1652\sqrt[4]{\frac{d^3}{k}}$$

WHERE: E = YOUNG'S MODULUS OF ELASTICITY = 4×10^6 psi
k = SUBGRADE MODULUS, LB PER CU IN
d = RIGID PAVEMENT THICKNESS, IN
μ = POISSON'S RATIO = 0.15

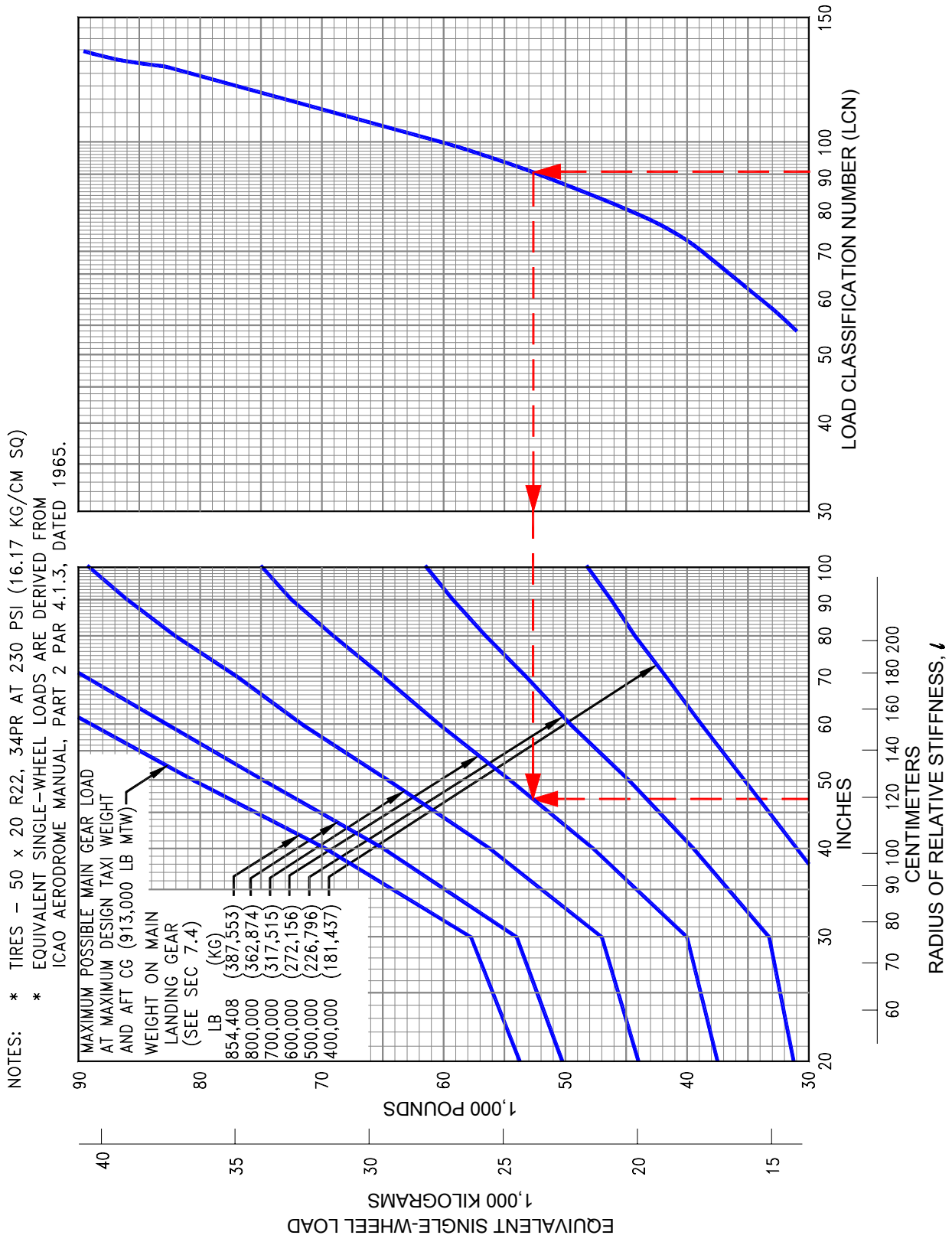
d	k = 75	k = 100	k = 150	k = 200	k = 250	k = 300	k = 350	k = 400	k = 500	k = 550
6.0	31.48	29.29	26.47	24.63	23.30	22.26	21.42	20.71	19.59	19.13
6.5	33.42	31.10	28.11	26.16	24.74	23.63	22.74	21.99	20.80	20.31
7.0	35.33	32.88	29.71	27.65	26.15	24.99	24.04	23.25	21.99	21.47
7.5	37.21	34.63	31.29	29.12	27.54	26.31	25.32	24.49	23.16	22.61
8.0	39.06	36.35	32.84	30.56	28.91	27.62	26.57	25.70	24.31	23.73
8.5	40.87	38.04	34.37	31.99	30.25	28.90	27.81	26.90	25.44	24.84
9.0	42.66	39.70	35.88	33.39	31.57	30.17	29.03	28.07	26.55	25.93
9.5	44.43	41.35	37.36	34.77	32.88	31.42	30.23	29.24	27.65	27.00
10.0	46.17	42.97	38.83	36.13	34.17	32.65	31.41	30.38	28.73	28.06
10.5	47.89	44.57	40.27	37.48	35.44	33.87	32.58	31.52	29.81	29.10
11.0	49.59	46.15	41.70	38.81	36.70	35.07	33.74	32.63	30.86	30.14
11.5	51.27	47.72	43.12	40.12	37.95	36.26	34.89	33.74	31.91	31.16
12.0	52.94	49.26	44.51	41.43	39.18	37.43	36.02	34.83	32.94	32.17
12.5	54.58	50.80	45.90	42.71	40.40	38.60	37.14	35.92	33.97	33.17
13.0	56.21	52.31	47.27	43.99	41.60	39.75	38.25	36.99	34.98	34.16
13.5	57.83	53.81	48.63	45.25	42.80	40.89	39.34	38.05	35.99	35.14
14.0	59.43	55.30	49.97	46.50	43.98	42.02	40.43	39.10	36.98	36.11
14.5	61.01	56.78	51.30	47.74	45.15	43.14	41.51	40.15	37.97	37.07
15.0	62.58	58.24	52.62	48.97	46.32	44.25	42.58	41.18	38.95	38.03
15.5	64.14	59.69	53.93	50.19	47.47	45.35	43.64	42.21	39.92	38.98
16.0	65.69	61.13	55.23	51.40	48.61	46.45	44.69	43.22	40.88	39.92
16.5	67.22	62.55	56.52	52.60	49.75	47.53	45.73	44.23	41.83	40.85
17.0	68.74	63.97	57.80	53.79	50.87	48.61	46.77	45.23	42.78	41.77
17.5	70.25	65.38	59.07	54.97	51.99	49.68	47.80	46.23	43.72	42.69
18.0	71.75	66.77	60.34	56.15	53.10	50.74	48.82	47.22	44.65	43.60
19.0	74.72	69.54	62.83	58.47	55.30	52.84	50.84	49.17	46.50	45.41
20.0	77.65	72.26	65.30	60.77	57.47	54.91	52.83	51.10	48.33	47.19
21.0	80.55	74.96	67.73	63.03	59.61	56.95	54.80	53.00	50.13	48.95
22.0	83.41	77.62	70.14	65.27	61.73	58.98	56.75	54.88	51.91	50.68
23.0	86.23	80.25	72.51	67.48	63.82	60.98	58.67	56.74	53.67	52.40
24.0	89.03	82.85	74.86	69.67	65.89	62.95	60.57	58.58	55.41	54.10
25.0	91.80	85.43	77.19	71.84	67.94	64.91	62.46	60.41	57.13	55.78

7.8.1 RADIUS OF RELATIVE STIFFNESS (REFERENCE: PORTLAND CEMENT ASSOCIATION)



7.8.2 RIGID PAVEMENT REQUIREMENTS - LCN CONVERSION

MODEL 747-400, -400 COMBI, -400 DOMESTIC, - 400 FREIGHTER



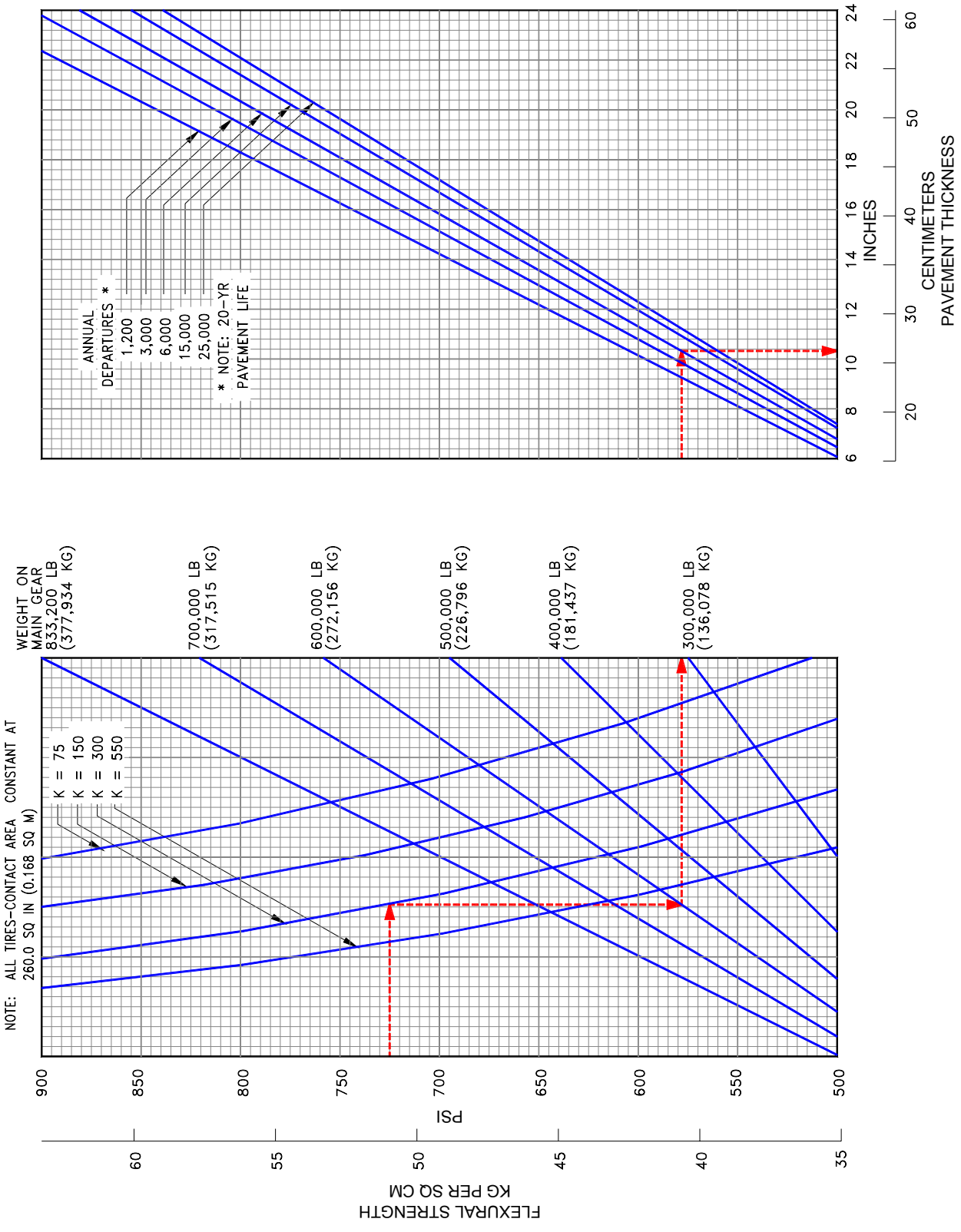
7.8.3 RIGID PAVEMENT REQUIREMENTS - LCN CONVERSION

MODEL 747-400ER, -400ER FREIGHTER

7.9 Rigid Pavement Requirements - FAA Design Method

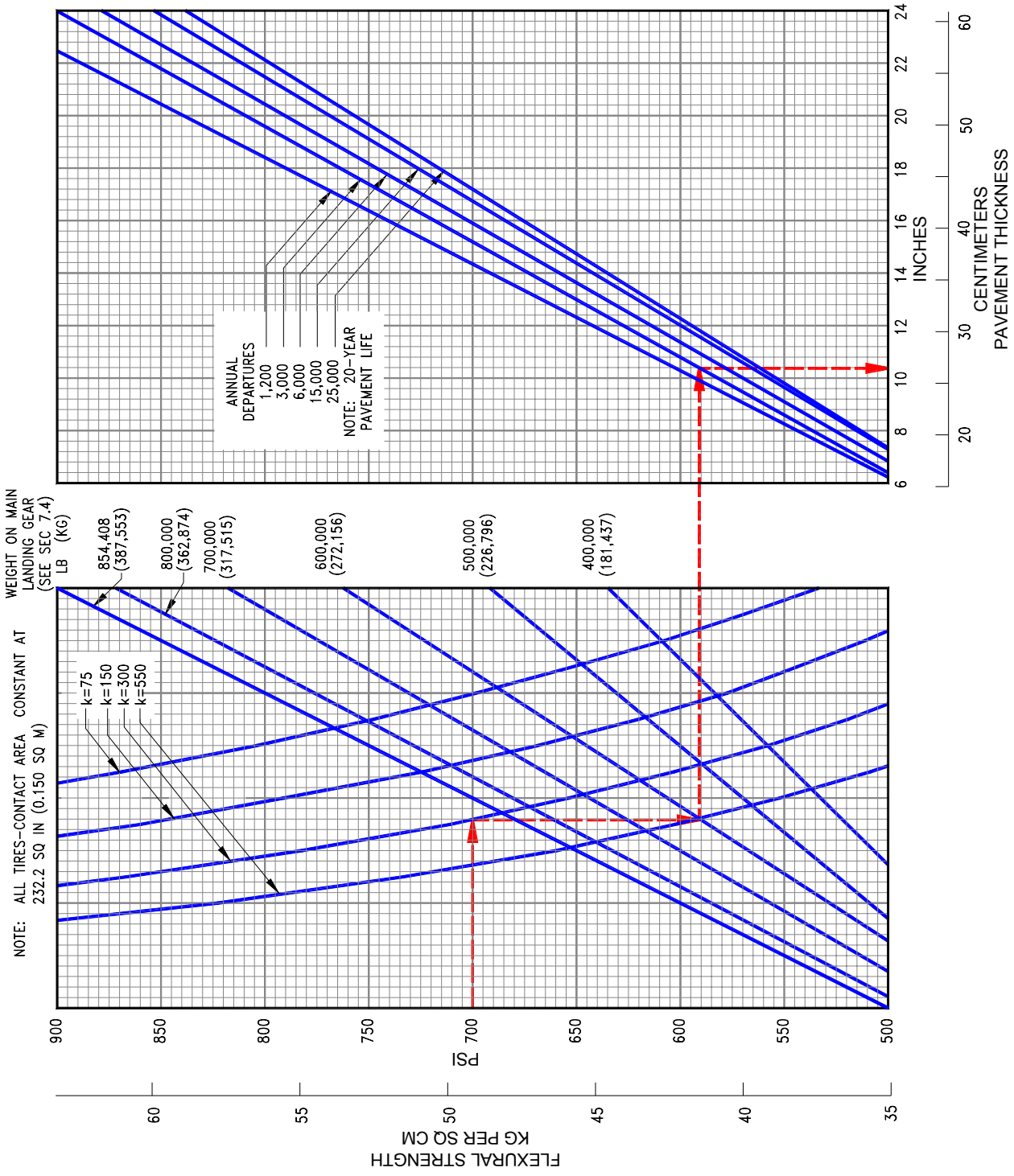
The rigid pavement design charts shown in Section 7.9.1 and Section 7.9.2 present data on six incremental main gear loads at the minimum tire pressure required at the maximum design taxi weight.

In the example shown in Section 7.9.1, for a pavement flexure strength of 725 psi, a subgrade strength of k = 300, and an annual departure level of 6,000, the required rigid pavement thickness for a 747-400 airplane with a main gear load of 600,000 pounds is 10.4 inches. In Section 7.9.2, for a pavement flexure strength of 700 psi, a subgrade strength of k = 300, and an annual departure level of 3,000, the required rigid pavement thickness for a 747-40ER airplane with a main gear load of 600,000 pounds is 10.4 inches.



7.9.1 RIGID PAVEMENT REQUIREMENTS - FAA DESIGN METHOD

MODEL 747-400, -400 COMBI, -400 DOMESTIC, - 400 FREIGHTER



7.9.2 RIGID PAVEMENT REQUIREMENTS - FAA DESIGN METHOD

MODEL 747-400ER, -400ER FREIGHTER

7.10 ACN/PCN Reporting System: Flexible and Rigid Pavements

To determine the ACN of an aircraft on flexible or rigid pavement, both the aircraft gross weight and the subgrade strength category must be known. In the example in Section 7.10.1, for a 747-400 aircraft with a gross weight of 675,000 pounds and medium subgrade strength, the flexible pavement ACN is 41.5. In Section 7.10.3, for the same aircraft and subgrade strength, the rigid pavement ACN is 43.8. In Section 7.10.2, for a 747-400ER aircraft with a gross weight of 900,000 pounds and medium subgrade strength, the flexible pavement ACN is 62. In Section 7.10.4, for the same aircraft and subgrade strength, the rigid pavement ACN is 57.8.

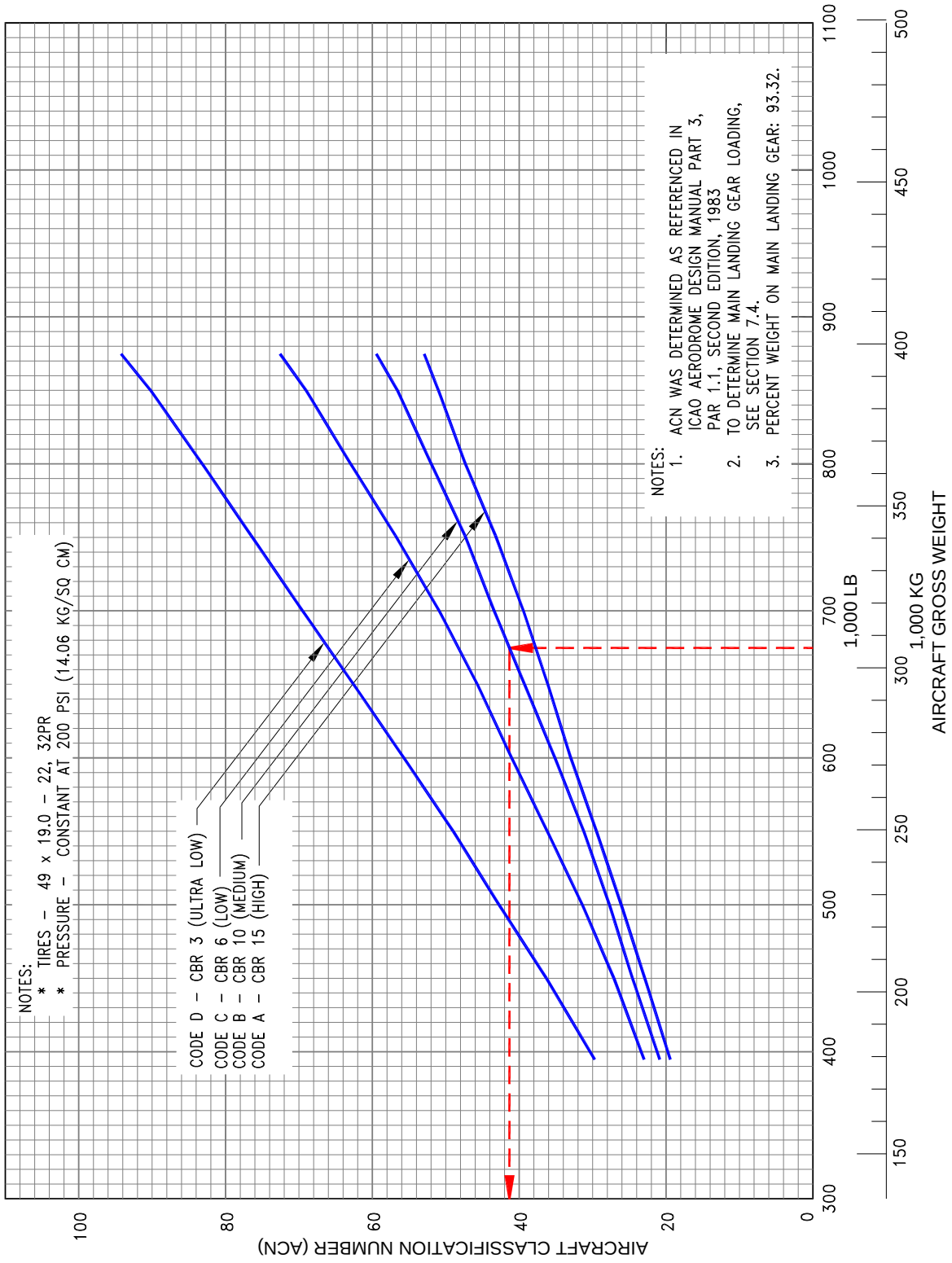
Notes: 1. An aircraft with an ACN equal to or less that the reported PCN can operate on that pavement subject to any limitations on the tire pressure. (Ref: ICAO Annex 14 Aerodromes, First Edition, July 1990.)

2. The ACN values on the Flexible Pavement charts were calculated using alpha factors proposed by the ICAO ACN Study Group.

The following table provides ACN data in tabular format similar to the one used by ICAO in the "Aerodrome Design Manual Part 3, Pavements." If the ACN for an intermediate weight between taxi weight and minimum weight of the aircraft is required, Figures 7.10.1 through 7.10.4 should be consulted.

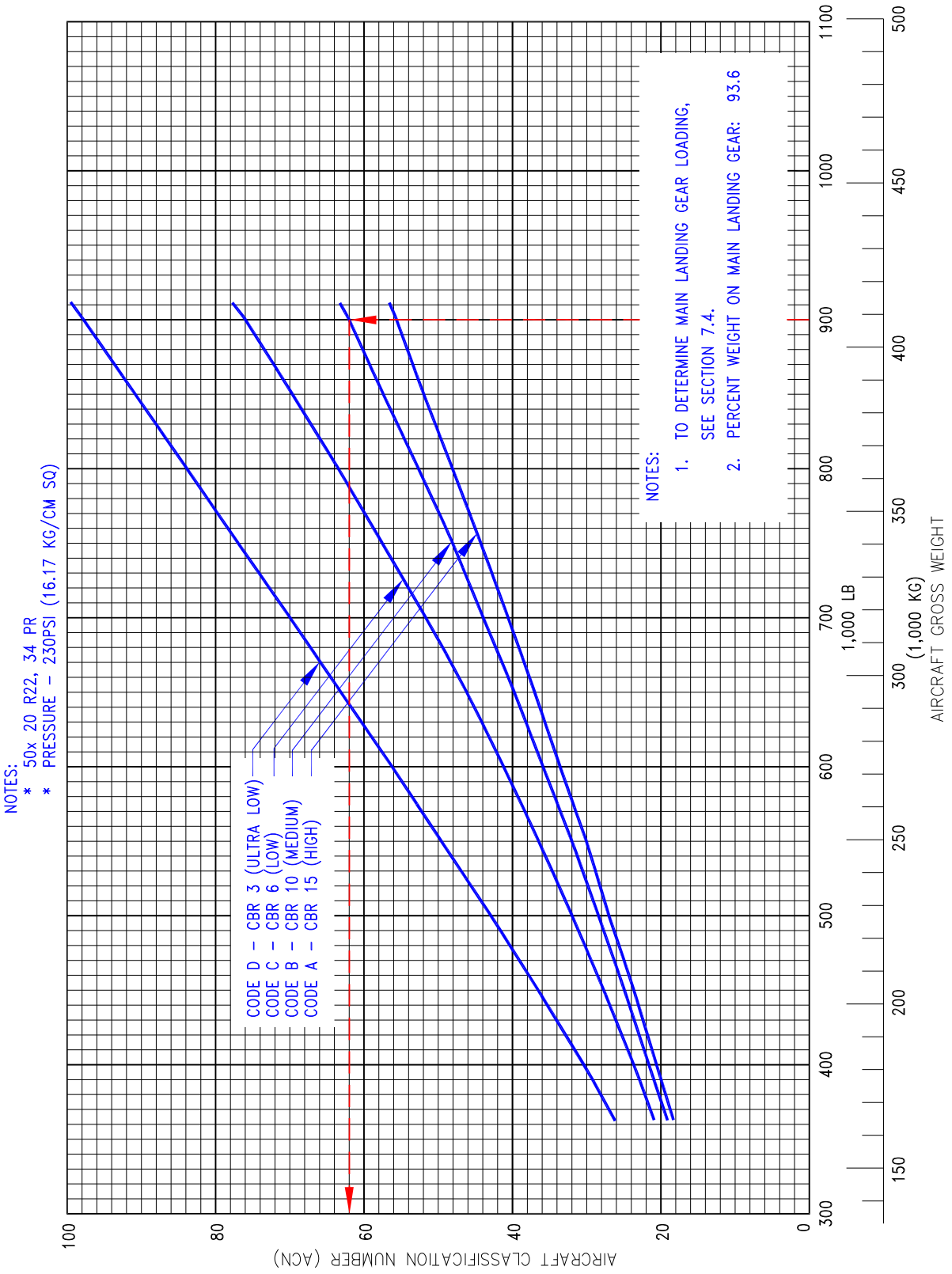
				ACN FOR RIGID PAVEMENT SUBGRADES – MN/m³				ACN FOR FLEXIBLE PAVEMENT SUBGRADES – CBR			
AIRCRAFT TYPE	MAXIMUM TAXI WEIGHT/ MINIMUM WT (1) LB (KG)	LOAD ON ONE MAIN GEAR LEG (%)	TIRE PRESSURE PSI (MPa)	HIGH 150	MEDIUM 80	LOW 40	ULTRA LOW 20	HIGH 15	MEDIUM 10	LOW 6	ULTRA LOW 3
747-400,	877,000(397,800)	23.33	200(1.38)	53	62	74	85	53	59	73	94
-400F	395,000(179,200)			19	21	25	29	20	21	23	30
747-400ER,	913,000(414,130)	23.40	230 (1.58)	59	69	81	92	57	63	78	100
-400 ER	362,400(164,400)			19	20	23	27	18	19	21	26
FREIGHTER											

(1) Minimum weight used solely as a baseline for ACN curve generation.



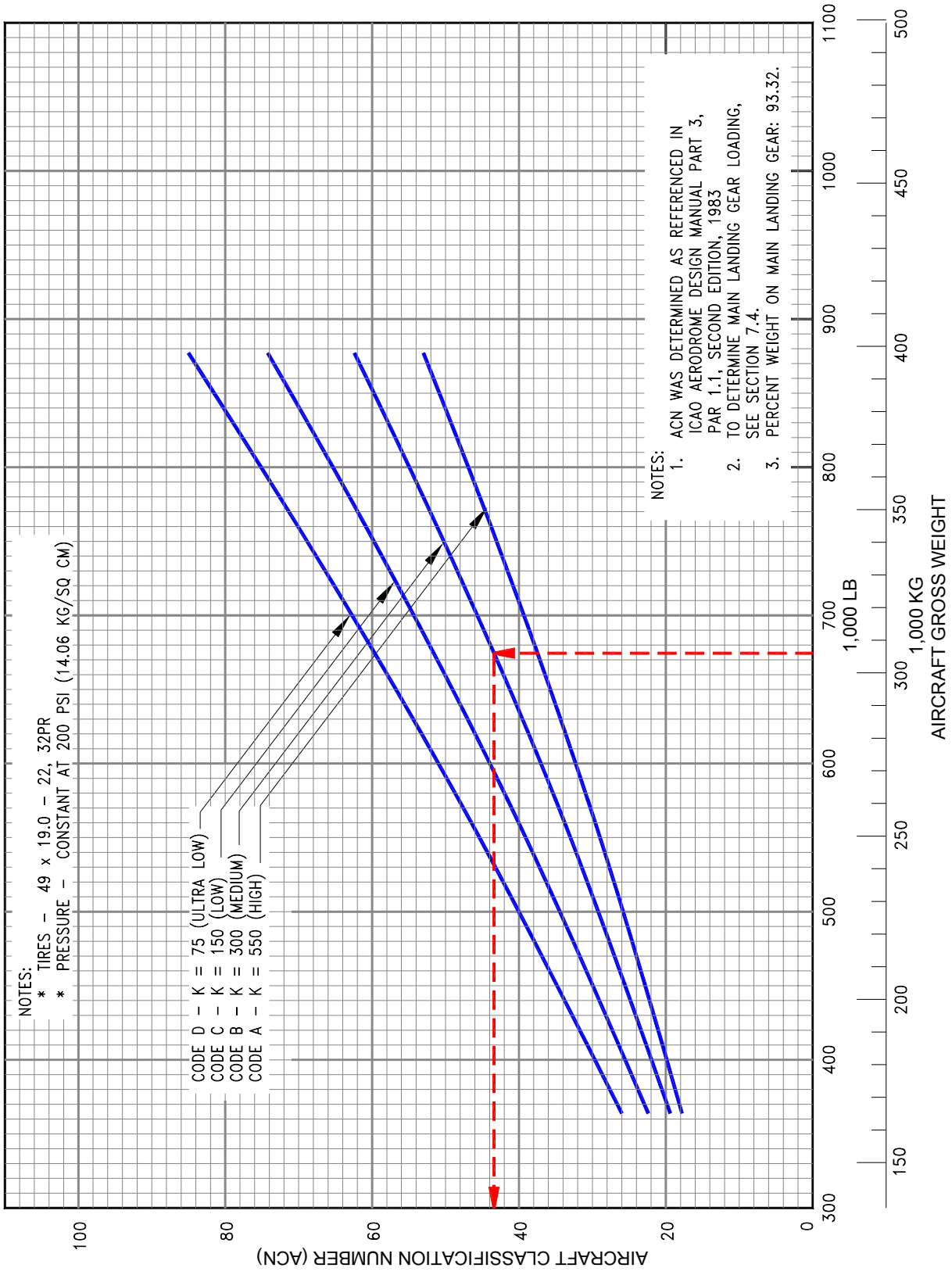
7.10.1 AIRCRAFT CLASSIFICATION NUMBER - FLEXIBLE PAVEMENT

MODEL 747-400, -400 COMBI, -400 DOMESTIC, - 400 FREIGHTER



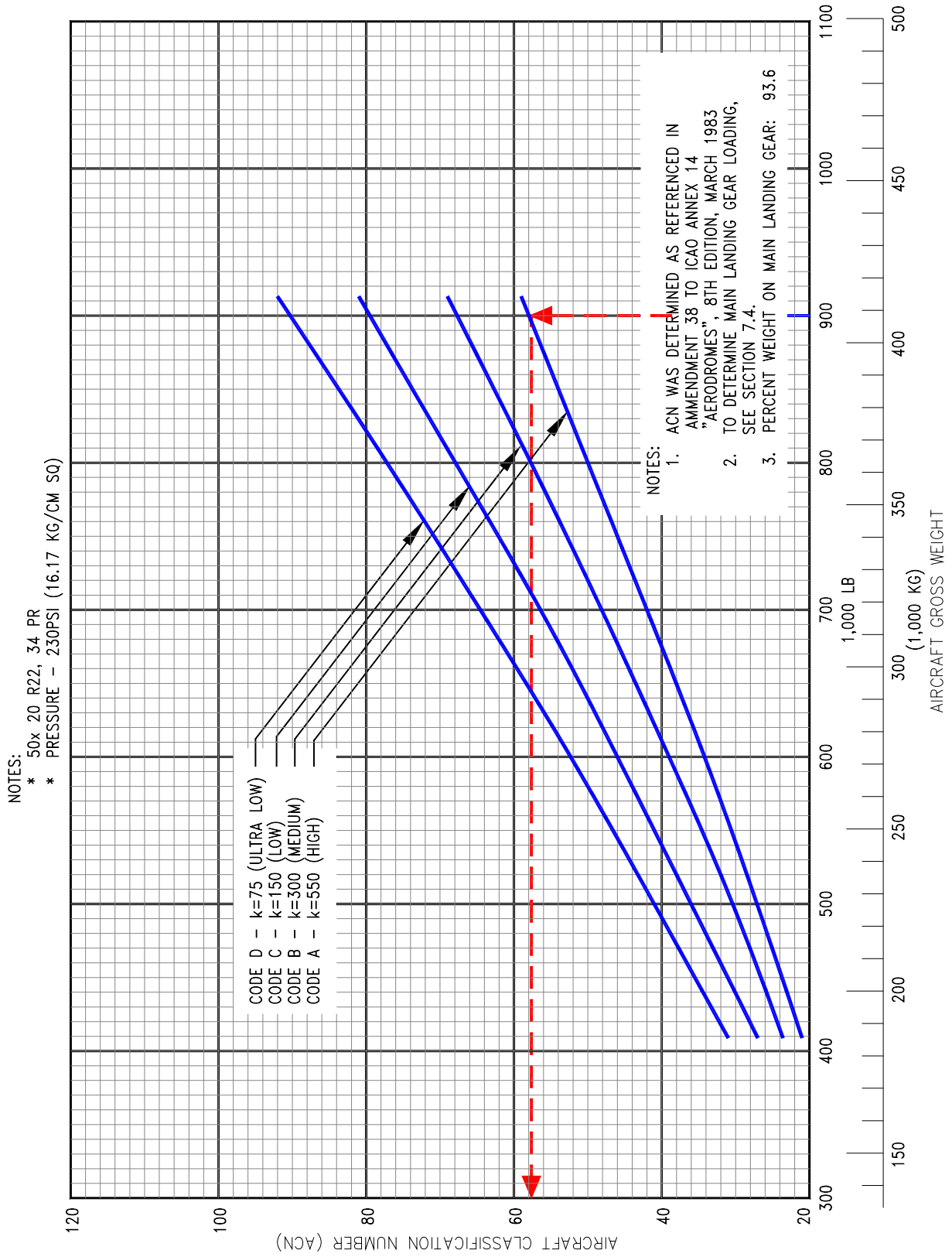
7.10.2 AIRCRAFT CLASSIFICATION NUMBER - FLEXIBLE PAVEMENT

MODEL 747-400ER, -400ER FREIGHTER



7.10.3 AIRCRAFT CLASSIFICATION NUMBER - RIGID PAVEMENT

MODEL 747-400, -400 COMBI, -400 DOMESTIC, - 400 FREIGHTER



7.10.4 AIRCRAFT CLASSIFICATION NUMBER - RIGID PAVEMENT

MODEL 747-400ER, -400ER FREIGHTER

8.0 FUTURE 747 DERIVATIVE AIRPLANES

8.0 FUTURE 747 DERIVATIVE AIRPLANES

Several derivatives are being studied to provide additional capabilities of the 747 family of airplanes.

Additional seating capacity could be obtained by conventional body extensions or by upper deck extensions. A 31-foot body stretch with a partial stretched upper deck could provide an increase of 150 passengers over the 747-400. Studies have verified that body length increases up to 50 feet are technically feasible. Landing gear wheel base would be modified accordingly. Full-length extension of the upper deck is an alternate method of increasing seating capacity. This could provide 650 total seats without increasing overall body length. Double deck configurations with moderate body extensions could provide mixed-class seating capacities in excess of 700.

Where current range capability can be traded for increased payloads, existing maximum gross weight will suffice and no wing dimensional changes are necessary. Where range must be maintained with substantial payload increases, gross weights close to 1,000,000 pounds are possible with new-generation wings, with potential increases in wingspan. As airplane weight and size increase, planned thrust growth of current engines will provide takeoff performance equal to or greater than that of current models, and the required pavement thickness can be controlled by landing gear configurations.

Future growth versions could also require increased tail heights depending on body length, engine size, and more outboard engine placement resulting from the increased wingspan.

The above discussion covers 747 growth possibilities. Whether and/or when these or other possibilities are actually built is entirely dependent on future airline requirements. In any event, the impact on airport facilities will be a consideration in configuration and design.

9.0 SCALED 747-400 DRAWINGS

9.1 – 9.5 747-400, -400 Combi, -400ER

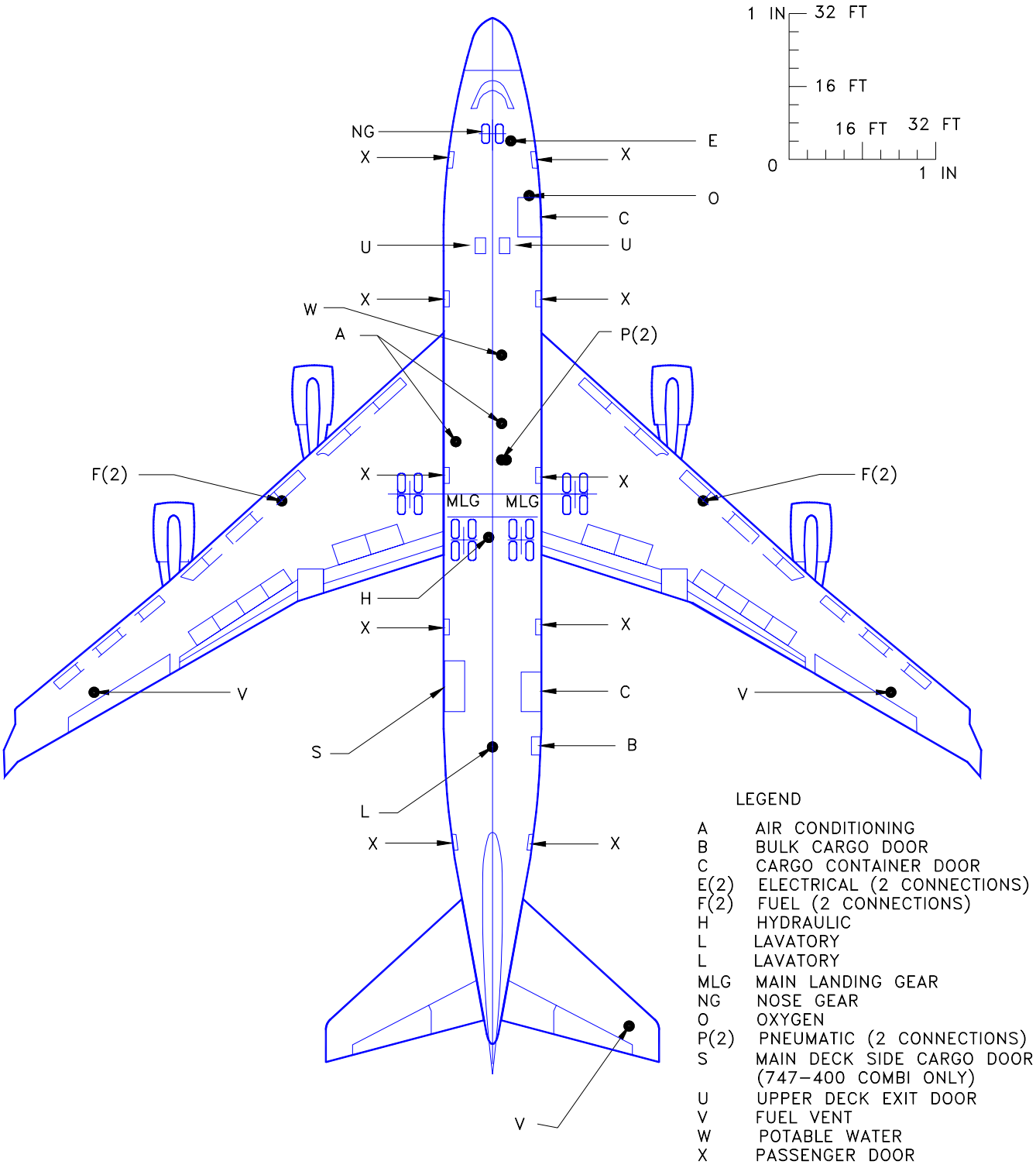
9.6 – 9.10 747-400 Freighter, -400ER Freighter

9.11 – 9.15 747-400 Domestic

9.0 SCALED DRAWINGS

The drawings in the following pages show airplane plan view drawings, drawn to approximate scale as noted. The drawings may not come out to exact scale when printed or copied from this document. Printing scale should be adjusted when attempting to reproduce these drawings. Three-view drawing files of the 747-400, along with other Boeing airplane models, can be downloaded from the following website:

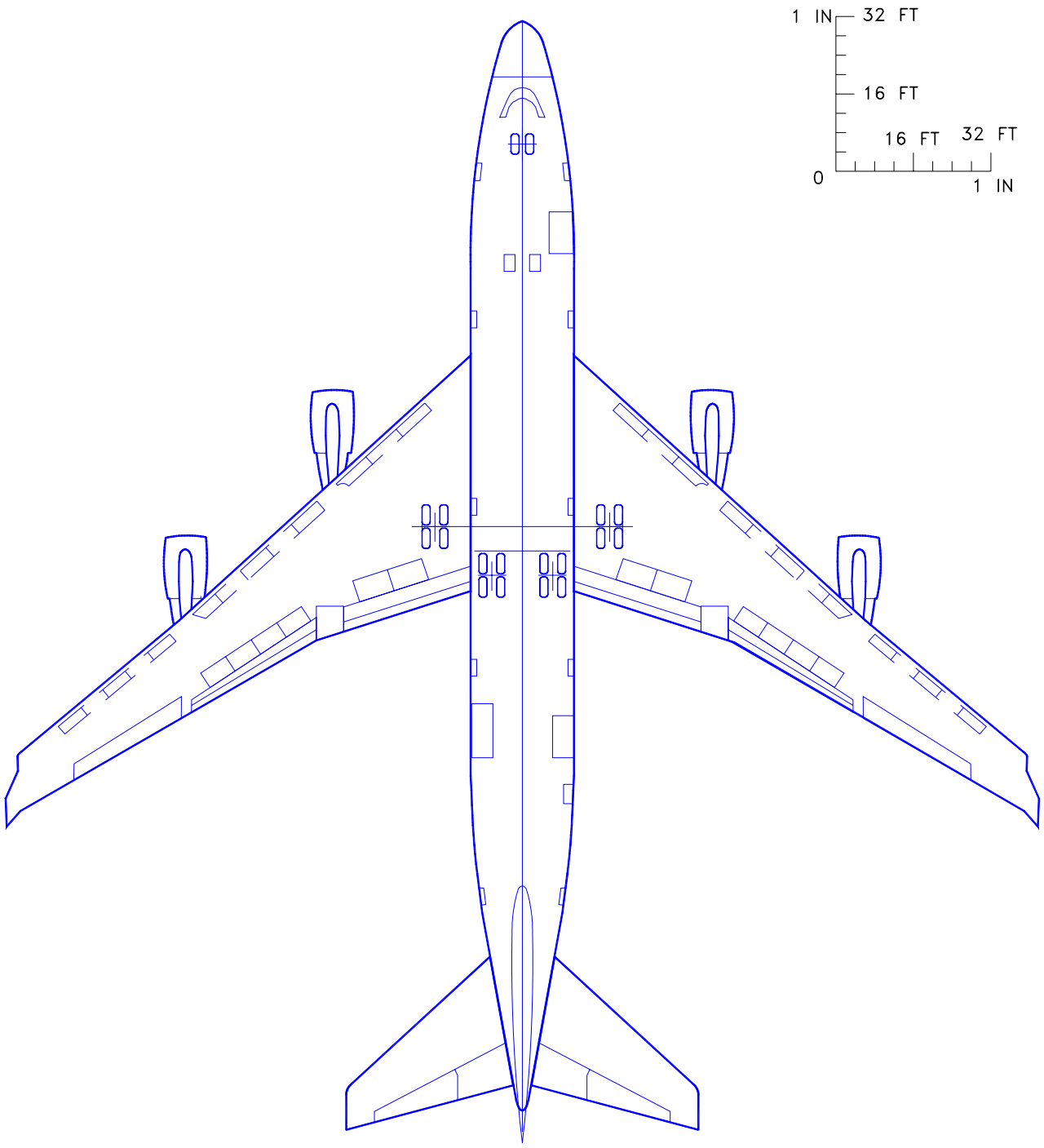
http://www.boeing.com/airports



NOTE: ADJUST FOR PROPER SCALING WHEN PRINTING THIS PAGE

9.1.1 SCALED DRAWING - 1 IN. = 32 FT

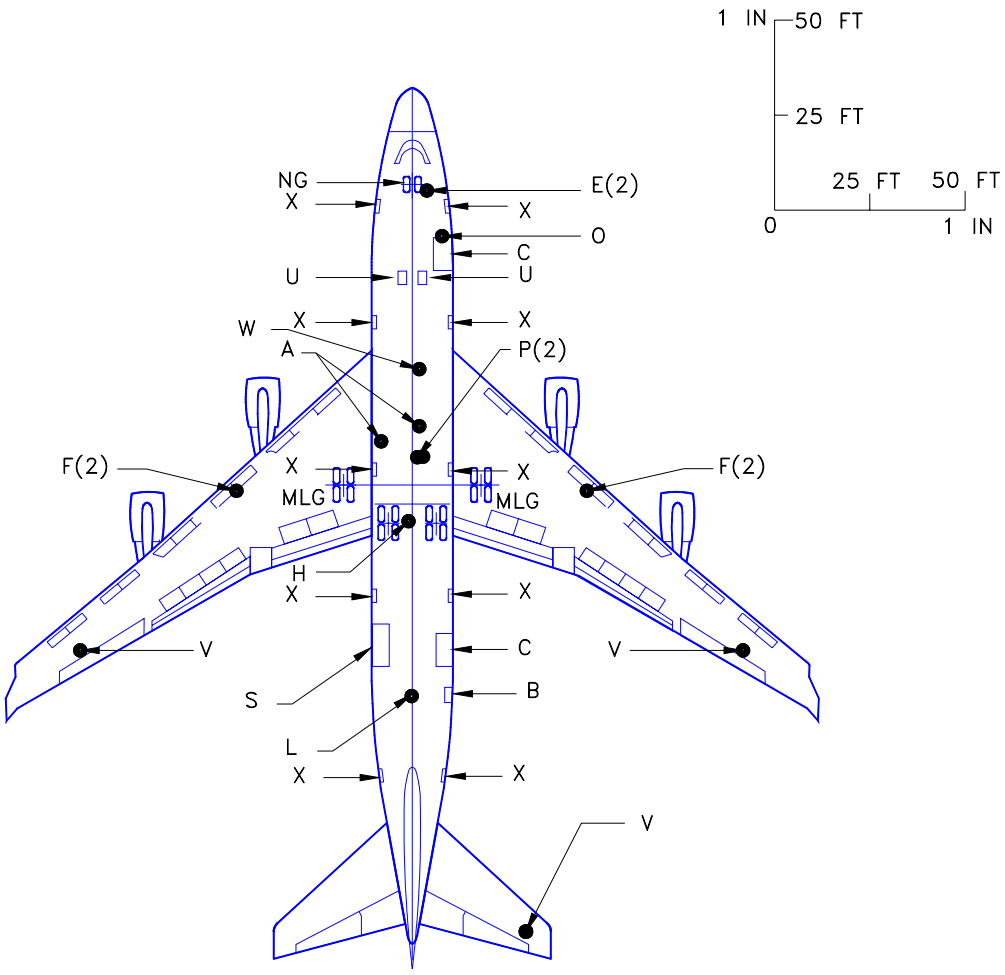
MODEL 747-400, -400 COMBI, -400ER



NOTE: ADJUST FOR PROPER SCALING WHEN PRINTING THIS PAGE

9.1.2 SCALED DRAWING - 1 IN. = 32 FT

MODEL 747-400, -400 COMBI, -400ER



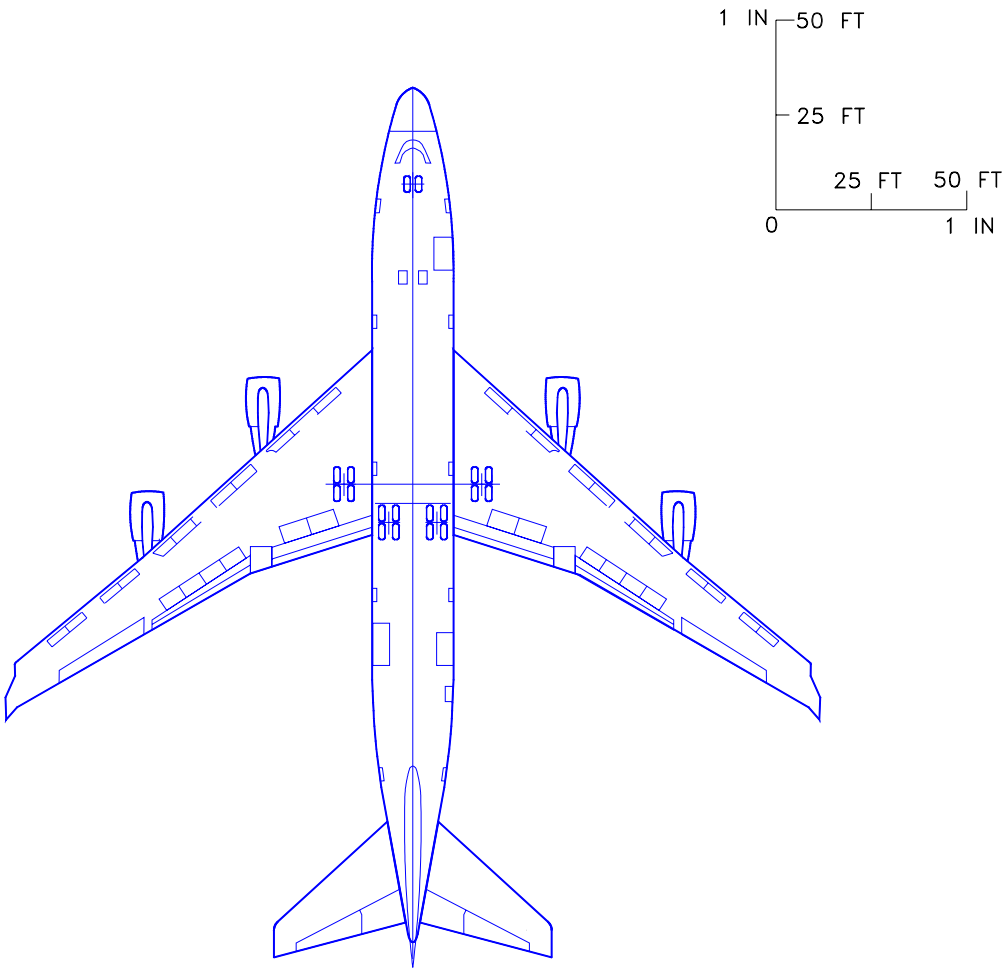
LEGEND

A	AIR CONDITIONING
B	BULK CARGO DOOR
C	CARGO CONTAINER DOOR
E(2)	ELECTRICAL (2 CONNECTIONS)
F(2)	FUEL (2 CONNECTIONS)
H	HYDRAULIC
L	LAVATORY
MLG	MAIN LANDING GEAR
NG	NOSE GEAR
O	OXYGEN
P(2)	PNEUMATIC (2 CONNECTIONS)
S	MAIN DECK SIDE CARGO DOOR (747–400 COMBI ONLY)
U	UPPER DECK EXIT DOOR
V	FUEL VENT
W	POTABLE WATER
X	PASSENGER DOOR

NOTE: ADJUST FOR PROPER SCALING WHEN PRINTING THIS PAGE

9.2.1 SCALED DRAWING - 1 IN. = 50 FT

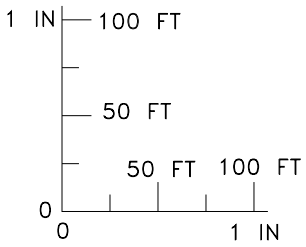
MODEL 747-400, -400 COMBI, -400ER

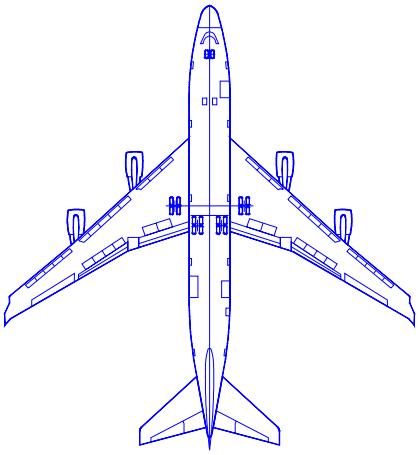


NOTE: ADJUST FOR PROPER SCALING WHEN PRINTING THIS PAGE

9.2.2 SCALED DRAWING - 1 IN. = 50 FT

MODEL 747-400, -400 COMBI, -400ER





NOTE:
SEE SEC 9.1.1 FOR IDENTIFICATION
OF LEGEND LOCATIONS

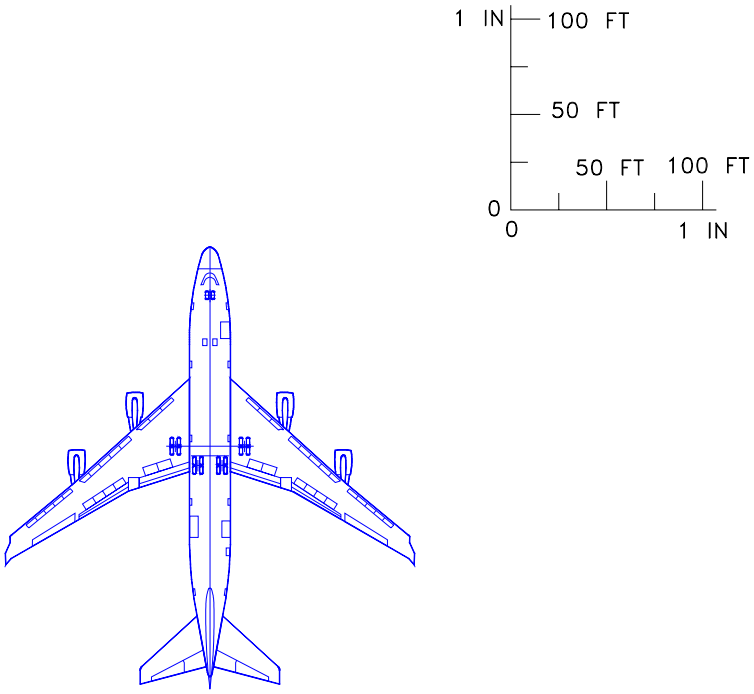
LEGEND

A	AIR CONDITIONING
B	BULK CARGO DOOR
C	CARGO CONTAINER DOOR
E(2)	ELECTRICAL (2 CONNECTIONS)
F(2)	FUEL (2 CONNECTIONS)
H	HYDRAULIC
L	LAVATORY
MLG	MAIN LANDING GEAR
NG	NOSE GEAR
O	OXYGEN
P(2)	PNEUMATIC (2 CONNECTIONS)
S	MAIN DECK SIDE CARGO DOOR (747-400 COMBI ONLY)
U	UPPER DECK EXIT DOOR
V	FUEL VENT
W	POTABLE WATER
X	PASSENGER DOOR

NOTE: ADJUST FOR PROPER SCALING WHEN PRINTING THIS PAGE

9.3.1 SCALED DRAWING - 1 IN = 100 FT

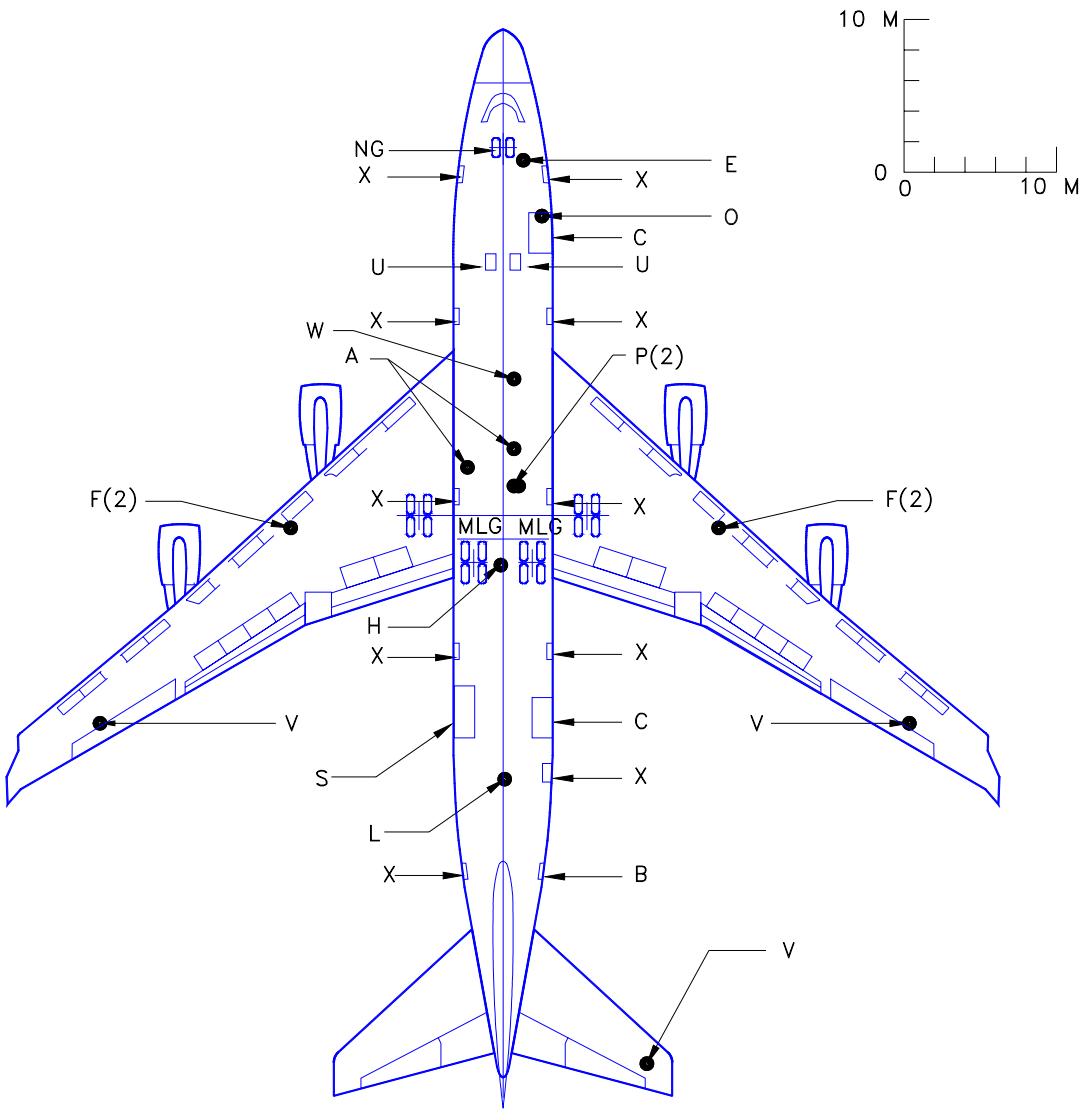
MODEL 747-400, -400 COMBI, -400ER



NOTE: ADJUST FOR PROPER SCALING WHEN PRINTING THIS PAGE

9.3.2 SCALED DRAWING - 1 IN. = 100 FT

MODEL 747-400, -400 COMBI, -400ER



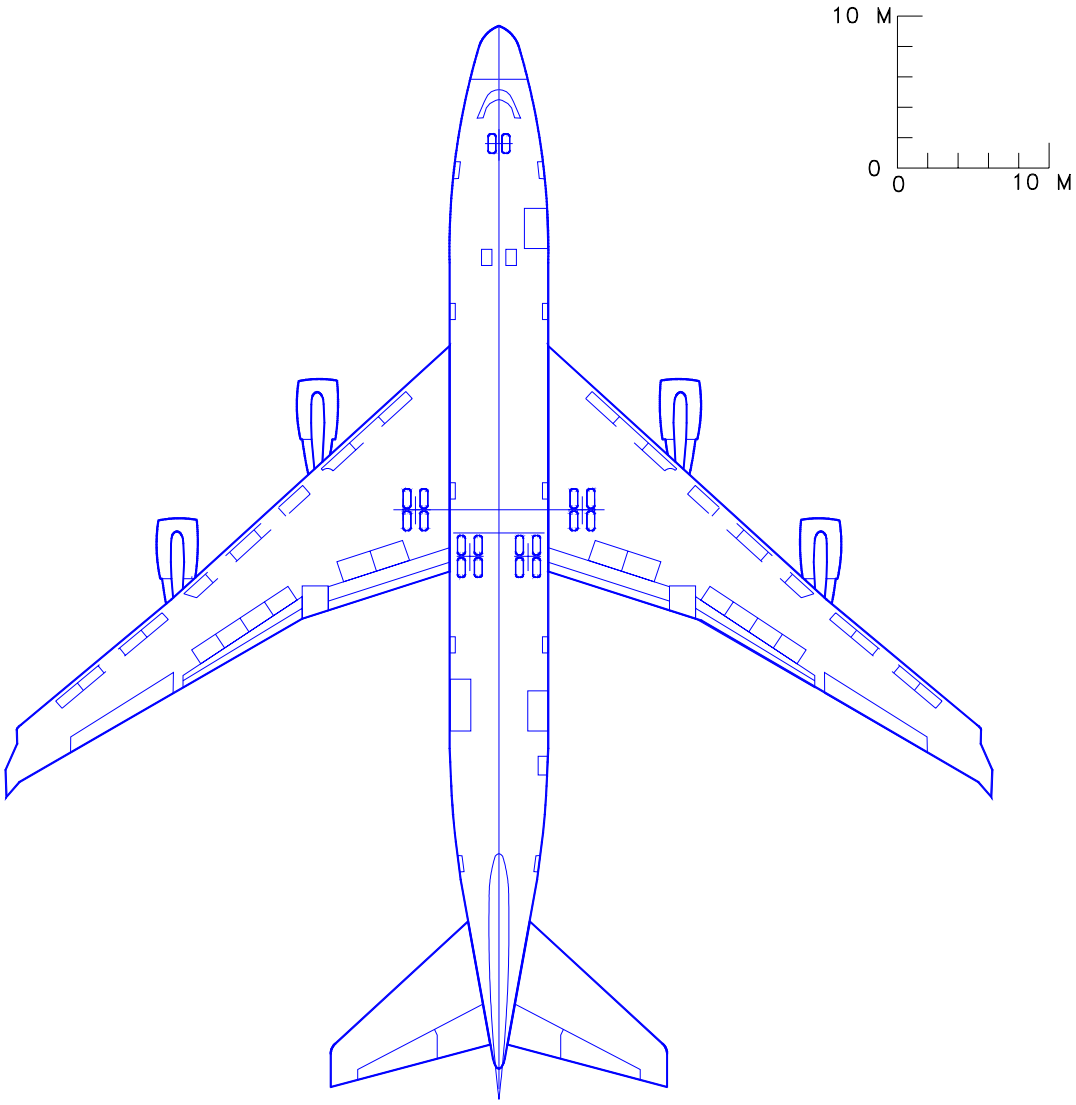
LEGEND

A	AIR CONDITIONING
B	BULK CARGO DOOR
C	CARGO CONTAINER DOOR
E(2)	ELECTRICAL (2 CONNECTIONS)
F(2)	FUEL (2 CONNECTIONS)
H	HYDRAULIC
L	LAVATORY
MLG	MAIN LANDING GEAR
NG	NOSE GEAR
O	OXYGEN
P(2)	PNEUMATIC (2 CONNECTIONS)
S	MAIN DECK SIDE CARGO DOOR (747–400 COMBI ONLY)
U	UPPER DECK EXIT DOOR
V	FUEL VENT
W	POTABLE WATER
X	PASSENGER DOOR

NOTE: ADJUST FOR PROPER SCALING WHEN PRINTING THIS PAGE

9.4.1 SCALED DRAWING - 1:500

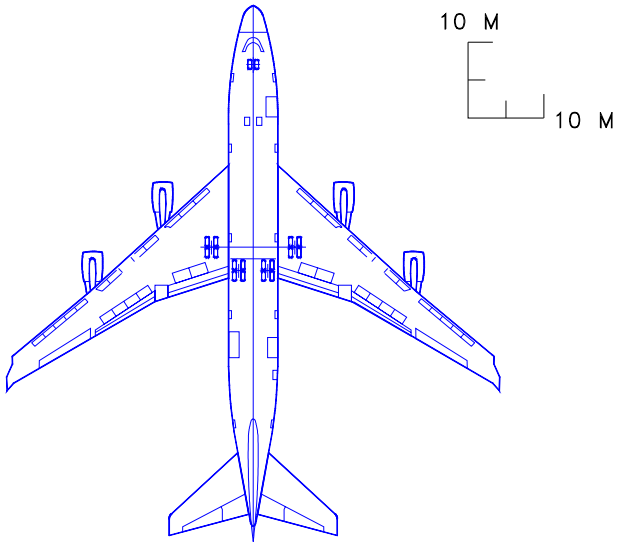
MODEL 747-400, -400 COMBI, -400ER



NOTE: ADJUST FOR PROPER SCALING WHEN PRINTING THIS PAGE

9.4.2 SCALED DRAWING - 1:500

MODEL 747-400, -400 COMBI, -400ER



NOTE:
SEE SEC 9.1.1 FOR IDENTIFICATION OF LEGEND LOCATIONS

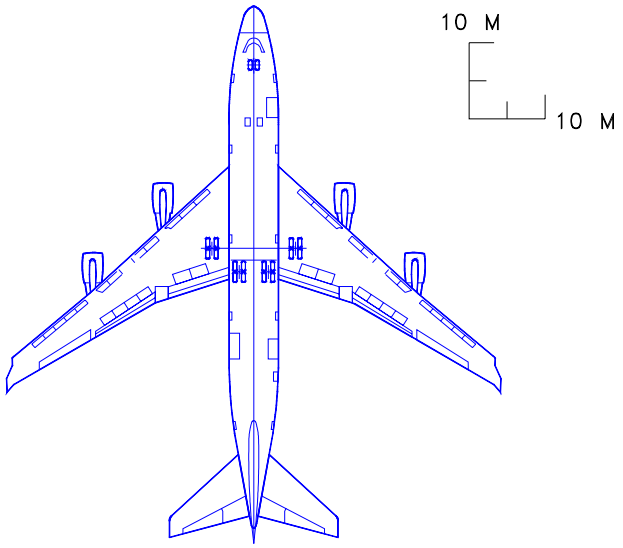
LEGEND

A	AIR CONDITIONING
B	BULK CARGO DOOR
C	CARGO CONTAINER DOOR
E(2)	ELECTRICAL (2 CONNECTIONS)
F(2)	FUEL (2 CONNECTIONS)
H	HYDRAULIC
L	LAVATORY
MLG	MAIN LANDING GEAR
NG	NOSE GEAR
O	OXYGEN
P(2)	PNEUMATIC (2 CONNECTIONS)
S	MAIN DECK SIDE CARGO DOOR (747–400 COMBI ONLY)
U	UPPER DECK EXIT DOOR
V	FUEL VENT
W	POTABLE WATER
X	PASSENGER DOOR

NOTE: ADJUST FOR PROPER SCALING WHEN PRINTING THIS PAGE

9.5.1 SCALED DRAWING - 1:1000

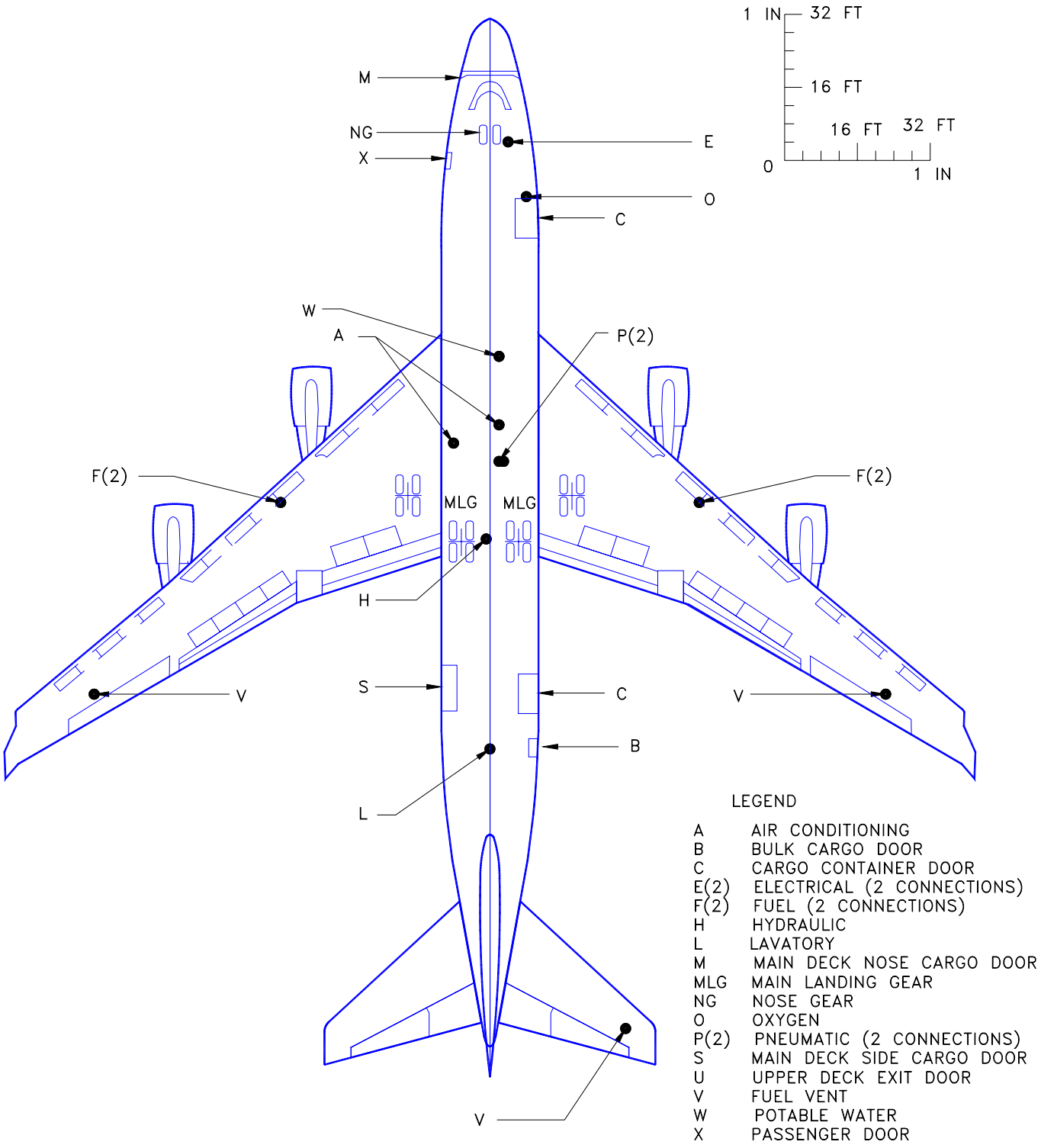
MODEL 747-400, -400 COMBI, -400ER



NOTE: ADJUST FOR PROPER SCALING WHEN PRINTING THIS PAGE

9.5.2 SCALED DRAWING - 1:1000

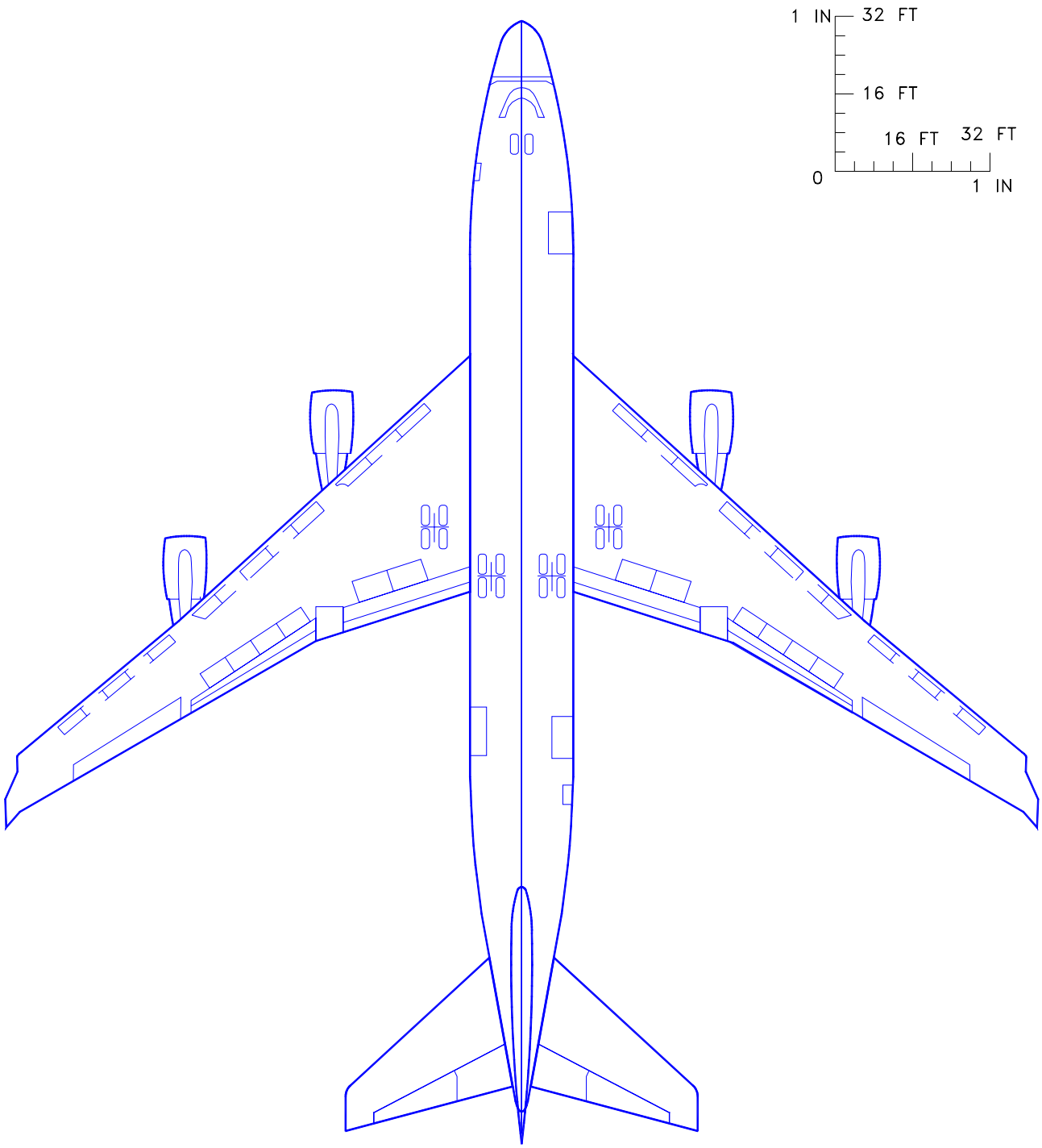
MODEL 747-400, -400 COMBI, -400ER



NOTE: ADJUST FOR PROPER SCALING WHEN PRINTING THIS PAGE

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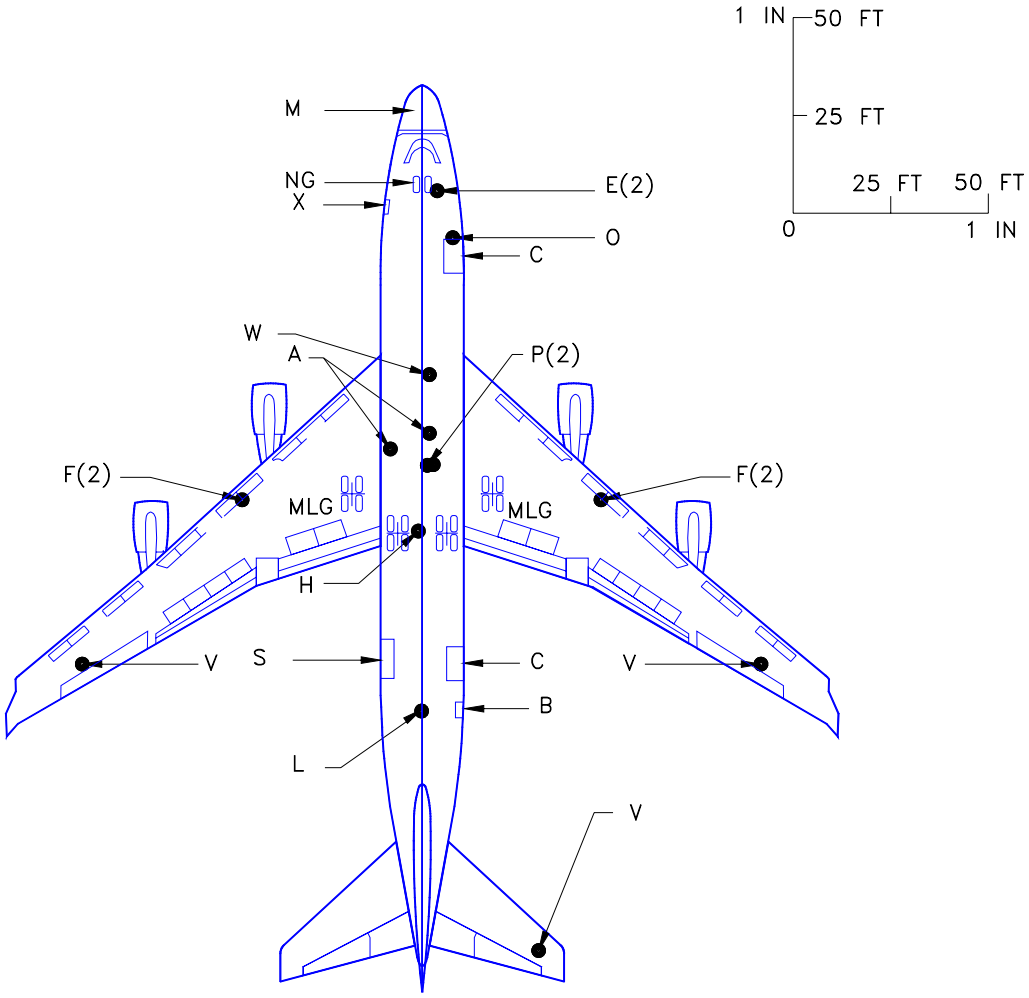
MODEL 747-400 FREIGHTER, -400ER FREIGHTER



NOTE: ADJUST FOR PROPER SCALING WHEN PRINTING THIS PAGE

9.6.2 SCALED DRAWING - 1 IN. = 32 FT

MODEL 747-400 FREIGHTER, -400ER FREIGHTER



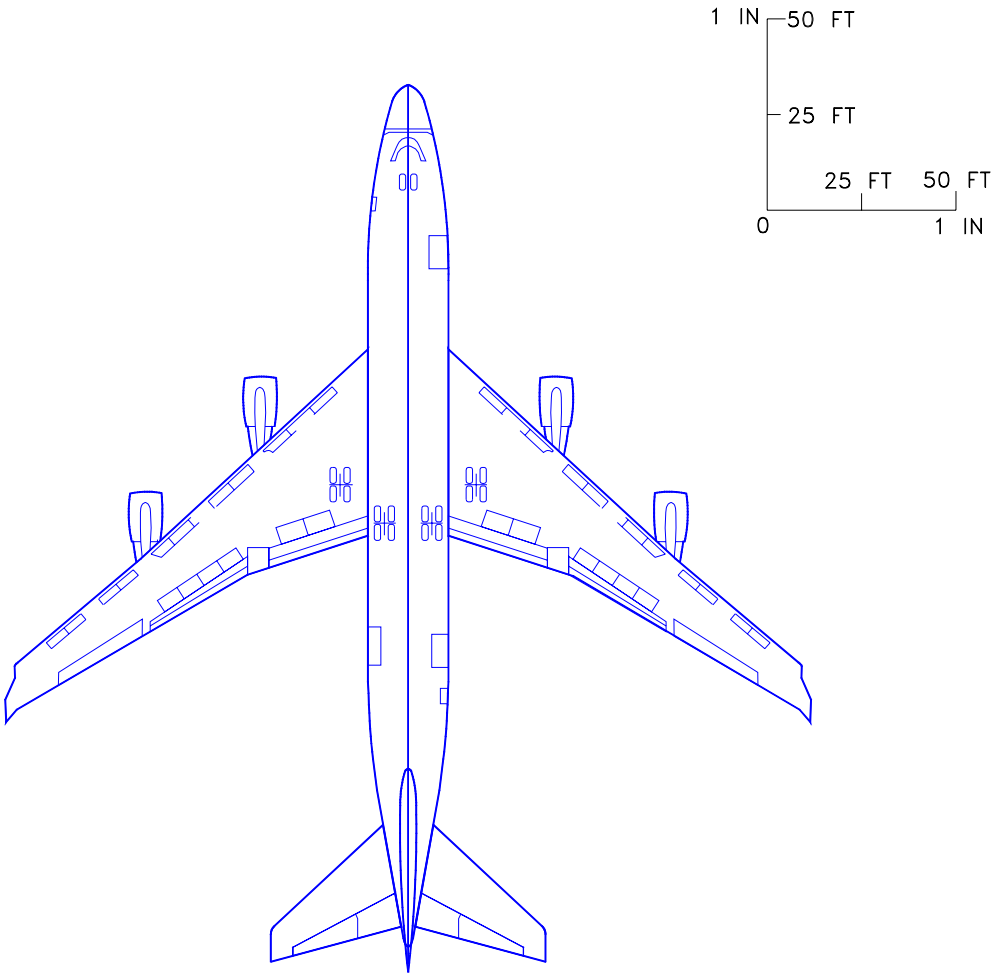
LEGEND

A	AIR CONDITIONING
B	BULK CARGO DOOR
C	CARGO CONTAINER DOOR
E(2)	ELECTRICAL (2 CONNECTIONS)
F(2)	FUEL (2 CONNECTIONS)
H	HYDRAULIC
L	LAVATORY
M	MAIN DECK NOSE CARGO DOOR
MLG	MAIN LANDING GEAR
NG	NOSE GEAR
O	OXYGEN
P(2)	PNEUMATIC (2 CONNECTIONS)
S	MAIN DECK SIDE CARGO DOOR
U	UPPER DECK EXIT DOOR
V	FUEL VENT
W	POTABLE WATER
X	PASSENGER DOOR

NOTE: ADJUST FOR PROPER SCALING WHEN PRINTING THIS PAGE

9.7.1 SCALED DRAWING - 1 IN. = 50 FT

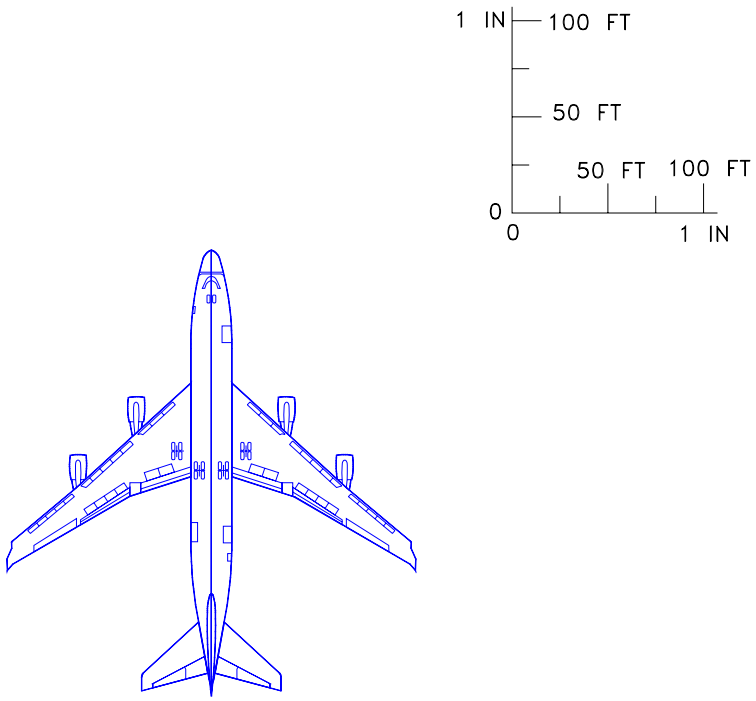
MODEL 747-400 FREIGHTER, -400ER FREIGHTER



NOTE: ADJUST FOR PROPER SCALING WHEN PRINTING THIS PAGE

9.7.2 SCALED DRAWING - 1 IN. = 50 FT

MODEL 747-400 FREIGHTER, -400ER FREIGHTER



NOTE:
SEE SEC 9.6.1 FOR IDENTIFICATION
OF LEGEND LOCATIONS

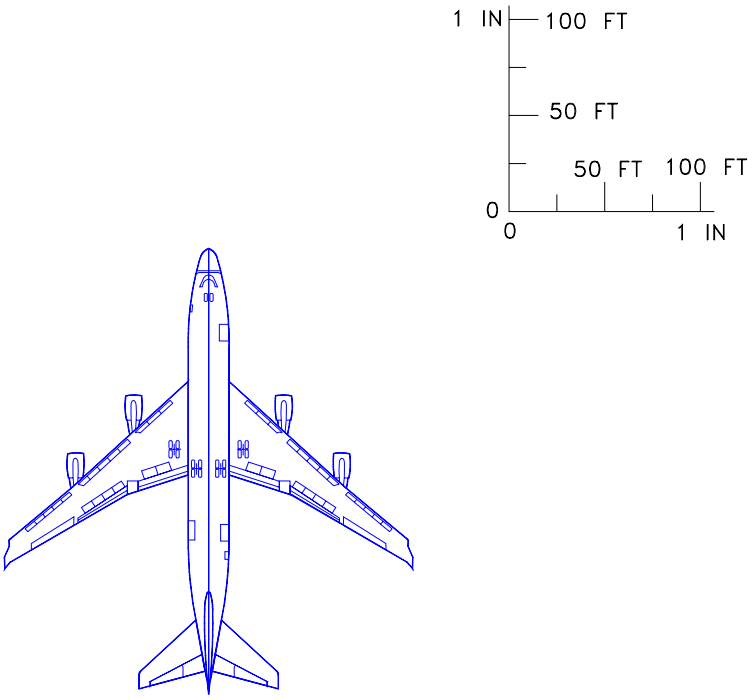
LEGEND

A	AIR CONDITIONING
B	BULK CARGO DOOR
C	CARGO CONTAINER DOOR
E(2)	ELECTRICAL (2 CONNECTIONS)
F(2)	FUEL (2 CONNECTIONS)
H	HYDRAULIC
L	LAVATORY
M	MAIN DECK NOSE CARGO DOOR
MLG	MAIN LANDING GEAR
NG	NOSE GEAR
O	OXYGEN
P(2)	PNEUMATIC (2 CONNECTIONS)
S	MAIN DECK SIDE CARGO DOOR
U	UPPER DECK EXIT DOOR
V	FUEL VENT
W	POTABLE WATER
X	PASSENGER DOOR

NOTE: ADJUST FOR PROPER SCALING WHEN PRINTING THIS PAGE

9.8.1 SCALED DRAWING - 1 IN = 100 FT

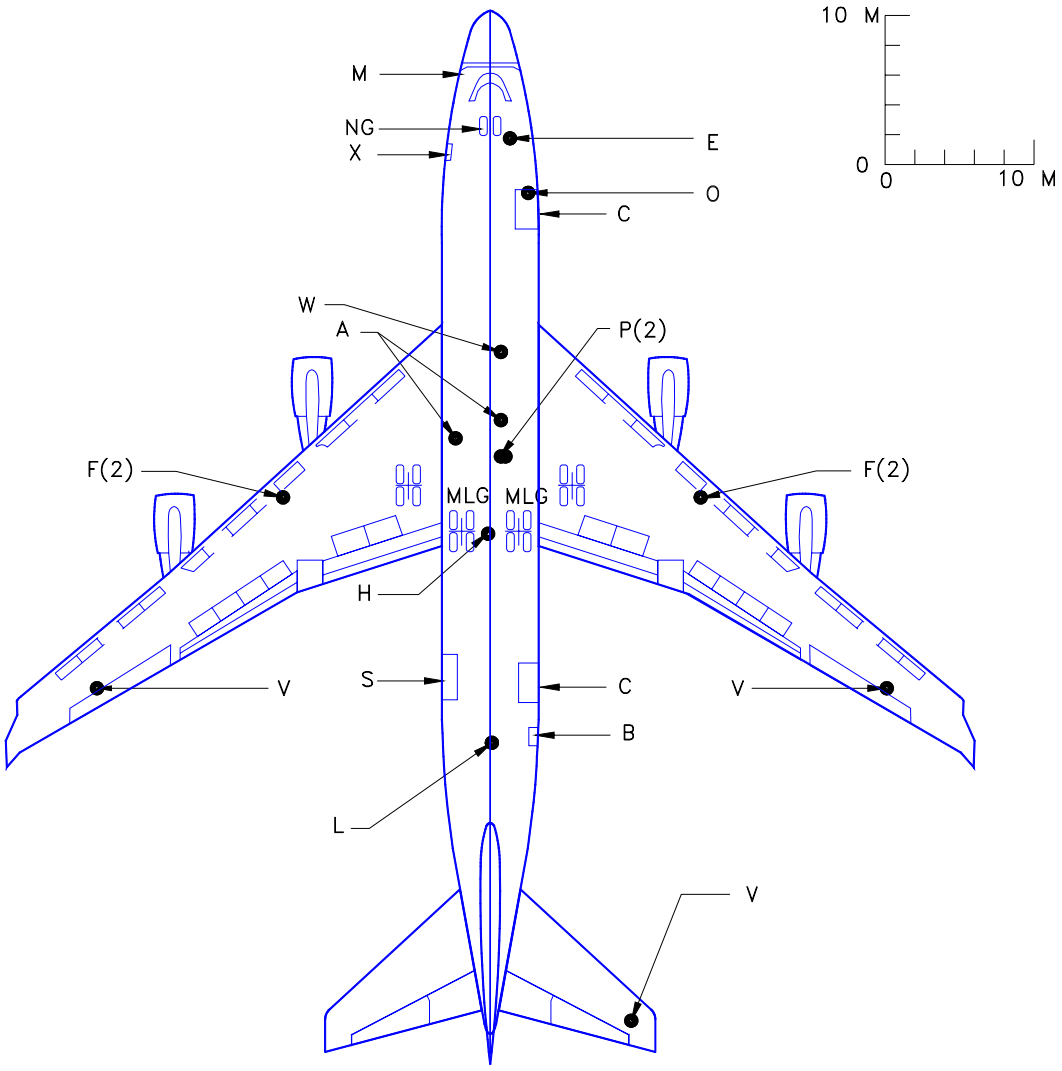
MODEL 747-400 FREIGHTER, -400ER FREIGHTER



NOTE: ADJUST FOR PROPER SCALING WHEN PRINTING THIS PAGE

9.8.2 SCALED DRAWING - 1 IN = 100 FT

MODEL 747-400 FREIGHTER, -400ER FREIGHTER



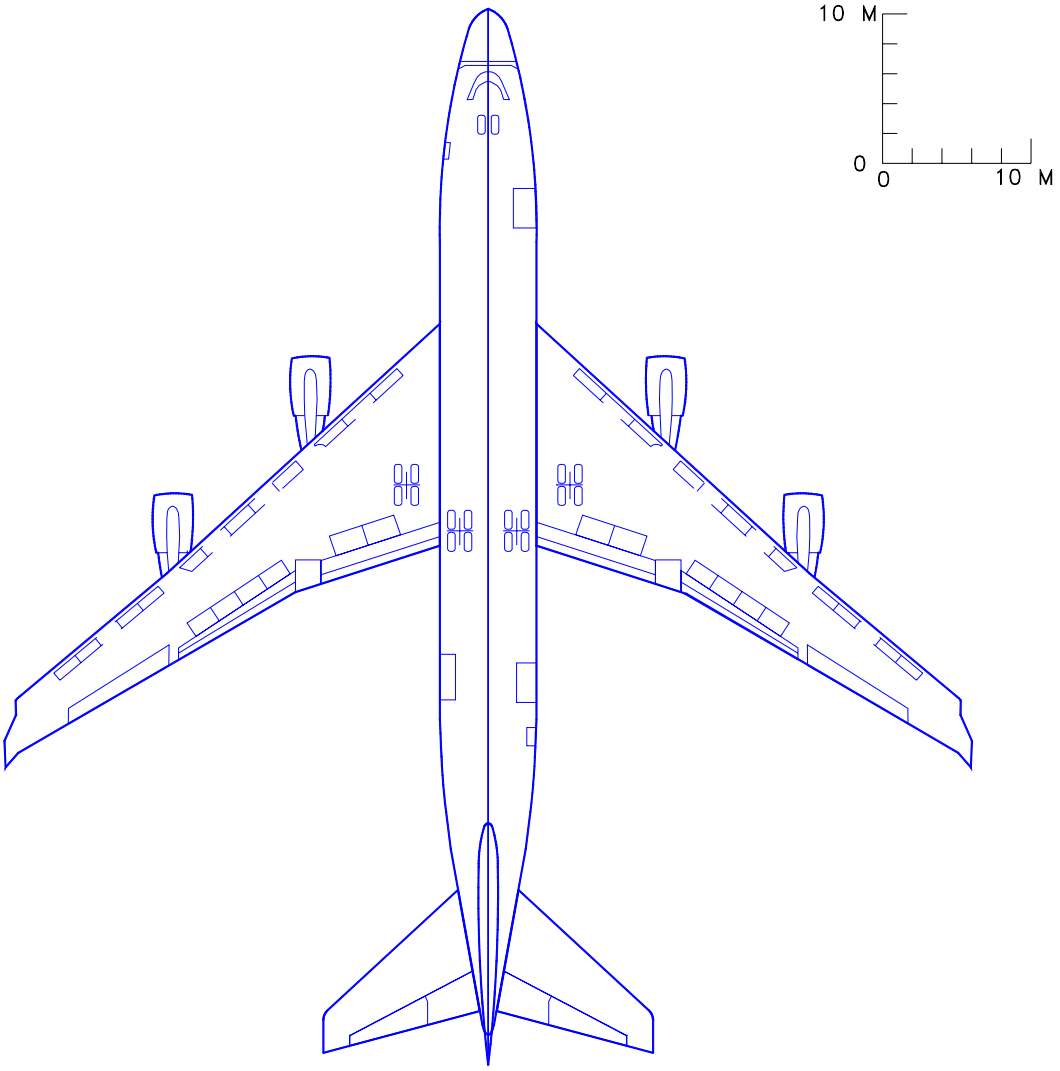
LEGEND

A	AIR CONDITIONING
B	BULK CARGO DOOR
C	CARGO CONTAINER DOOR
E(2)	ELECTRICAL (2 CONNECTIONS)
F(2)	FUEL (2 CONNECTIONS)
H	HYDRAULIC
L	LAVATORY
M	MAIN DECK NOSE CARGO DOOR
MLG	MAIN LANDING GEAR
NG	NOSE GEAR
O	OXYGEN
P(2)	PNEUMATIC (2 CONNECTIONS)
S	MAIN DECK SIDE CARGO DOOR
U	UPPER DECK EXIT DOOR
V	FUEL VENT
W	POTABLE WATER
X	PASSENGER DOOR

NOTE: ADJUST FOR PROPER SCALING WHEN PRINTING THIS PAGE

9.9.1 SCALED DRAWING - 1:500

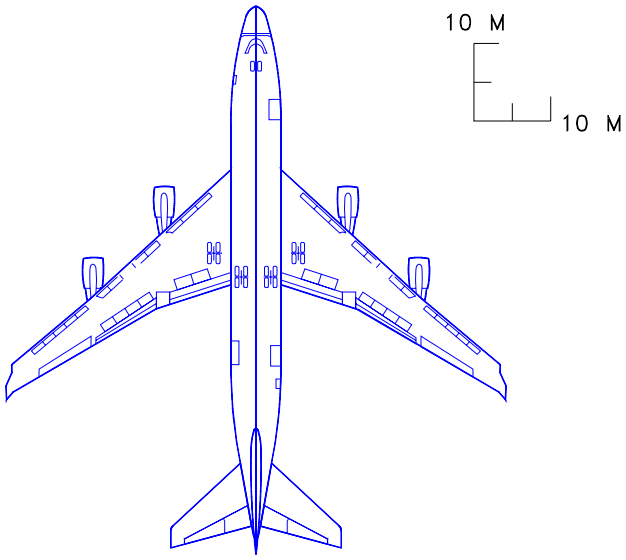
MODEL 747-400 FREIGHTER, -400ER FREIGHTER



NOTE: ADJUST FOR PROPER SCALING WHEN PRINTING THIS PAGE

9.9.2 SCALED DRAWING - 1:500

MODEL 747-400 FREIGHTER, -400ER FREIGHTER



NOTE:
SEE SEC 9.6.1 FOR IDENTIFICATION
OF LEGEND LOCATIONS

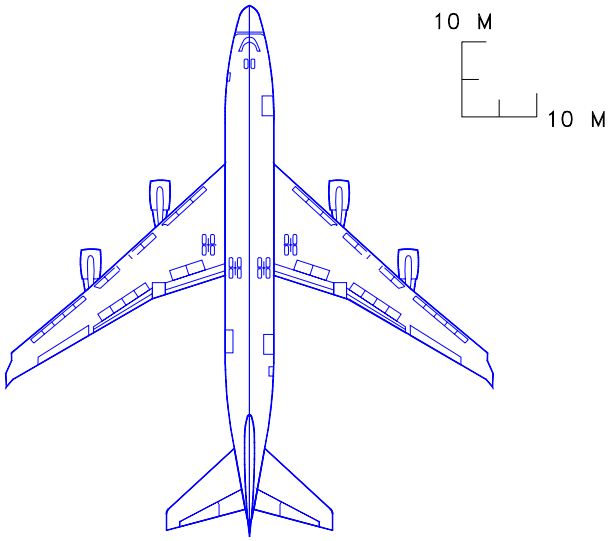
LEGEND

A	AIR CONDITIONING
B	BULK CARGO DOOR
C	CARGO CONTAINER DOOR
E(2)	ELECTRICAL (2 CONNECTIONS)
F(2)	FUEL (2 CONNECTIONS)
H	HYDRAULIC
L	LAVATORY
M	MAIN DECK NOSE CARGO DOOR
MLG	MAIN LANDING GEAR
NG	NOSE GEAR
O	OXYGEN
P(2)	PNEUMATIC (2 CONNECTIONS)
S	MAIN DECK SIDE CARGO DOOR
U	UPPER DECK EXIT DOOR
V	FUEL VENT
W	POTABLE WATER
X	PASSENGER DOOR

NOTE: ADJUST FOR PROPER SCALING WHEN PRINTING THIS PAGE

9.10.1 SCALED DRAWING - 1:1000

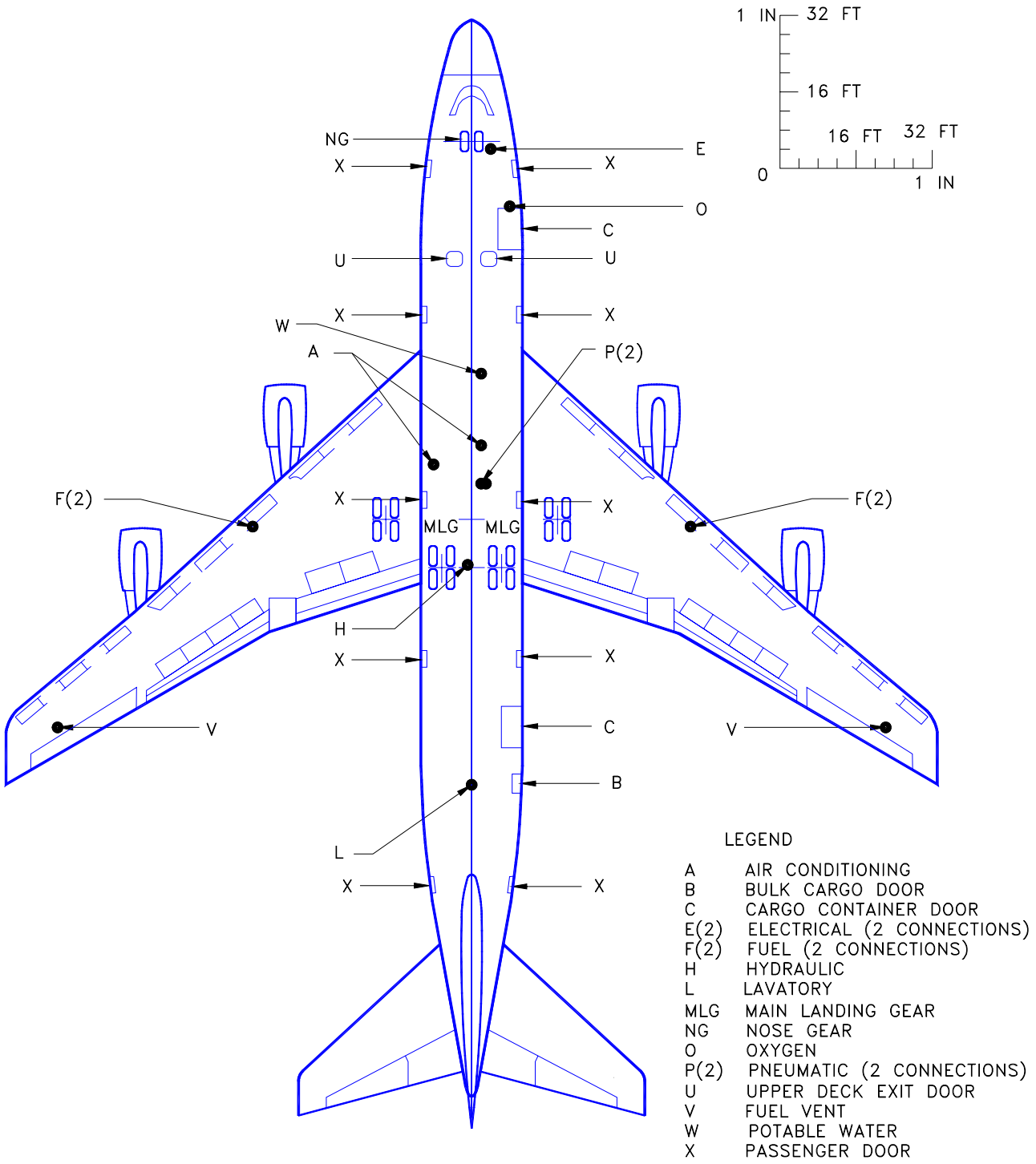
MODEL 747-400 FREIGHTER, -400ER FREIGHTER



NOTE: ADJUST FOR PROPER SCALING WHEN PRINTING THIS PAGE

9.10.2 SCALED DRAWING - 1:1000

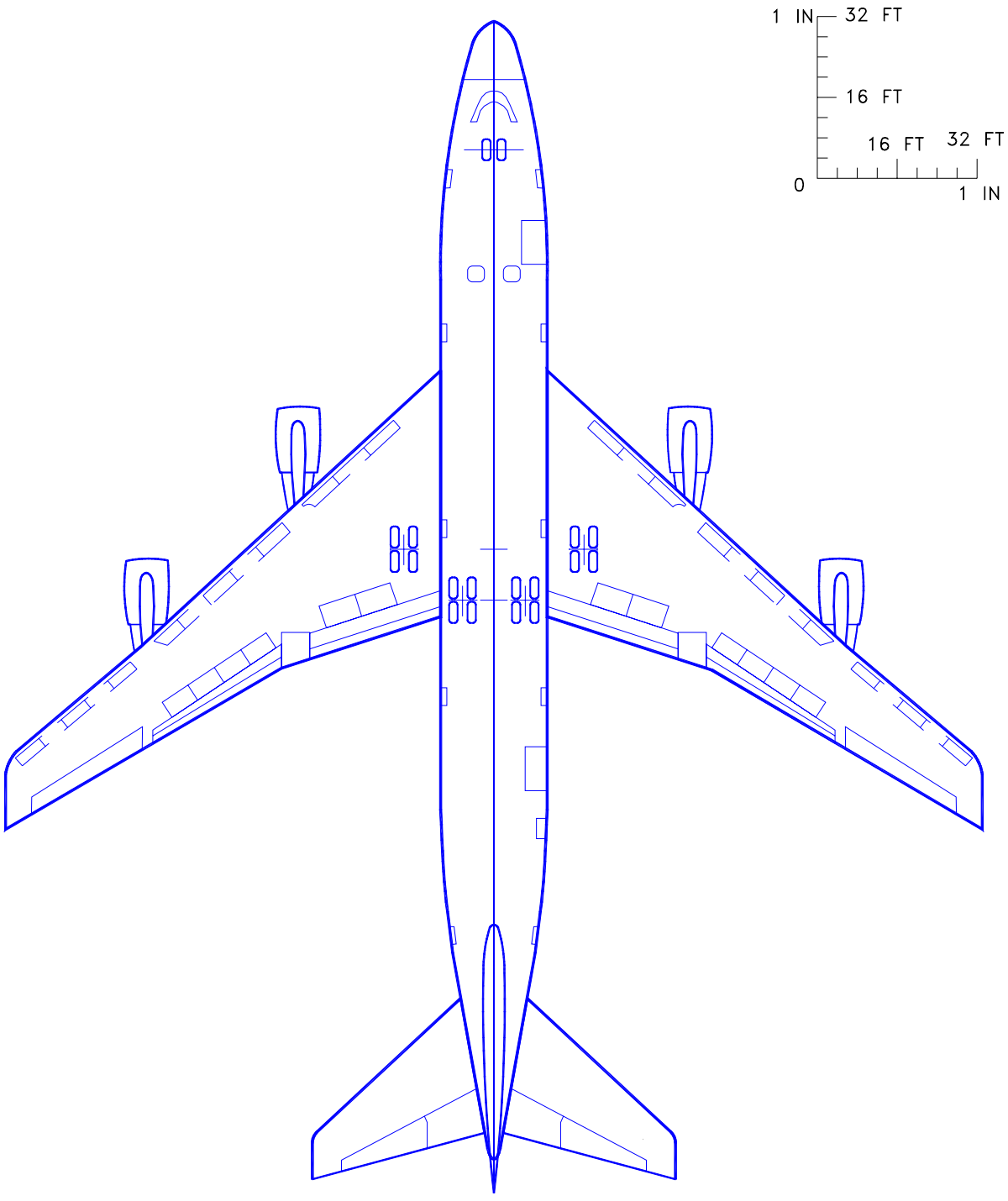
MODEL 747-400 FREIGHTER, -400ER FREIGHTER



NOTE: ADJUST FOR PROPER SCALING WHEN PRINTING THIS PAGE

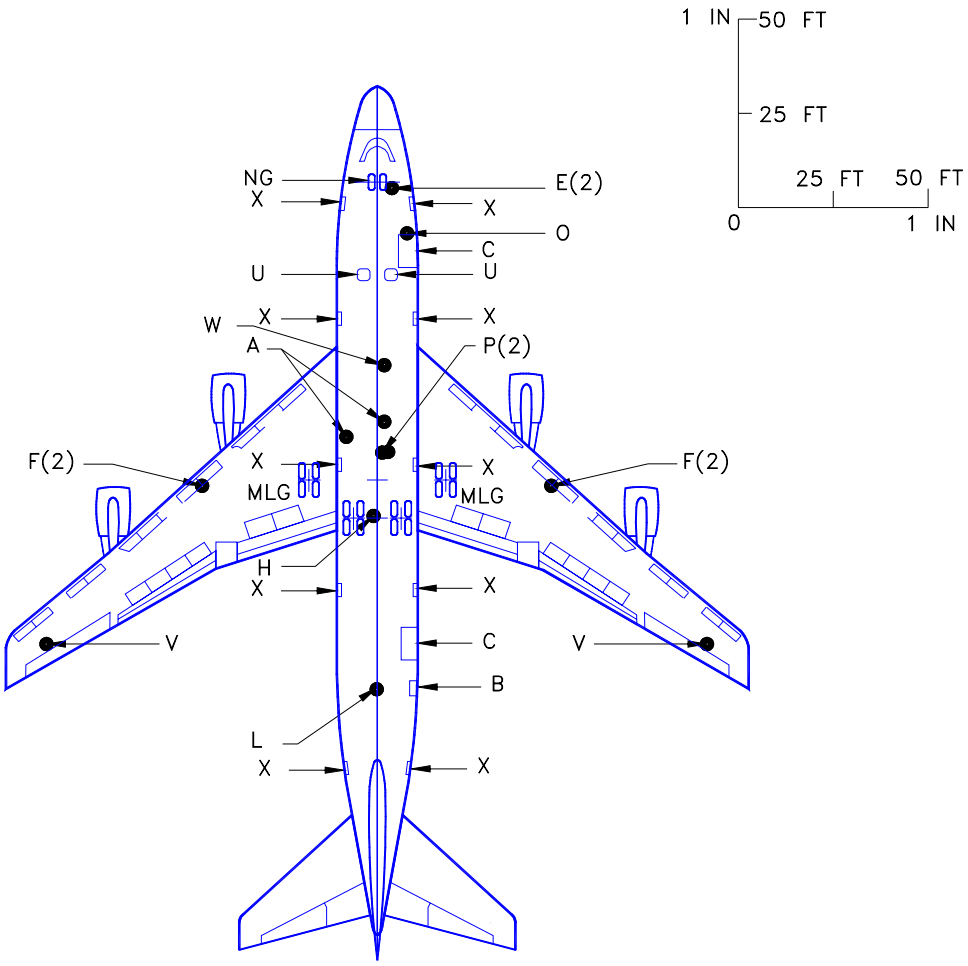
9.11.1 SCALED DRAWING – 1 IN = 32 FT

MODEL 747-400 DOMESTIC



NOTE: ADJUST FOR PROPER SCALING WHEN PRINTING THIS PAGE

9.11.2 SCALED DRAWING – 1 IN = 32 FT
MODEL 747- 400 DOMESTIC



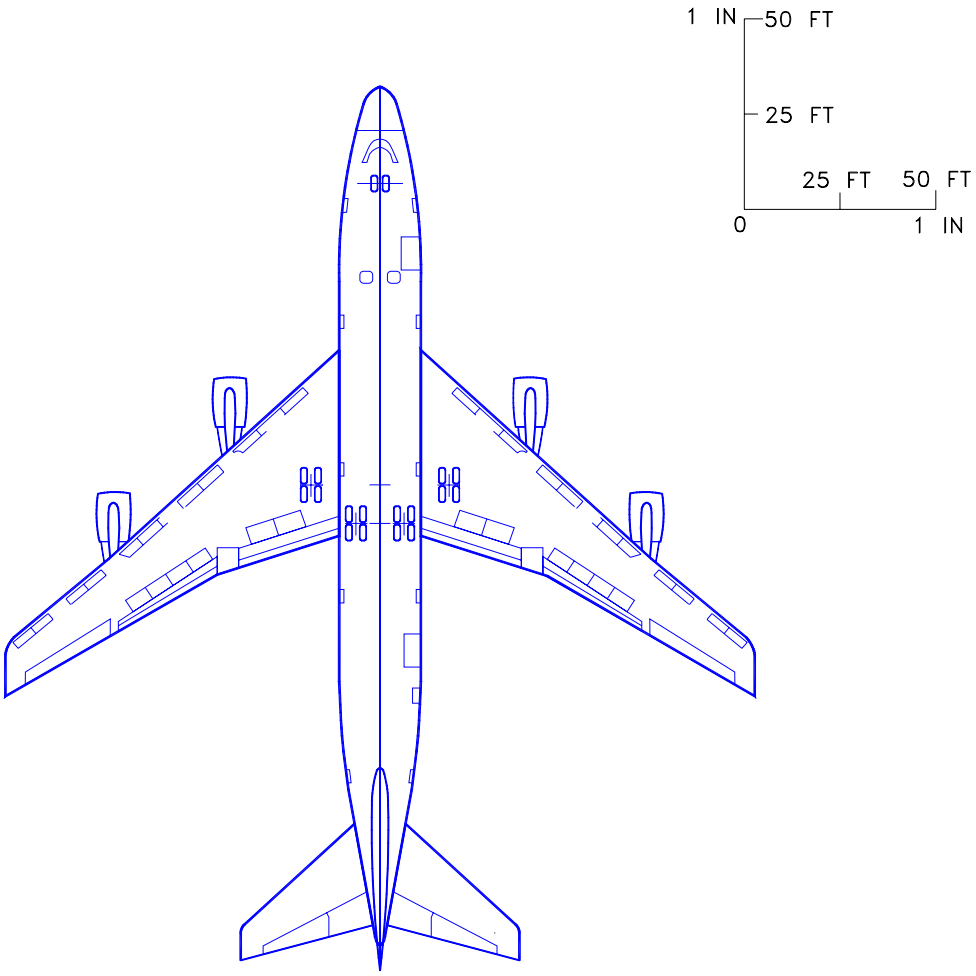
LEGEND

A	AIR CONDITIONING
B	BULK CARGO DOOR
C	CARGO CONTAINER DOOR
E(2)	ELECTRICAL (2 CONNECTIONS)
F(2)	FUEL (2 CONNECTIONS)
H	HYDRAULIC
L	LAVATORY
MLG	MAIN LANDING GEAR
NG	NOSE GEAR
O	OXYGEN
P(2)	PNEUMATIC (2 CONNECTIONS)
U	UPPER DECK EXIT DOOR
V	FUEL VENT
W	POTABLE WATER
X	PASSENGER DOOR

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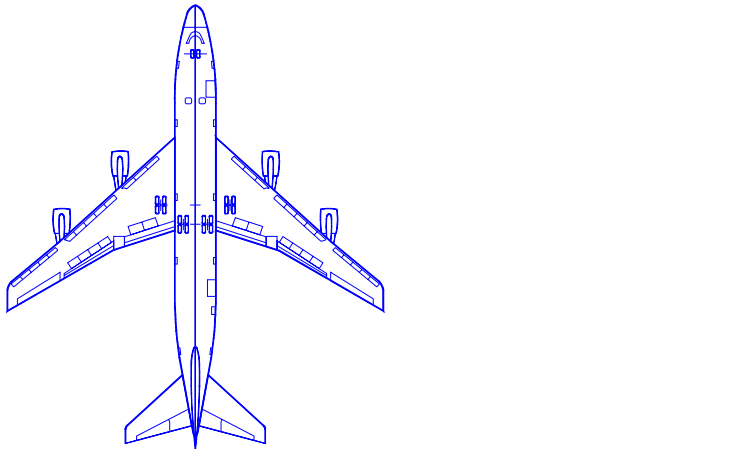
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OF LEGEND LOCATIONS

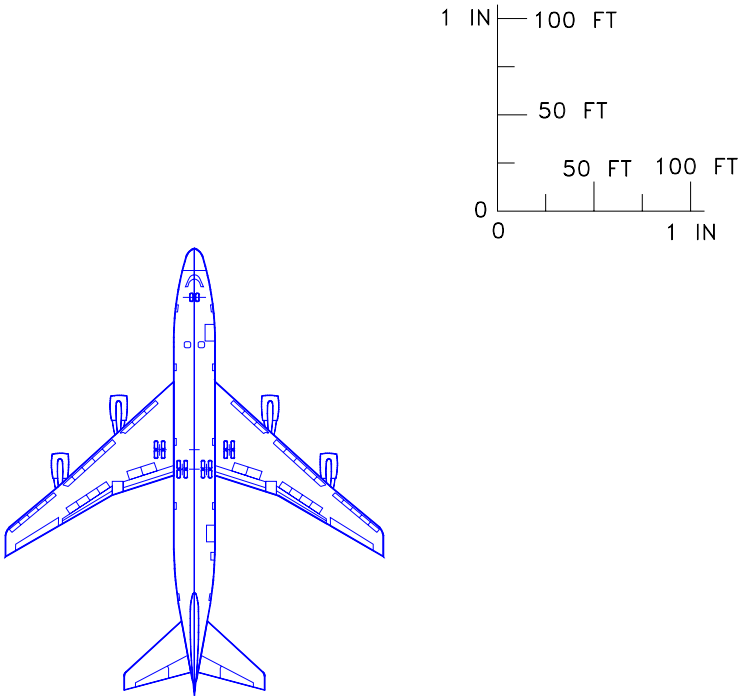
LEGEND

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B	BULK CARGO DOOR
C	CARGO CONTAINER DOOR
E(2)	ELECTRICAL (2 CONNECTIONS)
F(2)	FUEL (2 CONNECTIONS)
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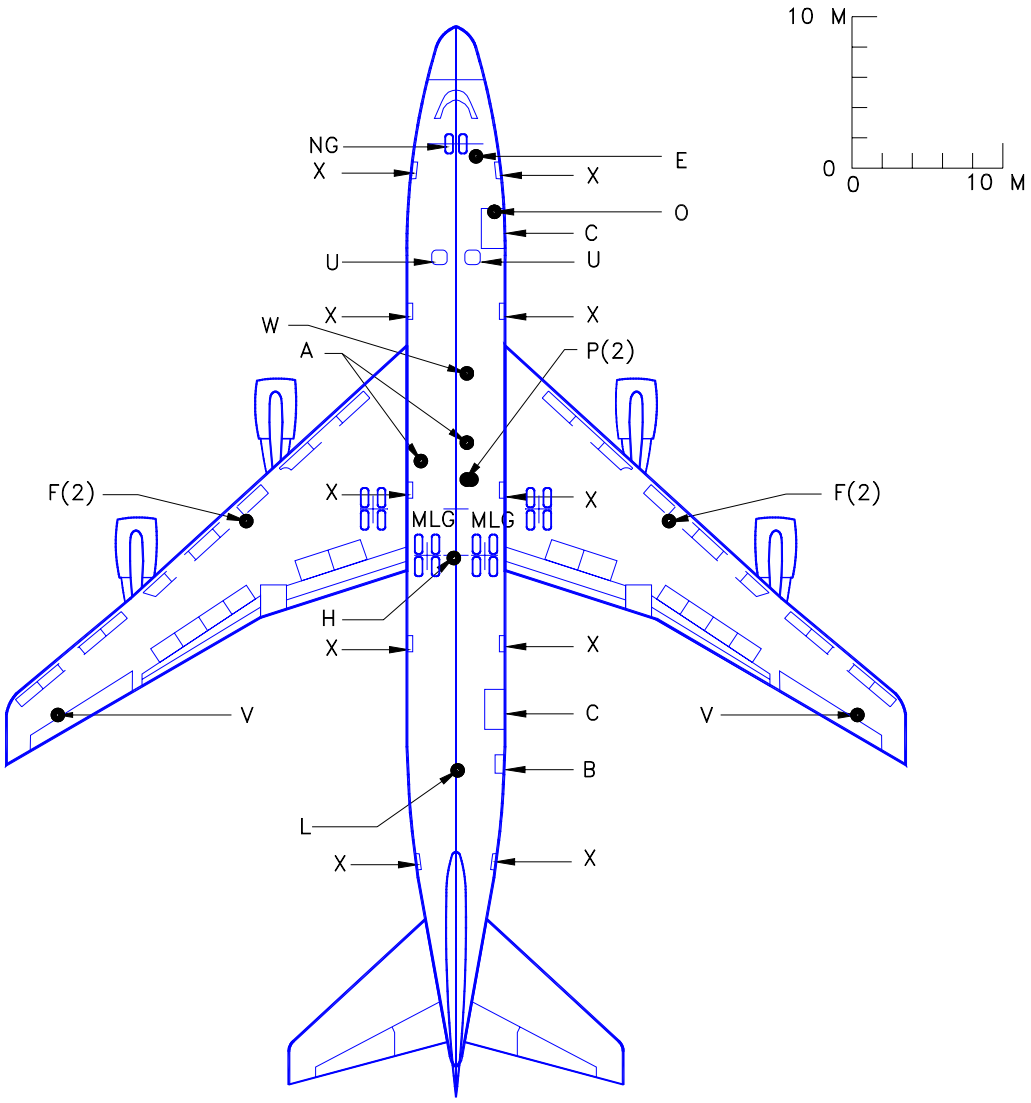
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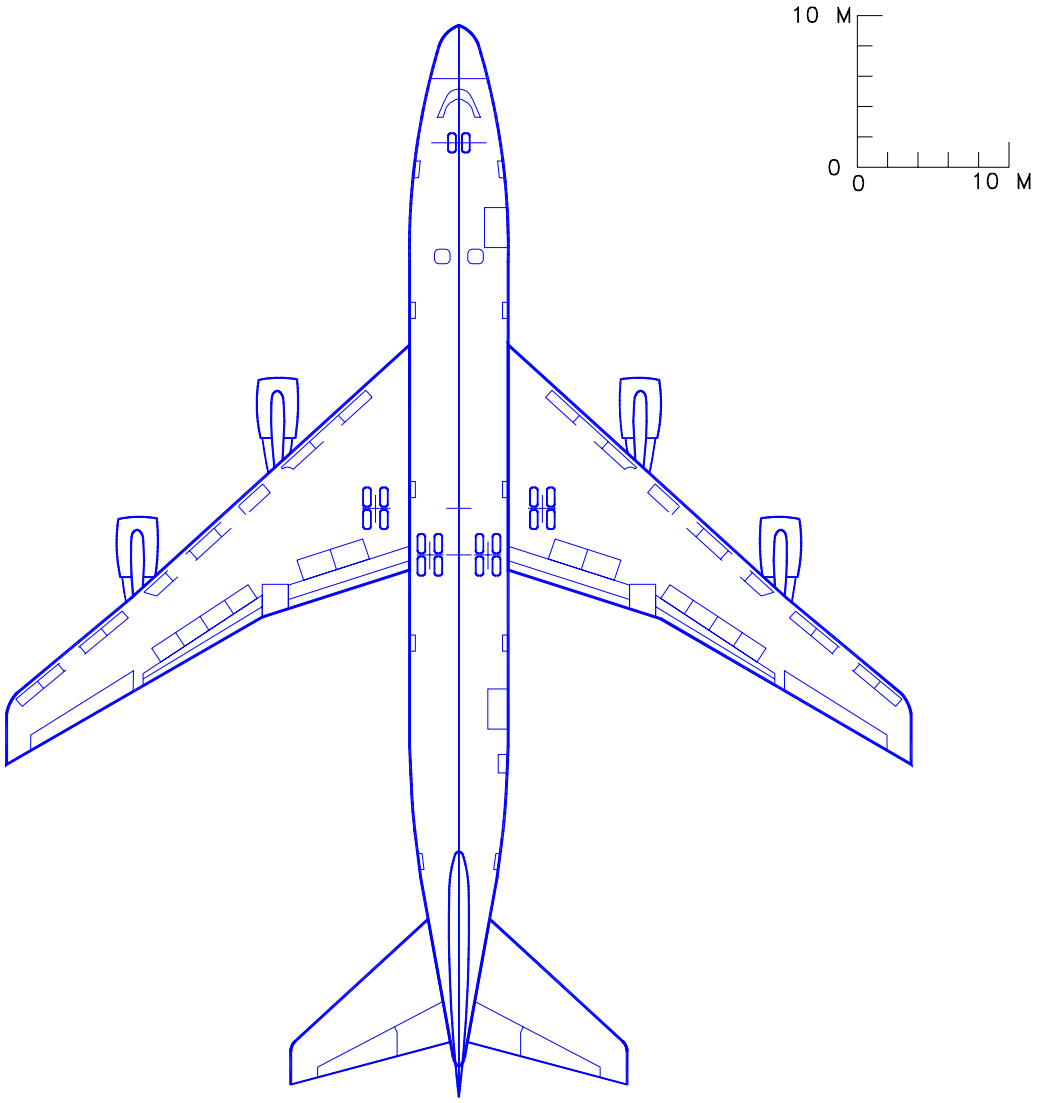
LEGEND

A	AIR CONDITIONING
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U	UPPER DECK EXIT DOOR
V	FUEL VENT
W	POTABLE WATER
X	PASSENGER DOOR

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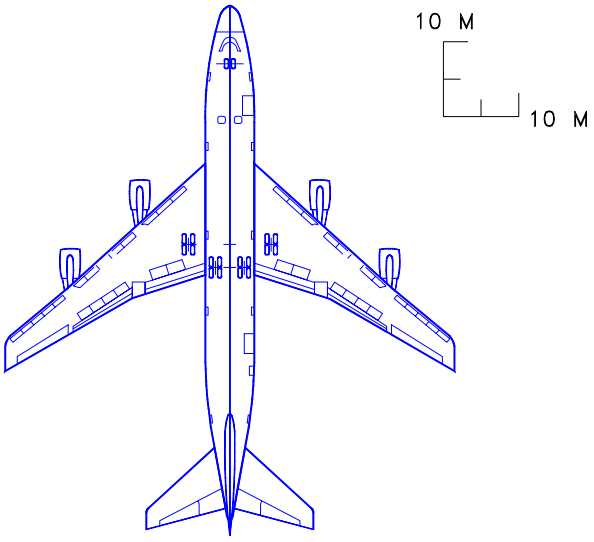
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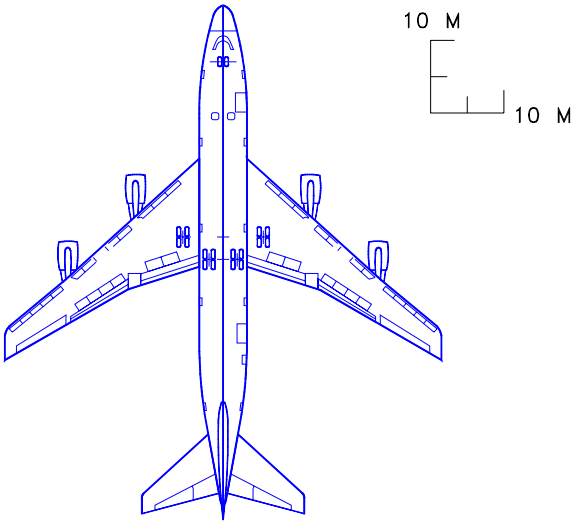
LEGEND

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Call for action: What next for UK air freight in a post-Brexit world?

Summary of policy recommendations arising from a joint webinar conducted in February 2021, with Logistics UK and AIPUT.

Foreword

Air freight currently accounts for 40% of UK imports and exports by value and is vital for the UK economy. UK airport capacity is a limiting factor for UK importers and exporters, air freight operators and the wider economy. Logistics UK and the Airport Industrial Property Unit Trust (AIPUT) are working closely with Government, members of our Air Council and other stakeholders to support sustainable growth for air freight while promoting a balanced approach to environmental issues.

Logistics UK is one of the UK's leading business groups, representing logistics businesses that are vital to keeping the UK trading, and more than seven million people directly employed in the making, selling and moving of goods. With COVID-19, Brexit, new technology and other disruptive forces driving change in the way goods move across borders and through the supply chain, logistics has never been more important to UK plc. Logistics UK supports, shapes and stands up for safe and efficient logistics, and it is the only business group that represents the whole industry, with members from the road, rail, sea and air industries, as well as the buyers of freight services such as retailers and manufacturers whose businesses depend on the efficient movement of goods.

AIPUT is an award-winning, long-term investor specialising in industrial property on or near the UK's major airports. Managed by Aberdeen Standard Investments, AIPUT is the only specialist airport-focused industrial fund in the UK for institutional investors. It currently holds 19 assets, including 2.1m sq ft at Heathrow Airport, making AIPUT one of the largest landlords serving the UK's global air freight hub. AIPUT aims to deliver a positive Environmental, Social and Corporate Governance (ESG) performance impact throughout its portfolio, with a strategic target to achieve carbon neutrality by 2025. The fund has successfully achieved GRESB Green Star status in each of the last five years.

Introduction

Aviation is vital for new opportunities and growth post-Brexit, and to the UK's economic recovery from the COVID-19 pandemic. Our air links, not least those with our largest trading partners including the US, are not a frivolous luxury. They connect Britain with the world and link British products and expertise with billions of potential buyers overseas. Pre-pandemic, some 49% of the total value of UK exports outside of the EU travelled by air, across a combination of dedicated freighters and onboard passenger flights.

In February 2021, Logistics UK together with AIPUT hosted a policy roundtable to discuss the future of air freight with representatives from across the aviation industry, including the warehousing sector, airlines, ground handlers, shippers and airports. Expert panellists included Nick Smith (AIPUT), Elizabeth de Jong (Logistics UK), Peter O'Broin (International Air Transport Association) and Stephen Harvey (Manchester Airports Group).

Inevitably, recovery from the pandemic is just as important an issue as ensuring the industry is well-positioned to make the best of Brexit. Throughout the pandemic and since the end of the Brexit transition period, air freight has contributed invaluable support to the economy and lives of everyone across the UK, facilitating both the rise in e-commerce and the movements of vital pharmaceuticals.

Despite questions remaining over the future of night flight provision, decarbonisation and the growth of aviation, air freight remains a cornerstone of the UK economy. It is vital that the Government and industry commit to a long-term partnership to support both investment and green growth. This paper outlines the steps that need to be taken to ensure the future of air freight in a post-Brexit world.

Fact and figures

- Air freight services contribute £7.2 billion to the UK economy and support 151,000 jobs[1].
- Across all sectors of the economy, £87.3 billion of UK gross value added (GVA) is currently dependent on air freight exports, including a very significant proportion of the GVA of some key industries and their supply chains:
  - Pharmaceuticals - £13.9 billion – of all pharmaceutical products produced in the UK, 41% are exported, 30% are for the UK market and the remainder (28%) are substances that are used in the production of other pharmaceutical products[2].
  - Computer, electronic and optical - £8.3 billion.
  - Creative arts and entertainment - £5.3 billion.
- In 2017, air freight represented 49% of the UK's non-EU exports by value (£91.5 billion) and 35% of non-EU imports (£89.9 billion) – over 40% of total trade by value but under 1% by volume of goods shipped[3].
- 60% of the UK's air freight travels via Heathrow, is the UK's hub airport.
- During the global pandemic, freight tonnage at Stansted was up by 30% year on year with East Midlands Airport seeing an increase of 18.7%[4].
- Germany ships just 25% of its non-EU export value by air, and most other major EU economies ship between 20% and 40%. Only Ireland ships a greater share of its non-EU exports by air than the UK.
- 9% of GVA in the North West (worth £14.9bn) is dependent on air freight service. Figures are 8.6% in Wales, 7.6% in the East Midlands and 6.8% in the South West.

Case study

A supplier of diagnostic and therapeutic medical products relies on air freight for their vital operations.

As a leading supplier of pharmaceutical products in the UK, a supplier of diagnostic and therapeutic medical products are heavily reliant on air freight operations and a comprehensive network of air routes from multiple origin points in Europe into the UK in order to service their customers across Great Britain and Northern Ireland.

They receive around 18,000 orders per annum from customers in the UK for short-lived pharmaceutical products which are used in the diagnosis of disease and treatments for patients. In many cases, owing to the short life of the products, delivery is required to hospitals in the UK on a next-day basis, with delays or longer transit times rendering them unusable and leaving clinicians frustrated and patients distressed. Many patients will have had long-standing courses of treatment suspended pending administration of the shipper's products, and failure to deliver within the prescribed time merely serves to cause added distress to the patients and create increased costs for the hospitals.

It is therefore essential that, for reasons of both timescale and capacity, adequate flights and connectivity into East Midlands, Birmingham and Belfast airports, remain unhindered and unrestricted. Without these services, it would be impossible to service the c.700 patients per day (175,000 per annum) in the UK, with a significant potential impact on healthcare across the UK as a result.

[1] 'Assessment of the value of air freight services to the UK economy', October 2018
[2] 'The UK Pharmaceutical Sector, an overview', December 2019
[3] 'Assessment of the value of air freight services to the UK economy', October 2018
[4] Manchester Airports Group, May 2021

Priorities

1. Positive perception of aviation

Air freight and aviation is a key driver of economic growth, both in terms of financial contribution and employment. The Government needs to give a clearer signal that it is supportive of and values air freight as a sector of national strategic importance. It is important the narrative surrounding the industry is positive and supported by Government at every juncture. Aviation is critical to the Government's 'Global Britain' objectives – in 2019, 65% of UK trade with Australia travelled through Heathrow. Aviation has a strong reputation for innovation and has supported the UK throughout the COVID-19 pandemic – now is the time to consider it as a crucial component of a Global Britain.

2. Joined-up approach – passenger and freight

It is widely known that passenger and freight operations work in tandem: prior to the pandemic, 95% of cargo at Heathrow was carried in the belly hold of passenger planes. Capacity in the air freight network is key, with freighter operations working alongside and complementing capacity provided by passenger services. Any assistance and support from Government needs to be targeted at aviation in general, without emphasising help for passenger services above freight, or vice versa; both rise and fall together.

3. Infrastructure

The UK needs to facilitate the timely delivery of the highest quality transport and real estate infrastructure serving its leading airports in order to underpin the future growth of a vibrant, sustainable and globally competitive aviation and air freight sector able to make its fullest contribution to the success of UK plc.

4. Funding

Air Passenger Duty (APD) and business rate holidays would be welcomed by the sector both to reinforce its recovery and signal Government support for the sector as strategically important for UK plc.

5. Brexit

The industry is calling for accelerated negotiations with the EU on improving traffic rights to open key markets and routes following the UK's departure from the EU. This will build on the sold foundations laid out in the Trade and Cooperation Agreement (TCA) and help ensure that air cargo can continue moving and operating efficiently.

We are seeking two priority changes. First, UK carriers are not currently operating on a level playing field owing to the Department for Transport (DfT) and Civil Aviation Authority's (CAA) liberal view on approval of traffic rights for EU operators which are not currently reciprocated. We call on the EU to grant equivalent rights to UK operators.

Second, we are seeking additional traffic rights beyond the first four freedoms of the air agreed in the TCA. The fifth freedom is vital for air cargo, as it enables a plane to take off in the UK, land in an EU member state, unload cargo and continue its journey onto a second country with additional cargo. We ask for a long-term sustainable plan for traffic rights.

6. Consumer behaviour

A healthy air freight sector is an essential part of the new digital economy. The UK is one of the top three online shopping nations. Consumer behaviour over the course of the pandemic and recent years has led to an increase in e-commerce. Just-in-time and next day deliveries are no longer an ambition but an expectation. Express freight airlines operate a significant number of services which support e-commerce – such as moving goods between working days (overnight), which accounts for £4 billion to the economy and just under 6,000

jobs[5]. We must continue to innovate, supporting flexible freight movements throughout the day and, where possible, at night to support this vital sector and growing market.

7. Innovation

Air cargo is a driver of innovation in logistics. Innovation can be seen in all aspects of the air cargo supply chain, from ground operations and aircraft technology, to warehousing solutions and security. The new generation of cargo warehouses, aircraft and equipment need to be fit for purpose, promoting safety and security, and designed to be as carbon neutral as possible, as well as future-proofed through the enabling of automation and digitisation. A long-term commitment to innovative solutions is the foundation of private investment and strategic planning for years to come. For its part, the industry must continue to drive innovation, strive to demonstrate its commitment to carbon reduction and its overall Environmental, Social and Governance (ESG) performance and enhance its 'licence to operate' with the communities it serves.

8. Freeports

While the industry has welcomed the Government's Freeport proposals, they need to deliver enhanced new opportunities for the air freight sector, as well as the maritime sector, in a post-Brexit world. Freeports must be structured in a way that will attract inward investment and job creation. They represent a once-in-a-lifetime opportunity for airports, maritime and inland ports, and other transport modes to work together. Freeports should also aim to play a major role in driving wider regeneration and spreading those benefits across the UK, while realising enhanced global trade routes and growth prospects.

9. Regulatory relaxations

For the air freight sector to succeed, the industry calls for targeted and appropriate regulatory relaxations in planning. Planning regulations are significant when planning for ambitious supply chains and connectivity. Appropriate planning flexibility at ports, for warehousing and connectivity infrastructure, will allow for continued investment and reactive supply chains in air freight. Specifically, we call for support for sustainable expansion at Heathrow and other regional airports where required.

10. Decarbonisation

There is a strong willingness from the air freight and wider aviation sector to meet decarbonisation targets. Many businesses are taking necessary measures to decarbonise as quickly as possible. This is the case across aviation, from warehouses and aircraft to ground operations. Carbon is the enemy, not flying, and low carbon Sustainable Aviation Fuel (SAF) will be key to decarbonisation. In addition, we call for a commitment from Government to support research and development in aviation, leading to new technologies for electric and hydrogen aircraft that are fit for the future and cargo handling.

11. Air freight growth

Alongside Government support, we need to put our vision into practice – leveraging our creative ideas, energy and innovation. Air Cargo should be a catalyst for growth. We need to be brave and more progressive, working with our competitors and working together rather than in silos. The trajectory of progress needs to accelerate and be driven by the challenges and opportunities we face. Air freight is a growing industry and will recover from the impacts of COVID-19 and Brexit, contributing millions to the UK economy and its position as a trading nation. However, the industry needs to know now more than ever that the Government is fully behind the sustainable growth of UK air freight.

Conclusion

Logistics UK and AIPUT would welcome the Government's commitment to the eleven priorities listed in this paper while working together with industry to realise the potential for UK air freight. New opportunities from Brexit, and recovery from COVID-19, present an unmistakable opportunity to consider the next steps for air

[5] Figures are for goods moved during the night-time Noise Quota Period. Source: 'The Economic Impact of Air Cargo – Night Flying', December 2016

freight. It is vital that a long-term partnership with the industry is developed and strengthened over time as we consider how best to enhance the UK's position as a global trading partner.

Forecasting air freight demand March 2018

Forecasts for the 2018-2022 period, prepared by IATA Economics

- We forecast industry-wide freight tonne kilometres (FTKs) to grow by 4.9% on average over each of the next five years, helped by a stronger economic and trade backdrop than we saw over much of the previous five year period.
- In keeping with the performance seen since 2014, we expect air freight to continue to outperform global goods trade modestly between 2018 and 2022. This is a key area of uncertainty and a prime area for our future research.
- Our baseline forecasts are just one way in which freight demand could develop. We have explored alternative scenarios to illustrate a range of possible outcomes in industry-wide FTKs over the forecast time horizon.

Introduction

This paper presents IATA's forecasts for air freight volumes over the next five years (as measured by air freight tonne kilometers, or FTKs). The layout of the paper is as follows:

The first section discusses the key relationships that underpin growth in air freight volumes, and explains how the strong performance seen in 2017 fits in with this framework. The next section details our forecasts for air freight volumes over the next five years at an industry-wide level and for selected major trade lanes; this section includes a discussion of the key risks to the outlook. The final section explores alternative scenarios to illustrate a range of possible outcomes over the forecast time horizon.

Section 1 – our forecasting framework

The key building blocks of air freight demand

The strength of demand for air freight each year depends on the broader health of global goods trade flows, as well as factors specific to air freight. These influences are captured by two key relationships:

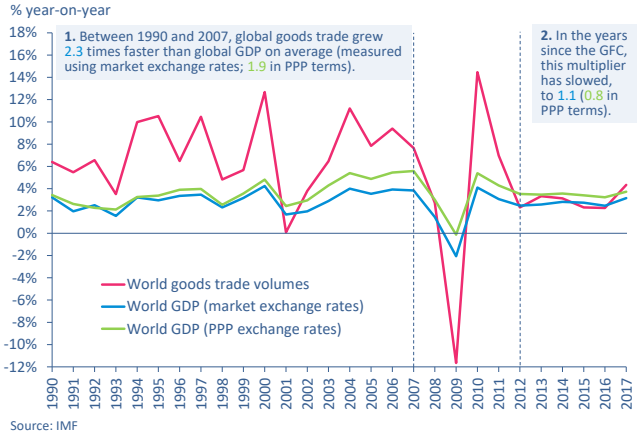
1) The relationship between global GDP growth and global goods trade growth; and,
2) the relationship between global goods trade growth and that of air freight volumes.

How much trade is generated by a given amount of economic activity...

The first of these relationships has seen a big change since the global financial crisis (GFC).

As shown in Figure 1, in the decades before the GFC it was usual for global goods trade to grow at around two times the pace of global GDP. (The exact multiplier depends on whether you measure GDP using market or purchasing power parity exchange rates – see Figure 1.) This was set against a backdrop of deepening globalization, including the fragmentation of global supply chains.

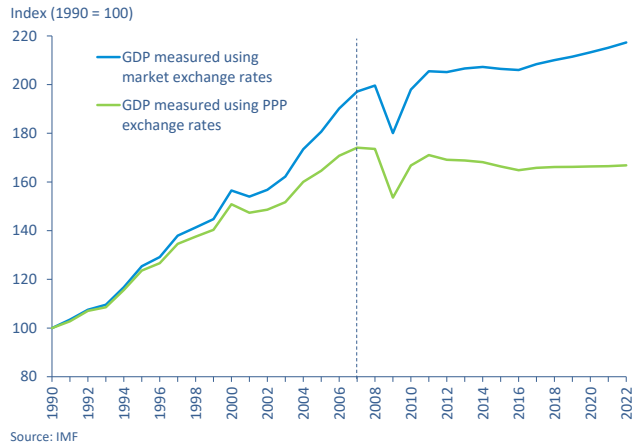
Figure 1 – Global goods trade and GDP growth



However, in the years since the GFC, global goods trade has only grown broadly in line with global GDP, and the long-standing upward trend in the goods trade/GDP ratio has stopped. (See Figure 2.)

This slowdown in trade growth has been the subject of much research and a number of reasons have been put forward to explain it, including protectionism, a slowdown in the fragmentation of supply chains/on-shoring, and a broader decline in investment growth.[1]

Figure 2 – Ratio of goods trade to GDP



[1] For example, see ECB, 'Understanding the weakness in global trade', Occasional Paper Series, no.178 Sept 2016,

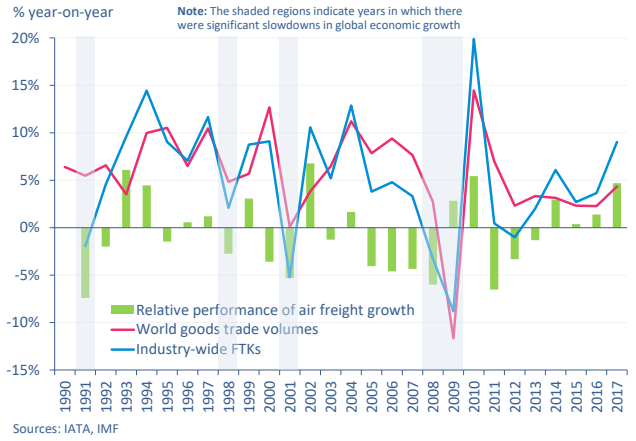
The big question of relevance to the future of air freight is when/if the ratio will return to pre-crisis norms (which we'll come back to later on).

…and how does this relate to air freight demand?

The second key relationship of relevance to the performance of air freight is that between freight volumes and global goods trade. On average, year-on-year growth in air freight volumes has tended to grow slightly more slowly than growth in global goods trade volumes over the past 30 years or so (around 0.95 times the pace), albeit with distinct periods of over- and under-performance.

Air freight has tended to underperform in periods of relative economic stability, partly related to modal shift to sea freight (this was certainly the case in the mid-2000s).[2] However, air freight has tended to outperform global goods trade strongly during the upturns following significant global economic slowdowns over the past 30 years. (See Figure 3.)

Figure 3 – Global goods trade and FTK growth



Sources: IATA, IMF

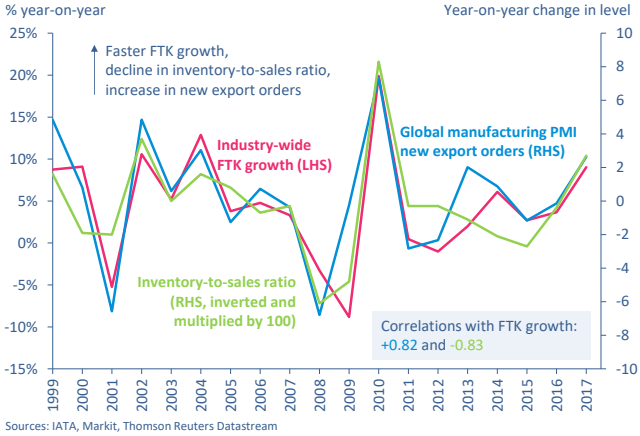
The cyclical outperformance of air freight growth relates in large part to its ability to move goods quickly and its key role in the restocking cycle. As shown in Figure 4, periods in which the inventory-to-sales ratio have fallen sharply have been consistent with strong demand growth for air freight volumes in the past. Similarly, periods when global manufacturing firms have reported rising demand for their exports have also been closely correlated with freight growth.

Stronger global trade backdrop helped in 2017…

The two key relationships help to explain what drove the strong growth in air freight volumes seen in 2017.

A stronger global trade backdrop certainly helped. According to the International Monetary Fund (IMF), global goods trade volumes increased by 4.3% in 2017 – the strongest year of growth since 2011 – alongside a broad-based pick-up in global economic activity. (Again, see Figure 1.) Having fallen below 1.0 during the previous two years, the goods trade to GDP multiplier increased to 1.4 in 2017. This was above the average seen since 2012, albeit still well below the 2x level that was the norm in the decades leading up to the GFC.

Figure 4 – FTK growth versus cyclical indicators



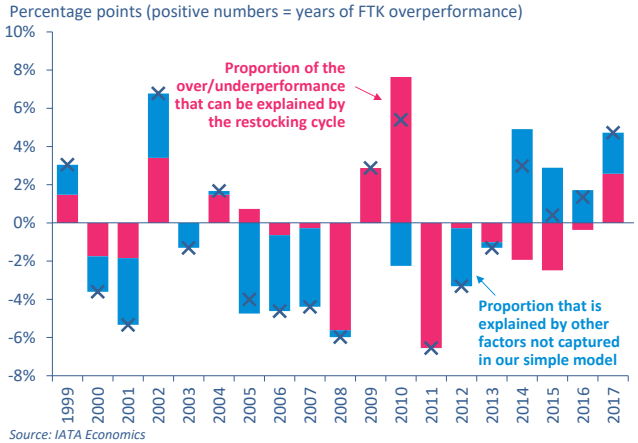
Sources: IATA, Markit, Thomson Reuters Datastream

…but cyclical FTK outperformance evident too

However, FTKs grew more than twice as fast as global trade volumes in 2017 as a whole, which was the widest margin of outperformance since 2010. (Again, see Figure 3.) This outperformance largely reflects the boost from the restocking cycle, which was also evident in buoyant demand for global manufacturing firms' exports.

On average, we estimate that every 0.01-point year-on-year decline in the inventory-to-sales ratio is consistent with annual air freight growth outperforming its world trade counterpart by around 0.9 percentage points. Given the magnitude of the fall in the inventory-to-sales ratio seen last year, this factor explains around half of air freight's outperformance relative to global goods trade in 2017. (See Figure 5.)

Figure 5 – Year-on-year FTK growth minus year-on-year global goods trade growth



Source: IATA Economics

A number of factors are likely to be contributing to the remainder of the outperformance, including the long-awaited pick-up in investment seen last year, notably in Europe, as well as the impact that growing sectors

[2] See: [redacted]

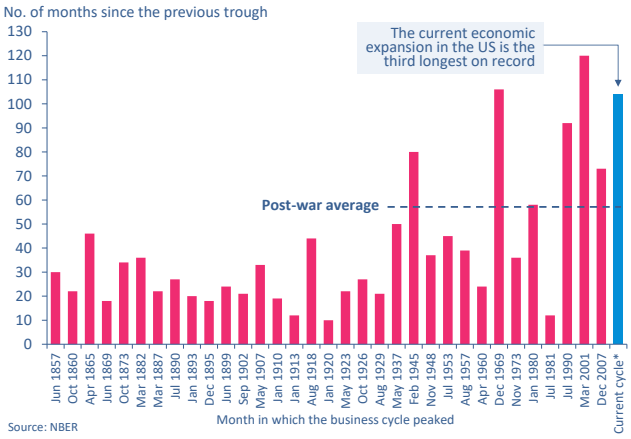
such as e-commerce and pharmaceuticals are having on air freight growth. The extent to which the latter continues is a key consideration and uncertainty for the forecasts.

Section 2 – outlook over the next five years

This benign period of economic growth *will* end, but when?

The global economy is currently enjoying its broadest-based pick-up in growth in many years, although the long length of time since the last recession means that some people worry that it is 'due' a downturn. Certainly, as shown in Figure 6, the ongoing period of expansion in the US economy is closing in on being the second longest on record – well above the post-war average of 58 months.

Figure 6 – Length of economic cycles in the US



Of course, no two business cycles are the same and they do not 'die of old age'; indeed, the length of the current period of expansion has been helped in large part by the extraordinarily accommodative monetary policy settings seen in recent years, which are still only being normalized very slowly. However, at the time of writing, signs of rising wage inflation pressures in the US, as well as the expected stimulus to activity from President Trump's tax package, are causing investors to reappraise the scope of future interest rates rises. Pronounced increases in interest rates have typically been one factor that has ended periods of economic expansion in the past.

All told, history would suggest that we are highly likely to see an economic downturn at some point within the next five years, although we cannot say when. The key point is that any set of macroeconomic forecasts looking into the future should be viewed as a trend projection through the cycle, rather than precise estimates from year to year.

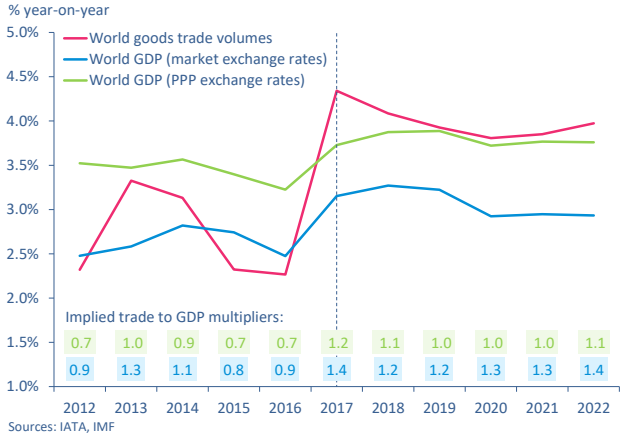
More supportive economic and trade backdrop…

With this caveat in mind, the general expectation is that the outlook for air freight over the next five years will be supported by a brighter economic and trade backdrop than we saw between 2012 and 2017. (There is, of course, a wide range of forecasts about how economic growth will develop in the future. We have used the latest from the IMF's bi-annual *World Economic Outlook* publication.)

Having accelerated in 2017, global GDP growth is expected to remain relatively robust over the next five years. The IMF forecasts real GDP growth to average 3.1% between 2018 and 2022, compared to 2.8% during the previous five years (measured using market exchange rates; the corresponding PPP-based figures are 3.8% and 3.5%). Similarly, global goods trade is also forecast to grow more quickly than it did in the 2012-2017 period. The IMF forecast global goods trade growth to average 3.9% between 2018 and 2022, up from 3.1%.

The IMF's forecasts are consistent with an increase in the global goods trade to GDP multiplier over the coming five years compared to that seen between 2012 and 2017. (See Figure 7.) Nonetheless, the ratio is expected to remain well below the 2 times average that was the norm in the decades before the GFC. Alternative scenarios, which explore different possibilities in this key relationship, are included in section 3.

Figure 7 – IMF forecasts of growth in global GDP and goods trade



…and further modest FTK outperformance in 2018

As shown in Figure 3 earlier, traditionally years in which air freight growth has far exceeded that of global goods trade have been followed by underperformance as the restocking cycle has waned.

Having outperformed global goods trade by the biggest margin in seven years during 2017, business surveys are currently consistent with air freight outperforming global goods trade growth again in 2018, albeit much more modestly than last year.

Indeed, having increased to a fresh seven-year high in January 2018, the new export order books component

of the global manufacturing PMI is currently 1.3 points higher than its average during the whole of 2017. While there is a long way to go this year, we estimate that this is consistent with industry-wide FTK growth outperforming world trade growth by around 1 percentage point in 2018.

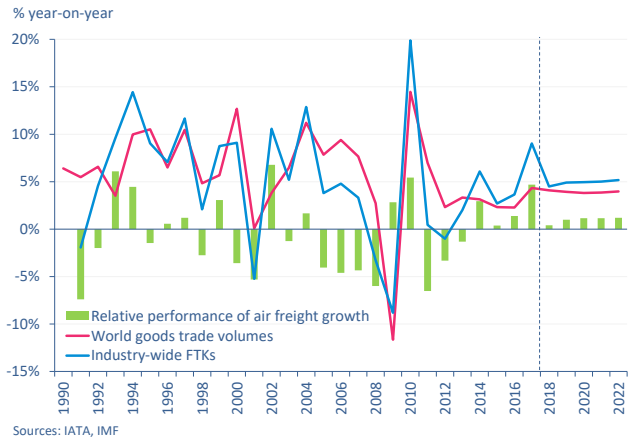
Based on the IMF's forecasts for goods trade, this implies FTK growth in the region of 5.3% in 2018, and is consistent with an FTK to goods trade multiplier in the region of 1.1, down from 2.1 in 2017.[3]

Can air freight decouple from global goods trade?

The big question is how the relationship between air freight and global goods trade will settle in the later years of the forecast period.

Typically modal shift has eaten into air freight's market share during periods of economic stability.[4] However, we have now seen FTK growth outperform global goods trade growth in every year since 2014. As shown in Figure 5, the bulk of this outperformance has not been explainable by the usual 'cyclical' indicators of demand. This suggests that other factors – potentially the increasing importance of areas such as e-commerce and pharmaceuticals – are helping air freight growth to 'decouple' from global goods trade.

Figure 8 – Forecast relationship between air freight and global goods trade



Sources: IATA, IMF

In our baseline forecast we expect that this modest decoupling between air freight and goods trade growth continues across 2019-2022, with a degree of FTK outperformance broadly in line with the average seen since 2014. (See Figures 8 and 9.) This is a key area of uncertainty and a prime area for our future research.

[3] For reference, the World Trade Organization (WTO) is currently forecasting world goods trade growth of 3.2% in 2018, within a range of for 1.4-4.4%. However, the WTO has indicated that this forecast is likely to be revised higher during the next update in early-April:

[redacted]

Figure 9 – Key forecast numbers

% CAGR, unless specified otherwise	2012-2017 (actual)	2017-2022 (forecast)
A *Global GDP (market ex. rates)*	2.8%	3.1%
B *Global GDP (PPP ex. rates)*	3.5%	3.8%
C Global goods trade	3.1%	3.9%
Trade to GDP multiplier (=C/A)	1.12	1.28
Trade to GDP multiplier (=C/B)	0.88	1.03
D Industry-wide FTKs	4.7%	4.9%
FTK to trade multiplier (=D/C)	1.52	1.25

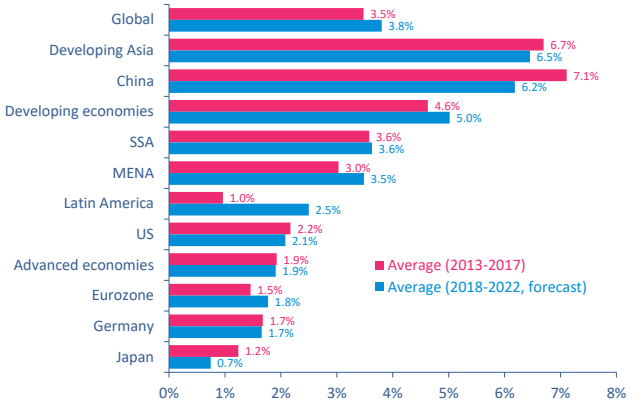
Sources: IMF, IATA

Assessing the outlook for the major trade lanes

While global economic growth is forecast to increase in aggregate over the next five years, this masks a wide range in regional and country-level performance.

Economic activity in the so-called advanced economies is expected to grow at a broadly similar pace over the next five years than it did in the previous five, with modest slowdowns in the US and Japan being offset by stronger growth in the Eurozone. (See Figure 10.) The latter is likely to support inbound demand for air freight into Europe on the key trade lanes between North America and Asia over the next five years.

Figure 10 – Real GDP growth (selected regions and countries, PPP exchange rates)



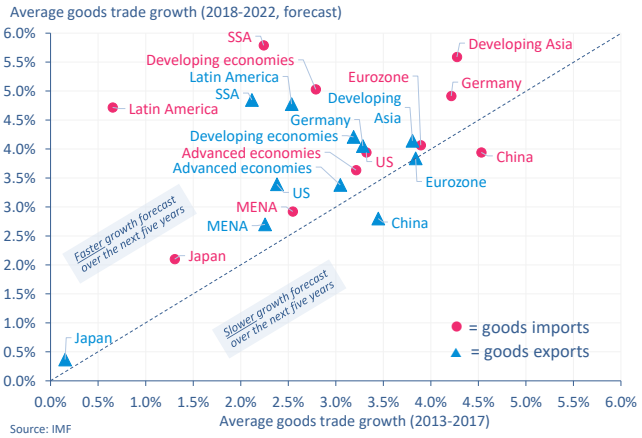
Source: IMF

GDP growth in the developing group of countries is expected to accelerate over the next five years, helped by stronger activity in energy-producing countries including Brazil and Russia.

There is a similar range in expectations for global goods trade at a regional and country level. Stronger economic growth in the developed economies is expected to translate into faster goods import growth over the next five years. (See Figure 11.) Sub-Saharan Africa is also expected to see strong goods trade growth over the next five years, linked in part to FDI inflows from Asia. (Recall that African airlines flew around 25% more international FTKs in 2017 than

they did in 2016, helped by a surge in FTKs flown on the Africa to Asia market segment.)

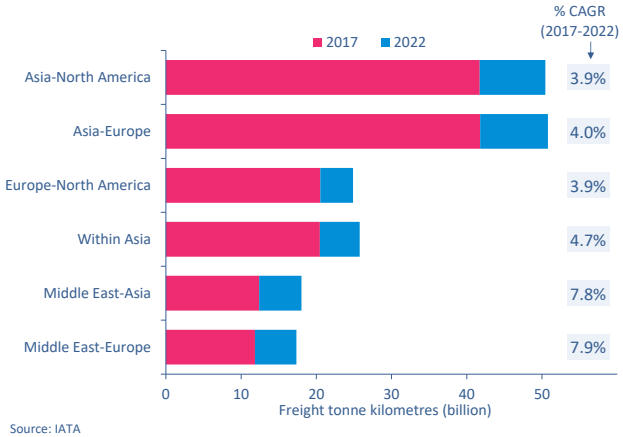
Figure 11 – Goods trade forecasts; selected regions and countries



Notably, China is the only major region or country expected by the IMF to see a slowdown in goods trade growth over the next five years. However, we expect this impact to be felt most acutely by bulk shippers and sea freight as demand for heavy materials linked to investment declines. In fact, we see opportunities for air freight as the country moves towards a more consumer-led growth model.

All told, we expect to see robust FTK growth on the segment-based trade lanes to, from and within Asia over the next five years. As mentioned earlier, a stronger economic backdrop in Europe is also expected to drive faster growth on the key trade lanes to and from the region over the forecast horizon than in the previous five years. (See Figures 12 and 13.)

Figure 12 – FTK forecasts by major trade lane



FTK growth (% CAGR, segment-based trade lanes)	2012-2017 (actual)	2017-2022 (forecast)
Asia-North America	5.2%	3.9%
Asia-Europe	1.1%	4.0%
Europe-North America	2.2%	3.9%
Within Asia	3.7%	4.7%
Middle East-Asia	8.3%	7.8%
Middle East-Europe	8.3%	7.9%

Source: IATA

Figure 13 – Selected economic and trade metrics by major region

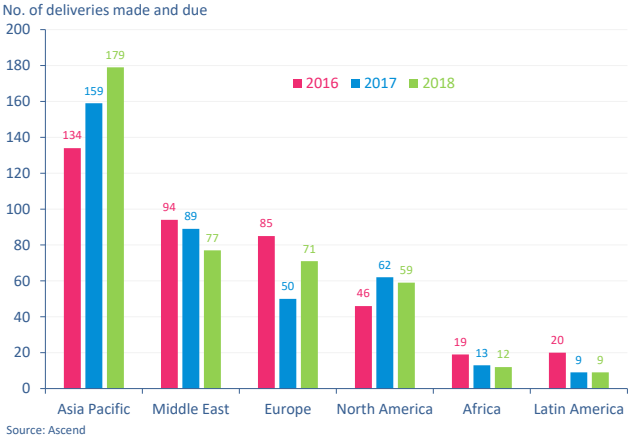
	Share of global GDP (%)*	Real GDP growth 2012-2017	Real GDP growth 2017-2022	Trade (% of GDP)**
Asia Pacific	35%	5.6%	5.4%	54%
North America	28%	2.1%	1.9%	30%
Europe	25%	1.4%	1.8%	83%

*2017 at market exchange rates **2016

Sources: IMF, World Bank

Having stalled in 2017, we expect the upward trend in traffic passing through the Middle East to resume over the forecast period, linked partly to ongoing strong growth in the widebody fleet in the region. 77 widebodies are due to be delivered to carriers based in the region in 2018 – down slightly from the amount made in the previous two years, but still the second highest of all regions. (See Figure 14.)

Figure 14 – Widebody aircraft deliveries by region



Key risks, uncertainties, and opportunities…

The baseline forecasts presented above are just one way in which air freight demand could develop over the coming five years. As always, there are many risks and uncertainties on both the upside and the downside, which range in nature, severity, and likelihood.

One key risk is to the economic backdrop. The global economy is currently experiencing its broadest-based cyclical growth pick-up since 2010. However, some economists argue that unorthodox central bank policies since the GFC have created asset bubbles in financial and housing markets rather than driven a sustainable path to economic growth; by encouraging credit and debt expansion, these policies pose a threat to financial stability and potential economic growth in the future. To the extent that such risks eventuate, this could see slower economic growth

than in the baseline, and translate directly into lower demand for air freight.

…including from trade protectionism…

A more specific risk to global goods trade volumes is that posed by protectionism. After decades of globalization and the breaking down of borders, there is a risk that policymakers continue down a more inward-looking path. Certainly, recent years have seen politicians embrace more national solutions; the recent imposition of tariffs on steel and aluminium imports by the US are a case in point. Once again, a pick-up in protectionism would weaken the underlying operating environment for air freight in the coming years.

Geopolitical risks could also play a key role in shaping the composition of growth and traffic in the air freight industry in the years ahead, particularly in the Middle East. Airlines based in the region have increased their share of industry-wide FTKs from less than 4% in 2000 to almost 14% at present. If, for example, regional unrest or conflict were to deter traffic from using the region's major hubs, this could see European and Asia Pacific airlines regain some of the market share that they have lost in recent decades. Of course, similar geopolitical tensions and risks exist in other regions too.

…as well as on the upside

Not all uncertainties are negative. Indeed, in a converse situation to that noted earlier, if economic activity turns out to be stronger than forecast in the baseline, this will translate directly into stronger demand for air freight. Moreover, while the US has become openly more hostile to trade openness, it is worth noting that the other countries involved in the now defunct Trans-Pacific Partnership, for example, are determined to reach a new agreement without the US's involvement. Any progress on new or amended trade agreements could help to reinvigorate global trade flows in the future and to subsequently help boost air freight demand. Meanwhile, and as noted earlier, new and fast-growing areas such as e-commerce and pharmaceuticals appear to offer opportunities for air freight to potentially decouple altogether from the link with global goods trade in future years.

It is worth noting that only around 1% of total goods trade volumes are flown by air (although around 35% in value terms). Even a very small increase in this share over a short-period of time would be consistent with sizeable FTK outperformance relative to global goods trade. To illustrate, if the share were to rise by just 0.1 percentage points over five years, this would see air freight growth outperform wider goods trade by around 2 percentage points each year. Such a shift could happen if key air freight sectors like e-commerce or pharmaceuticals outperform other areas of the economy.

Section 3 – scenario analysis

The risks and opportunities discussed in the previous section can be examined in the framework established earlier. Any factors such as trade protectionism that result in less global goods trade being generated by a given amount of economic activity, and/or slower global economic growth than in the baseline, fit into our framework by reducing the first of our key multipliers.

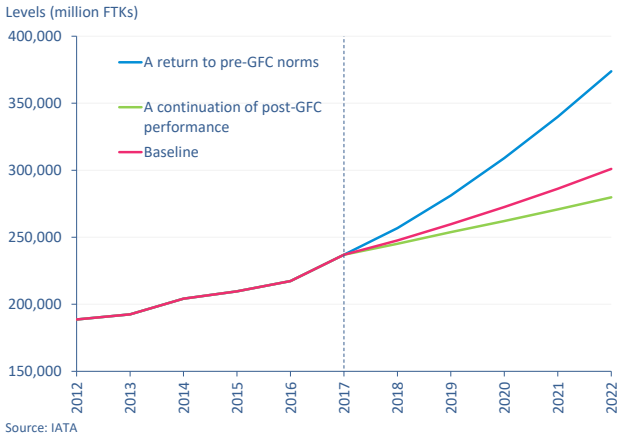
Similarly, any factors that allow air freight to outperform global goods trade on a consistent basis will show up in our framework as a stronger FTK to air trade multiplier than we have seen in the past.

Two alternative scenarios

To help explore the range of possibilities over the coming five years, we have produced two illustrative alternative scenarios to our baseline, which primarily flex the key relationship between global GDP growth and global goods trade.

Figure 15 provides an overview of the scenario outcomes. Detailed charts relating to the scenarios can be found in the appendix.

Figure 15 – FTK scenarios



A) A return to pre-GFC norms

In this scenario, global GDP growth is assumed to be stronger than in the baseline, averaging 3.6% each year over the next five years; this is broadly in line with the pace seen in the 'great moderation' in the run-up to the GFC.

Moreover, the global goods trade to GDP multiplier is assumed to recover over the forecast horizon from 1.4 in 2017 back to around the 2.0 level that was the norm in the two decades leading up to the GFC. The relationship between goods trade and FTK growth is assumed to be unchanged from the baseline.

The 'return to pre-GFC norms' scenario sees industry-wide FTKs growing by 9.5% each year on average over the next five years – almost double the pace seen in the baseline. This results in a cumulative 14% more FTKs being flown over the five-year forecast horizon than in the baseline scenario.

B) A continuation of post-GFC performance

In this scenario, we assume that global GDP growth is unable to maintain the pace seen in 2017: annual GDP growth is assumed to average 2.7% over the forecast horizon, slightly below the average pace over the previous five years.

Moreover, the modest recovery in the goods trade to GDP multiplier expected by the IMF in the baseline scenario is also assumed to be too optimistic: the multiplier between goods trade and GDP is expected to fall back towards 1.0 over the forecast horizon, in keeping with the experience seen between 2012 and 2016. As in the previous scenario, the relationship between goods trade and FTK growth is assumed to be unchanged from the baseline.

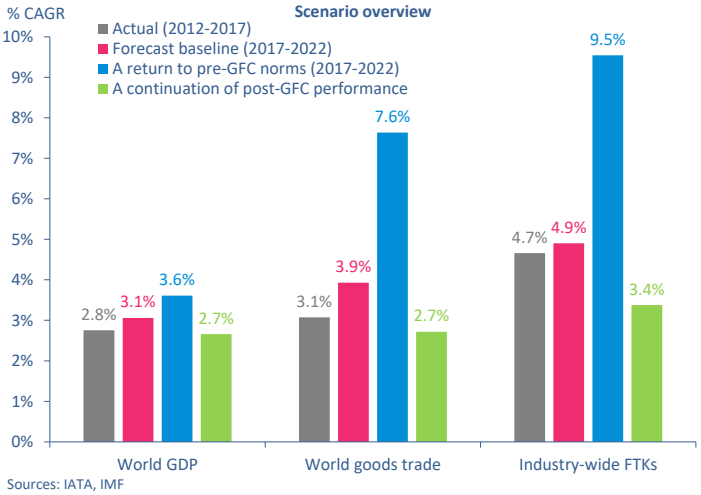
The 'continuation of post-GFC economic and trade performance' scenario is consistent with FTK growth of 3.4% per year on average between 2018 and 2022 – 1.5 percentage points slower than in the baseline. All told, this results in a cumulative 4% fewer FTKs being flown over the forecast horizon than in the baseline.

Conclusion

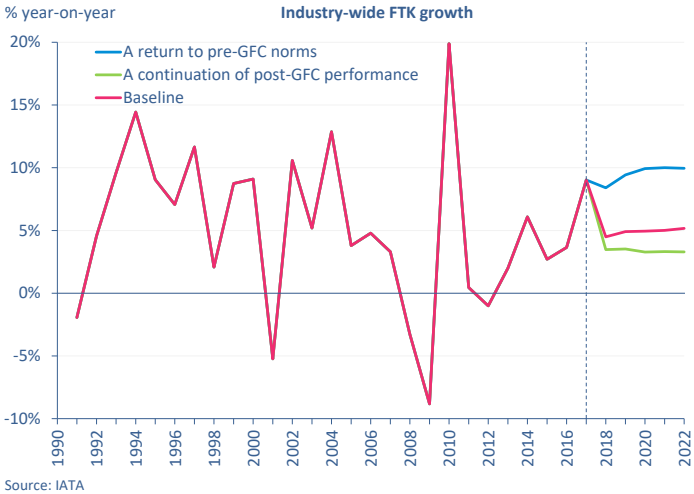
We forecast industry-wide FTKs to grow by 4.9% on average each year between 2018 and 2022, helped by a stronger economic and trade backdrop than we saw over much of the previous five year period. In keeping with the performance seen since 2014, our forecasts assume that air freight continues to outperform global goods trade modestly over the next five years. This is a key area of uncertainty and a prime area for our future research.

Andrew Matters
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March 2018

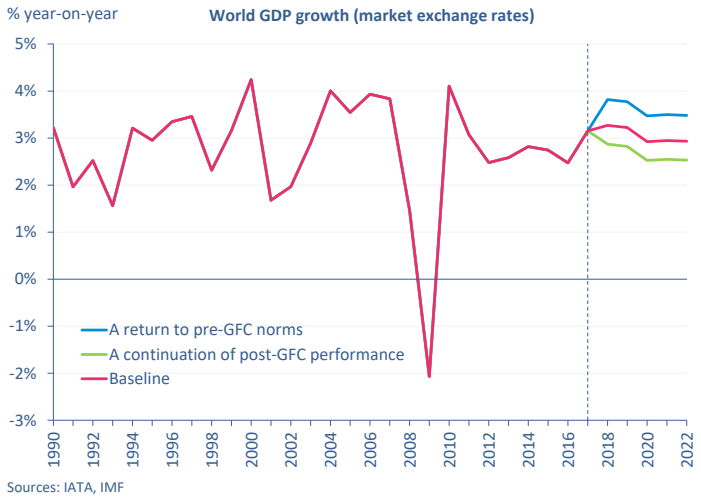
Appendix: detailed scenario overview



Sources: IATA, IMF



Source: IATA



Sources: IATA, IMF



Sources: IATA, IMF

The economic & social benefits of air transport



AIR TRANSPORT ACTION GROUP

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Glossary and abbreviations

Foreword

In December 1944, when Franklin Roosevelt and his peers signed the Chicago Convention, which contains the basic rules for civil aviation, they emphasised that the future development of international civil aviation can greatly help and preserve friendship and understanding among the nations and peoples of the world.

Over sixty years later, this vision has become an evident reality, to such an extent that air transport is now accepted as a fundamental pillar of our global society, as indispensable to our daily lives as medicine and telecommunications, and essential for social progress and economic prosperity.

The growing availability of affordable air travel has considerably widened aviation's role in our sustainable society. Air travel is no longer a luxury commodity. The air transport industry has not only underpinned wealth creation in the developed world, but has also brought enormous benefits to developing economies by unlocking their potential for trade and tourism.

This brochure provides new data on the economic and social benefits of air transport – including its valuable contribution to job creation and Gross Domestic Product (GDP). It also supplies, for the first time, regional economic data for Africa, Asia-Pacific, Europe, the Middle East, Latin America & the Caribbean and North America.

Based on a study undertaken for the Air Transport Action Group (ATAG) by Oxford Economic Forecasting (OEF), this brochure is a reliable source of facts and figures, which highlights air transport's main benefits. This updated information should enable governments and industry to make sound decisions to ensure air transport's continued and sustainable growth according to mobility requirements.



Philippe Rochat
Executive Director
ATAG

The Air Transport Action Group is an independent coalition of organisations and companies throughout the air transport industry that have united to drive infrastructure improvements in an environmentally-responsible manner. ATAG's global membership includes airports, airlines, manufacturers, air navigation services providers, airline pilot and air traffic controller unions, chambers of commerce, travel and tourism institutions, ground transportation and communications providers.

ATAG has a worldwide mandate, and is active at regional and national levels to press for specific infrastructure developments and to provide sound advice to public authorities on behalf of the international air transport industry. It looks for a balance between the environmental, social and economic effects of increased infrastructure capacity and, therefore, works closely with governments, environmental groups, planning institutes and the public to achieve this balance and to ensure that the right degree of commitment is made in time to meet mobility requirements.

This brochure has been financed by ATAG's funding members:

The importance of the industry – facts & figures

Air transport provides vital economic benefits

- Aviation provides the only worldwide transportation network, which makes it essential for global business and tourism. It plays a vital role in facilitating economic growth, particularly in developing countries.
- Aviation transports close to 2 billion † passengers annually and 40% of interregional exports of goods (by value).
- 40% of international tourists now travel by air.
- The air transport industry generates a total of 29 million jobs globally (through direct, indirect, induced and catalytic impacts).
- Aviation's global economic impact (direct, indirect, induced and catalytic) is estimated at US$ 2,960 billion, equivalent to 8% of world Gross Domestic Product (GDP).
- The world's 900 airlines have a total fleet of nearly 22,000 aircraft[1]. They serve some 1,670 airports[2] through a route network of several million kilometres managed by around 160 air navigation service providers[3].
- 25% of all companies' sales are dependent on air transport. 70% of businesses report that serving a bigger market is a key benefit of using air services.

Air transport is a major employer

The air transport industry generates a total of **29 million jobs globally.**

5.0 million direct jobs
- The airline and airport industry directly employ 4.3 million people globally.
- The civil aerospace sector (manufacture of aircraft systems, frames and engines, etc.) employs 730,000 people.

5.8 million indirect jobs through purchases of goods and services from companies in its supply chain.

2.7 million induced jobs through spending by industry employees.

15.5 million direct and indirect jobs through air transport's catalytic impact on tourism. Some 6.7 million direct tourism jobs are supported by the spending of international visitors arriving by air.

As a capital-intensive business, productivity per worker in the air transport industry is very high, at three and a half times the average for other sectors.

Air transport is a highly efficient user of resources and infrastructure

- Aviation boasts high occupancy rates of 65 to 70% – which is more than double those of road and rail transportation.
- Air transport entirely covers its infrastructure costs. Unlike road and rail, it is a net contributor to national treasuries[4] through taxation.
- Modern aircraft achieve fuel efficiencies of 3.5 litres per 100 passenger-km or 67 passenger-miles per US gallon. The next generation aircraft (A380 & B787) are targeting an efficiency of less than 3 litres per 100 passenger-km or 78 passenger-miles per US gallon[5], which exceeds the efficiency of any modern compact car on the market.

Aviation provides the only worldwide transportation network, which makes it essential for global business and tourism. It plays a vital role in facilitating economic growth, particularly in developing countries.

1 ICAO Annual Report of the Council, 2004
2 Airports Council International (ACI) figure, 2005
3 CANSO estimation, 2005
4 Mott MacDonald, 2005
5 Airbus and Boeing data

† The figure of 2 billion passengers is based on counting passengers per flight (method used by the majority of the air transport industry). This corresponds to ACI's 3.9 billion passenger figure, since airports count their passengers twice according to both passenger departure and arrival.

Air transport may provide the only transportation means in remote areas, thus promoting social inclusion.

Air transport provides significant social benefits

- Air transport improves quality of life by broadening people's leisure and cultural experiences. It provides a wide choice of holiday destinations around the world and an affordable means to visit distant friends and relatives.
- Air transport helps to improve living standards and alleviate poverty, for instance, through tourism.
- Air transport may provide the only transportation means in remote areas, thus promoting social inclusion.
- Air transport contributes to sustainable development. By facilitating tourism and trade, it generates economic growth, provides jobs, increases revenues from taxes, and fosters the conservation of protected areas.
- The air transport network facilitates the delivery of emergency and humanitarian aid relief anywhere on earth, and ensures the swift delivery of medical supplies and organs for transplantation.



Air transport is responsibly reducing its environmental impact

- Aircraft entering today's fleets are 20 decibels (dB) quieter than comparable aircraft 40 years ago. This corresponds to a reduction in noise annoyance of 75%.
- A further 50% reduction in noise during take-off and landing (minus 10dB) is expected by 2020[6].
- Aircraft entering today's fleets are 70% more fuel-efficient than they were 40 years ago. Carbon monoxide emissions have been simultaneously reduced by 50%, while unburned hydrocarbon and smoke have been cut by 90%.
- Research programmes aim to achieve a further 50% fuel saving and an 80% reduction in oxides of nitrogen by 2020[7].
- Enhancements in air traffic management have the potential to reduce fuel burn by 6-12%, while operational improvements can bring an additional 2-6% fuel saving[8].

[6] ACARE and NASA goals
[7] ACARE and NASA goals
[8] IPCC Special Report on Aviation, 1999

The air transport industry

Air transport is one of the world's most important industries. Its development and its technical and service achievements make it one of the greatest contributors to the advancement of modern society.

Since the first jet airliner flew in 1949, use of commercial aviation has grown more than seventy-fold. This growth is unmatched by any other major form of transport and is essential to economic progress.

Demand for air services increases the influence of air transport on the global economy, making possible the rapid movement of millions of people and billions of dollars' worth of goods to markets around the world.

The industry plays a decisive role in the work and leisure of millions of people. It promotes an improved quality of life and helps to improve living standards.

By facilitating tourism, air transport also helps generate economic growth and alleviate poverty – providing employment opportunities, increasing revenues from taxes and fostering the conservation of protected areas.

Air transport – what it comprises

The air transport industry includes those activities that are directly dependent on transporting people and goods by air. This includes:

- the **aviation sector** – airports, airlines, general aviation, air navigation service providers and those activities directly serving passengers or providing airfreight services; and
- the **civil aerospace sector**, which comprises the manufacture and maintenance of aircraft systems, frames and engines.

Together, these two sectors provide a measure of the total industry, which we have termed the **air transport industry**.

Drivers of growth

The demand for air transport has increased steadily over the years. Passenger numbers have grown by 45% over the last decade and have more than doubled since the mid-1980s. Freight traffic has increased even more rapidly, by over 80% on a tonne-kilometre performed basis over the last decade and almost three-fold since the mid-1980s. In 2004, the air transport industry carried 1,890 million scheduled passengers and 38 million tonnes of freight[9].

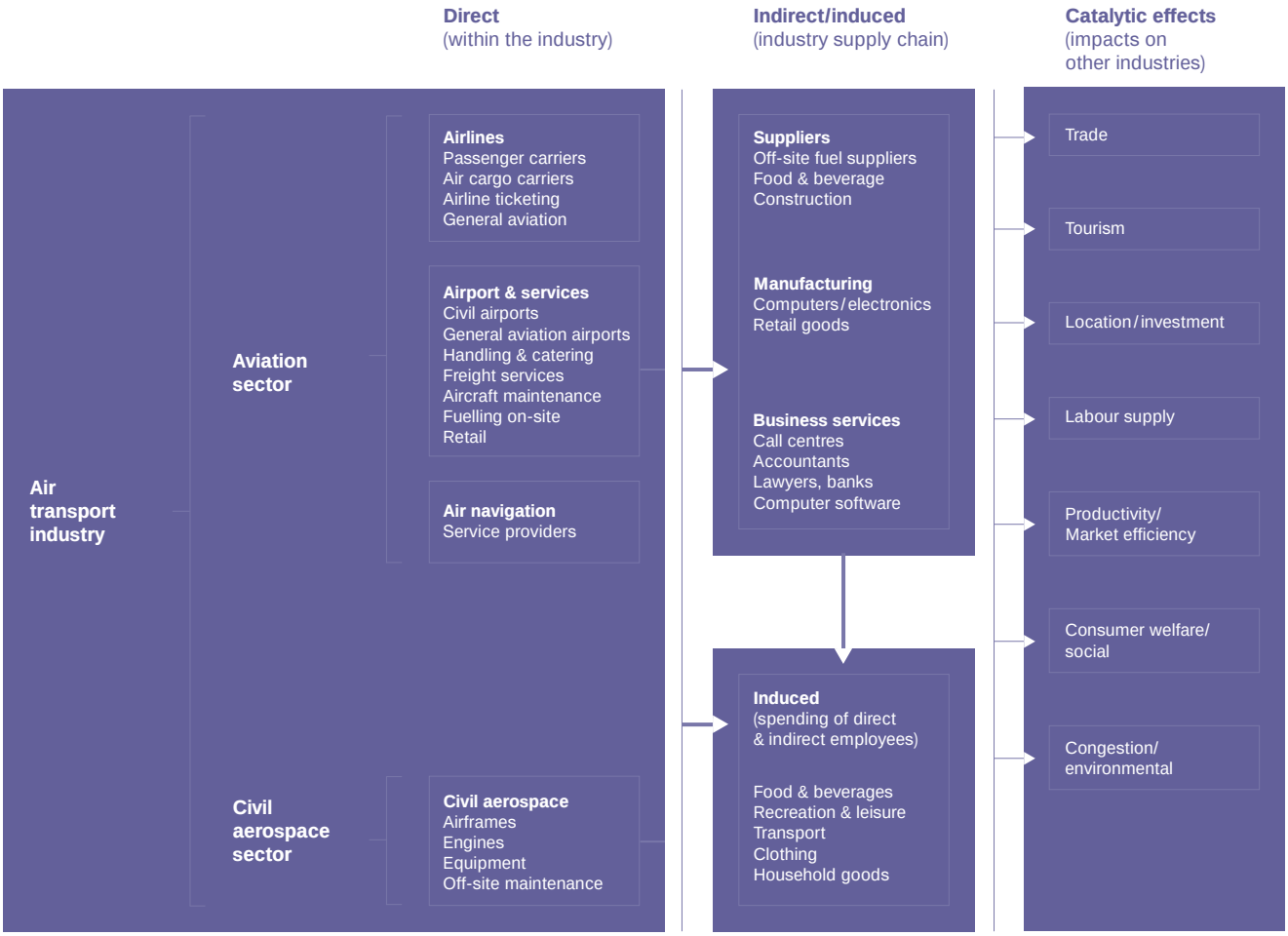
Its rapid growth has been driven by a number of factors, including:

- **Rising GDP, disposable income, and living standards** – increasing the demand for travel for both business and leisure purposes.
- **Reduced air travel costs** – improvements in airline efficiency and increased competition have reduced world airfares by around 40% in real (i.e. inflation-adjusted) terms since the mid-1970s[10].
- **Globalisation** – the average distance travelled tends to increase as people take long-haul holidays and do business in countries which now have more favourable political and social environments.
- **Deregulation** – starting with the US domestic air market in the late 1970s, followed in the 1980s by the European Union (effectively completed in the late 1990s), with other regions deregulating gradually.

The world's 900 airlines have a total fleet of nearly 22,000 aircraft. They serve some 1,670 airports through a route network of several million kilometres managed by around 160 air navigation service providers.

[9] ICAO Annual Report of the Council, 2004
[10] World Air Cargo Forecast 2004/2005, Boeing (2004); The Economic Benefits of Air Transport, ATAG (2000)

The air transport industry and its economic impacts



Source: OEF, 2005

Air transport is one of the world's most important industries. Its development and its technical and service achievements make it one of the greatest contributors to the advancement of modern society.

The economic benefits of air transport

Air transport generates employment and wealth

Air transport generates a total of 13.5 million jobs (direct, indirect and induced). Of these, 5 million are direct jobs.

The air transport industry has a substantial economic impact, both through its own activities and as an enabler of other industries. Its contribution includes direct, indirect and induced impacts, which are related to the total revenues of the air transport industry. The catalytic impacts of the industry are "spin-off" effects on other industries (outlined on page 9.)

Direct impacts

These cover employment and activity within the air transport industry including airline and airport operations, aircraft maintenance, air traffic control and regulation, and activities directly serving air passengers, such as check-in, baggage-handling, on-site retail and catering facilities. Not all of these activities necessarily take place at an airport, with some taking place at head office. Direct impacts also include the activities of the aerospace manufacturers selling aircraft and components to airlines and related businesses.

Of the **5 million direct jobs** generated by the air transport industry worldwide, 4.3 million people are employed by the airlines and airports (aviation sector) globally, contributing around US$ 275 billion of GDP to the global economy. This is as large a world industry as the pharmaceuticals sector.

The breakdown of the 5 million direct jobs is as follows:

- The civil aerospace sector (manufacture of aircraft systems, frames and engines, etc.) employed 730,000 (14% of total direct jobs) people in 2004.
- An estimated 2.1 million people (or 41%) work for airlines or handling agents (e.g. as flight crew, check-in staff, maintenance crew, etc.).
- Around 330,000 people (7%) work directly for airport operators (e.g. in airport management, maintenance, security, etc.).
- A further 1.9 million (38%) work on-site at airports in retail outlets, restaurants, hotels, etc.

Indirect impacts

These include employment and activities of suppliers to the air transport industry, for example, jobs linked to aviation fuel suppliers; construction companies that build additional facilities; the manufacture of goods sold in airport retail outlets, and a wide variety of activities in the business services sector (call centres, IT, accountancy, etc.).

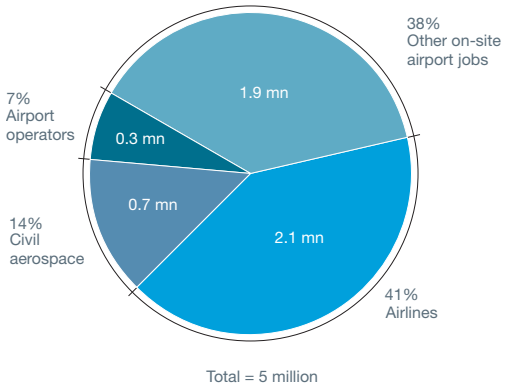
5.8 million indirect jobs are supported through purchases of goods and services by companies in the air transport industry. Examples include jobs in the energy sector generated through the purchase of aircraft fuel; employment in the IT sector providing computer systems for the air transport industry; or the workers required to manufacture retail goods. The contribution of these indirect jobs to global GDP is US$ 375 billion.

Induced impacts

These include spending by those directly or indirectly employed in the air transport sector that supports jobs in industries such as retail outlets, companies producing consumer goods and a range of service industries (e.g. banks, restaurants, etc.).

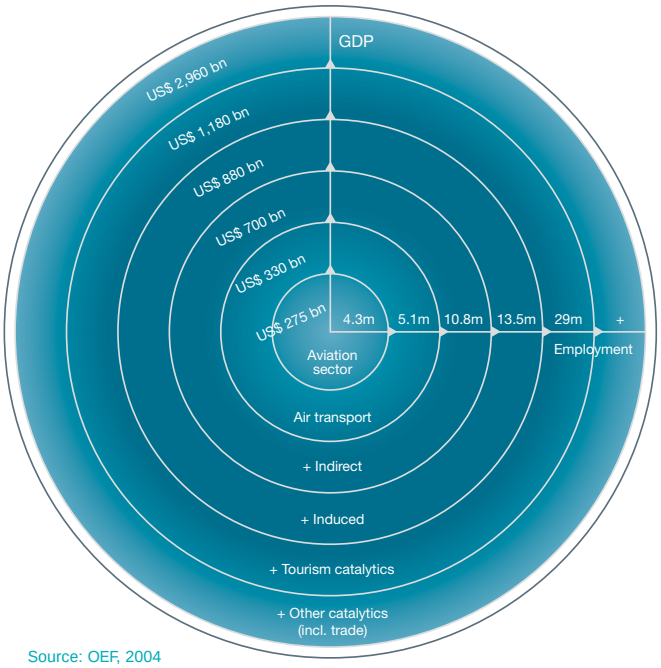
2.7 million induced jobs are supported through employees in the air transport industry (whether direct or indirect) using their income to purchase goods and services for their own consumption. This includes jobs in retail and a range of service industries. The induced contribution to global GDP is US$ 175 billion (2004 estimation).

Direct employment by sector
in the air transport industry, 2004



Source: OEF, 2004

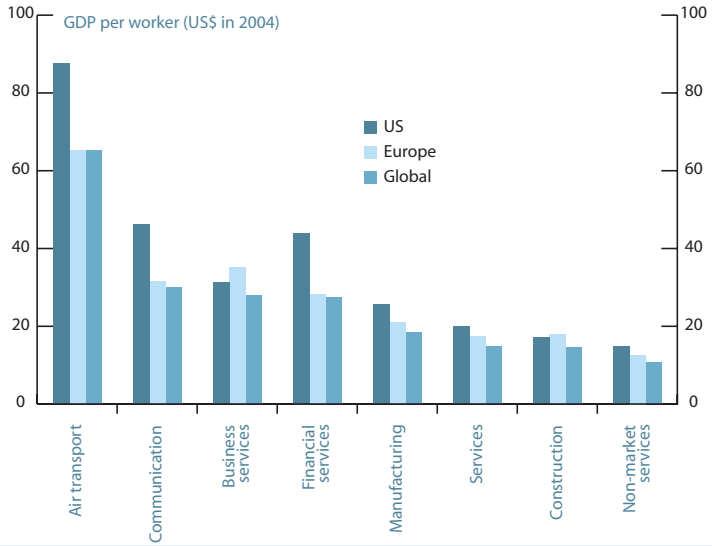
Global economic impact – employment and GDP, 2004



Source: OEF, 2004

GDP in billions of US$

GDP per worker by sector, 2004



Source: OEF, 2004

The air transport industry contributes around US$ 880 billion a year to world GDP, taking into account direct, indirect and induced impacts – equivalent to 2.4% of global GDP. Its direct impact on GDP is US$ 330 billion.

GDP per air transport worker

The air transport industry is one of the most efficient sectors measured in terms of GDP per worker. At US$ 65,000 per worker per year, this is around three and a half times the average across the world economy as a whole and exceeds most other sectors of the economy. This means that air transport employees individually make a greater contribution to the global economy.

There are several reasons for this:

- The industry is highly capital-intensive.
- The air transport industry is typically concentrated in more developed economies, where it makes a greater than average contribution to the global economy simply because GDP per worker is generally higher.
- Air transport employees are highly skilled, trained and experienced – and the industry carries out intensive research and development.

As a capital-intensive business, productivity per worker is very high – indeed it is three and a half times the average in other sectors.

The economic benefits of air transport

Air transport generates employment and wealth

Air transport's regional economic benefits

Employment: Most air transport employment is in the developed regions of the world. Some 1.8 million people are directly employed in North America, 1.5 million in Europe and 1.2 million in Asia-Pacific.

However, the air transport industry also makes a substantial direct contribution to developing and transition economies. For example, air transport supports 170,000 jobs in Africa, 165,000 jobs in the Middle East and 210,000 jobs in Latin America (see Regional Annexes from page 23).

GDP: The air transport industry in Europe and North America make the greatest contribution to GDP when comparing all regions. North America accounted for 37% of global employment in the aviation industry in 2004, but accounted for over 50% of the contribution of air transport to global GDP. Europe accounts for around 27% of global air transport employment and GDP (see Regional Annexes from page 23).

Regional employment and GDP impacts, 2004

	Africa	Asia-Pacific	Europe	Latin America	Middle East	North America
Jobs (in millions)						
Direct/indirect/induced	0.5	3.2	4.1	0.6	0.5	4.6
Catalytic	2.6	6.6	3.4	1.6	0.5	0.8
Total	3.1	9.8	7.5	2.2	1.0	5.4
GDP (in billions)						
Direct/indirect/induced	11.3	148.4	273.6	20.6	16.1	409.6
Catalytic	44.2	540.1	768.1	101.4	46.0	583.2
Total	55.5	688.5	1041.7	122.0	62.1	992.8

Source: OEF, 2004

The economic impact of the Houston Airport System

The Houston Airport System provides passenger, cargo and general aviation services via three airports (George Bush Intercontinental Airport, William P. Hobby Airport and Ellington Field). It is the sixth largest airport system in the world, handling 42 million passengers and 740 million pounds of freight in 2003. An economic impact study[11] undertaken in 2003 found:

- The total economic impact in terms of sales is US$ 24.2 billion, supporting 151,000 jobs in the local economy. This economic impact is expected to double as passenger numbers are forecast to increase to 80 million passengers in 2020.
- Around one-third of sales (US$ 8.9 billion) was attributable to on-site airport activity, around 8% (US$ 2.0 billion) to spending in travel and tourism industries by visitors to Houston, and over 50% (US$ 13.3 billion) to the multiplier impacts from the spending of both wages and sales in the local economy.
- The corresponding number of jobs supported in each of these areas was 37,000 people in on-site activities, 26,000 jobs from visitor spending and 88,000 jobs from induced/supplier multiplier impacts.
- The largest amount of sales (US$ 19.4 billion) originated from George Bush Intercontinental Airport, which supported the employment of 118,000, followed by US$ 4.5 billion at Hobby Airport, supporting 29,000 jobs and US$ 328 million at Ellington Field supporting 3,600 jobs.

One of the key benefits of the Houston Airports System is the way it operates as a network. George Bush Intercontinental acts as the main international hub, Hobby focuses on regional and low-cost airlines and Ellington Field is geared towards general aviation. Each airport, therefore, has its own specialised role, meaning that economies of scale can be better exploited and overall efficiency improved.

[11] Economic Impact Study Houston Airport System, City of Houston by the Campbell-Hill Aviation Group and Dr. Steven G. Craig, University of Houston (2003 and 1998)

The economic benefits of air transport

Air transport generates wider catalytic (spin-off) benefits

The air transport industry's most important economic contribution is through its impact on the performance of other industries and as a facilitator of their growth. It affects the performance of the world economy, improving the efficiency of other industries across the whole spectrum of economic activity – referred to as catalytic or "spin-off" benefits.

- **Air transport facilitates world trade:** air transport helps countries participate in the global market by increasing access to main markets and allowing globalisation of production. Air transport also encourages countries to specialise in activities in which they have a comparative advantage, and to trade with countries producing other goods and services. See page 14.
- **Air transport is indispensable for tourism,** particularly for remote and island destinations. Tourism directly supports jobs in airlines and airports, and spending of visitors arriving by air creates a substantial number of jobs in the tourism industry. See page 17.
- **Air transport boosts productivity across the global economy:** improved transport links expand the market in which companies operate. As a result, companies are better able to exploit economies of scale thereby reducing costs, and to specialise in areas of comparative advantage. By opening up markets, air services expose companies to stiffer competition, encouraging them to become more efficient.
- **Air transport improves the efficiency of the supply chain,** for example, many industries use air transport to shorten delivery times as part of their just-in-time delivery systems, enabling them to deliver products to clients quickly and reliably and to reduce costs.
- **Air transport is an enabler of investment both into and out of countries and regions:** viable air transport links are one of the key considerations that influence where international companies choose to invest.
- **Air transport can act as a spur to innovation** by encouraging effective networking and collaboration between companies located in different parts of the globe. A good transport infrastructure can also encourage greater spending on research and development by companies – for example, increasing the size of potential markets allows the fixed costs of innovation to be spread over larger sales.
- **Air transport provides consumer welfare benefits to individuals** in terms of the increased availability of travel connections, and for local airport communities. These must be taken into account when considering environmental impacts on, for example, air quality, noise and congestion in the vicinity of airports.

There is a clear distinction between these 'catalytic' impacts and the direct, indirect and induced economic impacts of air transport. In simple terms, the economic value of the direct, indirect and induced effects is related to the total revenues of the air transport industry, whereas the catalytic impacts are "spin-off"' effects on other industries.

The economic catalytic impacts generated by air transport are greater than the combined direct/indirect/induced impacts.

The economic benefits of air transport

Air transport generates wider catalytic (spin-off) benefits

70% of businesses say that a key benefit of using air services is the ability to serve a bigger market.

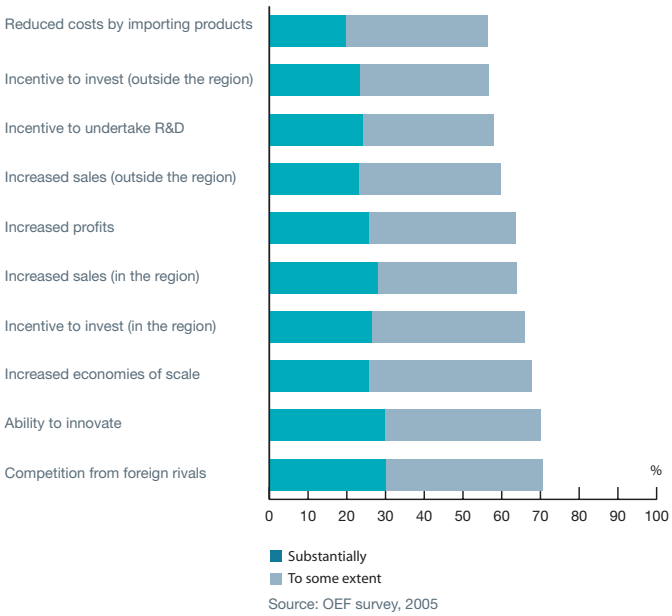
Air transport's ability to serve larger markets

Air transport enables easier and cheaper trade with distant markets and marketing of goods and services on a global basis. A survey of companies in Chile, China, the Czech Republic, France and the US[12] found that 70% of businesses reported the ability to serve a bigger market as a key benefit.

Implications included:

- **Increased competition:** a significant benefit for consumers which can force companies to be more efficient, drive down prices and even improve the quality of goods as companies seek to maintain their global market position.
- **Innovation spur:** 30% of businesses reported a substantial impact on their ability to innovate through the potential to serve a bigger market and 70% reported some impact.
- **Increased sales:** air services enable global marketing of goods and services, providing a competitive transportation medium, especially for time-sensitive products and trade with distant markets. Over 80% of businesses reported that air services are sometimes important for their impact on sales, with almost 60% considering them either vital or very important. Companies reported that on average, 25% of all sales are dependent on air services.
- **Better exploitation of economies of scale:** around 25% of businesses report that air transport services have a substantial impact on their ability to exploit economies of scale, and over 40% report an impact to some extent.

Implications of serving a bigger market



Source: OEF survey, 2005

Express carrier industry[13]

The express industry simplifies and speeds up the process of transporting goods. It enables small companies, which almost by definition include many suppliers in developing countries, to utilise high quality, rapid delivery services that they could not provide themselves. This is particularly important in facilitating participation in export markets.

The express industry is one of the world's fastest-growing sectors, expanding at double the rate of the global economy especially in transition and emerging market economies.

- The direct contribution of the global express industry to world GDP was US$ 64 billion in 2003 – double that of the electrical appliances industry and almost 50% larger than the shipbuilding industry.
- The express industry supports 1.25 million jobs, more than the petroleum refinery industry, and helps to support at least 2.65 million jobs in total (including those employed in companies supplying the express operators and jobs dependent on the spending of express industry workers).

The most important impacts of the express industry, however, are on the operations of companies in other sectors – for example, by enabling companies to source spare parts rapidly to avoid production shutdowns and by allowing the implementation of techniques such as build-to-order.

[12] Survey conducted on behalf of IATA: Measuring Airline Network Benefits, OEF (2005)
[13] See 'The Impact of the Express Delivery Industry on the Global Economy', OEF (March 2005) for a more detailed discussion of the express carrier industry.

Air transport enables companies to service and meet clients, and promotes the efficient organisation of production.

Air transport's impact on business operations

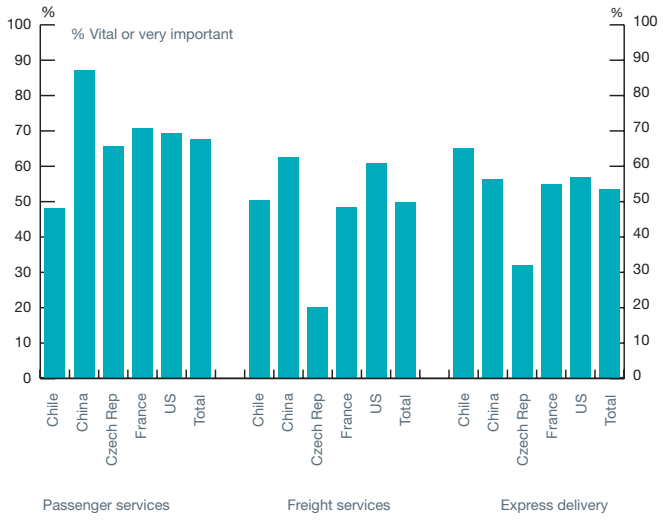
Air transport enables companies to service and meet clients, and promotes the efficient organisation of production.

- **Servicing and meeting customers:** air services allow better contact and more effective communication between buyers and sellers, which contributes to companies making new sales and to meeting the needs of their existing customers.
- **Production efficiency:** some 50% of businesses rely on air services for production efficiency. Passenger services enable managers to visit overseas sites and other sub-sections of their business in other countries, enable a choice of the best suppliers from a range of competitors, facilitate the spread of new production techniques and make it easier for companies to attract high quality employees.

The global supply chain is becoming increasingly dependent on the rapid and reliable movement of high-value low-weight goods such as computer parts. Air transportation facilitates such movements by:

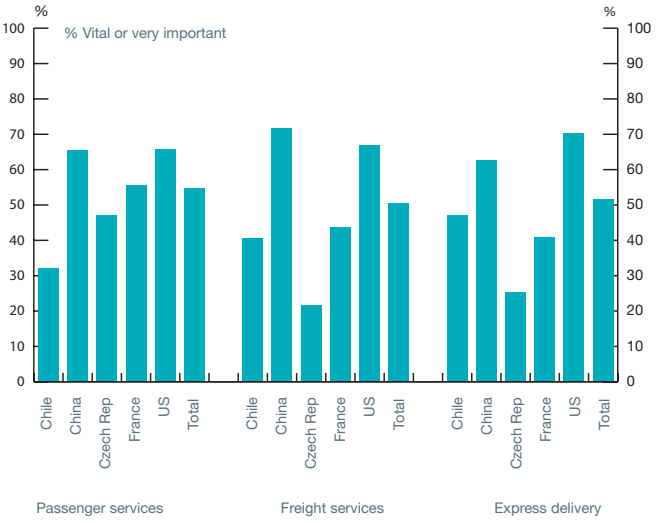
- **providing fast and reliable delivery of high-value products:** especially relevant to modern-dynamic industries, such as the pharmaceutical/ biotechnology and telecommunication equipment sectors;
- **increasing the range of product markets:** the development of e-business helps companies identify low-cost suppliers and air transport helps connect buyers and suppliers;
- **improving companies' handling of returns and complaints:** for example, allowing a quick turnaround of repairs or delivery of replacement parts;
- **facilitating the development of e-commerce:** enabling, for example, companies to transport online shopping orders quickly and reliably between countries, allowing products to be stored in large warehouses reducing retail and distribution costs;
- **facilitating improved stock-management and production techniques:** reducing companies' storage costs, losses due to stock-outages and disruption caused by failure of machinery on production lines; and
- **facilitating the development of the express carrier industry:** which provides guaranteed, rapid, door-to-door delivery services and increasingly offers logistics support for companies.

Importance of air services for servicing/meeting with customers



Source: OEF survey, 2005

Importance of air services on efficiency of production



Source: OEF survey, 2005

The economic benefits of air transport

Air transport generates wider catalytic (spin-off) benefits

On average, 25% of companies' sales are dependent on air services.

Air transport's influence on investment

Good air transport links influence where companies choose to invest. According to a survey[14], 56% of companies consider international transport links to be an essential factor for locating businesses in Europe.

Another survey[15] found that 18% of businesses' past investment decisions were directly affected by the absence of good air transport links, especially in high-tech sectors. Around 28% of companies believe that innovation and investment in research and development would be very badly or fairly badly affected if air transport services were constrained.

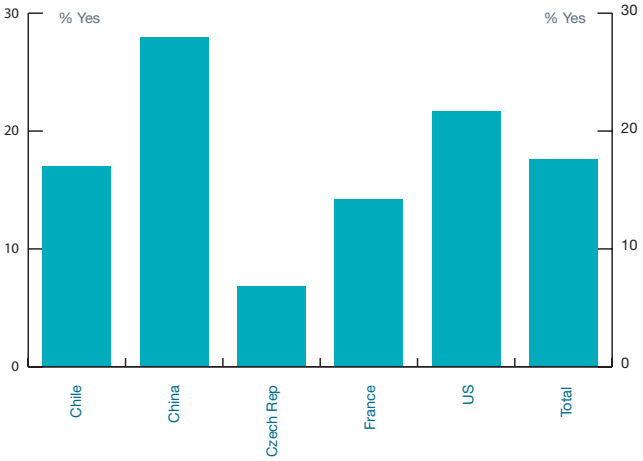
Changi International Airport, – an attractive location

Singapore Changi International Airport is one of the world's leading airports, in terms of throughput and quality of service to both airlines and customers. It handled 30.4 million passengers[16] in 2004. It is also a key part of the global airline network with 40% of passengers transferring to another airline and a further 10-15% making a temporary stop-over. Changi also handles a large volume of cargo with 1.7 million tonnes carried in 2004 – an increase of 10% on the previous year.

The airport is one of Singapore's primary economic assets and has a significant influence on the economy. A 1999 study[17] on the economic impact of Changi Airport found:

- S$13.3 billion of GDP was generated by Changi Airport from the combined direct and indirect impacts, equating to 9.2% of total Singapore GDP.
- On-site employment comprised 14,000 airline employees and a further 30,000 workers in ground support, aircraft parts, concessionaries, air cargo agents, CAAS, etc. The high ratio of airline jobs to airport employment at 2:1 mainly reflects Changi's role as a major international hub airport.
- A further 36,000 jobs were supported in sectors providing services to air passengers outside the airport, such as travel agents and accommodation for crew.
- The indirect employment in the supply chain, as a result of the purchase of goods and services by businesses at Changi Airport, supported a further 33,600 workers.

Has the absence of good air transport links ever affected your organisation's investment?



Source: OEF survey, 2005

Air transport facilitates improved investment and productivity.

[14] Healey and Baker, 2003
[15] Survey conducted on behalf of IATA: Measuring Airline Network Benefits, OEF, 2005
[16] Passenger Traffic 2004 Preliminary, ACI
[17] Economic impact of Singapore Changi Airport, National University of Singapore, 2001

The impact of Changi, however, goes far beyond employment and GDP. The airport is increasingly becoming a key attractor of domestic and foreign companies. Large numbers of airport-linked businesses have clustered in a wide geographical area around the airport. These businesses include logistics companies wishing to benefit from close proximity to the airport, plus a range of other industries. Businesses benefit not only from airport accessibility but also from economic benefits such as knowledge spillovers from other firms, access to specialist labour and a reduction in search costs that proximity to suppliers and customers brings.

Combining these off-site impacts with those provided on-site – the numerous retail, entertainment, food and beverage outlets, business centres and transit hotels – means that Changi has become a major employment and economic centre in its own right.

Air transport's impact on the labour market

Air transport improves the labour market by making it easier for companies to attract high quality employees from around the globe. This is important for senior staff and professionals for whom access to good international links influences their decision on where to live and work – as confirmed by 43% of companies in a 2005 survey[18].

Similarly, high quality employees may find it easier to commute by air on a weekly basis or to be based in two locations (i.e. headquarters and a regional location). Overall, improved access to a wider pool of appropriately skilled labour will improve productivity leading ultimately to higher employment in the local economy.

Value of air transport's wider catalytic impacts

Recent research by Oxford Economic Forecasting (OEF) provides direct evidence of the value of the wider spin-off effect of air transport on investment and productivity throughout the economy. The analysis is based on ten years of data from 25 European Union countries. It shows that the wider supply-side impact of the expansion of air services over the past decade has contributed an additional 4% to European GDP. The same scale of impact at the global level would imply that the contribution to world GDP was around US$ 1,550 billion in 2004.These supply-side catalytic effects are additional to those arising from trade and tourism.

The same statistical research shows that the expansion of trade by air services over the past decade has contributed an additional 0.6% to European GDP. This translated into an impact at the global level of around US$ 230 billion in 2004. Adding together the trade catalytic impact with the above supply-side catalytic effects provides a total catalytic impact (excluding tourism) of around US$ 1,780 billion.

Air transport improves the labour market by making it easier for companies to attract high quality employees from around the globe.

[18] Survey conducted on behalf of IATA: Measuring Airline Network Benefits, OEF, 2005

The economic benefits of air transport

Air transport contributes to world trade

Air transport plays a major role in the development of a globalised economy. Some US$ 1,750 billion of goods were transported internationally by air in 2004.

One of air transport's most important economic benefits is its spin-off effect on international trade – which plays a key role in promoting economic growth in countries in different stages of development.

Air transport is an important trade facilitator. It increases the global reach of companies, enables them to get products to market more quickly and allows them to be more responsive to customer needs, thereby contributing to improved living standards.

The value of international trade

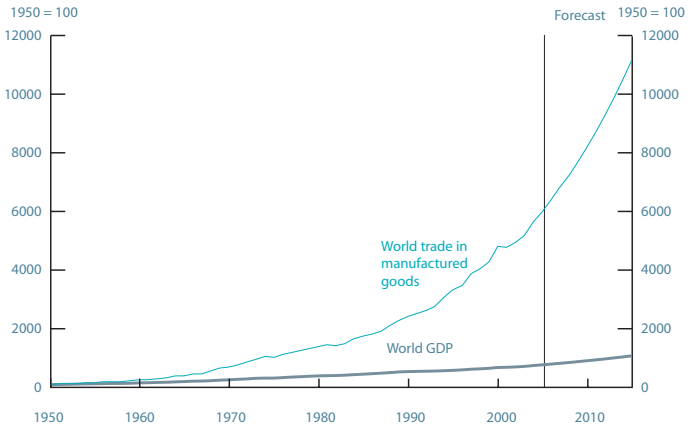
Trade performance is determined by economic growth and prosperity. Over the last 40 years, countries that have grown the fastest have been those with the fastest growth in international trade.

The surge in international trade has been driven by:

- **Reductions in barriers to international trade:** most notably, the creation of free trade blocs such as the European Single Market, North American Free Trade Agreement (NAFTA) and Mercosur, and the widening influence of the World Trade Organization (WTO). In addition, many bilateral trade barriers have also been removed.
- **Increased specialisation:** countries have specialised in activities where they have a comparative advantage, and trade with countries specialising in other goods and services.
- **Globalisation:** more companies have established international operations and foreign subsidiaries, leading to the homogenisation of domestic markets, more global brands and greater import penetration.
- **Technological advances:** improved communication systems have enabled companies to market their products globally and liaise with customers and suppliers around the world.
- **Political developments:** more favourable political circumstances have increased the number of potential trading partners to include former communist countries – a number of which are now members of the EU – and some remaining communist economies, such as China and Vietnam.

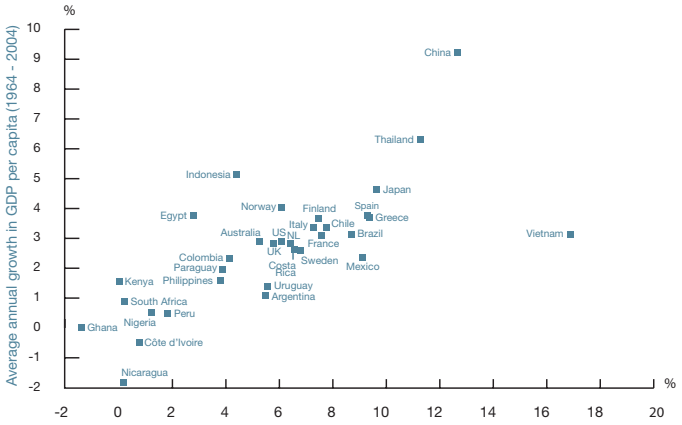
Forecasts suggest that the global economy will become even more dependent on trade over the next decade. World trade is expected to nearly double, rising at more than twice the rate of global GDP growth, with emerging markets leading the way.

World trade and GDP



Source: WTO/OEF

Economic growth and trade



Source: WDI, OEF calculations

40% of the value of inter-regional manufacturing exports is transported by air.

Airfreight's role in international trade

Most air cargo consists of manufactured products or products that will be used in a manufacturing process. The bulk of growth in world trade has come about further to the increased trade of manufactured goods.

40% of the value of inter-regional trade[19] in manufactured goods is transported by air. Larger amounts of traded goods within regions are transported by other modes, including road and rail-based transport. If intra-regional trade is included, then around 25% of the total value of international trade in manufactured goods is transported by air, which corresponded to a value of approximately US$ 1,750 billion in 2004.

The air transport industry has also contributed to trade in same-day and next-day delivery services and to the transportation of urgent or time-sensitive goods, such as post and packages, foreign newspapers and perishable goods, such as fresh fruit, vegetables and flowers – benefiting many developing nations.

Air transport and trade: a catalyst for economic development

Air transport contributes to improved living standards for many developing nations by expanding opportunities to join the global economy. Air cargo is important for getting supplies to landlocked and developing island countries, and for countries whose main exports are high value goods or perishables. For example:

- In Kenya, exports by air of agricultural products (e.g. fresh vegetables and cut flowers), largely to Europe, already constitute one of the country's largest industries and the second biggest earner of foreign exchange.
- Ghana's World Bank-sponsored Trade and Investment Gateway Project aims to attract export-orientated investors and to place the country as a hub in West Africa for trade and passenger flows through measures such as creating free-trade zones with labour-intensive export industries, deregulation of the air transport industry and investments in Kotoka International Airport.
- Fresh and dried fruits and fish are important export commodities for many Caribbean economies.
- Colombia is the largest exporter to North America of cut flowers, with vegetables and clothing also being important air exports. An estimated 16% of the value of merchandise exports from Colombia is by air.

Passenger air services' role in international trade

Passenger air services are vital for creating trading opportunities: they enable companies to market their business globally and to meet their clients face-to-face. By allowing better personal contact and more effective communication between buyers and sellers, air services contribute both to companies making new sales and to meeting the needs of their existing customers.

The importance of passenger air services to companies

A survey of companies in Chile, China, the Czech Republic, France and the US[20] focusing on the importance of air services for their operations found that more than 65% of businesses consider passenger air services as vital or very important for servicing or meeting customers. Chinese firms place the greatest reliance on passenger air services for servicing or meeting clients, with nearly 90% of businesses reporting that they are vital or very important. Overall, 85% of businesses report that passenger air services are at least sometimes important for their sales, with 70% considering them to be either vital or very important. This dependency on air services means that companies have incentives to locate their operations in the vicinity of major airports.

[19] Intra-Asia Pacific trade is included in this definition due to the geographically disparate nature of the countries in the region. A technical note is available from OEF setting out the basis of this calculation.
[20] Survey conducted on behalf of IATA: Measuring Airline Network Benefits, OEF, 2005

The economic benefits of air transport

Air transport contributes to world trade

Growing world trade in services depends on air transport to facilitate meetings and the individual attention often required to tailor financial and business services.

According to a survey of financial and business service companies[21]:

- almost 70% of firms consider air services to be critical for business travel;
- 50% of respondents consider air services to be critical for travel by their clients to meet with them; and
- while new technology, such as video-conferencing, can be useful, companies in the financial and business services sector still consider flying for face-to-face meetings to be essential for winning new business and developing clients' relationships.

Schiphol Airport: essential for trade[22]

Trade has for many centuries been important to the development of the Dutch economy. The Netherlands has developed into Europe's key entrepôt, providing a gateway for international trade between Europe and the rest of the world. The development of the Netherlands' modern transport network has been centred on Amsterdam's Schiphol Airport. A specific goal of the Dutch government is to establish Amsterdam as Europe's most efficient transport hub by 2015. To achieve this, the Netherlands has introduced liberal policies for aviation, foreign investment and trade, as well as developing Schiphol Airport as a complete business environment and a leading European 'Mainport', which is crucial to the future growth prospects of the Randstad region in Holland.

- Schiphol is Europe's 3rd largest cargo airport (accounting for around 10% of the European air cargo market) and 4th largest passenger airport. In 2004, the total volume of cargo amounted to 1.4 million tonnes, an increase of 8.5% on 2003, while the number of passengers went up by 6.5% to over 42.5 million. Over 20 airlines that carry cargo operate from Schiphol and overall there are 237 direct connections in 87 countries.
- The Dutch government estimates that Schiphol accounts for nearly 2% of GDP, with this figure expected to rise to 2.8% in 2015. The Mainport generates between 80,000 and 120,000 jobs, with almost 60,000 direct jobs. If employment in all companies in the Schiphol Mainport region is taken into account, this corresponds to approximately 12.5% of total Dutch employment. Employment growth in the region was almost 7% during the 1990s, which was three times the national average.
- There are more than 1,800 foreign companies located in Amsterdam, including 250 European regional headquarters, and over 1,100 firms are located within the Amsterdam Airport area.
- Over 50% of all American and Asian companies' European logistics centres are located in the Netherlands. Moreover, the Economist Intelligence Unit rates the Netherlands as the number one business location in Europe for the period 2004-2008.
- The percentage of businesses in different sectors dependent on the airport are 88% in the transport and distribution sector, 72% in large international operations, 75% in leisure hotels, 46% in business and financial services, and 42% in the technology sector[23].

[21] Survey carried out in the Central London Business District, Aviation Services for the City of London, OEF, 2002
[22] See 'Air Cargo: Engine of Economic Development', Kasarda, J.D, Green, J. and Sullivan, D (2004) for a more detailed discussion.
[23] Survey of businesses around Schiphol Airport undertaken by VNO-NCW

The economic benefits of air transport

Air transport stimulates tourism

The tourism industry worldwide directly employs 72 million people, accounting for 3.8% of world GDP[24] (direct impact).

One of air transport's most important economic benefits is its spin-off effect on other industries. Tourism is one such industry. It is also inextricably linked with air transport: tourism depends on transportation to bring visitors, while the transport industry depends on tourism to generate demand for its services.

Benefits of tourism

The importance of tourism as an economic activity has increased dramatically in recent years.

- Tourism employs 72 million people worldwide.
- Global tourism expenditure is estimated to be nearly US$ 3 trillion.
- Tourism accounts directly for 3.8% of world GDP.

Moreover, tourism is expected to maintain its growth. By 2014, the World Travel & Tourism Council (WTTC) expects the tourism industry to employ more than 84 million people globally.

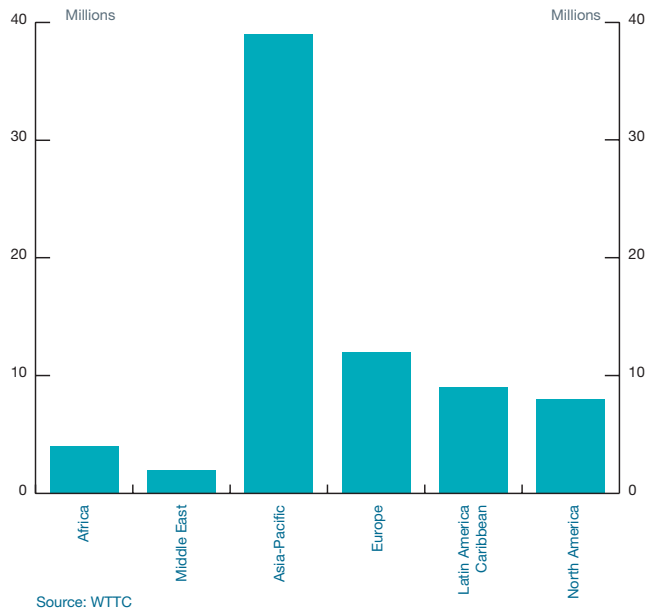
The tourism industry includes obvious sectors like hotels, restaurants and bars, and recreational activities plus other less obvious sectors, such as retailing in many heavily-visited areas. Tourism has the potential to generate strong linkages with other industries, including agriculture, fishing, construction and craft production – and it is particularly important in many developing countries, where it is a major contributor to the balance of payments, and a significant source of foreign exchange.

Contribution of tourism to the balance of payments in Costa Rica

Costa Rica is a good example of tourism's potential to generate foreign exchange and employment, as well as playing a role in conservation. Costa Rica started promoting eco-tourism at the beginning of the 1980s as a way of reversing a growing process of deforestation. Now the tourism industry is the second largest source of foreign exchange – after microchip exports – and provides the resources needed to maintain the country's national parks.

The tourism industry's rapid development is highlighted by a number of indicators. Between 1990 and 2001, international tourism spending increased five-fold, to US$ 1.3 billion (26% of total exports), while spending per arrival nearly doubled. In 2001, the number of international arrivals in the country reached 1.1 million (of which 72% arrived by air), more than 25% of the country's population. In terms of accommodation capacity, the number of hotel rooms almost doubled in less than a decade, from 8,548 in 1992 to 14,990 in 2001.

Tourism employment, 2004



Source: WTTC

[24] Tourism Satellite Accounts, WTTC, 2005

The economic benefits of air transport

Air transport stimulates tourism

Air transport is indispensable for tourism.
Around 40% of international tourists now travel by air.

Air transport's role in supporting tourism

Air transport has contributed to a huge expansion in the range of tourist destinations and thereby plays a major role in shaping the scale and diversity of tourism worldwide.

Some 40% of international tourists now travel by air, up from 35% in 1990[25], including business travellers, as well as those on leisure trips or visiting friends and relatives. At the same time, the WTTC estimates that foreign visitors account for just under 25% of overall tourism spending around the world.

The economic impact of tourism at Minneapolis airport[27]

A 2005 study explored the local and regional economic impacts of Minneapolis/St. Paul International Airport and estimates that the airport generates 28,545 direct jobs in the air transport industry. Of these, around 63% (18,000) are in airlines that use the airport. In addition, 3,000 people are employed by freight airlines/freight forwarders and around 2,300 by ground transportation companies, such as taxis and car rental firms. Retail outlets at the airport terminal support 1,200 jobs with various other sectors accounting for the remaining 4,045 jobs.

From this direct activity:

- 11,264 indirect jobs are generated as a result of expenditure by firms located at the airport, on the goods and services they buy from their suppliers; and
- 26,406 jobs are induced by the spending of those directly employed in the airport.

However, by far the biggest impact on the local economy is visitor spending. The study estimates that this supports a total of around 87,000 jobs (60,500 directly and the remainder from indirect and induced effects of tourism). The tourism impact is, therefore, over 30% greater than the employment generated by the combined direct-indirect-induced effects of air transport. Nearly 75% of these jobs are within the hotel, restaurant, retail outlets and entertainment sectors.

Employment and GDP in tourism – air transport's spin-off effect

Direct: 6.7 million direct jobs in tourism are supported by the spending of foreign visitors arriving by air, taking into account both the importance of overseas visitors for tourism spending and the importance of air travel for overseas visitors. This includes jobs in industries such as hotels, restaurants, visitor attractions, local transport, car rental, etc., but it does not include air transport industry jobs.

Indirect: A further 5.7 million indirect jobs in tourism (industries supplying the tourism industry) are supported by visitors arriving by air.

Induced: These direct and indirect tourism jobs – supported by air transport – generate a further 3.1 million jobs in other parts of the economy, through employees spending their earnings on other goods and services.

Total of air transport's spin-off effect: These direct, indirect and induced tourism jobs add up to a total of 15.5 million jobs globally that are supported by the spending of foreign visitors travelling by air, contributing an estimated US$ 300 billion a year to world GDP[26].

Spending by international visitors arriving by air directly supports 6.7 million tourism jobs.

[25] Economic Contribution of Civil Aviation, ICAO, 2004
[26] Does not include air transport's contribution to domestic tourism, which is significant in large countries – e.g. the USA.
[27] The Local and Regional Impacts of the Minneapolis/St. Paul International Airport, prepared for: The Metropolitan Airports Commission, 7 March 2005, by John C Martin Associates LLC

Air transport's spin-off effect supports 15.5 million jobs within tourism, contributing around US$ 300 billion a year to world GDP.

Regional impacts of tourism and air transport

The importance of tourism jobs supported by air transport varies according to different regions. Tourism is a particularly important source of new jobs and increased prosperity in a number of developing countries.

The WTTC simulated Tourism Satellite Accounts illustrate that spending by foreign visitors ranges from a little over 10% of overall tourism spending in North America to more than 50% in Africa. In Africa, the jobs of an estimated 675,000 people directly employed in tourism are supported by overseas visitors arriving by air, representing 20% of all tourism jobs in Africa. In contrast, the estimated 310,000 direct jobs in tourism in North America supported by overseas visitors arriving by air represent only slightly less than 4% of all direct tourism jobs.

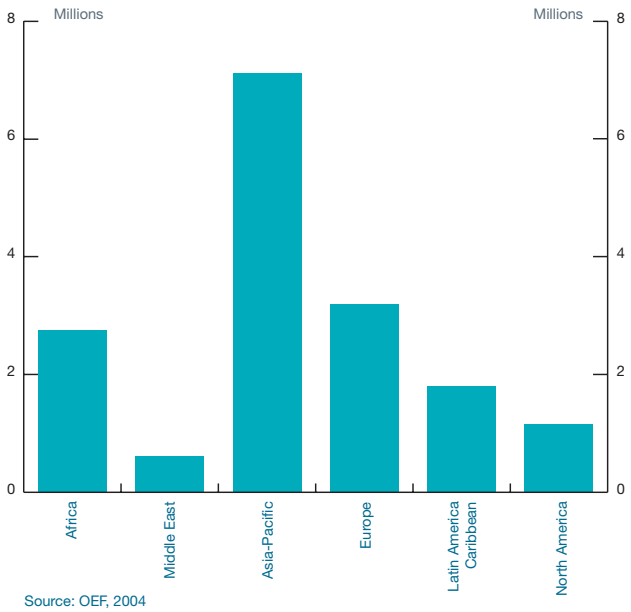
The role of tourism in Africa

In Africa, tourism has driven the expansion of the domestic economy and employment. Tourism is key to economic activity in countries such as Mauritius, Morocco, Tunisia, Egypt and Ghana.

Africa has enjoyed the fastest growth of tourist arrivals worldwide in recent years, although this partly reflects its low starting point. The recent expansion has been particularly strong in Tanzania, Ghana and Senegal – driven by an active promotion of nature-based tourism. Tourism to the African islands has also been buoyant. Not surprisingly, these countries have also been among the fastest-growing African economies.

There is also an association between tourism, investment and standards of living. The African non-oil economies with the fastest growth in investment and the highest GDP per capita tend to be those with the largest share of tourism in GDP. This is particularly the case for Tunisia, Mauritius, Morocco, and Egypt. This is evidence of a virtuous cycle where the tourism potential of a country attracts foreign and local investment, inducing and supporting economic growth and improving the living conditions of the population.

Tourism-related employment supported by air, 2004



Source: OEF, 2004

The economic benefits of air transport

Air transport is a significant tax payer

The air transport industry finances its infrastructure through user charges and also pays taxes to national treasuries.

The air transport industry finances its infrastructure through user charges and also pays taxes to national treasuries. It is, therefore, totally misleading to suggest that aviation enjoys tax privileges versus other transport modes.

Airlines pay some US$ 42 billion[28] each year to airports and air navigation service providers. This includes specific user charges, such as landing, air navigation and passenger service charges, for domestic and international traffic worldwide.

The difference between user charges and taxes

User charges defray the costs of providing facilities and services for civil aviation. Taxes are generally levied to raise general governmental revenues that are not applied directly for aviation purposes.

Levying user charges

The air transport industry covers its infrastructure costs (airport operations and air traffic management) through the payment of user charges, by airlines to airports and air navigation services providers. These charges are generally included and sometimes identified in the price of the airline ticket.

Levying taxation

The air transport industry pays substantial taxes to local, provincial and national authorities around the world via passenger duties, domestic value-added tax (VAT), customs or immigration levies, etc. In the United States, for example, taxes levied on aviation exceeded US$ 14 billion in 2004, corresponding to 25% of airfares[29].

Air transport is the only transport mode that pays both user charges and taxes

In the road and rail sectors, user charges are not applied as such except in the case of some highways that apply a toll charge to road users.

- In the road sector, governments levy taxes such as fuel taxes, which in turn balance state investments in road networks.
- In the rail sector, governments levy taxes such as VAT, eco-taxes, etc. that are included in the rail ticket price. However, total revenues collected in this way are not sufficient to fully cover the rail sector's infrastructure costs, which is why most States heavily subsidise this sector. In Europe, for example, governmental aid to the rail sector represents close to US$ 50 billion per year.

Air transport makes a net contribution to public funds in the developed world

According to a recent study[30], air transport frequently makes a net contribution to public funds. This study compares road, rail and aviation in terms of infrastructure costs versus taxes and charges per 1,000 revenue-kilometre (000 rkm):

- Germany: aviation infrastructure costs represent US$ 112 per 000 rkm, while user charges and taxes generate US$ 125, thus resulting in a net surplus of US$13 per 000 rkm. Conversely, revenues from German rail users represent US$ 41 per 000 rkm, while infrastructure costs amount to US$ 107, thus resulting in a public subsidy of US$ 66 per 000 rkm.
- United Kingdom: aviation's net contribution to public funds is around US$ 14 per 000 rkm while government subsidies for rail correspond to US$ 43.
- France: the situation is comparable with a net contribution of aviation to public funds of around US$ 83 per 000 rkm and government subsidies for rail of US$ 97.

Aviation pays for all of its infrastructure costs, and more, through taxes and user charges – making a net contribution to public funds in most developed States.

[28] IATA
[29] Air Transport Association of America (ATA)
[30] Mott Mac Donald (February 2005) 'Comparison of Taxation and Subsidy for Transport Modes around the World'

The social benefits of air transport

Air transport expands the range of consumer choices and opportunities to visit other countries and to experience new cultures.

The impact of the air transport industry is not just a result of the economic activity it generates or facilitates. Air transport also contributes to people's quality of life in a number of other ways that are not captured in standard economic indicators: for example, by contributing to sustainable development, supporting remote communities and widening consumer choice.

Air transport contributes to sustainable development

Air transport makes a major contribution to sustainable development by supporting and promoting international tourism. Tourism helps reduce poverty by generating economic growth, providing employment opportunities, increasing tax collection, and by fostering the development and conservation of protected areas and the environment.

In effect, protecting the environment attracts tourism and the development of the tourism industry, which in turn makes it possible to finance the protection of nature and cultural heritage, thereby increasing the benefits of protected areas to the country. Moreover, the promotion of nature-based tourism is an effective lobbying tool that favours nature conservation over non-sustainable agricultural activities. It can also increase the sense of ownership and responsibility for natural resources, among local communities.

Sustainable development in Africa
Air transport can make a significant contribution to sustainable development in Africa. This continent is home to nearly 15% of the total protected areas worldwide, giving Africa a valuable comparative advantage in attracting international visitors. The expansion of nature-based tourism (eco-tourism) could become a significant source of revenue and employment, whilst helping to ensure the conservation of protected areas.

Air transport provides access to remote areas

Air transport provides access to remote areas where other transport modes are limited, thus opening them up to contact with other communities, and providing a means for the delivery of essential supplies. Many essential services such as hospitals, education, post, etc. would not be available for people in such locations, without the presence of air services.

Air transport delivers humanitarian aid

Air services play an essential role in humanitarian assistance to countries facing natural disasters, famine and war – through cargo deliveries, refugee transfers or the evacuation of people trapped by natural disasters. They are particularly important in situations where access is a problem.

Natural disasters often mean that whole communities are cut off. Humanitarian assistance in such circumstances can only be delivered rapidly to those in need through the use of airports and air services. In certain circumstances when even the airports are damaged, 'air drops' are among the first response of aid agencies to stem a humanitarian crisis.

Air transport also plays a vital role in the rapid delivery of medical supplies and organs for transplantation worldwide.

Air transport contributes to consumer welfare

Travel and tourism provide substantial consumer welfare and social benefits.

- **Increasing understanding of different cultures and nationalities** which facilitates closer international integration.
- **Improving living standards by widening choice:** cheaper and more frequent access to air travel has increased the range of potential holiday destinations. Seasonal fruit and vegetables are now available year round at reasonable prices. The large number of overseas visitors has also helped widen the range of leisure and cultural activities available in many countries.

Air transport is fundamental for effective humanitarian aid-relief.

Air transport plays a vital role in the rapid delivery of medical supplies and organs for transplantation worldwide.

Conclusions

Since the beginning of time, people have dreamed of flying. This dream has become a reality for a growing number of us.

Air transport is an innovative and environmentally-responsible industry that drives economic and social progress. It has become one of the greatest contributors to the advancement of modern-day society and is the consumer's preferred mode of transportation.

This new ATAG brochure confirms air transport's enormous economic and social benefits by providing an update to reliable findings at both worldwide and regional levels. The information provided is essential in order for governments and industry to take sound decisions and responsible actions, working in close partnership.

The air transport industry has responded to the growing demand for mobility, by investing regularly in:

- new technologies;
- safety and security improvements;
- quieter and more fuel-efficient aircraft;
- infrastructure modernisation and adaptation; and
- business simplification, improved services and facilitation for its customers.

"In more than 50 years with ICAO, I have witnessed the extraordinary contribution of civil aviation to national, regional and global economies. When ICAO was created in 1944, barely 9 million passengers travelled on the world's airlines. In 2004, there were close to 1.9 billion passengers on scheduled services alone, while 37.7 million tonnes of freight were transported by air. This activity was supported by extensive airport and air navigation facilities and a dynamic manufacturing sector for aircraft, engines and avionics. Air transport generates millions of jobs and supports many more millions in associated industries, including the world's largest – travel & tourism."

Dr Assad Kotaite, President of the ICAO Council

The air transport industry's efforts must be matched by government action and investment. Governments are urged to:

- further liberalise aviation markets without micro-managing the industry nor over-taxing it;
- provide a suitable framework for a mass transportation system without perpetuating nationalistic rules nor distorting competition through subsidies; and
- support infrastructure improvements – through new and shorter air routes, increased airport capacity and improved ground access to airports – without imposing unreasonable conditions nor restricting the industry's sustainable growth.

People want to fly!

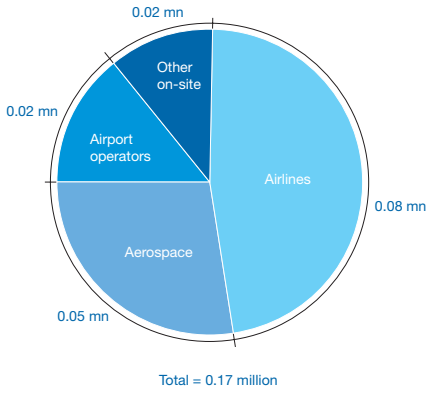
Let's make it possible for each and everyone of us now and in the future.

Economic impact per region

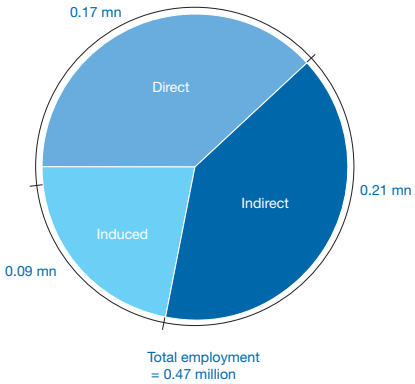
Africa (2004)

The air transport industry generates around 470,000 jobs in Africa and contributes more than US$ 11.3 billion to African GDP (direct, indirect and induced impacts). If catalytic impacts are included, the number of jobs increases to 3.1 million and GDP to US$ 55.5 billion.

Direct employment
in the air transport industry



Total employment
in the air transport industry



Direct and total employment and GDP (2004)

	Employment		GDP US$ million	
	Direct	Total (incl. direct, indirect & induced)	Direct	Total (incl. direct, indirect & induced)
Airport operators	21,459	56,331	816	2,141
Other on-site airport jobs	17,849	46,852	49	129
Airlines	82,562	216,725	2,851	7,485
Aerospace	46,486	151,079	483	1,570
Total	168,355	470,986	4,199	11,325

Direct, indirect and induced employment, GDP and gross output (2004)

Impact	Employment	GDP US$ million	Output US$ million	
Direct	168,355	4,199	9,879	
Indirect	208,434	4,861	11,166	
Induced	94,197	2,265	5,261	
Total	470,986	11,325	26,307	

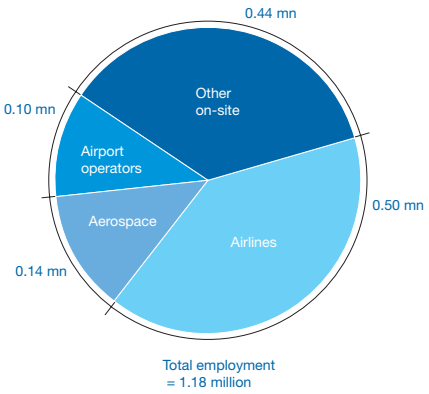
Africa: all countries on the continent of Africa (including Egypt).

Economic impact per region

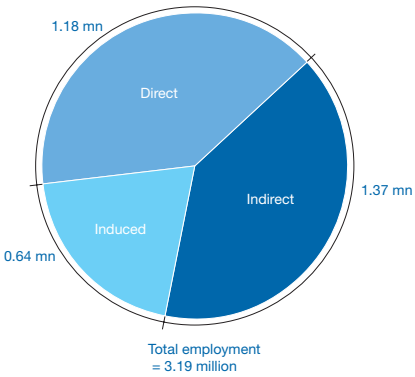
Asia-Pacific (2004)

The air transport industry generates around 3.2 million jobs in the Asia-Pacific region and contributes more than US$ 148 billion to Asia-Pacific GDP (direct, indirect and induced impacts). If catalytic impacts are included, the number of jobs increases to 9.8 million and GDP to US$ 688.5 billion.

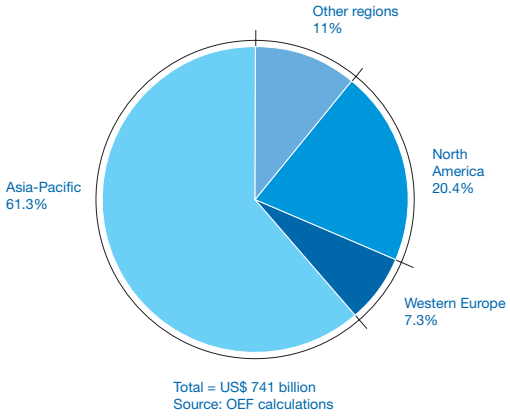
Direct employment
in the air transport industry



Total employment
in the air transport industry



Merchandise exports
by air



Direct and total employment and GDP (2004)

	Employment		GDP US$ million	
	Direct	Total (incl. direct, indirect & induced)	Direct	Total (incl. direct, indirect & induced)
Airport operators	102,000	267,750	8,477	22,252
Other on-site airport jobs	443,179	1,163,345	5,052	13,262
Airlines	498,613	1,308,859	32,440	85,155
Aerospace	138,272	449,383	8,541	27,757
Total	1,182,064	3,189,336	54,510	148,426

Direct, indirect and induced employment, GDP and gross output (2004)

Impact	Employment	GDP US$ million	Output US$ million	
Direct	1,182,064	54,510	123,956	
Indirect	1,369,406	64,231	145,404	
Induced	637,867	29,685	67,340	
Total	3,189,336	148,426	336,700	

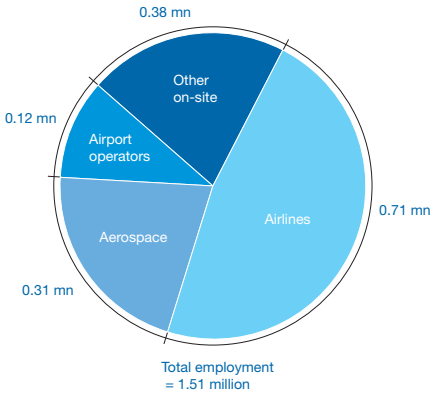
Asia-Pacific: all countries to the East of Pakistan (including Pakistan) to Australia/New Zealand, etc.
Central Asian countries Afghanistan, Turkmenistan, Uzbekistan and Kazakhstan are also included.

Economic impact per region

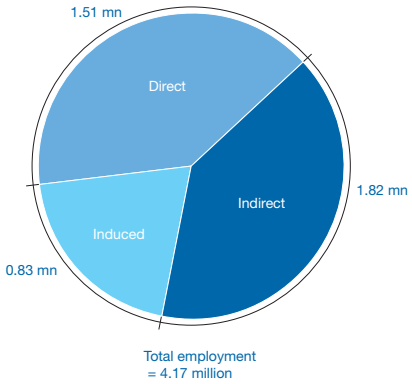
Europe (2004)

The air transport industry generates around 4.1 million jobs in Europe and contributes nearly US$ 274 billion to European GDP (direct, indirect and induced impacts). If catalytic impacts are included, the number of jobs increases to 7.5 million and GDP to US$ 1,041.7 billion.

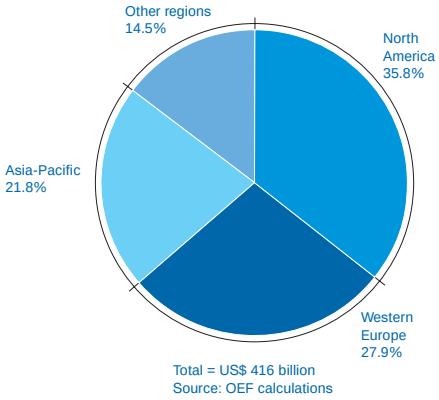
Direct employment
in the air transport industry



Total employment
in the air transport industry



Merchandise exports
by air



Direct and total employment and GDP (2004)

	Employment		GDP US$ million	
	Direct	Total (incl. direct, indirect & induced)	Direct	Total (incl. direct, indirect & induced)
Airport operators	120,000	315,000	17,312	45,444
Other on-site airport jobs	377,119	989,937	12,656	33,223
Airlines	709,272	1,861,839	44,716	117,380
Aerospace	307,313	998,767	23,871	77,581
Total	1,513,704	4,165,543	98,556	273,628

Direct, indirect and induced employment, GDP and gross output (2004)

Impact	Employment	GDP US$ million	Output US$ million	
Direct	1,513,704	98,556	211,680	
Indirect	1,818,731	120,347	260,966	
Induced	833,109	54,726	118,161	
Total	4,165,543	273,628	590,807	

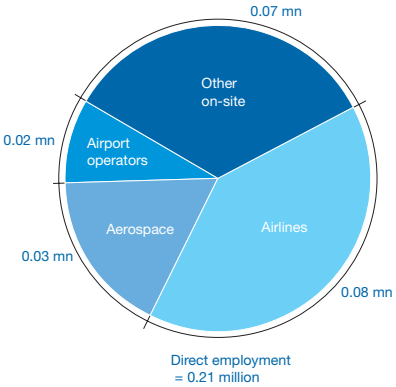
Europe: EU25 and other non-EU countries (e.g. Switzerland), plus Russia and former Soviet Union countries in Eastern Europe (Estonia, Latvia, Lithuania, Belarus, Ukraine, Moldova, etc.).

Economic impact per region

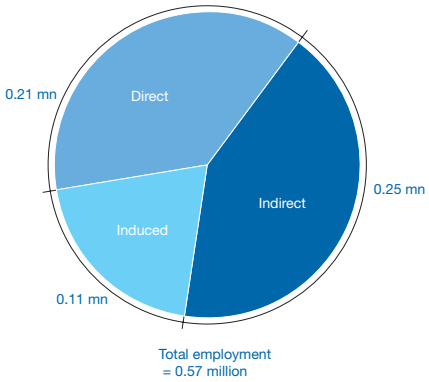
Latin America and the Caribbean (2004)

The air transport industry generates around 570,000 jobs in Latin America & the Caribbean and contributes more than US$ 20.6 billion to Latin American & Caribbean GDP (direct, indirect and induced impacts). If catalytic impacts are included, the number of jobs increases to 2.2 million and GDP to US$ 122 billion.

Direct employment
in the air transport industry



Total employment
in the air transport industry



Direct and total employment and GDP (2004)

	Employment		GDP US$ million	
	Direct	Total (incl. direct, indirect & induced)	Direct	Total (incl. direct, indirect & induced)
Airport operators	19,380	50,873	1,060	2,782
Other on-site airport jobs	72,207	189,545	487	1,278
Airlines	84,250	221,156	5,237	13,748
Aerospace	33,907	110,197	849	2,759
Total	209,744	571,770	7,633	20,566

Direct, indirect and induced employment, GDP and gross output (2004)

Impact	Employment	GDP US$ million	Output US$ million
Direct	209,744	7,633	18,864
Indirect	247,672	8,820	21,523
Induced	114,354	4,113	10,097
Total	571,770	20,566	50,483

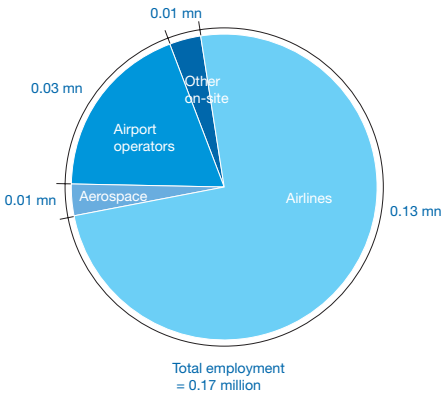
Latin America & the Caribbean: all countries in South America and the Caribbean up to and including Mexico.

Economic impact per region

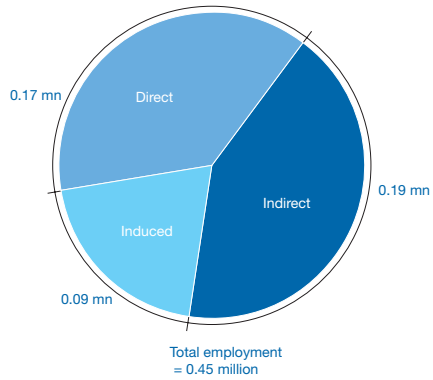
Middle East (2004)

The air transport industry generates around 450,000 jobs in the Middle East and contributes some US$ 16.1 billion to Middle Eastern GDP (direct, indirect and induced impacts). If catalytic impacts are included, the number of jobs increases to 1 million and GDP to US$ 122 billion.

Direct employment
in the air transport industry



Total employment
in the air transport industry



Direct and total employment and GDP (2004)

	Employment		GDP US$ million	
	Direct	Total (incl. direct, indirect & induced)	Direct	Total (incl. direct, indirect & induced)
Airport operators	28,521	74,867	1,084	2,846
Other on-site airport jobs	8,395	22,037	93	244
Airlines	127,764	335,379	3,967	10,413
Aerospace	5,003	16,261	814	2,645
Total	169,683	448,544	5,958	16,148

Direct, indirect and induced employment, GDP and gross output (2004)

Impact	Employment	GDP US$ million	Output US$ million	
Direct	169,683	5,958	14,835	
Indirect	189,153	6,961	17,411	
Induced	89,709	3,230	8,062	
Total	448,544	16,148	40,308	

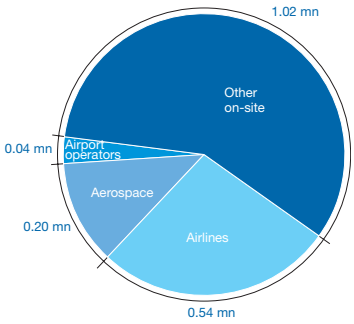
Middle East: the Gulf States and the core Middle Eastern countries (not including Egypt).

Economic impact per region

North America (2004)

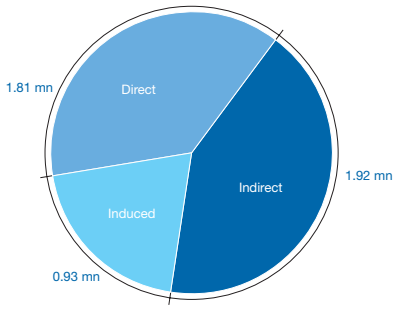
The air transport industry generates around 4.7 million jobs in North America and contributes nearly US$ 410 billion to North American GDP (direct, indirect and induced impacts). If catalytic impacts are included, the number of jobs increases to 5.4 million and GDP to US$ 992.8 billion

Direct employment
in the air transport industry



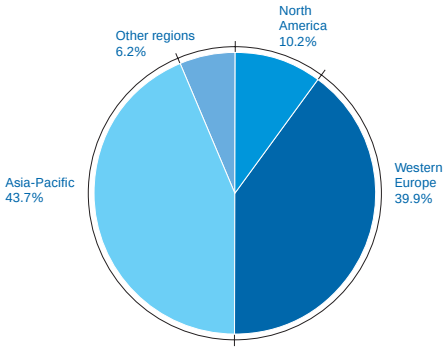
Direct employment = 1.81 million

Total employment
in the air transport industry



Total employment = 4.66 million

Merchandise exports
by air



Total = US$ 295 billion
Source: OEF calculations

Direct and total employment and GDP (2004)

	Employment		GDP US$ million	
	Direct	Total (incl. direct, indirect & induced)	Direct	Total (incl. direct, indirect & induced)
Airport operators	42,840	107,100	10,231	25,577
Other on-site airport jobs	1,024,099	2,560,248	73,022	182,556
Airlines	544,778	1,361,944	55,672	139,180
Aerospace	195,387	635,007	19,172	62,308
Total	1,807,103	4,664,298	158,097	409,620

Direct, indirect and induced employment, GDP and gross output (2004)

Impact	Employment	GDP US$ million	Output US$ million	
Direct	1,807,103	158,097	314,826	
Indirect	1,924,335	169,599	341,107	
Induced	932,860	81,924	163,983	
Total	4,664,298	409,620	819,916	

North America: United States and Canada.

Glossary and abbreviations

ACARE	Advisory Council for Aeronautics Research in Europe
ACI	Airports Council International
Air transport industry	Aviation and civil aerospace sectors
ATA	Air Transport Association of America
ATAG	Air Transport Action Group
ATC	Air traffic control
Aviation sector	Airports, airlines, commercial aviation, activities directly serving passengers or providing airfreight services, air navigation service providers
Balance of payments	The difference between a country's exports and imports of goods and services
CAAS	Civil Aviation Authority of Singapore
CANSO	Civil Air Navigation Services Organisation
Catalytic impact of air transport	Impact on industries that are outside (includes tourism) of air transport
Civil aerospace sector	Manufacture and maintenance of aircraft systems, frames and engines
dB	Decibels
Direct impact of air transport	Employment and activity within the air transport industry
Economies of scale	Where the average cost of production decreases as output increases
GDP	Gross Domestic Product. The 'total market' value of all final goods and services produced in a country.
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
Indirect impact of air transport	Employment and activity linked to supplying the air transport industry
Induced impact of air transport	Employment and activity supported by the spending of air transport employees (e.g. suppliers of goods and services that employees purchase)
IPCC	Intergovernmental panel on climate change
Intraregional trade	Trade (excluding domestic) within a region
Interregional trade	Trade between different regions
Labour productivity	Contribution to the global economy, per worker
Mercosur	South American Free Trade Association
NAFTA	North American Free Trade Agreement
NASA	National Aeronautics and Space Administration
OEF	Oxford Economic Forecasting
Productivity per worker	The amount of output or GDP per worker
Spin-off effect of air transport	Impact on industries that are outside (includes tourism) of air transport
VAT	Value added tax
WTO	World Trade Organization
WTO-OMT	World Tourism Organisation-Organisation Mondiale du Tourisme
WTTC	World Travel & Tourism Council

This brochure is based on 2004 figures and estimations.
Oxford Economic Forecasting (OEF) undertook the research for this brochure.

September 2005

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Maersk targets air cargo with Senator acquisition and freighter order

02 / 11 / 2021

By Damian Brett



Shipping giant AP Moller Maersk is expanding into the air cargo market with the acquisition of freight forwarder Senator International and the addition of five freighters.

The company, which owns the world's largest container shipping line Maersk Line, said it "intends" to acquire Senator International to "accelerate its product offering which integrates Logistics, Ocean, Rail and Air and expand its global air network".

Air Cargo News sister title DVZ reports that the deal is worth eight times the adjusted operating profit (EBITDA) expected for 2021, equating to an enterprise value of around $644m. The transaction is subject to regulatory approval during the first half of 2022.

Senator has an advanced airfreight operation centered around own controlled capacity using nineteen weekly **flights across its network with a dedicated air bridge with own controlled capacity.** [redacted]

"This focus on own controlled capacity is highly aligned with Maersk´s airfreight strategy," the shipping group said.

Maersk's ambition is to have approximately one third of its annual air tonnage carried within its own controlled freight network.

"This will be achieved through a combination of owned and leased aircraft, replicating the structure that the company has within its ocean fleet," the shipping group said. "The remaining capacity will be provided by strategic commercial carriers and charter flight operators."

Senator chief executive and shareholder Tim-Oliver Kirschbaum said: "Senator's own controlled air product started in 2016 and has proven to be a success story.

"By joining Maersk, we strongly believe that we will be able to deliver an even broader portfolio with own controlled air capacity as well as also in other modes of transportation. Senator´s customers and team will love it."

Maersk's aim is to increase its presence in the airfreight industry, combining its airfreight services with Senator's offering will "benefit customers through extended global routes and capacity".

Senator said: "For many customers operating in technology, Fast-Moving-Consumer-Goods, lifestyle, pharmaceuticals, and the automotive industry, airfreight solutions are a critical component of their supply chain.

"These industries have high demand for speed and delivery reliability, and high value cargo.

"Servicing a high demand for speed and delivery reliability is the core of Senator's business.

"Events like the pandemic and Suez vessel blockage have demonstrated that integrated logistics, including airfreight solutions, provides critical flexibility to manage supply chain disruptions."

Freighter orders

Meanwhile, the company has also announced that Star Air, its in-house aircraft operator, will purchase two new B777 Freighters to be delivered by Boeing in 2024 and leased three B767-300 Freighters which will be operational next year through Cargo Aircraft Management, the leasing arm of ATSG.

Boeing senior vice president of commercial sales and marketing Ihssane Mounir said: "We are delighted to welcome Star Air to the Boeing family of 777 operators and we look forward to many years of partnership as they continue to grow their air cargo division.

"The market leading efficiency and incredible range of the 777 Freighter will provide Maersk the flexibility to profitably operate the airplane across its large air freight network while helping to deliver on its sustainability objectives."

Maersk is committed to explore carbon neutral fuels for the Star Air operated fleet of aircraft in line with IATA guidance.

AP Moller Maersk executive vice president and chief executive of ocean and logistics Vincent Clerc said: "As a global provider of integrated logistics, Maersk is improving the ability to provide a one-stop-shop and end-to-end logistics capabilities to our customers.

"We have strengthened our integrated logistics offering through E-commerce logistics acquisitions, tech investments, expanding our warehouse footprint and, as a natural next step, we are now ramping up our airfreight capacity significantly and creating a broader network to cater even better for the needs of customers."

Star Air, which was founded in 1987 and is based at Copenhagen Airport, already has a freighter fleet of 15 aircraft:
12 Boeing 767-200 SF's, one Boeing 767-300BCF and two Boeing 767-300F

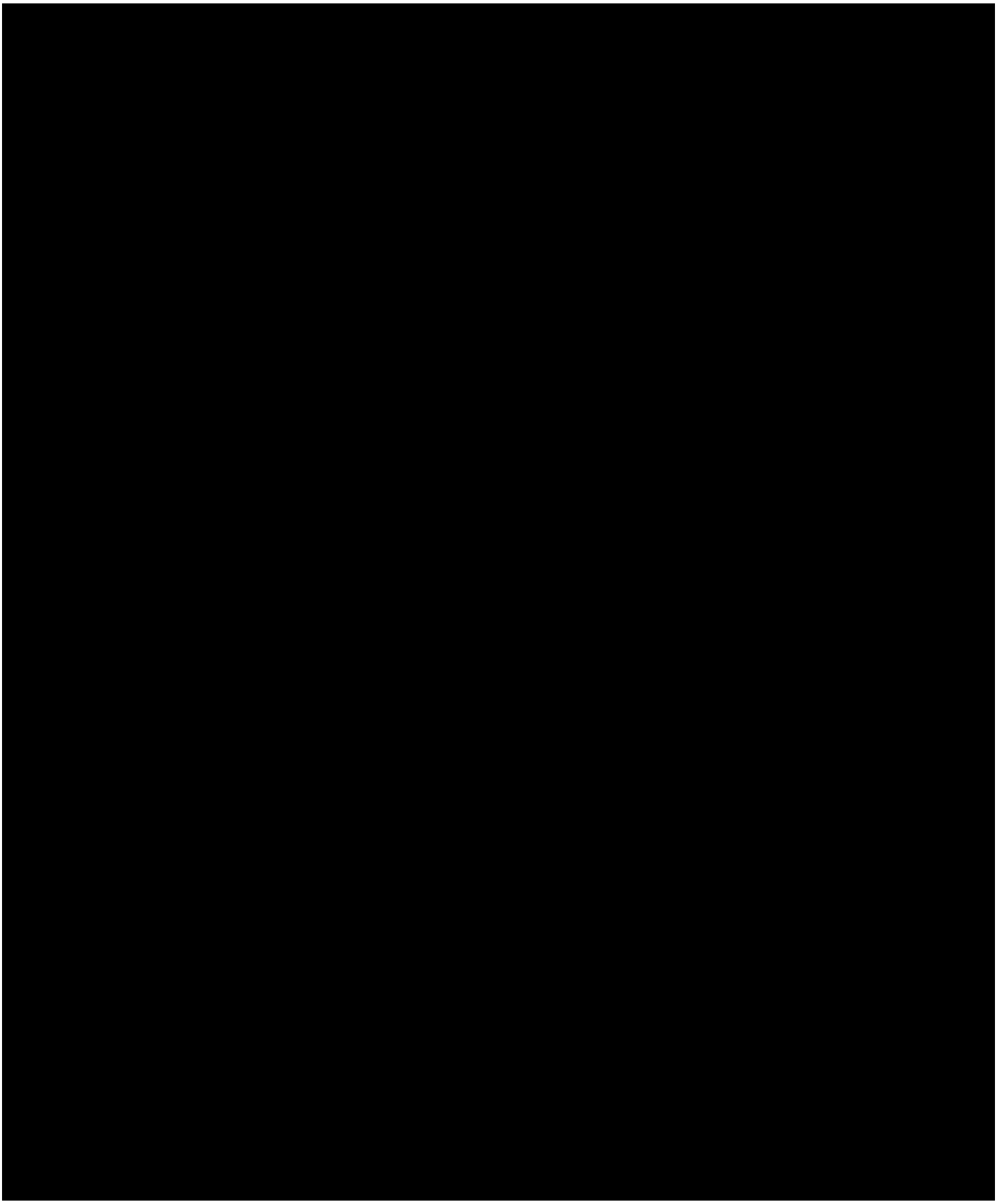
So far, the airline has primarily been using its capacities to serve other cargo airlines. Star Air's planes have long been flying from Cologne-Bonn Airport for the US integrator UPS.

Senator has more than 1,700 employees across a global network with 64 offices in 21 countries across Europe, the Americas and Asia.

It operates across three segments: Air freight (65% of 2020 revenue), Ocean freight (30% of revenue) and Logistics & Packaging (5% of revenue).

Its primary vertical is automotive – BMW is one of its major customers – with established and growing exposure within industrials, technology and pharmaceuticals.

In 2020, Senator reported revenues of $730m and adjusted EBITDA of $50m. For 2021, Senator is expected to raise revenues of $950m and adjusted EBITDA of more than $80m.



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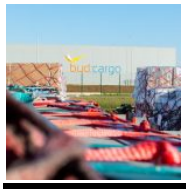


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22 March 2022 - 25 March 2022

Wed
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[redacted]

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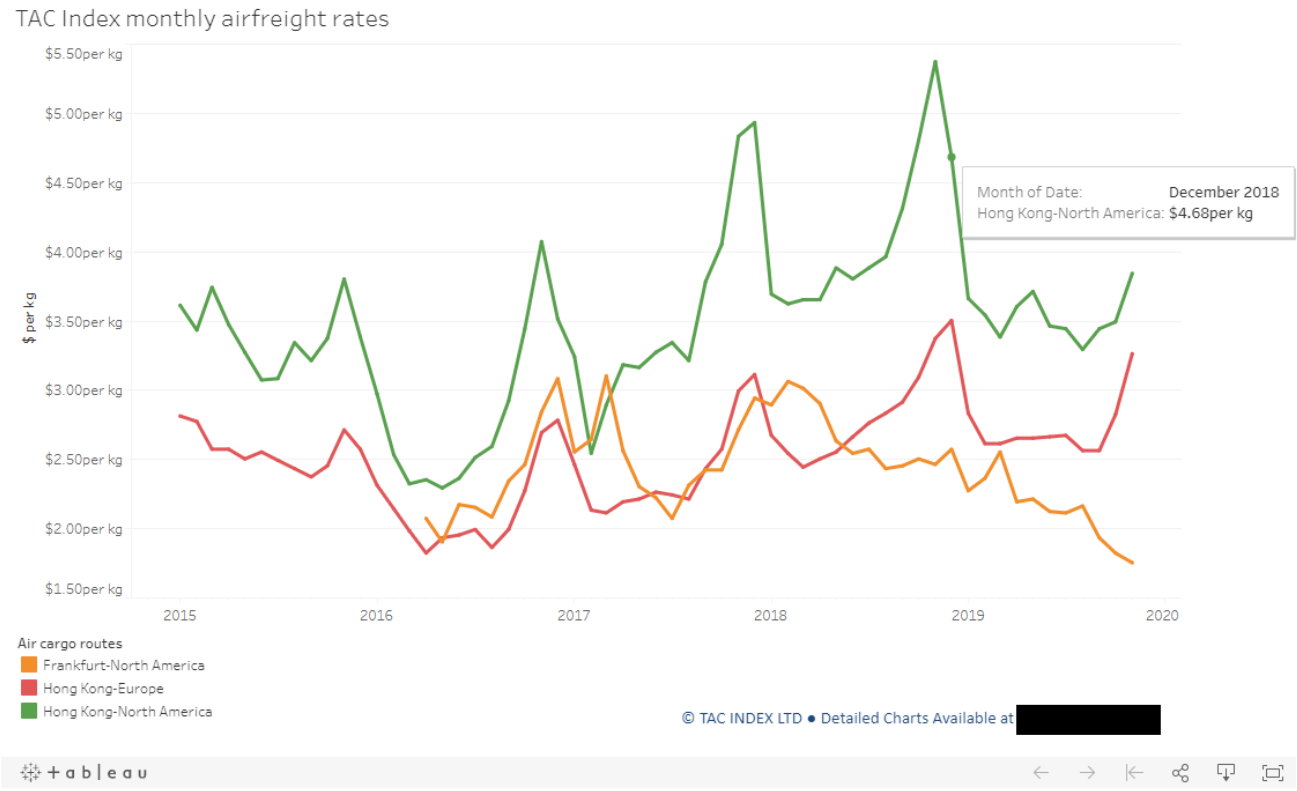


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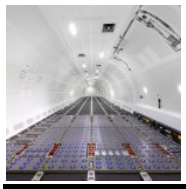


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[redacted]

GA TELESIS RETURNS FOR SIX MORE B737-800 CONVERSIONS

[redacted]

GA Telesis has placed an order for an additional six B737-800SF freighter ...



[redacted]

PACIFIC AIR CARGO LAUNCHES NEW CARGO TRACKING SYSTEM

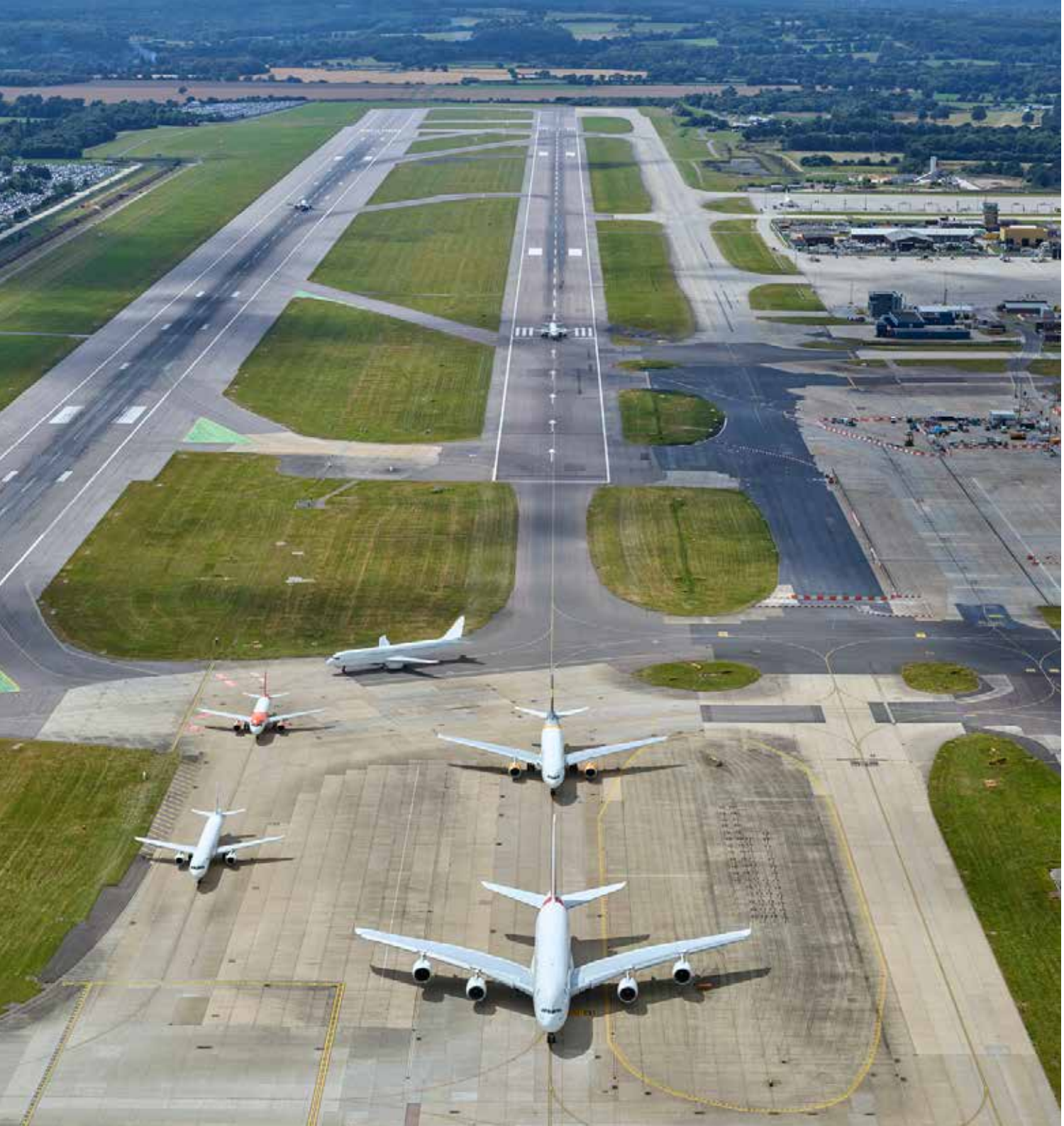
[redacted]

Freighter operator Pacific Air Cargo has introduced PACTRAK, a new airfreight tracking ...

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GATWICK AIRPORT

MASTER PLAN 2019

YOUR LONDON AIRPORT
Gatwick



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FOREWORD

It has been a period of change and positive developments since our draft master plan was published in October 2018.

In the last nine months alone, Gatwick has surpassed 46 million passengers in a year for the first time, adding more routes to its growing global connections including Shanghai, Rio and San Francisco; the operational issues that UK and European airports faced over the winter brought the matter of airport resilience into sharp focus; and there has been a renewed focus on the UK's climate change commitments as well as the need for airspace modernisation across Britain's skies.

Meanwhile VINCI Airports took a majority stake in Gatwick, starting a new long-term partnership with Global Infrastructure Partners (GIP), that will bring continuity, further investment and an exciting new chapter in the airport's 60 year story.

These factors and many others highlight how dynamic and ever-changing the aviation industry can be – it underlines the need for airports to be forward-thinking in how they will grow and adapt to build resilience and meet future demand, whilst doing so in a sustainable way that respects the environment.

Against this backdrop, our draft master plan published last Autumn set out three scenarios for Gatwick's future operations and growth. It explored how we might grow in the near term by deploying the latest technology to increase the capacity of our main runway. It also made clear that whilst we are not actively pursuing the provision of an additional runway to the south of the airport, we believe it is in the national interest to continue safeguarding this land for the future.

Finally, in line with Government policy, our draft master plan looked at how we could make best use of our existing runways through bringing our existing standby runway into routine use for the first time, alongside our main runway.

Since the draft master plan was published, events over the last nine months have reinforced the need for greater resilience and additional capacity through sustainable airport growth. We were therefore encouraged that the 12-week consultation on our draft master plan highlighted broad support for Gatwick's future growth ambitions.

Two-thirds (66%) of respondents supported our intention to grow by making best use of Gatwick's existing runways, including the innovative plan to add resilience and capacity by bringing our existing standby runway into routine use alongside our main runway. There was also clear support (59%) for the continued safeguarding of land for an additional runway should it be required in the future. More generally, there was recognition of the economic benefits Gatwick delivers, with over half of respondents (53%) making positive comments about the potential employment and economic opportunities from the continued growth of the airport.

Nonetheless, the feedback received made clear that our local communities and stakeholders have questions on the consequences of continued growth in terms of increased environmental impacts, noise effects and pressure on existing local infrastructure and services. This is entirely understandable and indeed matches Government policy that airport growth must be subject to environmental impacts being appropriately addressed. It also echoes wider discussions about the UK's climate change commitments.

Gatwick has always recognised the importance of faster global and local action on climate change and we support the Government's leadership and commitments to net zero carbon by 2050. Clearly the aviation industry has a crucial role to play and Gatwick looks forward to working with Government and our industry partners to meet this new level of ambition. Gatwick's strong track record means we are already playing our part – we became not only the first carbon neutral London airport, but also the first airport to achieve zero waste to landfill.

We are encouraged but not complacent by the feedback we have received on our plans - there is clearly broad support for Gatwick's growth ambitions and the economic benefits they will deliver; but so too is there a need for more work and more information on key areas such as noise, environmental impact, transport and local infrastructure needs.

It is with this in mind that we will undertake further detailed design and development work to bring our existing standby runway into routine use and thereafter to seek consent via the planning process through what is known as a Development Consent Order (DCO). As part of the DCO process, we will present detailed plans on the scheme, having regard to the feedback to our draft master plan, for a public consultation which will allow our local authorities, communities, businesses and partners an opportunity to provide more feedback as our scheme evolves. As always, we will listen to all views before submitting an application for a DCO to the Planning Inspectorate.

New initiatives and innovative solutions are needed if we are to tackle the challenges and seize the opportunities ahead. Our standby runway plans will help build greater resilience in the UK airports system as well as creating more competition and choice to benefit all passengers, as well as enhancing the local region with jobs, trade, connectivity and tourism. Crucially, by unlocking additional capacity largely within the airport's existing footprint, we can grow in the most sustainable way, allowing Gatwick to continue its good track record on carbon reduction and managing its other environmental effects.

In the meantime, through the development of better technology we will also continue to make best use of our existing main runway, so that Gatwick can continue to serve its passengers and UK plc with more choice and new global connections. Similarly, we will continue to seek the safeguarding of land that has been identified for an additional runway, not as a scheme that we are actively pursuing, but a 'future-proofing' step that we believe is in the national interest.

The key to making these plans a success will be collaborative working. As we said in our draft master plan, Gatwick has got to where it is today only through partnership with our local authorities, our communities, our passengers, our airlines, our airport partners and our stakeholders. So, as we look towards the future we will continue to engage with interested parties and listen to feedback to ensure we shape these plans together.

I look forward to outlining our plans in more depth in the future so that as we move towards the formal DCO process, we can deliver on our ambitions with the broadest possible consensus.

Stewart Wingate, Chief Executive Officer



PREFACE

INTRODUCTION

Gatwick Airport's draft master plan was published on 18 October 2018. The document had two aims. Firstly, to bring our stakeholders up to date with our thinking on how we see Gatwick developing in accordance with our current Capital Investment Programme and potential investment plans to 2022. Its second aim was to explain how we believe the airport can meet the growing demand for air travel by aligning with Government policy of making best use of existing runways and providing Britain with enhanced global connectivity delivering more flights to more destinations.

We presented three growth scenarios for the airport's longer-term future. These were:

- Scenario 1: where it remains a single runway operation using the existing main runway
- Scenario 2: where the existing standby runway is routinely used together with the main runway
- Scenario 3: where we continue to safeguard land for an additional runway to the south.

In the draft master plan we indicated that these three scenarios could be used either separately, or in combination, and were not mutually exclusive choices.

NATIONAL AVIATION POLICY

In December 2018 following the publication of the draft master plan consultation, the Government published its UK Aviation Strategy Green Paper: Aviation 2050: The future of UK aviation.

The Green Paper states that "the Government believes that forecasted aviation demand up to 2030 can be met through a Northwest runway at Heathrow and by airports beyond Heathrow making best use of their existing runways subject to environmental issues being addressed", (para 3.11).

It also states that "it is prudent to continue with a safeguarding policy to maintain a supply of land for future national requirements and to ensure that inappropriate developments do not hinder sustainable aviation growth" (para 3.66).

Further guidance is also given in relation to other considerations including noise, emissions, surface transport and resilience.

We believe that the three scenarios outlined within the draft master plan document are aligned with Government policy.

THE CONSULTATION AND FEEDBACK

The draft master plan was published on 18 October 2018 with the public consultation running for 12 weeks until 10 January 2019.

Alongside this document we have published a draft master plan Consultation Report which sets out the consultation activity undertaken. It also contains an overview of the feedback received on the key issues and how we have responded to the main themes raised by our stakeholders.

Other than this new chapter, an update to the Foreword, an update to section 2.1.1 regarding Gatwick ownership, the contents of and data contained in our master plan 2019 remain the same as was presented during the consultation. However, as explained in Chapter 4 of the Consultation Report many of the key themes raised by participants will be addressed further as we take forward our plans for future growth.

FUTURE GROWTH

In reaching a decision on how we intend to take forward future growth plans, we have carefully considered the current and emerging national aviation policies and strategy and also our ability to use improved technology to enable future growth. We have also considered the feedback and comments received as part of the draft master plan consultation.

Taking the three scenarios in turn, our approach to growth and improved resilience is:

Scenario 1: where it remains a single runway operation using the existing main runway

We will continue to develop Gatwick's longer term future through the use of technology to increase capacity on our existing runway.

Scenario 2: where the existing standby runway is routinely used together with the main runway

Our intention is to progress detailed design and development work associated with Scenario 2. This would make best use of our existing runways, subject to environmental issues being appropriately managed. It would provide additional operational resilience; and a growth scenario which offers capacity benefits whilst minimising development outside of the existing airport boundary.

Making best use of Gatwick's existing runways provides greater UK point to point airport capacity to assist in delivering unmet Department for Transport forecasted aviation demand to 2050.

Future growth of the airport would generate significant economic benefits to the national, regional and local economies, including supporting inward investment for business travellers and tourism. Jobs and skills would be created as well as opportunities for local businesses and the local area.

In progressing this approach, we will have regard to the consultation feedback received during the draft master plan consultation. Additionally, we will assess the economic benefits such as job and skills creation and how these are balanced against environmental impacts associated with this growth scenario, including any potential mitigation measures.

Scenario 3: where we continue to safeguard land for an additional runway to the south.

In line with Government policy (both local and national) we would continue to safeguard land for an additional runway to the south of the airport as set out in Scenario 3.

STAKEHOLDER ENGAGEMENT

We are aware that in responding to the draft master plan stakeholders had many different views. We will have regard to all these responses as we move forward and will use them to help shape our plans.

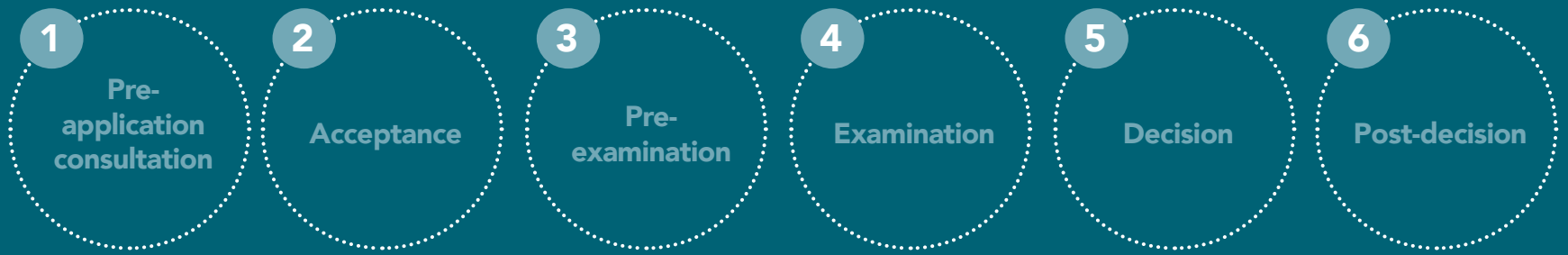
We will continue to engage with our stakeholders in further consultation once we have worked up more detailed information. We will do this within a Development Consent Order process for Scenario 2 – more information on this is set out on the following pages.

SCENARIO 2 – THE PLANNING PROCESS

As we outlined in our draft master plan the indicative passenger forecasts for growth Scenario 2 showed the potential for an increase in passenger numbers of greater than 10 million passengers per annum (mppa). This increase in capability requires that the development be consented through the Nationally Significant Infrastructure Project (NSIP) route under the Planning Act 2008. This means that we will need to apply for a Development Consent Order (DCO) to gain planning permission. NSIP applications are examined by the Planning Inspectorate (PINS) and finally decided by the Secretary of State.

See flow diagram below of the process.

THE SIX STEP PROCESS AS SET OUT BY THE PLANNING INSPECTORATE[1]



1 Pre-application consultation	2 Acceptance	3 Pre-examination	4 Examination	5 Decision	6 Post-decision
Look out for information in local media and in public places near the location of the proposed project; such as your library. We will be developing proposals and will consult widely before making a DCO application.	The Planning Inspectorate, on behalf of the Secretary of State, has 28 days to decide whether the application meets the required standards to proceed to examination.	You can register as an interested party: you will be kept informed of progress and opportunities to put your case. Inspectors will hold a Preliminary Meeting and set the timetable for examination.	You can send in your comments in writing. You can request to speak at a public hearing. The Inspectorate has 6 months to carry out the examination.	A recommendation to the relevant Secretary of State will be issued by the Inspectorate within 3 months of the close of the examination. The Secretary of State then has a further 3 months to issue a decision.	Enactment of the consent post Secretary of State decision.

[1] *https://infrastructure.planninginspectorate.gov.uk/*

NEXT STEPS AND FURTHER CONSULTATION

Before we submit our DCO application we will carry out a number of studies around design and development to help us define and refine our proposals, understand the potential impacts and identify any necessary mitigation measures which could be brought forward as part of the development proposals.

Once we have completed this our intention is to bring forward and consult on a wide range of information, prior to the submission of a DCO application. This consultation will be a further opportunity to give your views on our proposals before we submit our proposals to the Planning Inspectorate.

We will be contacting people and businesses with an interest in any land that may be affected so that we can work with them to carry out more detailed on-the-ground environmental and other studies. This is to help us to understand environmental conditions, potential impacts and any mitigation required.

We will also be beginning conversations with key stakeholders and regulators as well as engaging with local community members and their representatives and local businesses. We will continue to keep our website and other communications channels updated.



MASTER PLAN

EXECUTIVE SUMMARY

1. Gatwick has been transformed under new ownership since 2009. It has become a key element in the country's national infrastructure, an economic engine for local and regional growth and the airport of choice for millions of passengers. It contributes £5.3bn to the UK economy and supports over 85,000 jobs[2]. At peak times it is the busiest single-runway airport in the world and is ranked 12th in the world for the number of long-haul destinations served. Aviation will have an ever more important role to play in the next chapter for Britain and we are ambitious to do even more for the country at this critical time.

2. We recognise our responsibilities to those living near the airport. Gatwick supports thousands of jobs and is active in developing skills and opportunities in all parts of the local community. Equally the nature of the aviation industry inevitably means that those living closest to an airport will at times be impacted by its operations. At Gatwick we will continue to do everything we can to develop and grow sustainably, creating the right balance between economic growth and environmental impact.

3. The purpose of this draft master plan is two-fold. Firstly, a great deal has changed since the last master plan was published in 2012 and we wish to bring our wide range of stakeholders up to date with our present thinking on how we see Gatwick developing over the next 5 years. Secondly, in a situation where demand for air travel continues to outstrip capacity, we look ahead a further 10 years to 2032 and present three growth scenarios for the airport's longer term future:

1. One where it remains a single runway operation using the **existing main runway;**
2. one where the **existing standby runway** is routinely used together with the main runway, and;
3. one where we continue to **safeguard for an additional runway** to the south.

[2]*Oxford Economics: The economic impact of Gatwick Airport. 2017. Includes induced benefits.*

4. This draft master plan provides information on these scenarios, not only to help the reader understand how Gatwick might develop in terms of passenger numbers and physical infrastructure, but also to understand the potential environmental impacts and economic and employment benefits. A key priority for us is that the airport should develop in a sustainable manner. For this reason, the master plan sets out in some detail Gatwick's environmental strategies as well as our strategies in relation to employment and skills, as well as supporting local business and economic growth. Another important priority for us is delivering a high quality service for our customers, and the master plan explains some of the projects we plan to deliver which will ensure an efficient and resilient operation.

5. The Government recently published a policy document titled 'making best use of existing runways' which sets out its thinking on how airports should make best use of their existing runways whilst balancing their economic benefits and environmental impacts. The first two of our growth scenarios are consistent with this policy. This policy document forms part of the Government's work to develop a new Aviation Strategy. As details of this strategy emerge, we will monitor how it affects our draft master plan. The Government has recently finalised its Airports National Policy Statement supporting expansion at Heathrow. As a result we are not actively pursuing plans for an additional runway to the south.

6. Gatwick's single runway handled 45.7 million passengers in the year 2017/18. When the North Terminal was proposed in the late 1970s it was thought that the one runway/two terminal airport could accommodate around 25 million passengers per annum (mppa). Through a combination of greater use of the airport in the off-peak periods, more intensive use of the runway at the peak periods, and a shift to larger aircraft and higher load factors, airport capacity grew over time to today's level of just over 45mppa. We now believe that these same factors will enable the single runway airport to grow over the next 5 years to 53mppa. We set out later in this document how the airport's infrastructure may need to evolve to accommodate this level of throughput.

7. Demand for air travel is forecast to continue growing. The Department for Transport's most recent forecast of October 2017 shows demand for air travel in the UK rising from 267mppa in 2016 to 355mppa by 2030 and 495mppa by 2050. Capacity constraints (which are principally felt in the South East of England) would, however, limit throughput to well below these levels. We know that more airlines would use Gatwick if runway slots were available. Consequently, we have been considering how we could maximise Gatwick's ability to meet this growing demand in the medium and longer term, and the master plan outlines three growth scenarios. These scenarios are not exclusive choices; Gatwick could transition from one to another within the timeframes discussed in this draft master plan.



8. If the airport continues with the existing single runway operation we believe that by 2032 Gatwick could be processing up to 61mppa, although year on year growth rates will decline as the runway constraints become more binding. This level of throughput would be possible if, as expected, new air traffic management technologies allow some additional peak hour capacity to be released. Even so, most of the growth will be outside the current peak times and therefore the need for additional infrastructure will be relatively modest. With the introduction of quieter aircraft, we expect to see Gatwick's noise footprint continue to reduce despite the increase in aircraft movements.



9. A higher level of growth would be possible if we bring the existing standby runway into regular use (for departing flights only). The standby runway is currently used only when the main runway is temporarily closed. Our 1979 Section 52 Agreement[3] with West Sussex County Council precludes the simultaneous use of both runways. This agreement expires in 2019. By operating both runways simultaneously, we would be able to add between 10 and 15 additional hourly aircraft movements in the peak hours, which could deliver up to 70 million passengers by 2032. The airfield would need some reconfiguration and some additional support infrastructure would be required. However we expect to keep the airport development within the airport's existing footprint and the airport would remain a two terminal operation. Initial indications are that aircraft noise generated by this scheme would
be broadly similar to today's level.

10. This scheme would make best use of our existing runways and provide Gatwick with a growth scenario which offers capacity and resilience benefits but without the scale of change required for the full additional runway scheme we submitted to the Airports Commission. It also aligns with Government's long established, and recently reiterated, policy of making best use of existing runways. It would provide the country with much needed additional runway capacity and would promote greater competition between airports, which has been proven to deliver benefits to the consumer.

[3] *1979 Agreement with West Sussex County Council not to build a second runway, or operate the standby runway simultaneously with the main runway.*



11. The Department for Transport's guidance on the preparation of airport master plans encourages airports to engage with their stakeholders at an early stage even if the full facts are not known. In accordance with this guidance, and in the light of the impending expiry of the Section 52 Agreement, we are bringing forward now our present thinking on how the existing standby runway could be used in the future, even though we have not completed all of our technical studies on this scheme. If we decide to take forward this scheme, it is likely that planning permission would need to be obtained through the Development Consent Order process - in which case, formal consultations would be undertaken based on a more complete understanding of the implications than is available at this stage. This consultation might take place during 2019. We believe that preparing for and completing this consent process would take up to five years and, allowing for the necessary construction activity, the standby runway could be brought into use alongside the main runway in the mid-2020s.

12. Althoughthe Government's Airports National Policy Statement supports a third runway at Heathrow, we believe an additional Gatwick runway, built to the south, should continue to be safeguarded. We believe it is in the national interest to preserve this opportunity to build a new runway in the south east to meet longer term demand growth. DfTs forecasts show that by 2025 the main London airports, with the exception of Stansted, are expected to be effectively full and that, even with a third runway at Heathrow, UK airport capacity constraints will be apparent by 2030 and in subsequent years.

13. An additional runway could be delivered within approximately ten years of starting the planning process and would take Gatwick's capacity to approximately 95mppa. This is a much higher capacity scheme, requiring more significant changes to the airport and surrounding roads. While it would maximise the economic benefits Gatwick brings to the region, it would increase environmental impacts and, for that reason, our additional runway proposal submitted to the Airports Commission included both mitigation and compensation measures. Although, in view of Government support for expansion at Heathrow, we are not currently pursuing this scheme we believe it remains a credible means of providing longer term growth for the country, and it should therefore continue to be safeguarded

A SUSTAINABLE OPERATION

14. Regardless of the development scenario selected we remain committed to operating and developing Gatwick in a sustainable way. We will continue to use our Decade of Change sustainability strategy to drive efficiency improvements and reduce Gatwick's environmental footprint. This strategy has already delivered strong results and Gatwick has become the first London airport to hold Airport Carbon Accreditation at "Neutral" level (level 3+) and the first airport to hold Carbon Trust's Zero Waste to Landfill standard. We will continue to engage with stakeholders on issues such as noise management and air quality and we will continue our community support programme through sponsorship, grants, educational programmes and business development fora.

Gatwick is the first London airport to hold both AIRPORT CARBON ACCREDITATION at "Neutral" level (level 3+) and the Carbon Trust's Zero Waste to Landfill standard



1 INTRODUCTION

1.1 Our vision for Gatwick
1.2 This Master Plan



1.1 OUR VISION FOR GATWICK

1.1.1. Our overarching vision for Gatwick is for it to be the airport of the future and a model for sustainable growth. We can achieve this by being the UK's most innovative and progressive airport, meeting the needs of our customers – airlines and passengers, driving improved service standards and global connectivity, and delivering sustainable economic growth for the region and the UK. It is this vision which shapes the way we plan to develop the airport over the next 15 years and beyond.

OUR SIX STRATEGIC PRIORITIES

1.1.2 Our approach to operating the airport is guided by six priorities:

PASSENGERS
We want to be the airport of choice for all passengers and to provide a high-quality efficient service to them at all times

PARTNERS
We want to help all our airlines grow and succeed by developing strong commercial partnerships

PEOPLE
We want to invest in our people and to make sure that Gatwick is a great place to work

COMMUNITY
We want to be a good neighbour to the communities around the airport, supporting jobs and skills and limiting or, where possible, reducing negative impacts

SAFETY
We want to continue our relentless focus on zero incidents by promoting a strong health and safety culture throughout the airport

INNOVATION
We want to continue to innovate as 'the airport of the future', delivering efficiency and service through new technologies and process improvements

AIRPORT FOR BRITAIN

National infrastructure asset

1.1.3 Gatwick is already a key component of the UK's transport infrastructure and we want to maximise its future potential. In recent years Gatwick has seen unprecedented investment and growth and has benefited from serving a continually expanding range of destinations and airlines, maintaining its position as the second largest airport in the UK. In a post-Brexit Britain, we want Gatwick to continue its key role in strengthening global connections, trade, tourism, jobs and investment.

Global connectivity

1.1.4 Gatwick already serves over 45m passengers per year and is the 7th busiest airport in Europe, with the 12th largest long-haul network. Our airlines fly to over 200 destinations including over 60 long-haul routes with, for example, over 300 flights a week to North America alone. Mirroring this growth in long-haul passenger flights, cargo volumes are growing rapidly – up 20% in the last year. Our aim is to build on this success, growing our route network further and opening up new travel and business opportunities.

Ability to serve all aviation markets

1.1.5 A particular strength we want to capitalise on is Gatwick's ability to accommodate and support the full range of airline business models. We have a long history of hosting airlines which offer full-service and charter services, and recent years have seen remarkable growth in low-cost operators on long-haul, short-haul and domestic routes. This growth by low-cost airlines stems from our relatively low landing charges, a focus on operational efficiency, a willingness to innovate, and easy access to destinations in London and the South East. The recent strong growth in long-haul services has also increased the number of inbound overseas visitors travelling to the UK for both business and leisure purposes.

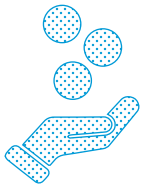
Enabler of economic growth

1.1.6 We want to maximise Gatwick's potential as an enabler of economic growth. The airport already contributes £5.3bn to the UK's GDP and supports 85,000 jobs in the UK, of which around 23,000 are located at the airport itself. By facilitating the continued growth of the airport, we can help generate higher levels of economic benefits and more job opportunities.

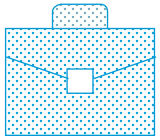
Ground transport connectivity

1.1.7 We want to build on Gatwick's already strong surface transport links. Our rail station has daily, direct connections to over 120 other stations, which we believe is more than any other European airport station. Significant improvements are underway on the road and rail network, and a radically improved station will shortly be under construction. This will help us increase the already high proportion of our passengers and staff who use sustainable transport modes to access the airport.

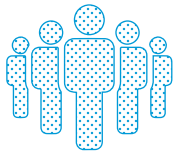
GATWICK



CONTRIBUTES
£5.3bn
TO THE UK'S GDP



SUPPORTS
85,000
JOBS IN THE UK



23,000
PEOPLE EMPLOYED AT THE AIRPORT ITSELF

AIRPORT FOR THE FUTURE

Aviation trends

1.1.8 We are well placed to capitalise on the changes that are taking place within the aviation industry, such as the introduction of more efficient and quieter aircraft, the growth in low-cost long-haul services, and the availability of new technologies to streamline processes, deliver greater efficiency and improve customer service.

New routes

1.1.9 New, longer range and more fuel-efficient aircraft types are entering service and these are opening up opportunities for new direct air services. Allied to the rapidly increasing demand for air travel from emerging global markets, this is generating a growing demand for air travel to and from the UK.

New technology

1.1.10 We will continue to focus on innovative use of new technologies and processes. This focus has already allowed us to outstrip all previous expectations on the amount of capacity and the quality of service that can be provided at the airport.

1.1.11 We will continue our investment in new technologies designed to improve the passenger experience, for example reducing the time spent at check-in and security. We are already exploring the use of machine-assisted technology (for example in car parks), augmented reality technology to assist wayfinding, and the use of electric and driverless vehicle technology. These new technologies and processes will enable Gatwick's infrastructure to process more passengers whilst maintaining or improving service standards.

Efficient and Resilient operations

1.1.12 We will work collaboratively with our industry partners to ensure that best use can be made of our existing main and standby runways. This work is not limited to seeking additional capacity but importantly focuses on how the operation can be made more efficient, more resilient and more punctual. We will seek ways to reduce delays to aircraft operations through the development and application of the latest processes and technology. This will not only bring commercial and passenger service benefits but will also reduce carbon emissions.

Sustainability

1.1.13 Technology and process improvements can help reduce our environmental impacts. We were the first airport in London to be given a 'Level 3+ Neutral' certificate by Airport Carbon Accreditation. We use 100% certified renewable energy to run the airport and have built a world-leading waste-processing plant. By driving energy efficiency we will continue to reduce costs and limit our carbon emissions. It will also assist us to ensure that the airport's air quality continues to meet legal standards.

1.1.14 We will continue supporting our Noise Management Board and engaging with local communities to identify and implement noise reduction and mitigation strategies. We will also seek outcomes from the planned modernisation of the South East airspace which will help to reduce engine emissions and noise impacts.

AIRPORT FOR EVERYONE

Meeting the needs of all passengers

1.1.15 We want to maintain our unique position as the airport that caters for all airline types and all categories of passengers – from business travellers to families going on holiday. We will continue to consult these different types of passengers to identify their specific requirements and expectations so that we deliver the future airport which best serves their needs.

Accessibility

1.1.16 We will continue to strive for accessible air travel for all passengers. For example we have been focusing on delivering improved services for passengers with accessibility issues, an area where we acknowledge more attention is required. This includes the introduction of lanyards for those with hidden disability, the appointment of autism champions, and investing in new facilities for passengers who need special assistance.

Innovative service offers

1.1.17 We will continue to explore ways of improving services in a world where passenger expectations and requirements are constantly evolving. We will exploit IT developments to provide customers with new ways of accessing real-time information about their journey, for example through our innovative passenger app. We will also continue to develop new and exciting retail and catering offers so that passengers' spare time at the airport can be as enjoyable as possible.

AIRPORT FOR THE COMMUNITY

Economic and employment benefits

1.1.18 We want to maximise the positive contribution Gatwick makes to local communities through employment opportunities and through our supply chain. We are developing new ways of raising local awareness of job vacancies at the airport and provide help to local unemployed people through our employability programme. We will focus on improving opportunities for local business to supply goods and services to Gatwick. We are sponsoring partners for the Gatwick Diamond 'Meet the Buyers' event, and will continue to work actively with regional partners to create new business opportunities for local companies.

Education

1.1.19 We will continue to promote Science, Technology, Engineering and Maths (STEM) subjects amongst local school children, for example 'Crawley STEMfest' and the 'Big Bang South East'. Our exciting new programme, Learn Live, broadcasts Gatwick Airport live into classrooms across the country, showcasing key airport themes and careers

Managing and mitigating impacts

1.1.20 We aim to do everything we reasonably can to deliver a sustainable operation. As Gatwick's growth continues, we will remain sensitive to the impacts our operation has on local people. We have a wide range of engagement fora in place. In 2016 we set up a Noise Management Board, through which we will continue to work with industry and community representation to seek practical ways of reducing noise impacts. We will continue to provide grants for sound insulation to those most affected by noise. We will continue to implement schemes designed to improve air quality and will ensure that all air quality standards continue to be met.

Local community support

1.1.21 We want to continue our role in assisting local good causes through sponsorship and direct grants. We launched the Gatwick Foundation Fund in 2016, working in partnership with the Community Foundations in Kent, Surrey and Sussex to oversee £300,000 of annual grants for good causes across the region.


LONDON AIRP

1.2 THIS MASTER PLAN

1.2.1 Gatwick's last master plan was published in July 2012. Since then there have been significant changes within the industry. The Government has decided to support a third runway at Heathrow and is in the process of developing a new Aviation Strategy. It is best practice to provide regular updates about how Gatwick might develop, and we believe that now is the right time to set out our current thinking.

1.2.2 Our 2012 Master Plan was published at a time when the UK aviation industry was recovering from a major, worldwide recession. Passenger numbers at Gatwick had still not returned to their pre-recession levels, and our focus was on making much-needed improvements to the existing airport, following its sale by BAA in 2009. The Coalition Government had cancelled plans for expanding Heathrow and our forecasts predicted that the milestone of 40 million passengers per annum (mppa) at Gatwick would be reached in 2021.

1.2.3 Since the publication of our 2012 Master Plan there have been significant changes. We have seen unprecedented levels of growth in demand at Gatwick which have been accommodated through the application of industry-leading technology and processes, along with significant development projects. We have seen major changes in the industry including the introduction of new generation long-haul aircraft such as the B787 and A350, and the introduction of low-cost long-haul services. We have also seen a much greater level of engagement with our local communities on issues such as the management of aircraft noise and increased support for educational and training programmes.

1.2.4 The current airport operation and infrastructure is described in **Chapter 2.**

GATWICK'S ROLE IN FACILITATING FUTURE GROWTH

1.2.5 Following the work of the Airports Commission the Government has given policy support for a third runway at Heathrow. However the process of obtaining planning consent is such that it will be many years before the third runway can be brought into use. In the meantime the Government is developing a new Aviation Strategy which should be completed in the first half of 2019.

1.2.6 The Government's forecasts show that demand for air travel will continue to rise and is likely to be capacity constrained. London City, Stansted and Luton airports all have plans to grow to help meet this growth in demand - but there will still be a gap.

1.2.7 Changes in the aviation market and the latest developments in the Government's aviation strategy are explored in **Chapter 3**.

1.2.8 This draft master plan shows how Gatwick can respond to these changes and grow over the next fifteen years, in order to deliver economic benefits for the region and the UK, particularly by making best use of its existing infrastructure. There are three broad ways that – used either separately or in combination – might enable Gatwick to grow to meet increasing demand for air travel:

- **Growing by making the best use of the existing main runway** If Gatwick remains a single runway airport then we are committed to extracting the maximum value from the existing infrastructure, whilst delivering a sustainable and resilient operation.
- **Growing by bringing the existing standby runway into regular use alongside the main runway.** This is an opportunity which we are still exploring but, based on current findings, it is one which we may choose to progress in the near future.
- **Growing by building an additional new runway to the south of the existing airport.** We are not currently progressing this scheme but believe it is one which is in the national interest to continue to safeguard for the future.

THE SINGLE MAIN RUNWAY AIRPORT

1.2.9 Gatwick has grown much faster than anyone predicted when the 2012 Master Plan was published. We are now handling over 45 million passengers per annum, which was previously considered to be the ultimate capacity limit of the single main runway airport. Despite this, traffic is still growing and we believe it can continue to do so.

1.2.10 Using one main runway, Gatwick is already capable of accommodating significantly more flights and passengers than was previously thought possible. In the late 1970s, when North Terminal was being planned, the maximum airport capacity was thought to be 25 mppa. Since 2000, estimates have suggested 40-45 million passengers to be the maximum potential. This draft master plan shows that Gatwick's capacity with one main runway is now expected to be up to 61 mppa by 2032.

1.2.11 The development of Gatwick with one main runway is explored in the short term (5 years) in **Chapter 4**, and in the longer term (10-15 years) in **Chapter 5.**

THE STANDBY RUNWAY SCENARIO

1.2.12 In view of the eventual constraints of the existing single runway and the clear evidence of increasing demand for air travel, we have examined ways to further increase the capacity potential of Gatwick as well as improving its operational efficiency and resilience.

1.2.13 In this work we have explored the possible use of our existing standby runway simultaneously with our existing main runway – although for departing flights only. The standby runway (also known as the emergency runway or northern runway) was granted planning permission in 1979. It provides an alternative runway for use when the main runway is closed as a result of planned maintenance or an incident. The standby runway was created by widening an existing taxiway.

1.2.14 Owing to the close proximity of the two runways, the capacity gain would be appreciably smaller than under the full additional runway scheme submitted to the Airports Commission. Nevertheless it would support more growth than the single main runway could sustain on its own, adding around 10-15 additional movements in the peak hours, which could deliver up to 70 million passengers by 2032. This strategy aligns with the Government's support for making best use of existing runways as confirmed in its 2018 policy document 'The future of UK aviation: making best use of existing runways'.

1.2.15 **Chapter 5** provides more information on the standby runway scenario and how it might be delivered.

SAFEGUARDING FOR AN ADDITIONAL NEW RUNWAY TO THE SOUTH

1.2.16 In our submissions to Government in connection with its review of runway capacity in the UK, we demonstrated that an additional independent runway at Gatwick would be a viable and credible project. However, we acknowledge that Government has instead chosen to support the provision of a third runway at Heathrow.

1.2.17 The DfT's October 2017 forecasts show that demand for air travel will continue to exceed supply both before and after a third runway is provided at Heathrow. It is therefore likely that a further, additional new runway will be required in the south-east at some point. The new Aviation Strategy will provide a framework for growth beyond 2030, by which time the DfT's forecasts show Heathrow will be full, even with a third runway. For this reason, it is prudent – and in the national interest - to continue to safeguard land at Gatwick for an independent full length southern runway.

1.2.18 Previously we have referred to our scheme submitted to the Airports Commission as the 'second runway' scheme (sometimes shortened to 'R2'). However in this draft master plan we refer to this scheme as the 'additional runway' to avoid confusion with the standby runway scheme described above.

1.2.19 Details of the safeguarded additional runway scheme can also be found in **Chapter 5.**

A SUSTAINABLE OPERATION

1.2.20 One of our key objectives is for Gatwick to be the UK's most sustainable airport, managing our environmental impacts in line with Government policies, and maximising the economic and social benefits that Gatwick's operation can support.

1.2.21 This draft master plan provides more information on our sustainability strategies and community engagement in **Chapters 6, 7 and 8.**

2 GATWICK TODAY

2.1 Introduction
2.2 Traffic characteristics
2.3 Gatwick's infrastructure
2.4 Recent investment projects

2.1 INTRODUCTION

2.1.1. In 2009 the Competition Commission concluded its market investigation into the BAA group, which then included Gatwick Airport. It found evidence of substantial competition problems and required Gatwick and two other airports to be sold. Gatwick was sold by BAA in December 2009 to Global Infrastructure Partners (GIP). The airport company (Gatwick Airport Limited) recently transferred to new management with VINCI Airports on 14 May 2019, who now own the majority shareholding of 50.01% with the remainder owned by a consortium of investors managed by GIP.

2.1.2. Since the change in ownership in 2009, Gatwick's passenger throughput has grown by nearly 40%. New low-cost long-haul routes have been introduced and the airport has benefited from £1.5 billion of investments. These have transformed the infrastructure and the services we offer to our airlines and passengers.

2.1.3. In 2016 the Competition and Markets Authority (CMA) reviewed the outcomes of the break-up of BAA. The CMA found strong evidence of the benefits of separate airport ownership, particularly at Gatwick. Examples provided include better service quality, with innovative improvements to passenger services, more productive relationships with the airlines, more efficient capital investment, and greater efforts to attract new airlines and routes which have delivered strong traffic growth.

2.1.4. The shareholder board, chaired by Sir David Higgins and supported by the executive management team led by CEO Stewart Wingate, is committed to making Gatwick an even more successful international airport and London's Airport of Choice.

2.1.5. This chapter of our draft master plan provides information on our current air traffic, our passengers, airlines, aircraft and routes. It also describes the current airport infrastructure and identifies recent improvements that have been made to enhance capacity, service, sustainability and operational efficiency.

2.2 TRAFFIC CHARACTERISTICS

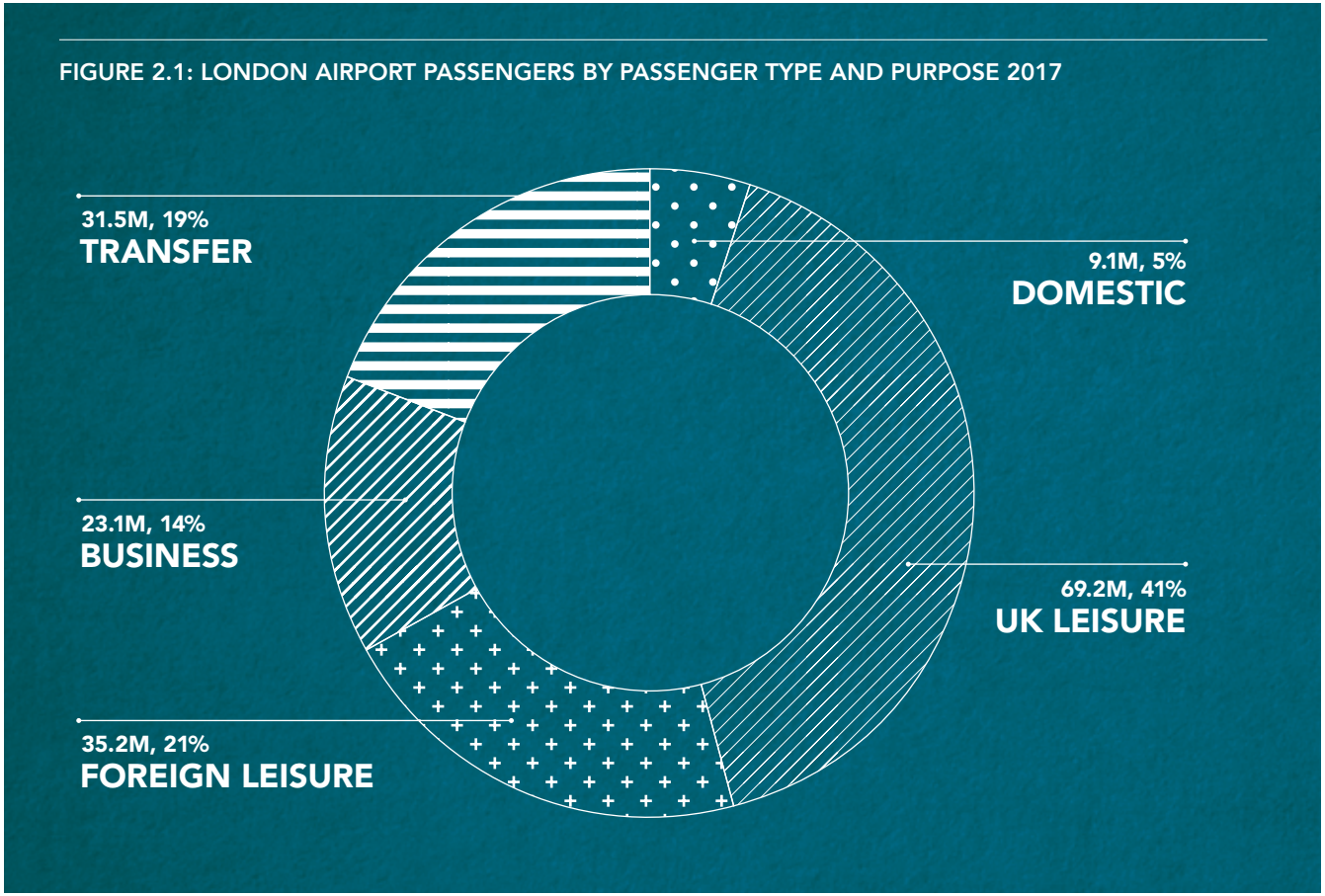
2.2.1 The following section describes the nature of Gatwick's current air traffic; the passengers, airlines, routes and aircraft. For a commentary on potential future traffic growth see sections 3.2, 4.2, 5.2, 5.3 and 5.4.

THE LONDON MARKET

2.2.2 London is the biggest aviation market in the world in terms of passenger numbers. In 2017/18 the five main London airports handled 171m passengers. This is more than New York, Tokyo, and Shanghai, the next three largest markets, and in large part this stems from the size of London itself. The capital is home to more than 8.9m people with another 8.8m living in the surrounding South East of England. The prediction is that London's population will grow by a further 800,000 over the next 10 years. More than a quarter of London's air passengers chose to use Gatwick Airport in 2017/18.

2.2.3 During 2017 (calendar year) 69m UK-based, and 35m overseas-based, passengers used London's airports for international leisure purposes. This is due to the city's large and prosperous catchment as well as its status as a global tourist attraction. In the same year 23m international business passengers (of which approximately half were foreign visitors) passed through London's airports, reflecting the capital's status as a major business services and financial hub. A further 9m domestic passengers used London's airports in 2017. The balance, 31m, were passengers using London's airports solely to connect between flights, rather than beginning or ending their journey in the capital.

FIGURE 2.1: LONDON AIRPORT PASSENGERS BY PASSENGER TYPE AND PURPOSE 2017



GATWICK'S PASSENGERS

2.2.4 In the two years following the global financial crisis in 2008, UK airport passenger volumes fell by almost 15%. Since then UK airport traffic has recovered steadily, surpassing the pre-recession peak in 2015/16. Assisted by our strategies to develop and grow the business Gatwick has fared better than most UK airports, recovering to its pre-recession peak by 2013/14. Many regional airports have yet to recover to pre-recession levels.

2.2.5 Since our last master plan was published in 2012, Gatwick has added almost 12m passengers in just 6 years, adding more than any other UK airport. This is also a much higher level of growth than we predicted in the previous master plan, and much higher than the Airports Commission predicted.

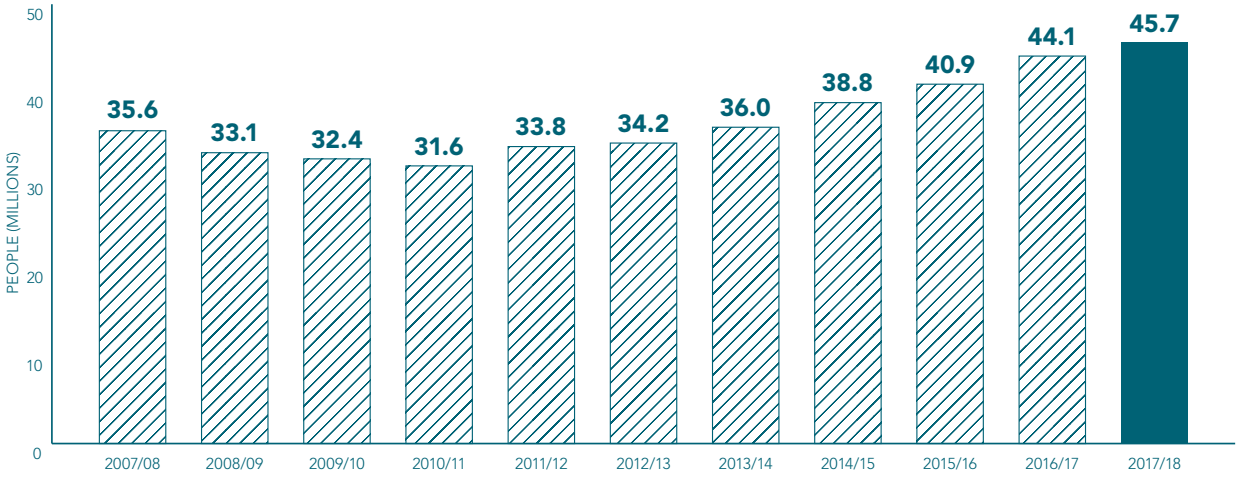
2.2.6 Department for Transport (DfT) forecasts have also underestimated Gatwick's growth in traffic. In 2013 the DfT forecast that Gatwick would accommodate 34m passengers in 2017, over 10m fewer than were actually handled in that year. The DfT's 2017 forecast update continues to underestimate passenger demand at Gatwick, projecting 45m passengers by 2030 in their central case although we have already exceeded this volume in 2017/18.

2.2.7 The increasing demand for air travel has provided the platform for growth at Gatwick and this is explored further in Sections 3.1 and 3.2. There are three main ways in which this growing demand has been converted into higher levels of traffic throughput:

(a) More passengers per flight

2.2.8 Average passengers per aircraft movement have grown from 140 in 2011/12 to 163 in 2017/18. This has been driven by higher load factors (the percentage of seats filled) and an increase in the average size (and therefore number of seats) of aircraft used.

FIGURE 2.2: GATWICK AIRPORT PASSENGERS (M)



SOURCE: GATWICK AIRPORT

(b) Peak spreading

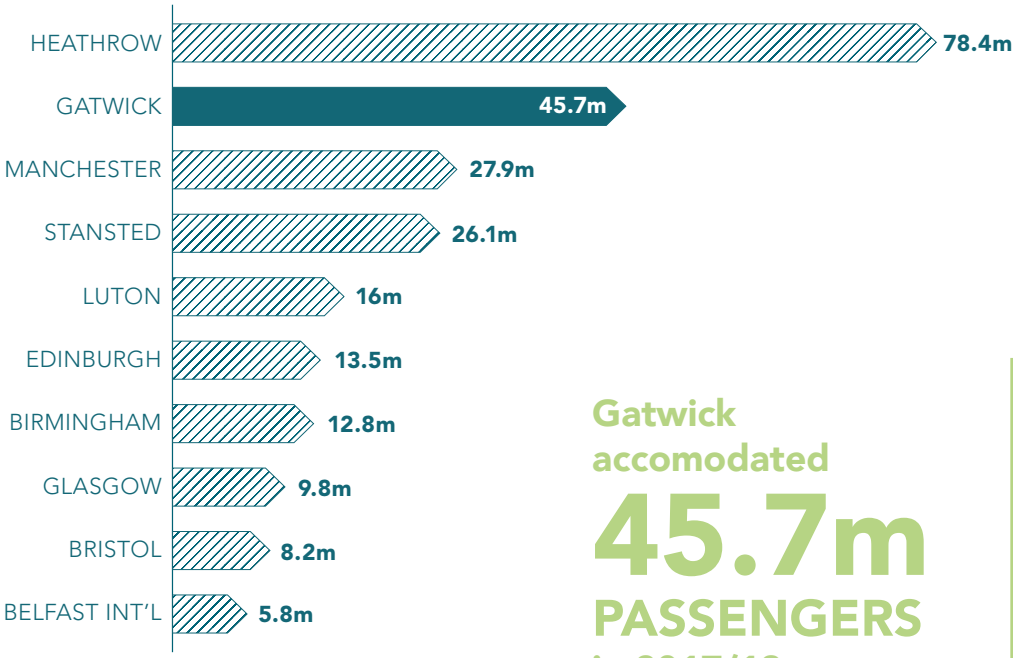
2.2.9 There has been a change in the profile of flights across the year, with a higher level of growth in the traditionally quieter periods of the year. This 'peak spreading' makes use of spare capacity on the runway and leads to a higher level of annual utilisation of the existing assets on the airport.Gatwick is still busier in the summer months than the winter months, and so we see further potential for this peak spreading to continue.

(c) Growth in peak runway capacity

2.2.10 The maximum number of scheduled aircraft movements that can be accommodated on our runway has grown from 53 an hour in 2012 to 55 an hour today. This increase has allowed more flights, including during the busy summer period.

2.2.11 This traffic growth represents a compound annual growth rate (CAGR) of 5.2% p.a. compared to the UK average of 4.1% between 2011/12 and 2017/18. In 2017/18 Gatwick reached 45.7m passengers and remains the second largest airport in the UK by passenger volume.

FIGURE 2.3: UK AIRPORT PASSENGERS (M), 2017/18





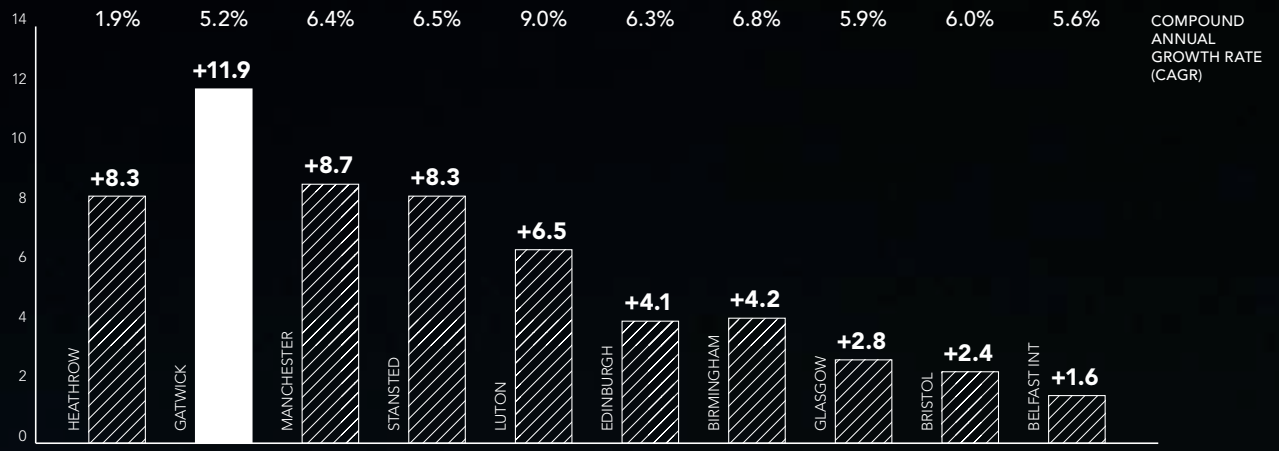
Gatwick accomodated
45.7m
PASSENGERS
in 2017/18

12M
ADDITIONAL PASSENGERS SINCE 2012

Remains the second
LARGEST AIRPORT
IN THE UK BY PASSENGER VOLUME

SOURCE: CAA AIRPORT STATISTICS

FIGURE 2.4: AIRPORT PASSENGER GROWTH BETWEEN 2011/12 AND 2017/18



SOURCE: CAA AIRPORT STATISTICS (FY = FINANCIAL YEAR ENDING MARCH, CAGR = COMPOUND ANNUAL GROWTH RATE. TOP 10 UK AIRPORTS CHOSEN BASED ON PASSENGER RANKING IN 2017/18)



2.2.12 Gatwick's proximity to London and extensive surface access links to the wider South East (and beyond) give us a wide catchment area. 81% of Gatwick's terminating passengers (i.e. excluding transfer passengers) were travelling to/from destinations in London or the South East. Greater London is the largest source market (42%), but nearby counties Kent, Surrey and Sussex account for a further 27%. Of the 19% of passengers travelling to/from destinations outside the South East, the majority were travelling to/from the East or South West of England (See Figure 2.5).

27%

Gatwick passengers travel to/from Kent, Surrey and Sussex

FIGURE 2.5: UK ORIGIN/DESTINATION OF GATWICK'S PASSENGERS

REGION	SUB-REGION	% OF GATWICK TERMINATING PASSENGERS
South East	Greater London	42.2%
	Kent	7.4%
	West Sussex	6.7%
	Surrey	6.7%
	East Sussex	6.3%
	Hampshire & Isle of Wight	6.0%
	Berkshire	2.7%
	Oxfordshire	1.9%
	Buckinghamshire	1.2%
East of England		7.5%
South West		5.4%
West Midlands		1.5%
East Midlands		1.5%
Wales		1.1%
Yorkshire and the Humber		0.8%
North West		0.4%
Scotland		0.3%
North East		0.3%
Northern Ireland & Isles		0.1%

SOURCE: CAA SURVEY, 2017

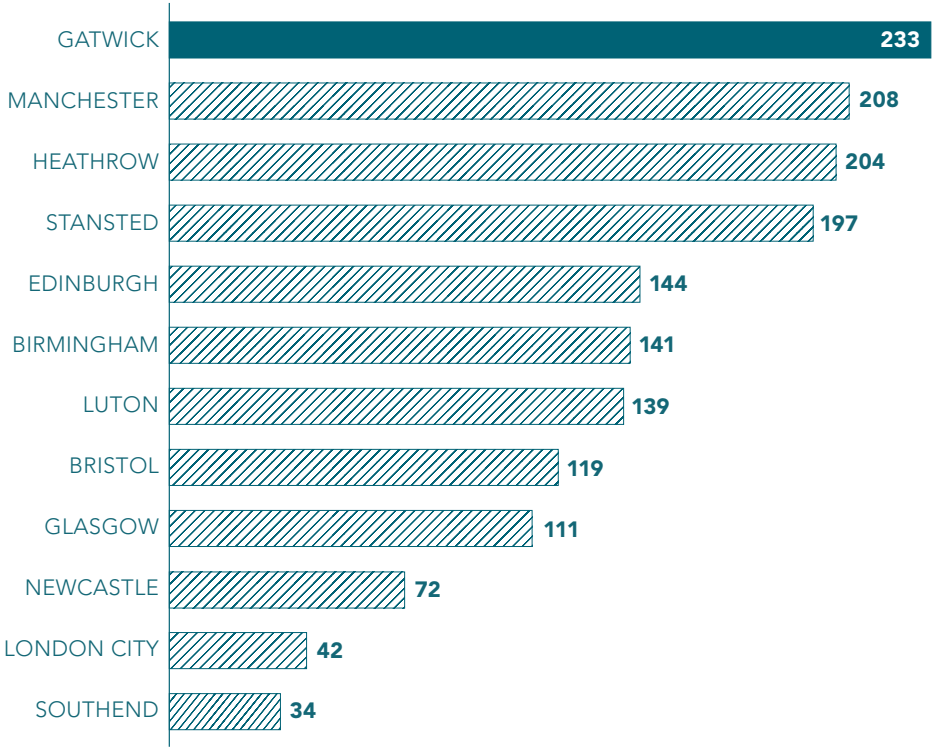
AIRLINES AND DESTINATIONS

2.2.13 Gatwick currently serves 233 destinations, more than any other airport in the UK, across long-haul, short-haul and domestic routes. Figure 2.6 compares UK airports in terms of the number of destinations served in 2017/18. **Plan 1** shows the location of the destinations served from Gatwick at the time of publication.

2.2.14 Gatwick is unique amongst London's airports as it accommodates significant numbers of low-cost, full-service, charter and regional airlines. This broad range of carriers helps support a large route network. Gatwick is the largest base for easyJet, who accounted for 18.5m passengers in 2017/18. However we are also home to a wide range of other airlines reflecting the diverse markets and passenger types using Gatwick.

2.2.15 Sadly Monarch, which was Gatwick's 8th largest airline, entered administration on 2nd October 2017. Prior to the administrators winning the right to sell the airline's slot portfolio, airlines submitted requests amounting to 6 times the available slot portfolio, confirming the significant demand that exists for Gatwick slots.

FIGURE 2.6: NUMBER OF DESTINATIONS SERVED BY UK AIRPORTS



SOURCE: OAG (ANALYSIS OF WINTER 2017 AND SUMMER 2018 SCHEDULES. DESTINATIONS SERVED BY FLIGHTS WITH TOTAL OUTBOUND SEAT CAPACITY OF AT LEAST 2,000)

2.2.16 Traffic through the London airport system is dominated by short-haul international passengers and Gatwick shows the same trend with short-haul routes accounting for 72% of passengers.

2.2.17 Gatwick also has a significant, and growing, share of long-haul traffic. Long-haul markets account for 17% of passengers at Gatwick with 7.6m long-haul passengers using the airport in 2017/18. Gatwick's long-haul market had traditionally been built around a solid core of primarily leisure routes to the US and the Caribbean. However, this has been changing in recent years. We have witnessed the rapid expansion of long-haul operation with new services to New York, Boston, Los Angeles, Buenos Aires, Singapore, Seattle and Taipei. There are also new long-haul routes from Cathay Pacific, Tianjin Airlines, WestJet, Air Canada, China Airlines, Air China, Norwegian and British Airways. Gatwick now serves over 60 long-haul destinations and further routes are planned.

2.2.18 The pace of long-haul growth has increased in recent years, delivering 1.2m additional passengers in 2016/17 and 1m in 2017/18. In 2017/18, long-haul accounted for 60% of Gatwick's traffic growth. 2018/19 will deliver even greater growth following the launch of large number of new long-haul services in late 2017 and early 2018. Long-haul growth is expected to exceed 1.4m passengers in 2018/19.

2.2.19 We have also seen some growth in the UK domestic market, with 4m passengers in 2017/18 representing 9% of our total.

AIRCRAFT

2.2.20 Gatwick handled over 282,000 aircraft movements across 2017/18. Almost 87% of these movements were carried out by narrow-body jets, which reflects the dominance of short-haul markets. Wide-body jets made up 12% of movements, while smaller regional jets and turboprops accounted for the remainder.

2.2.21 The vast majority of flights at Gatwick are by scheduled and charter passenger air transport movements (PATMs), making up 98.5% of the total. Positioning flights and general aviation flights account for the majority of the remainder (1.4% combined). A few other flights consist of air taxis, training flights and other non-commercial movements.

2.2.22 We play host to many of the newest aircraft types in the industry, with low-cost carriers typically maintaining a young fleet. Norwegian, Qatar and TUI operate the Boeing 787 Dreamliner from Gatwick, and this is now the second most frequently used wide-body jet operating from the airport. Cathay Pacific's Hong Kong service uses the new Airbus A350, the first scheduled A350 service to the UK, and China Airlines launched A350 services from Taipei to Gatwick in December 2017. EasyJet has started introducing the new A321 Neo into its Gatwick fleet with more seating capacity and more fuel-efficient and quieter engines.

2.2.23 One of the major changes we have seen since the last master plan is the introduction by Emirates of the A380 aircraft to Gatwick with 3 rotations per day by these aircraft, the largest types in service.

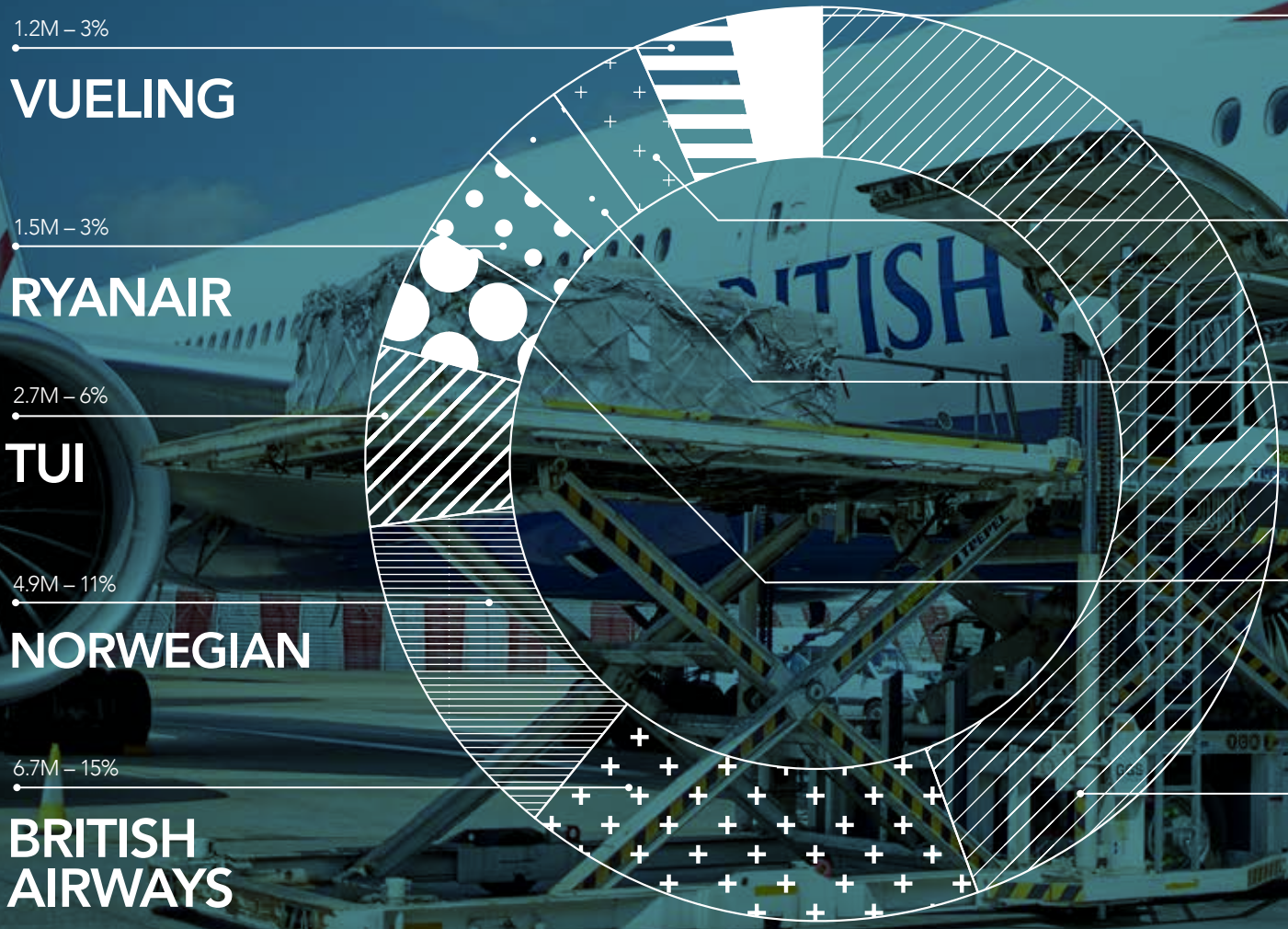
CARGO

2.2.24 In 2017/18 Gatwick handled just over 102,000 Tonnes of Cargo – a 24% increase on the previous year, driven by the additional long-haul services. A recent study by Oxford Economics[4] showed that almost two-thirds of freight (63 percent) is outbound (i.e. exported). Oxford Economics estimated that in 2017 this cargo amounted to some £5.3 billion worth of exports, supporting a £4.2 billion contribution to GDP, along with 61,900 jobs.

2.2.25 Route-level analysis reveals that, in terms of cargo volumes carried, long-haul routes at Gatwick perform at a level similar to comparable routes at London Heathrow. With the resurgence in long-haul services currently being experienced, we are already seeing cargo volumes responding proportionately.

[4] *Oxford Economics: Gatwick's economic contribution through trade and investment. June 2018.*

FIGURE 2.7: GATWICK'S LARGEST AIRLINES BY PASSENGERS FLOWN IN 2017/18



2.3 GATWICK'S INFRASTRUCTURE

2.3.1 Gatwick Airport has been evolving continuously since South Terminal first opened in 1958. Although the airport has changed out of all recognition, we still retain the original design philosophy of providing a simple-to-use integrated transport hub, with easy connections between air, road and rail networks.

2.3.2 Gatwick's location relative to local towns, transport links and other features is illustrated in **Plans 2, 3 and 4**. The airport is located between the towns of Horley to the north and Crawley to the south. The London to Brighton railway line and the A23 are adjacent to South Terminal, and the M23 motorway runs north to south to the east of the airport. The River Mole and Crawters Brook flow from south to north, passing beneath the runway in a culvert. Gatwick Stream flows alongside the railway line, joining the River Mole to the north of the airport.

THE AIRPORT BOUNDARY

2.3.3 The airport boundary illustrated in **Plan 4** is defined by the land which is owned by Gatwick Airport Limited (GAL). It also includes some additional parcels of land which are not GAL-owned (or are GAL-owned but subject to long-term lease agreements) which are used for airport-related purposes. These additional land parcels are either surrounded by GAL-owned land (for example the cargo sheds) or are positioned immediately adjacent to GAL-owned land.

2.3.4 This boundary differs slightly to that shown in the 2012 Master Plan which included some land on the perimeter of the airport which is not GAL-owned and is not used for airport related purposes and excluded some land on the airport perimeter which is used for airport related purposes.

2.3.5 The differences between the boundary in this draft master plan and the 2012 version are:

- The Tinsley House Immigration Centre in Lowfield Heath has been removed. This is not GAL-controlled land.
- An area of airport car parking positioned on the south-west corner of the airport is now included.
- On the north-east boundary, Schlumberger House has been excluded as this is not GAL-controlled land.
- On the north-west corner of the airport, we have included 7.4ha of land which we have agreed to purchase from the Gatwick Aviation Museum. We are considering options for this land which include additional surface water drainage infrastructure, relocated natural habitats and the general enhancement of our green spaces.

2.3.6 We recommend that the airport boundary represented in **Plan 4** is adopted by other organisations wanting to illustrate the perimeter of the airport.

2.3.7 **Plan 5** identifies some of the key features of the airport, for example some of the principal buildings and other elements of major infrastructure.

2.3.8 The total area of the airport defined by the boundary shown in **Plan 6** is 760ha. This is 1ha more than the area of 759ha quoted in the 2012 Master Plan owing to the boundary changes outlined above. **Plan 6** also shows how the existing airport can be sub-divided into the eight land use categories described below.

AIRFIELD FACILITIES

2.3.9 Gatwick's airfield extends over an area of 230ha. This is approaching one third of the total land within the airport boundary. The airfield comprises the Airport's primary and standby runways, the northern parallel taxiway (Juliet Taxiway), navigational and landing aids, the Airport's fire training ground and the extensive grass areas surrounding these facilities.

2.3.10 The primary runway is an instrument runway (suitable for operations in low visibility conditions) with a pavement length of 3,316m. It is designated 08R/26L. This means that when the wind is from the East, aircraft using the runway operate on a heading of 080°, and when the wind is from the West 260°. Due to prevailing wind conditions, the runway is used in the Westerly (260°) direction for approximately 75% of the time in a typical year. However this does vary by year.

2.3.11 The parallel standby runway (designated 08L/26R) is currently used only when the primary runway is unavailable due to planned maintenance or an unplanned closure. 08L/26R is a visual runway (it cannot be used in low visibility conditions) with a pavement length of 2,565m. In 2017 there were 3,722 movements on the standby runway which equates to 1.3% of total runway movements for the year.

PASSENGER TERMINALS

2.3.12 Gatwick has two passenger terminals, North Terminal which opened in 1988, and South Terminal which opened in 1958. Along with their associated facilities the terminals occupy approximately 18ha of airport land. North and South Terminals have gross floor areas of approximately 98,000m² and 119,000m² respectively. This quoted floor area for South Terminal is lower than the figure used in the 2012 Master Plan (160,000m²). This is because the floor areas have been re-measured to ensure consistency of treatment between both terminals. For example the larger area for South Terminal quoted in the 2012 Master Plan included various ancillary spaces and some adjacent buildings and other structures.

FIGURE 2.8: TERMINAL FACILITIES

	SOUTH TERMINAL	NORTH TERMINAL	TOTAL
Terminal size (m²)	119,278	98,096	217,374
Check-in desks	160 traditional/ 26 self-bag drop	89 traditional/ 74 self- bag drop	249 traditional/ 100 self-bag drop
Security	11 lanes	10 lanes	21 lanes
Outbound baggage	4,320 bags/hour	4,256 bags/hour	8,576 bags/hour
Gates	32	40	72
Air bridges	32	38	70
Immigration	28 traditional/ 25 e-gates	26 traditional/ 25 e-gates	54 traditional/ 50 e-gates
Arrival baggage	8 belts	11 belts	19 belts

2.3.13 North Terminal currently accommodates more than half of Gatwick's annual passenger traffic, processing 24.5mppa in 2017/18, while South Terminal processed 21.2mppa.

2.3.14 Associated facilities within the Passenger Terminal land-use category include office buildings, baggage handling facilities, boilers and chillers and air/cabin crew reporting facilities.

2.3.15 The train station adjacent to South Terminal (owned by Network Rail) provides access to a wide range of rail services. These include the Gatwick Express service to London Victoria as well the Southern and Thameslink networks. Both terminals also provide access to local and regional bus and coach services.

2.3.16 The two terminals are connected by an automated people mover, with two three-car trains running every few minutes between the terminals.

APRONS AND PIERS

2.3.17 Gatwick's apron area currently extends to 160ha comprising:

- Aircraft parking stands
- Taxiways
- Fuel farm
- Piers
- Support facilities (fire station, control tower, etc.).

2.3.18 The current stand provision is summarised in Figure 2.9. Many of Gatwick's aprons are configured to allow flexible parking. This allows stands that are used for overnight parking by small aircraft to be used later in the morning by larger but fewer aircraft. The table below presents the maximum numbers of aircraft parking positions for two situations - the maximum number of large aircraft and the maximum number of small aircraft.

2.3.19 There are six piers at Gatwick. Piers 1, 2 and 3 are at South Terminal and Piers 4, 5 and 6 are at North Terminal.

2.3.20 The Apron area also includes Gatwick's fuel farm, airport fire station and the control tower.

FIGURE 2.9: AIRCRAFT PARKING STANDS

	NUMBER OF STANDS (with maximum use by the largest aircraft)	NUMBER OF STANDS (with maximum use by smaller aircraft)
South Terminal pier-served	31	38
North Terminal pier-served	31	42
Remote parking stands	47	66
Total stands	109	146

CARGO FACILITIES

2.3.21 The Cargo Centre covers some 10ha. This is made up of 23,000m² of cargo sheds, plus office accommodation, areas for HGV loading, unloading and parking, and open equipment parking areas.

2.3.22 The cargo sheds are owned by a third party with a long-term ground lease. Gatwick has no direct commercial involvement with the cargo operation, although we do manage the Border Inspection Post located there. The inspection post is used for temporary storage, inspection and clearance of live animals and foodstuffs. The Gatwick direct logistics operation run by DHL, which consolidates deliveries and some of the waste collection operation, is also located in part of the cargo building.

AIRCRAFT MAINTENANCE

2.3.23 British Airways operates one hangar south of the runway on a 5ha site. In addition, there are currently two hangars to the north of the runway. One is operated by Virgin Atlantic Airways and the other, a hangar for EasyJet, is adjacent to the cargo shed. An additional two-bay hangar is being built north of the runway for use by Boeing. The site it occupies, between Uniform Taxiway and Brockley Wood, was earmarked for aircraft maintenance in the 2012 Master Plan. In total, all four maintenance hangars and associated aprons and parking areas occupy approximately 16ha.

ANCILLARY ACTIVITIES

2.3.24 The airport includes many ancillary buildings and compounds which accommodate services needed to support the airport operation. These include:

- Hotels
- Offices
- Vehicle and equipment maintenance
- Contractors' compounds
- Filling stations
- Police station

2.3.25 A number of separate on-airport sites of this type occupy approximately 28ha.

FIGURE 2.10: CURRENT ON-AIRPORT PARKING SPACES



NORTH TERMINAL

SHORT STAY

2,099

Includes all spaces in the multi-storey car parks (MSCPs), including those for Valet operations

LONG STAY

6,266

Excludes 'Zone T' (counted as 'Summer Special')

SUMMER SPECIAL

5,277

Only storage space that is part of Summer Special site is counted here, other storage sites are included under "Valet".

SOUTH TERMINAL

SHORT STAY

2,803

Excludes floors used for Valet product

LONG STAY

9,180

Excludes H Zone (used for valet storage)

VALET

NORTH AND SOUTH

13,375

Includes all storage sites used for Valet product

TOTAL SPACES: 39,000

SURFACE TRANSPORT FACILITIES

2.3.26 Gatwick has excellent surface transport links, with direct access to the national motorway and railway networks. It was the first airport in the world to be developed with fully integrated airport, main road and mainline rail facilities.

2.3.27 The airport is located adjacent to the M23 motorway, approximately 25 miles south of central London, and less than 10 minutes from the M25. Gatwick Airport has its own mainline railway station, which serves over 18 million rail passengers a year. This makes it the busiest railway station in the South East outside central London. It has direct services to 129 other stations each day and up to 26 train departures an hour.

2.3.28 Surface transport facilities within the airport boundary are made up of on-airport roads, forecourts and car parks, including facilities for coaches, taxis and car rental companies. Together these occupy 154ha of airport land, around half of which is made up of car parks. This area also includes premium drop-off and valet facilities, waiting areas for taxis and coaches, the main bus and coach stations serving both Terminals, cycling facilities, pedestrian routes and the Terminals' forecourt road systems.

2.3.29 Gatwick itself manages around 27 miles of on-airport roads, ensuring they remain safe, well-maintained and clear for passenger, staff, operational, contractor and emergency vehicle access. Gatwick employs its own fleet of winter maintenance vehicles for snow and ice clearance and gritting roads and footways.

2.3.30 There are currently 39,000 car parking spaces 'on airport' and a further 21,196 authorised spaces 'off-airport'. Figure 2.10 shows the current parking provision on-airport. There are a further 6,200 spaces allocated for staff car parking.



39,000
car parking spaces 'on airport'



21,196
approved spaces 'off-airport'



6,200
spaces allocated for staff car parking

LANDSCAPING AND SURFACE WATER DRAINAGE

2.3.31 Gatwick includes approximately 144ha of land devoted to surface water drainage, and to agriculture and landscaping (both natural and planted). This includes two areas managed with the aid of Biodiversity Action Plans.

2.3.32 The main surface water drainage features are illustrated in **Plan 7**. These include local water courses, balancing ponds and pollution lagoons.

2.3.33 The main landscape and biodiversity assets are shown in **Plan 8**. Gatwick has a diverse range of landscape and biodiversity assets across the campus. These include mature native woodlands, ancient woodland and mature hedgerows. These all combine to form high-quality, attractive landscape features that enclose and screen the airport, as well as providing wildlife habitats.

2.3.34 Mature planted woodland, avenue and specimen trees provide a valuable element of our green infrastructure and important wildlife corridors throughout the airport. While of lower value than ancient woodland, this still forms important screening and provides green corridors for many species. Planted earth bunds around the airport also help to screen it from local communities.

2.3.35 Like the woodland, our natural watercourses provide important wildlife corridors and habitats for many species.

2.3.36 Public spaces connected with our main buildings allow easy access through the airport for passengers, visitors and employees. These routes, walkways and spaces are an essential part of the airport, but of limited biodiversity value. We are exploring opportunities to improve these spaces.

£1.11 billion



expenditure over the next five years

£1.5 billion



already invested since change of ownership in 2009

2.4 RECENT INVESTMENT PROJECTS

2.4.1 We review our investment strategy annually to give us greater flexibility in responding to changes in regulations and the needs of our airline customers and passengers.

2.4.2 The investment strategy is developed in consultation with the airlines in accordance with our commitments included as part of the CAA's economic licensing of Gatwick and is described in the Capital Investment Programme (CIP). This programme looks at Gatwick's plans for investment over the next five years and reflects significant investment in optimising the effectiveness of the airport based on a single runway operation.

2.4.3 The 2018 CIP outlines a total expenditure of £1.11 billion over the next five years, with £266 million of this already committed for 2018/19. This is in addition to the £1.5 billion that Gatwick has invested to-date since the change of ownership in 2009.

PROJECTS THAT HAVE RECENTLY BEEN COMPLETED

Airline moves and the transformation of North Terminal

2.4.4 One of the most significant recent projects was the 'Airline Moves' project which saw the consolidation of easyJet in North Terminal and the relocation of British Airways to South Terminal and Virgin Atlantic to North Terminal. All moves were completed in January 2017. This required the reconfiguration of airline lounges and crew report facilities along with significant changes to check-in desks at both terminals. Enhancements were made to the North Terminal's baggage reclaim hall and the security facilities were upgraded to match those in South Terminal.

2.4.5 Perhaps the most ambitious part of the programme was the creation of the world's largest self-service bag-drop facility in North Terminal. Improvements have also been made to the arrivals area. There is now an onward travel centre and new shops, whilst the whole area has been transformed to be more welcoming for arriving passengers. The final piece of this programme was the provision of a new walk-through duty free store which opened in September 2017.

Construction of the new South Terminal Baggage Factory and Pier 1

2.4.6 This project (opened in June 2016) includes an automated baggage handling system along with a 2,000 bag storage facility. Amongst the benefits of the new system are the ability for passengers to check-in earlier. Modern gate rooms and separate departures and arrivals routes have also been provided. It replaces the original Pier 1 which was the oldest pier at Gatwick.

Reconfiguration of the aircraft stands and upgrading gate rooms in Pier 5

2.4.7 This project was designed to increase the use and efficiency of the existing pier and apron by rebuilding them to modern standards. The reconfigured apron and pier offer more flexibility for different aircraft types along with better passenger facilities, simpler segregation of arriving and departing passengers, and a more efficient boarding operation.

North Terminal Pier 4 reconfiguration

2.4.8 Also at North Terminal we have reconfigured the stands on Pier 4. This has provided three additional centrelines for aircraft parking and servicing to enhance pier service levels.

North Terminal border area

2.4.9 Since 2015 we have increased the size of the immigration hall in North Terminal as well as installing 15 new automated gates to increase capacity and reduce queues. In addition, new ceilings and lighting have been installed in the border zone and toilets have been relocated to the baggage reclaim hall.

Commercial projects

2.4.10 We have completed a wide range of projects aimed at enhancing the retail and advertising offer of Gatwick across both terminals. These include the opening of a new walk-through duty-free store in North Terminal, new stores for Hamleys, Reiss, Superdry and Jack Wills, and a Jamie Oliver's Diner in South Terminal. Real-time bus information is now operating on the bus shelters around the airport and new or replacement digital advertising screens have been installed.

Additional car parking

2.4.11 We have recently completed a project to deck part of South Terminal's long stay car parking to provide an additional 1,565 spaces and we are working on plans for more spaces, as explained later in this document.

Digital technologies to support security and queue management

2.4.12 We have implemented face recognition and IRIS scanning security control technology for domestic passengers. We hope to extend this to international passengers over the next few years. We have also introduced highly-effective monitoring systems for check-in queues which allow queue waiting times to be accurately predicted. The entire CCTV infrastructure has also been upgraded as part of the Capital Investment Programme.

Enhancing our ability to maintain resilient and stable operations.

2.4.13 We invest around £10 million per year on projects which help deliver 'stable operations'. Some recent examples include:

- We have provided additional flood water storage capacity at the western end of the runway. In addition, a new pumping station was installed to help protect the transformer and airfield ground-lighting equipment. Flood protection measures have been implemented to prevent water entering North Terminal basement switch rooms.
- We have invested in a back-up power generation plant to ensure the uninterrupted performance of critical IT data rooms across Gatwick. Further investment has been made in standby power generation to safeguard the operation of critical systems.
- We have installed new uninterruptible power supply equipment to key communications facilities across Gatwick to mitigate the risk of future outages having a serious impact on our operations
- We also have ongoing programmes to replace Fixed Electrical Ground Power units and slot drains on the apron. We have made upgrades to the Fire Main and replaced elements of the roof of North Terminal.

Improving the environmental performance of the airport

2.4.14 In recent years we have invested in initiatives aimed at improving the Airport's environmental performance. One of the best examples of this is the Materials Recycling Facility which is aimed at improving the efficiency of Gatwick's waste management programme. Once it is fully operational, the amount of operational and commercial waste recycled at Gatwick will rise from 50% to around 80-85% by 2020.

Level 3 baggage security screening

2.4.15 Work on this project is ongoing to introduce new baggage screening equipment (known as 'Standard 3') by 1 December 2019, to comply with EU security regulations. An extensive pilot programme of three different manufacturer's machines in the first half of 2016 has shown the best machines for our baggage operation. The phased installation of the replacement equipment has started.

2.4.16 Various other projects are currently in the planning stages for delivery during the next few years. These are described in Chapter 4.

PROGRESS ON DELIVERING THE 2012 MASTER PLAN

2.4.17 The 2012 Master Plan indicated how the airport was expected to develop to a throughput of around 40mppa. The main change since this plan was published has been the much faster than expected rate of growth, with 40mppa being reached in November 2015, some six years sooner than anticipated. This rapid growth has required even more focus on the use of technology and process improvements to deliver the required levels of service. These improvements have enabled the existing infrastructure to deliver more capacity than anticipated when the previous master plan was published.

2.4.18 For example, it has not been necessary to expand the floor area of either Terminal. Instead there has been a major internal reconfiguration of North Terminal so that the existing floor areas are used more efficiently. This was not a solution that had been identified at the time of the 2012 Master Plan.

2.4.19 It has also not been necessary to build any new piers beyond the planned reconfiguration of Pier 5 and replacement of Pier 1. These improvements have permitted pier service levels to be maintained, although we are now actively progressing a project to expand Pier 6 as described later.

2.4.20 As anticipated there is still a requirement to deliver a new hangar to provide an enhanced aircraft maintenance capability to Gatwick's airlines. This is now being constructed in the North West Zone as envisaged by the 2012 Master Plan.

2.4.21 Design and implementation of some of the suggested surface access improvements is ongoing. For example we have recently completed works to improve the North Terminal forecourt. Planning continues for further improvements to the pedestrian access between South Terminal and local bus stops located on the A23. A project is currently examining the best way to deliver these improvements to achieve the desired access requirements within the site constraints.

2.4.22 All that said, the infrastructure improvements which the 2012 Plan suggested were necessary to support a throughput of 40mppa have to a large extent been, or are in the process of being, delivered. In Chapters 4 and 5, we explain our analysis of the future development requirements that we believe are necessary to maintain targeted service levels as the airport continues to grow.

The investment projects envisaged in the 2012 master plan have, to a large extent, been delivered or are in the process of delivery.



3 LOOKING AHEAD

MARKET AND POLICY DEVELOPMENTS

3.1 Market trends
3.2 Traffic growth
3.3 Government policy
3.4 Airspace modernisation

3.1 MARKET TRENDS

CONTINUED GROWTH IN LOW-COST TRAVEL

3.1.1. The trend towards 'low-cost' airlines that started 20 years ago, revolutionising global air travel, has continued. Supported by the deregulation of aviation markets within Europe and elsewhere, low-cost airlines have opened up new routes and destinations to business and leisure travellers, and have stimulated a long period of growth in air traffic. Initially this growth took place in short-haul markets where operating economies could easily be gained by flying aircraft more intensively on multiple routes every day. This drove up aircraft utilisation, allowing air fares to be reduced whilst still achieving profitable operations. More recently the introduction of more fuel efficient long-haul aircraft is allowing airlines to extend the low-cost model to a wide range of long-haul destinations.

3.1.2. Gatwick has been at the centre of this lowcost revolution. In the last ten years we have seen passengers on low-cost airlines grow from less than 30% of our total throughput to 62% today. The increasing number of airlines serving this market is undoubtedly a big factor for driving growth at Gatwick, and it has also stimulated the wider London market with lower fares and greater choice.

3.1.3. Gatwick is also playing a key role in the emergence of low-cost long-haul services, supporting an expanding network of such routes flown by airlines such as Norwegian and WestJet.

3.1.4. Full service or 'legacy' airlines are also exploring these markets, with several of the largest European airline groups setting up low-cost brands, such as Level for IAG and Eurowings for Lufthansa group. Both of these airlines operate in low-cost long-haul and short-haul services.

3.1.5. However, demand remains for full service airlines and these also have growth plans. IAG acquired the Monarch slot portfolio which is now operated mainly by British Airways, opening up new routes and supporting existing mature markets. Gatwick therefore continues to see growth in inbound full-service airlines, operating on both short-haul and long-haul routes.

NEW GENERATION AIRCRAFT

3.1.6 New generation aircraft are entering service which are much more fuel efficient owing to improved engine technology and lighter weight airframes, made possible through the use of composite materials in their construction.

3.1.7 These new-generation aircraft, which are able to fly further at economically attractive prices, are opening up an increasing number of direct long-haul point-to-point routes which are proving very appealing to international passengers and attracting traffic which would previously have travelled through hub airports. Gatwick already has five airlines which operate the B787 Dreamliner and Airbus A350 on long-haul services.

3.1.8 The same technology improvements are being introduced into narrow-body aircraft such as the B737 Max, A320 Neo and A321 Neo, and these aircraft will become the largest part of the fleet operating at Gatwick within the next 10-15 years. As well as improved fuel efficiency they also offer substantial noise reductions compared to the previous generation of aircraft.

THE EMERGENCE OF NEW TRANSFER HUBS

3.1.9 London continues to play an important role as a transfer hub for transatlantic services, due in part to its geographic location and strong local market. Along with other European hubs, it has also served as a transfer point for markets flowing to the Middle East and Asia. However, with the growth of new hub airports in for example Turkey, the Gulf and Asia, there has been a significant decline in the share of transfer passengers choosing to route via European hub airports. Gatwick is already well connected to many of these new hub airports and added Qatar Airways with double daily flights to Doha in May 2018. In addition the increase in new long-haul, point to point services has eliminated the need for a hub on many flows entirely. This has been driven by the emergence of long-haul, low-cost carriers which have now gained a meaningful share of demand on transatlantic routes

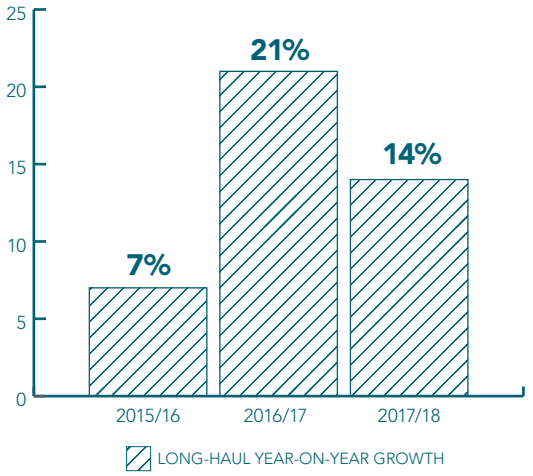
3.1.10 Looking ahead, transfer passengers will remain an important part of London's aviation market. However, owing to the presence of a strong and growing local demand for air travel; increased capacity at other better positioned hubs; and new direct long-haul routes to and from the UK; the significance of transfers at London airports will continue to decline. Gatwick's airlines have already demonstrated the ability to serve established and emerging long-haul markets with over 60 long-haul routes now being operated from the airport.

EMERGING GLOBAL MARKETS

3.1.11 London remains the world's biggest aviation market and the 3rd most visited city in the world. Therefore it is one of the first long-haul destinations that airlines seek to connect to. It is also a destination that copes well with growth, with many cities connected with multiple daily frequencies.

3.1.12 There is strong demand from China, India and Africa, supported by a liberalisation of Air Service Agreements and traffic rights allocation, as well as by economic growth. As these economies become richer, their populations grow wealthier driving a desire to travel. We are already well connected to Asian markets and these routes have seen very high growth rates. China Eastern will begin flights between Gatwick and Shanghai in December 2018.

FIGURE 3.1: GROWTH IN GATWICK LONG-HAUL PASSENGERS – 2015 TO 2017



NEW WAYS OF BUYING TICKETS

3.1.13 As low-cost airlines continue to grow and offer cheaper tickets to a wider range of destinations, passengers are seeking to use these flights to create their own connecting opportunities where direct services are unavailable or more expensive. In order to simplify the process for making these 'self-connections', we created the 'GatwickConnects' product. This helps passengers find and book connecting flights, and smooths the process of transferring between flights at Gatwick.

3.1.14 In late 2017, easyJet extended the GatwickConnects concept further, by distributing it through its website and creating a product 'worldwide by easyJet' which enables self-connections across its network. This concept continues to evolve with ongoing product developments from airlines, airports and distribution channels working towards mainstream adoption.

AIR FREIGHT

3.1.15 Growth in air freight follows growth in long-haul passenger traffic, as exporters and importers take advantage of passenger-led route development to ship goods around the world in the belly-holds of aircraft flying those routes. As the number of long-haul services at Gatwick increases, the recent trend of strongly growing freight volumes handled at the airport is likely to continue. In 2018 Cargo throughput at Gatwick is growing at about 25% per annum.

EXITING THE EUROPEAN UNION

3.1.16 The UK's exit from the EU inevitably brings a period of some uncertainty for the aviation industry. Nevertheless the Government has made clear that one of its key objectives is to establish an ambitious new aviation relationship with the remaining member states, including market access. The emerging Aviation Strategy makes clear the government's intention to examine the UK's air service agreements to ensure these are used to drive even more connectivity and competition for the benefit of the consumer.

CONCLUSION ON MARKET TRENDS

3.1.17 In conclusion, a review of the market trends highlights a number of reasons why Gatwick is well placed to deliver additional traffic growth:

- It has a proven track record of supporting the continued expansion of low-cost airlines, and particularly their growth into long-haul markets;
- It is also able to support legacy airlines which are adapting to compete effectively;
- It provides access to London for the transfer hubs in the Middle East and Far East which are growing so rapidly;
- It is a leader in adopting new processes and technologies which provide customers with more choice on how they purchase their tickets and other air travel services;
- It is already home to a growing fleet of new generation aircraft which support new long-haul, point-to-point services.

3.1.18 Gatwick's location, and its ability to deliver efficient flexible infrastructure, mean that we are well placed to benefit from these trends.

3.2 TRAFFIC GROWTH

GOVERNMENT AIR TRAVEL FORECASTS

3.2.1 The Government's latest forecasts, produced by the DfT, show air travel in the UK growing from 267m passengers in 2016 to 410m passengers in 2050 without a new runway, or to 435m passengers in 2050 with a new third runway at Heathrow[5]. However this is less than the underlying, unconstrained demand, which the DfT forecasts to be 495m passengers in 2050.

3.2.2 This indicates that even with a third runway at Heathrow there is insufficient airport capacity to meet the unconstrained demand for UK air travel. This 'capacity gap' is forecast by the DfT to be evident in 2030 and 2040 and to increase over time.

3.2.3 Capacity constraints will be most apparent in the London airport system where there is the most serious shortage of runway capacity. The DfT's forecasts show that by 2025 the main London airports, with the exception of Stansted, are expected to be effectively full. The constrained nature of the London airport market, along with the fact that it attracts more air passengers than any other city, provides a high level of confidence that additional capacity will quickly become utilised.

GROWTH AT GATWICK

3.2.4 As outlined above, Gatwick is well placed to compete to win a significant share of this growth scenario, notwithstanding the growth plans at Heathrow and of other South East airports:

- It has a strong base of low-cost and legacy airlines (see section 2.2);
- It has a strong catchment area with excellent rail access across London, the South East and beyond;
- It has efficient flexible infrastructure, and competitive airport charges;

3.2.5 Although the DfT's latest forecasts for Gatwick show throughput constrained to 45mppa until 2030 and then growth to 50mppa by 2040, this is acknowledged to be a cautious assumption pending the publication of a new master plan. There is a history of Gatwick's traffic throughput being underestimated by the DfT's forecasting model, and passenger numbers at Gatwick in 2018 already exceed the DfT's latest forecast for 2030.

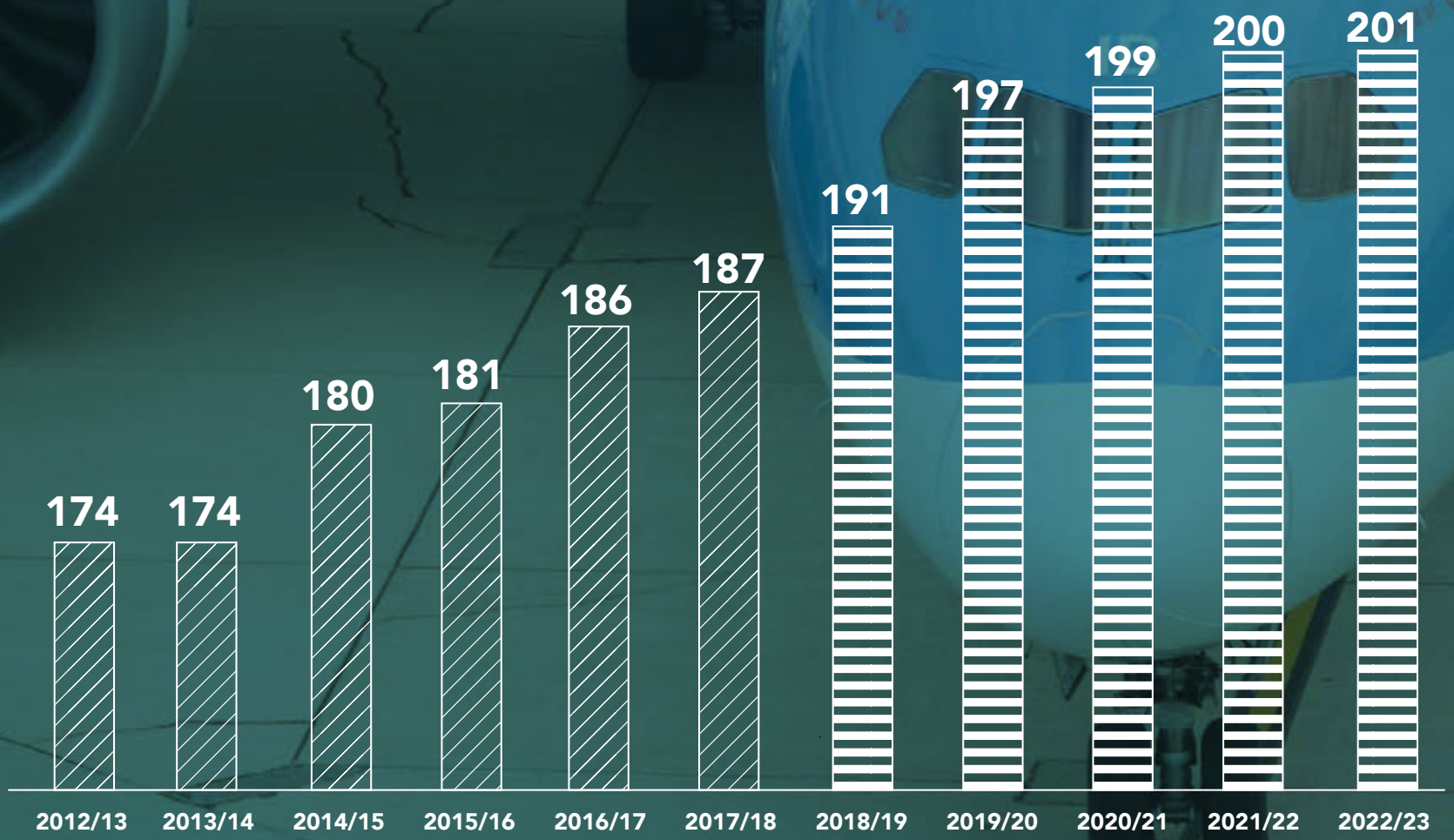
3.2.6 The strong demand for the former Monarch slots at Gatwick, despite the fact that a number of other South East airports had capacity available, confirms the continued attractiveness of the airport to airlines.

3.2.7 In recent years Gatwick has proved that it can provide the right type of capacity to meet the growing demand, and particularly the types of efficient, flexible infrastructure which low-cost operators require. In addition to addressing the short-haul market, Gatwick is actively supporting development of new long-haul destinations to both existing and emerging markets. Gatwick now serves over 60 long-haul destinations for a full range of airline business models. This already exceeds the number of long-haul routes that the Airports Commission forecast Gatwick would have in 2050 with an additional runway.

3.3.8 As operators look to reduce costs and maximise the use of the available capacity at Gatwick and elsewhere, we are seeing a shift towards the use of larger-gauge aircraft. In 2017/18 there were on average 163 passengers per air traffic movement at Gatwick, an increase from 140 in 2011/12. We expect this trend to continue. For example, Gatwick's largest carrier easyJet is now taking delivery of A321 sized aircraft which should increase their average passenger loadings by a further 20%. The continued growth of long-haul is also increasing the number of passengers per aircraft movement as the aircraft used are typically significantly larger than those on short-haul flights. This ongoing trend for larger aircraft is illustrated in Figure 3.2 which shows how the number of seats per aircraft has increased, and is expected to continue increasing over time.

3.2.9 Another trend at Gatwick which is continuing to deliver growth is the spreading of services into the traditionally quieter times of the year. Long-haul services tend to be less seasonal but we are seeing short-haul airlines also taking up runway slots at times that were previously less attractive. Gatwick is still significantly more seasonal than either Heathrow or Stansted and we therefore see the opportunity for more services outside the peak periods of the year.

FIGURE 3.2: GROWTH IN AIRCRAFT SIZE (REPRESENTED BY SEATS PER AIRCRAFT MOVEMENT) AT GATWICK – 2012 TO 2022



3.3 GOVERNMENT POLICY

AVIATION POLICY

Aviation Policy Framework 2013

3.3.1 Current Government policy on aviation strategy is set out in the 2013 Aviation Policy Framework (APF). This recognises the important role and major contribution the aviation sector makes to the UK's long term economic growth. It sets out its support for the growth of the sector within a framework which maintains a balance between the benefits of aviation and its costs, particularly its contribution to climate change and its noise impacts.

3.3.2 The APF set out the Government's four main objectives:

- To ensure that the UK's air links continue to make it one of the best connected countries in the world. This includes increasing our links to emerging markets so that that the UK can compete successfully for economic growth opportunities.
- To ensure that the aviation sector makes a significant and cost-effective contribution towards reducing global emissions
- To limit and where possible reduce the number of people in the UK significantly affected by aircraft noise.
- To encourage the aviation industry and local stakeholders to strengthen and streamline the way in which they work together.

3.3.3 Within these objectives the APF set out that a key priority in the short term is to make the best use of existing capacity at all UK airports.

New Aviation Strategy

3.3.4 The APF will soon be replaced by a new Aviation Strategy – The Future of UK Aviation – that will set out long term policy to 2050 and beyond. A first phase of consultation on policy issues commenced in July 2017 and has now been completed. The Government is working on a Green Paper which it plans to publish in the Autumn of 2018, followed by the completed Aviation Strategy in the first half of 2019.

3.3.5 For this new strategy the Government has confirmed that its aim 'is to achieve a safe, secure and sustainable aviation sector that meets the needs of consumers and of a global, outward-looking Britain'. The strategy is expected to be based around six core objectives which are:

- Help the aviation industry work for its customers
- Ensure a safe and secure way to travel
- Build a global and connected Britain
- Encourage competitive markets
- Support growth while tackling environmental impacts
- Develop innovation, technology and skills

3.3.6 Following its Aviation Strategy call for evidence, and further analysis, the Government has recently set out its policy support for airports, beyond Heathrow, to make best use of their existing runways, subject to full consideration of related economic and environmental impacts and proposed mitigations[6]. Gatwick welcomes this policy position which we see as in important enabler for airports other than Heathrow to play their parts in meeting the growing demand for air travel to and from the UK.

NATIONAL POLICY STATEMENT

3.3.7 The Government has recently designated its Airports National Policy Statement (NPS) which provides policy support for a third runway at Heathrow. This follows nearly six years of study by the Airports Commission and the Department for Transport – a process in which we participated fully with our own scheme for a new runway to be built to the south of the existing airport.

3.3.8 Although we strenuously made the case for a new runway at Gatwick, we accept that it is current Government policy to instead supports the third runway at Heathrow and it is now for Heathrow's owners to seek development consent for that project within the terms set out by the NPS.

3.3.9 In light of this policy position we are not actively pursuing a new additional runway. However, should this or a future Government decide to support a new additional runway at Gatwick, then we would be ready to re-examine this with a view to seeking development consent. In the meantime the land required for an additional runway should continue to be safeguarded from incompatible development, in line with current Government policy.

[6] [redacted]

3.4 AIRSPACE MODERNISATION

AIRSPACE MODERNISATION STRATEGY

3.4.1 The airspace above the South East of England was designed in the 1950/60s and is rapidly approaching the limit of its capacity. The current airspace design contains choke points, restricts the free flow of traffic and requires the use of outdated air traffic management solutions. This increases delays, operating costs and fuel burn, and intensifies the environmental impacts (noise and emissions) experienced by those residing close to flight paths.

3.4.2 DfT forecasts that UK air passenger numbers will grow by around 30% by 2030. However, UK airspace also needs to accommodate overflights – for example transatlantic services from Europe. Taking account of both of these factors NATS estimates that by 2030 there will be an additional 1 million aircraft movements per year, compared to 2015, through UK airspace. Unless action is taken, the current airspace design is likely to lead to more than 1 in 3 flights being delayed by at least 30 minutes.

3.4.3 Government acknowledges that urgent action is now needed to address this issue and has instructed[7] the Civil Aviation Authority (CAA) to prepare a co-ordinated strategy for the modernisation of UK airspace up to 2040. As a result the CAA is developing a new 'Airspace Modernisation Strategy' which it plans to publish by the end of 2018.

FUTURE AIRSPACE STRATEGY IMPLEMENTATION

3.4.4 A key part of the Airspace Modernisation Strategy will be a programme to transform the airspace above Southern England. This is known as the 'Future Airspace Strategy Implementation (South)', or FASI(S). Within this programme, NERL (the en-route arm of NATS) is responsible for the design of the airspace above 7,000 feet. This element of the work is known as London Airspace Modernisation Programme (LAMP).

3.4.5 This is a comprehensive and complex redesign project. It is currently envisaged by NATS that the first phase of implementation could not take place before early 2024. However this redesign offers a unique opportunity to address many of the legacy issues that have constrained the aviation industry's ability to minimise environmental impacts. For example, it has the potential to offer new ways of offering noise respite to communities currently overflown and to permit aircraft to climb more steeply and continuously to their cruising altitudes.

3.4.6 All the airspace redesign will be done in accordance with the CAA's Airspace Change Process, which is detailed in CAP 1616. This process puts transparency and public engagement at the heart of all activities.

3.4.7 To support this Government initiative we will work closely with the CAA and NATS during this process which will require us to consider how the airspace below 7,000ft around Gatwick will need to be modified to support the Airspace Modernisation Strategy objectives. Any proposed changes that are necessary will be fully consulted on before being implemented.

3.4.8 In order to deliver a stable airspace solution, suitable for the next 30-40 years, we will seek a design which could accommodate all potential growth scenarios at Gatwick whilst minimising their environmental impacts.

[7] *Air Navigation Directions (October 2017)*



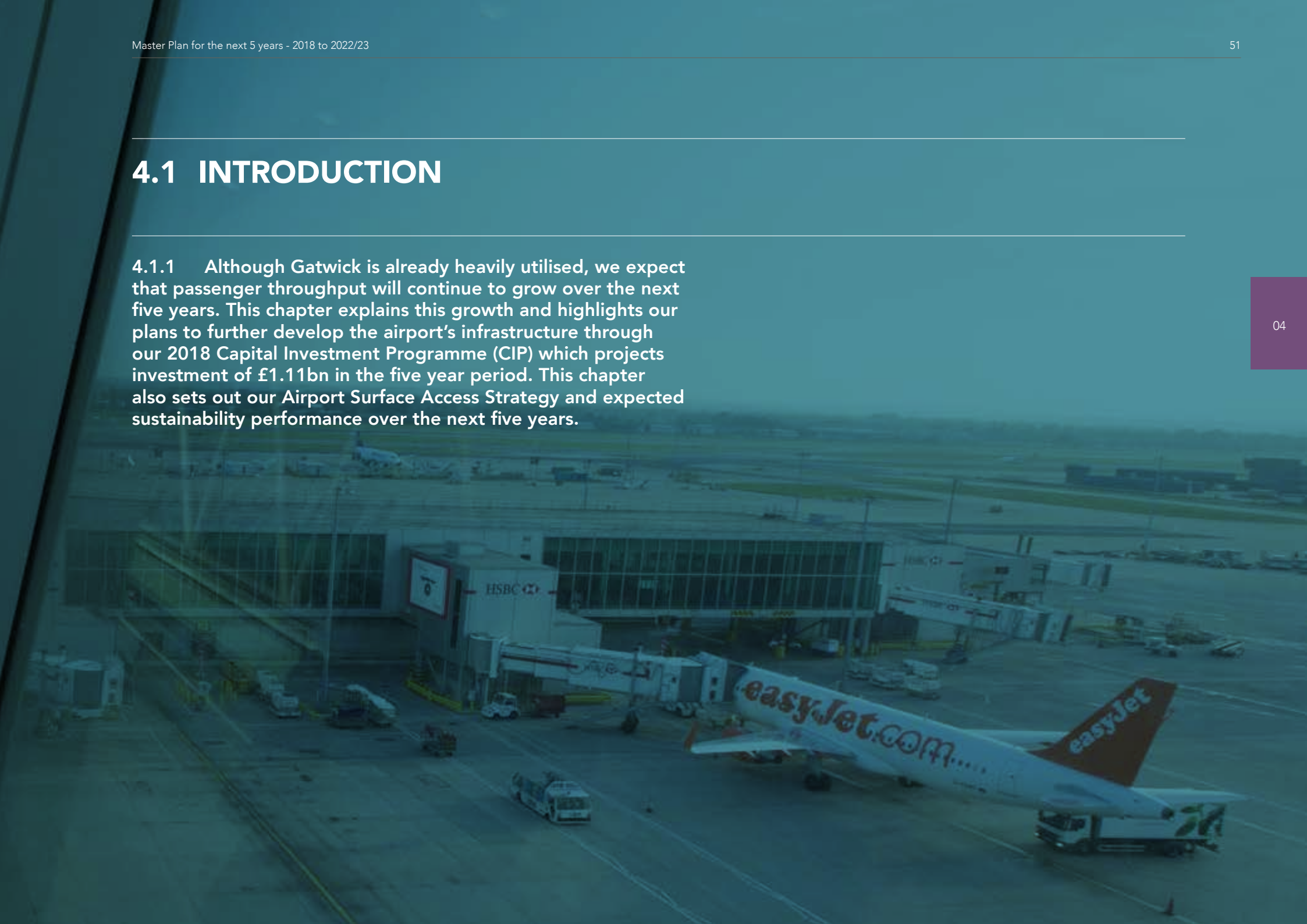
4 MASTER PLAN FOR THE NEXT 5 YEARS

2018 TO 2022/23

4.1	Introduction
4.2	Traffic projection
4.3	Capital Investment Programme
4.4	Airport Surface Access Strategy
4.5	Sustainability Performance

4.1 INTRODUCTION

4.1.1 Although Gatwick is already heavily utilised, we expect that passenger throughput will continue to grow over the next five years. This chapter explains this growth and highlights our plans to further develop the airport's infrastructure through our 2018 Capital Investment Programme (CIP) which projects investment of £1.11bn in the five year period. This chapter also sets out our Airport Surface Access Strategy and expected sustainability performance over the next five years.



4.2 TRAFFIC PROJECTION

IMPROVING THE RUNWAY OPERATION

4.2.1 The existing main runway at Gatwick is a key piece of national transport infrastructure which needs to be operated safely and efficiently. We believe that at peak times it is already busier than any other airport runway and its level of throughput has been gradually increasing over many years. We want to make use of its full capacity potential but also improve the resilience of the operation, in order to reduce delays and disruption.

4.2.2 To achieve this we are exploring a number of technology and process initiatives as well as some changes to the runway infrastructure. We are developing a programme of work to implement these changes over the next few years and in this we will be working closely with ANS, the provider of Gatwick's Air Traffic Control (ATC) services, and with our airline community.

4.2.3 Improvements in the runway operation can be realised through the introduction of new operating procedures and air traffic management tools. These will help the efficiency with which arriving and departing flights use the runway. With more efficient sequencing and more accurate orchestration of aircraft movements, the amount of 'dead time' between runway movements can be reduced, thus increasing capacity. It will also improve the resilience of the airport and help reduce delays.

4.2.4 Expected improvements include the introduction of 'time-based separation' which allows a more accurate method of spacing arriving flights than the current method based on fixed-distance separations. We also expect to realise the benefits of integrating a suite of new air traffic management tools (for example AMAN and DMAN) that have been developed to increase the predictability of departure and arrival flows.

4.2.5 In addition to the above, we are working very closely with ANS on a number of key initiatives to improve control of aircraft on the ground, reduce controller workload and improve the sequencing of aircraft prior to departure.

4.2.6 We are also looking at the runway and taxiway infrastructure and we are considering a number of improvements including the provision of a new rapid exit taxiway (RET), enhancement of instrument landing systems and the updating of ground lighting to provide taxiway routing guidance to pilots.

2017/18

163

AVERAGE NUMBER OF PASSENGERS PER FLIGHT



LIKELY TO INCREASE

2022/23

176



AVERAGE NUMBER OF PASSENGERS PER FLIGHT

TRAFFIC FORECASTS

4.2.7 As these operational improvements are introduced we will consider whether it is appropriate to increase the peak hour movement capacity of the runway. For the moment we have no immediate plans to increase this above 55 scheduled flights per hour. However it is possible that a small increase will be made within the next five years. We also expect there to be a limited release of additional slots in the evening off-peak period to allow for traffic growth.

4.2.8 We expect to see a continuation of the airlines' strategy of upgrading to larger aircraft, for example the purchase of A321s by easyJet. This trend is likely to increase the average passengers per flight from 163 in 2017/18 to 176 by 2022/23. We also see further potential for peak spreading and the addition of more flights in the traditionally quieter times of the year.

4.2.9 The traffic forecasts for the Gatwick over the next five years are shown in Figure 4.1.

4.2.10 As is the case with all the forecasts presented in this draft master plan, Figure 4.1 assumes that the levels of flying permitted by the DfT within the night quota period remain the same as today[8].

FIGURE 4.1: TRAFFIC FORECASTS UP TO 2022/23

	2017/18 ACTUAL	2018/ 2019	2019/ 2020	2020/ 2021	2021/ 2022	2022/ 2023
Passengers (m)	45.7	47.1	49.1	50.6	52.0	52.8
ATMs	280,790	284,270	289,770	294,490	297,670	300,000
Passengers per ATM	162.7	165.7	169.4	172.0	174.7	176.0

[8] *The night quota applies between 23:30 and 06:00. These night quotas, set by the DfT, are 11,200 flights during the summer and 3,250 flights during the winter season*

4.3 CAPITAL INVESTMENT PROGRAMME

OUR CAPITAL INVESTMENT PROGRAMME

4.3.1 Our 2018 Capital Investment Programme (CIP)[9], contains development projects with expenditure amounting to £1.11 billion over the next five years through to 2022/23, with £266 million planned for 2018/19 alone. The projects assume that during this period Gatwick will grow to a throughput of 53mppa.

4.3.2 Infrastructure projects are needed for a variety of reasons. We have identified six different drivers for investment decisions, which are:

- EHS, Security and Compliance
- Asset stewardship and resilience
- Capacity
- Service quality
- Cost efficiencies
- Commercial revenue

4.3.3 The key projects which will result in noticeable physical changes to the airport are described below and are illustrated in **Plan 9**.

Customer service

4.3.4 It is vital that our CIP reflects our customers' requirements and expectations. For our airlines we achieve this through bilateral and multilateral discussions where we share ideas, issues and opportunities to improve the airport and its operation.

4.3.5 However we also need to understand our passengers' needs, not least because we engage with them directly, for example at security search and the provision of special needs services.

4.3.6 One of our strategic priorities is to be the passengers' airport of choice. To achieve this we need to position our services so that passengers choose to fly with Gatwick airlines, rather than those of the other airports. We need to offer a high level of service, a competitive commercial offer (for example in our various car park products) and work with other parties, such as Border Force, handling agents and the train station operator to ensure an overall high quality airport experience.

4.3.7 Retail income helps to reduce the charges we make to the airlines. However maximising retail and catering income is not just about the quality of the offer. We also need to ensure the entire passenger journey through the airport is as stress-free as possible so that passengers have the time and inclination to make use of the facilities available.

4.3.8 Wide-ranging customer engagement is required in order to develop the right offer to Gatwick's users. In order to shape our development plans we track:

- How we are performing in terms of service over time
- Direct feedback from our passengers, both in terms of compliments and complaints. This can be both spontaneous (i.e. social media) or provided after the event.
- How we are performing in terms of service relative to our competitor airports, other comparable airports and other service industries.
- Customer preferences and priorities, including passengers in both general and specific groups.
- The perspectives of potential and future customers.
- Developments at other airports.

AIRFIELD PROJECTS

Runway resurfacing

4.3.9 Our main runway is intensively used and needs regular maintenance, including periodic resurfacing. This is to ensure it complies with all safety regulations and can be relied upon to serve almost 1,000 movements a day in the busy summer period. We have a programme of maintenance of both the main runway and standby runway planned over the next five years, including a full resurfacing of the pavements.

Boeing hangar

4.3.10 In November 2016 we announced that we were working with Boeing to deliver a new maintenance hangar. This will provide an operating base for Boeing's premium-line maintenance service for its Gatwick-based

FIGURE 4.2: KEY PROJECTS 2018 TO 2022

	PROJECTS	PRIMARY PURPOSE
AIRFIELD	Runway resurfacing	Asset stewardship and resilience
	Boeing Hangar	Commercial revenue
	Lima taxiway extension	Resilience
	Rapid exit taxiway	Capacity and resilience
	Pier 6 extension	Service Quality
	Push and hold stands	Resilience
	Additional remote stands	Resilience
	Flood mitigation	Asset stewardship and resilience
TERMINAL	Check-in and bag drop	Service Quality
	CTA / domestic bag reclaim	Service Quality
	Departure lounges	Service Quality and Commercial Revenues
OPERATIONAL EFFICIENCY & RESILIENCE	ATC technology and process improvements	Assest stewardship and resilience
SURFACE ACCESS	Rail Station	Service Quality
	Bus and coach facilities	Service Quality
	Car rental	Resilience
	Road improvements	Service Quality and Resilience
	Car parking	Capacity

customers. Planning permission was granted in October 2017 and the hangar is now under construction.

4.3.11 The hangar will be located at the western end of the airfield, accessed from Uniform taxiway, on a site identified for a new hangar in the 2012 Master Plan. This will be large enough to accommodate two B777X aircraft. Gatwick has invested in enabling works for the site, while the hangar construction is being delivered by Boeing. This development will offer significant employment, training and apprenticeship opportunities, including the creation of circa 100 jobs.

4.3.12 An architect's impression of the completed Boeing Hangar is shown in **Plan 10**.

Lima taxiway extension

4.3.13 As the airport becomes busier it is important to ensure the free-flow of aircraft on the taxiway system to avoid unnecessary delays caused by congestion. One potential improvement is the extension of the existing Lima taxiway westwards to connect with the northern end of Uniform taxiway. This would provide air traffic controllers with an additional east-west taxiing routing option to ease congestion on Juliet taxiway. The extension of Lima taxiway also supports the later construction of new stands and potentially a new pier, as described in the next chapter.

4.3.14 The delivery of a Lima taxiway extension is currently just outside our five-year capital plan and therefore is not included in the 2018 CIP. However it is possible that it will be advanced and therefore is noted here as a potential investment that may be under construction at the end of the five year period.

Rapid Exit Taxiway

4.3.15 Another project that is outside our current 2018 CIP but we are considering bringing forward is the provision of a new Rapid Exit Taxiway (RET) for Runway 26. This would reduce the length of time that the runway is occupied by an arriving aircraft which should reduce the number of go-arounds, where arriving aircraft have to abandon their landings. It may also have a small capacity benefit.

North Terminal Pier 6 extension

4.3.16 To maintain pier service levels in North Terminal as the airport continues to grow, we require further pier-served stands. One of the solutions for meeting this requirement is to build a western extension on Pier 6. This is a major and complex programme of works which involves creating a new A380 stand on Pier 5 and the associated reconfiguration of Quebec taxiway to provide access to the new stand. The new extension will offer 8 new pier-served stands capable of taking any Code C aircraft and bring into service an existing unused stand (103) to give a total of 17 stands on the pier when completed. Works are currently focusing on scoping, designing and planning the delivery of this programme.

4.3.17 An architect's impression of the completed Pier 6 extension project is illustrated in **Plan 11**.

Apron projects

4.3.18 Although we drive for greater punctuality of the operation there will inevitably be times when aircraft are delayed and unable to take off on schedule. This can be caused by a variety of issues, for example air traffic control restrictions caused by airspace congestion or bad weather.

4.3.19 To minimise disruption caused by these delays, and to maintain levels of pier service, we are exploring the possibility of converting a number of existing remote stands into 'push-and-hold' stands. Departing aircraft can push back on schedule and taxi to the new stands which provide an intermediate holding point, close to the runway. The pier served stands thus vacated are then available for other flights to use, helping the planned schedule to be kept and pier service levels to be maintained. As a possible location, we are examining reconfiguring an existing area of remote aircraft parking (See Plan 9 for location), which is ideally located for push-and-hold operations. It is likely that work to construct these push-and-hold stands will be underway at the end of the five year period.

4.3.20 The construction of the push-and-hold stands, and several of the other airfield projects described above, may impact on the availability of existing aircraft parking stands. Depending on the final construction sequence and programme, this may generate a shortfall in stand numbers. If this is the case it may be necessary to build additional stands to maintain an adequate supply of parking positions. A possible location for this new parking apron is south of the Virgin Hangar on an area used primarily for vehicle and equipment maintenance. This site is indicated on **Plan 9.**

Flood mitigation

4.3.21 We are prioritising the flood protection of 20 critical airport assets that will enable us to continue to operate in 1:200 flood event. This work includes improvements to substations to provide them with greater flood protection. We are also making specific improvements to facilities relating to the Gatwick Stream Flood Alleviation Scheme.

TERMINAL PROJECTS

Check-in automation and bag-drop

4.3.22 Following successful implementation of the North Terminal Level 10 bag-drop project many of our airlines would like to roll out more self-serve check-in and bag-drop infrastructure in both terminals. Our current CIP makes allowance for this, but the precise locations and solutions will depend on the outcome of ongoing discussions with our airlines.

4.3.23 The benefit to passengers will be reduced queues as a result of check-in process efficiencies. The technology and infrastructure solutions also offer the opportunity for reduced costs for airlines, and greater flexibility for them to respond to the service expectations of their passengers.

CTA/Domestic reclaim

4.3.24 The recent project to replace South Terminal's Pier 1 was designed for international passengers only. South Terminal does however process small numbers of domestic passengers. On arrival these passengers are coached to a domestic baggage reclaim belt adjacent to, but segregated from, the international reclaim hall. In 2015 the Border Force altered their requirements for the processing of passengers from the Common Travel Area (CTA) airports, i.e. Ireland, the Channel Islands and the Isle of Man. In essence, passengers from these destinations must now be physically segregated from international arriving passengers – as is the case already with domestic passengers. This change resulted in all inbound CTA passengers also being transferred by bus from their aircraft to the domestic arrivals route. When added to the domestic passenger numbers, this means over 2 million passengers per year receive an experience which is considered inferior to that of international arrivals.

4.3.25 This CTA/Domestic reclaim project would create a segregated walking route from Pier 1 for both CTA and domestic arriving passengers as well as a new CTA/domestic baggage reclaim facility. Passengers would enter the main South Terminal concourse adjacent to the current 'Lower Zone B' check-in area.

4.3.26 With the creation of the new domestic belt at Pier 1 the current domestic reclaim belt would revert back to an international belt, with the simple removal of the wall between the two reclaim halls.

Departure Lounges

4.3.27 Peak occupancy of our departure lounges is affected by passenger throughput but is also sensitive to factors such as fleet mix and destinations served. As airlines up-gauge their aircraft, passenger volumes in the departure lounges may rise. Passengers' expectations on services and amenities also change over time. For example, we have seen a significant increase in demand for food and beverage outlets, and the mix of catering is becoming more complex.

4.3.28 We will shortly be progressing the creation of a larger mezzanine floor in the North Terminal departure lounge. This will accommodate two new restaurants and provide additional seating space for passengers. We are also exploring options for expanding the South Terminal departure lounge.

SURFACE ACCESS PROJECTS

Improved rail station

4.3.29 Gatwick's railway station, on the main line between London and Brighton, is one of the busiest in the country, and has been struggling to cope with rising numbers of trains and passengers. Despite the excellent rail links available from the station, the passenger experience and first impression of onward travel for arriving passengers could be significantly improved. Gatwick is working with Network Rail, the owners of the station, to develop plans to expand and improve the concourse areas. This will add more vertical circulation to the busiest platforms to facilitate platform clearance and provide new enhanced pedestrian routes. The proposed scheme will be jointly funded by the airport, Network Rail and DfT, costing around £120m, and is due for completion by 2022/23.

4.3.30 An architect's impression of the completed rail station is shown in **Plan 12**.

Bus and coach facilities

4.3.31 We are exploring the possibility of providing additional bus and coach bays at North Terminal in the vicinity of Jubilee House where there are some existing coach bays accessed from Furlong Way.

Car rental facilities

4.3.32 This project is necessary because much of the existing South Terminal car rental operation will be displaced to form a logistics site for the construction of the improved rail station. Although we plan to retain the existing reception building which accommodates the rental desks, the car storage area is expected to be relocated to one of the existing multi-story car parks. Once the station construction work is completed, the logistics site will be available for other commercial uses.

Road improvements

4.3.33 Traffic conditions approaching Gatwick and Crawley will be substantially improved by the completion of the Highways England M23 Smart Motorway project. This project will add an extra running lane between M23 junctions 8 and 10 and on the westbound M23 Spur from junction 9 to 9a. This will help to reduce peak congestion and accommodate traffic growth. It will also introduce the latest technology for incident management and traffic control.

4.3.34 However this, and the growth in road traffic, will place additional pressure on the capacity of South Terminal entry roundabout (M23 Junction 9a) and the North Terminal entry roundabout, and the capacity at both junctions will therefore need to be increased to improve traffic flow. We are undertaking a planning and design process for proposed improvements that includes local widening on junction entry/exit lanes, adding signals to existing roundabouts and enhanced signing.

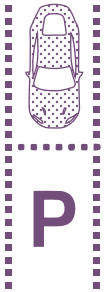
4.3.35 We are reviewing signage and access elsewhere around the airport to support our responsibility to maintain safety on our roads. We are also promoting the use of electric vehicles through our service providers (local taxi, bus and car share operators) as well as the airport's own fleet, and increasing the number of charging points publicly available.

Car park projects

4.3.36 With a view to increasing car parking supply, and developing our range of car parking products, we have identified two sites for additional multi-storey car parking, one at each terminal. Both sites are close to the terminals and will provide step-free, covered access into arrival and departure zones.

- Multi-storey car park 7 would create approximately 3,000 spaces in a multi-storey structure on the site of a current staff car park located just to the north of North Terminal. Road access to the car park would be from Longbridge Way (via North Terminal Roundabout).
- Multi-storey car park 4 at the South Terminal would create approximately 1,500 spaces in a multi-storey structure. This would be on the site of a current surface-level park for high-sided vehicles, adjacent to the other South Terminal multi-storey car parks. Road access would be the same as for the existing South Terminal Short Stay parking, from South Terminal Roundabout and via Ring Road South. Pedestrian access to and from the terminal would be via the current access point and covered link bridges over the railway.

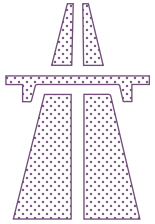
4.3.37 In addition we will reprovide any existing spaces lost as a result of the developments listed above; such as the extension of Lima taxiway.



WE ARE PLANNING AN ADDITIONAL

4,500

MULTI-STOREY CAR PARK SPACES



M23

SMART MOTORWAY SCHEME WILL ADD

a new running lane in each direction between junction 8 and 10


NORTH
TERMINAL
Gatwick
Lifts to
departures
Lifts
Lifts

4.4 AIRPORT SURFACE ACCESS STRATEGY

OUR VISION, OBJECTIVES & TARGETS

4.4.1 In May 2018 GAL published its new Airport Surface Access Strategy (ASAS), a five-year plan setting out an objective-led vision for sustainable access to and from Gatwick. Access to and from the airport is an essential part of Gatwick's ambition to grow and become London's airport of choice.

4.4.2 Although not a statutory document, the ASAS sets out important targets and action plans, which will be monitored by key stakeholders and provide the focus of activity for Gatwick's Surface Transport Team.

4.4.3 Our road and rail connections are essential to our passengers and staff. They ensure people and goods have efficient access to the airport, and connect returning travellers and overseas visitors to the rest of the UK. Our surface access connections also allow us to attract staff from across the region to the employment and training opportunities available at the airport.

4.4.4 We expect to be held to our commitment to promote sustainable travel for our passengers and staff, and we will work with our partners and service providers to deliver safe and efficient access 24 hours a day, seven days a week. The ASAS has a direct relationship with this draft master plan, our Decade of Change sustainability strategy and our Capital Investment Programme.

4.4.5 Rather than repeat the full ASAS here, we instead summarise the ASAS Objectives and Targets below and invite readers to explore the full strategy document which can be found at [redacted]

[redacted]

4.4.6 As the focus of the current ASAS is the next five years, it does not cater for the standby runway scenario described in Chapter 5 – although the objectives of the ASAS could also apply to this scenario. Should a DCO application for the standby runway scheme be brought forward, it would be supported by a Transport Assessment addressing the specific surface access requirements of the project, including how GAL would continue to support sustainable travel choices.

4.4.7 The main surface access features at Gatwick are shown in **Plan 13.**

Vision

4.4.8 Whilst we recognise that we can only influence certain aspects of our surface transport links we are committed to ensure the quality and efficiency of access does not compromise the safe operation of the airport or the transport and environmental impacts on our neighbours. Our surface access vision is:

To provide safe and sustainable access for all airport users, without compromising quality or choice, and to provide for growth while supporting the needs of our local communities, economy and environment.

4.4.9 The responsibility for delivering this vision lies with our Surface Transport Team, supported by the wider airport community and endorsed by the Executive Management Board. The progress against the ASAS targets and Action Plan will be monitored by our Transport Forum Steering Group, which meets quarterly.

4.4.10 Achieving this vision will be a constant and evolving challenge, requiring the participation and support of a wide range of partners. In order to measure progress and ensure this ASAS is consistent with our vision we have identified a number of key objectives that will guide our activities over the next five years.

Objectives

4.4.11 We work with a wide range of stakeholders and business partners to achieve a co-ordinated approach against shared objectives. The main consultative group is the Gatwick Area Transport Forum consisting of GAL, local authorities, transport providers and agencies, business, airlines and other interested parties. Our new ASAS is objective-led so that we can be transparent in measuring our performance and be held to account by our Transport Forum and stakeholders.

4.4.12 We will continue to meet the objectives set in our 2012 ASAS, which focus on being well connected, accessible, sustainable and innovative. However our rapid growth means that we will also need to be very focused on achieving a high level of passenger experience, at the same time as managing considerable change, especially to road and rail access in the next few years. With this in mind we have developed the following objectives in consultation with our Transport Forum Steering Group:

OBJECTIVES

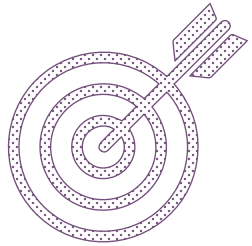
1. Continue to innovate as the best connected and most accessible UK airport, delivering integrated surface transport and sustainable growth by meeting customers' needs.

3. Collaborate with key stakeholders and communities in the region to maximise the economic potential from efficient road and rail access to Gatwick.

2. Manage the transition to enhanced rail and road provision, securing safe, efficient and reliable journeys for all users of the transport network, with effective communication.

4. Deliver a new standard in sustainable surface access in support of Gatwick's Decade of Change, using technology to achieve greater choice and efficiency.

4.4.13 These objectives give us high level, over-arching criteria against which to assess our projects and plans. We will also use these objectives to articulate our surface transport "contract" with staff/passengers/suppliers. To help with measuring how we are achieving our objectives we need a series of targets and a corresponding action plan. We have set out to make our targets challenging but realistic and achievable. We will strive to exceed our targets where possible. These will also contribute to meeting our statutory Section 106 obligations and Decade of Change targets.





Targets

4.4.14 Our main targets relate to mode share change, which supports the Government's objective to promote sustainable travel. Over the last two decades Gatwick has successfully grown its public transport mode share and supported sustainable staff travel through a variety of projects and initiatives. We currently sustain a public transport mode share for passengers of 44%, the great majority of which (39%) is by rail. This ASAS sets out specific targets for reductions in car journeys, which have the greatest environmental impact. We have also reflected the views of the Transport Forum Steering Group regarding stakeholder relationships and joint working initiatives.

Action Plan

4.4.15 Our targets are challenging but achievable, in many cases requiring continued close working with, and the support of our surface transport service providers and partners. Reflecting Gatwick's commitment to meet these targets, we have developed a series of actions which may be added to over the course of the ASAS, in consultation and agreement with the Transport Forum Steering Group. Each action is designed to contribute to the successful delivery of one or more of our ASAS Targets. The actions are listed in the ASAS.

4.4.16 We are starting from a strong base, with one of the highest public transport mode shares of any UK airport, and strong road and rail links serving the region. Capacity on rail services to and from Gatwick has more than doubled in the last five years, providing adequate capacity for us to increase rail mode share as we grow. The addition of a seventh platform at Gatwick Railway Station in 2014 and a project to almost double the size of the station concourse, which is due to start construction in 2019, will ensure there are no constraints to growth in rail demand over this master plan period. The station project has been designed to serve peak rail passenger flows up to 2036.

TARGETS

1. Achieve 48% public transport mode share for airport passengers by 2022 under the scrutiny of the Transport Forum Steering Group.
2. Demonstrate clear progress towards reaching a rail mode share aspiration of 45% by 2030, by achieving a rail mode share of over 40% by 2019 and sustaining at least this level to 2022.
3. Achieve 42% of staff journeys to work by sustainable modes (public transport, active travel modes and group travel provided by individual employers for their staff, referred to as "company transport") and 45% including other sustainable travel initiatives (car share and zero emission vehicles) by 2022.



4. Deliver a reduction in air passenger "Kiss and Fly" car journeys equivalent to at least 10% of its 2017 mode share by 2022, and a reduction in single occupancy car journeys by staff of at least 10% of its 2017 mode share.
5. Reduce the ratio of staff to parking spaces in line with a shift to more sustainable modes of at least 5% by 2022 and achieve 5% of staff car journeys by registered car share users.
6. Achieve in excess of a 5% year on year increase in bus use by staff and passengers, and demonstrate measurable value for money from Passenger Transport Levy funding.
7. Deliver continuous improvement across the full range of Quality Service Monitor metrics, maintaining a level above 4.0 with measurable scores for bus/coach, taxi and car rental.

4.4.17 Highways England's M23 Smart Motorway project, already on site and due to be completed in Spring 2020, adds approximately 30% capacity to the strategic network serving Gatwick, and we have allocated funding in our Capital Investment Programme to improve our main access junctions to adequately cater for predicted growth over the next decade. The proposed improvements have been modelled using future road traffic forecasts up to 2028, ensuring there is sufficient capacity for both airport and non-airport vehicles without incurring significant delay.

4.4.18 Our ASAS Action Plan builds on these major infrastructure improvements through measures that offer choice and improve efficiency, working with our partners to prioritise sustainable modes and low or zero emission travel to and from the airport. While the improvements to road and rail infrastructure are being constructed, our Action Plan seeks to ensure accessibility is maintained and surface access continues to be a positive factor for choosing Gatwick and not a barrier to travel.

4.4.19 The following sections describe the specific surface access improvements we anticipate over the next five years. Further improvements that may be required in the longer term are addressed in Chapter 5.

RAIL IMPROVEMENTS

4.4.20 Gatwick is the UK's best connected airport by rail, with direct connections to over 120 different stations across the South East and beyond, and many times this number with a single interchange. Like the airport, Gatwick's railway station is open 24 hours a day.

4.4.21 Since the last master plan and ASAS, a new platform has been constructed at Gatwick Airport station providing more capacity and operational flexibility. Although considerable disruption has taken place over the last three years, as a result of Thameslink engineering works, industrial disputes and the introduction of the new Thameslink timetable, significant service improvements are being delivered in 2018 as the benefits of the Thameslink Programme are realised. This transformation of services, resulting in a train every three minutes between Gatwick and London, new rolling stock and a major overall uplift in capacity, is being delivered by the DfT, Network Rail and train operators. By the end of 2018 train services between Gatwick and London will be boosted to nearly 14,000 seats per hour, with room for nearly 30,000 passengers per hour overall. These improvements will emphasise Gatwick's role as a regional transport interchange hub at the centre of a wide, connected network, generating pivotal economic value.

4.4.22 Our unparalleled frequency and coverage of rail services, along with the direct connection between the mainline station and South Terminal, delivers a higher rail mode share and more rail passengers than any other UK airport, with capacity for this to grow. The latest statistics from the Office for Rail and Road indicate 19.4m passenger journeys using Gatwick Airport station in 2016/17, making it the busiest station in the South East outside London. By May 2018, train capacity serving Gatwick will have more than doubled compared to 2014, with new rolling stock on most of the services calling at the airport. This provides sufficient overall capacity for us to continue to grow our rail mode share over the next decade.

Access to London

4.4.23 Services from Gatwick run direct to seven main London terminals and interchange stations, including London Victoria, London Bridge, Kings Cross St Pancras and Farringdon, for interchange with the new Elizabeth Line (Crossrail). From 2018 there will be a train to Central London every three minutes, reaching London Bridge and London Victoria in under 30 minutes and crossing the city in under 50 minutes.

4.4.24 London Victoria services include the premium Gatwick Express, which is designed to serve the particular needs of air passengers. Gatwick Express currently carries around 50% of all rail journeys between Gatwick and the Capital. Gatwick Express is operated using trains specifically designed for airport-users, which are all under two years old.

Access to the wider region

4.4.25 Whilst the Brighton Main Line supports high frequency services between the coast and the capital, Gatwick's rail connectivity extends much further. There are direct services as far west as Reading, Southampton and Portsmouth, and as far north as Bedford. From the end of 2018 there will also be half-hourly direct services to both Peterborough and Cambridge.

4.4.26 The GWR service between Gatwick and Reading, via Redhill and Guildford, is currently hourly but there is a franchise commitment to double this to half-hourly. In the longer term we have an aspiration, shared by GWR, to go further, taking advantage of the remodelling at Reading station, to extend direct services to Oxford or beyond.

4.4.27 Improvements to the Brighton Main Line are critical for the region. The upgrade programme includes removing bottlenecks around the Croydon area and will help deliver the full benefits of the Thameslink Programme, due for completion in 2018. Gatwick is supporting the Coast to Capital LEP, and stakeholders along the corridor, to lobby Government for these improvements at the earliest opportunity.

ROAD IMPROVEMENTS

The Gatwick road network

4.4.28 As the UK's second busiest airport, Gatwick relies on its excellent road and rail links to get passengers and staff efficiently to and from the airport. Our local road network and access to the M23 motorway are critical elements to the successful and safe operation of the airport. On an average summer day, approximately 47,000 vehicles enter the airport via its two main road access points; the South Terminal and North Terminal roundabouts.

4.4.29 GAL is the traffic authority for approximately 27 miles of internal road network, which distributes traffic to and from the forecourts, car parks and on-airport hotels. It also includes access for operational vehicles, transport operators, supplies and emergency services. We follow UK regulations, guidance and good practice for safe operations, and have a team on site 24 hours a day responding to incidents and keeping our roads clear.

4.4.30 We work closely with our neighbouring highway authorities, West Sussex County Council, Surrey County Council and Highways England, as well as Crawley Borough Council as the planning authority, to manage and maintain our roads and deal with any planned or unplanned disruption. Gatwick shares operational information with these key stakeholders and receives information that we can pass on to our staff and passengers in a timely manner when there is the potential for travel disruption.

Future demand for road travel

4.4.31 Despite approximately 30% growth in annual airport demand since 2012, road traffic associated with Gatwick's operation has increased by less than 15%. This has been achieved by promoting sustainable alternatives, and discouraging those trips with a disproportionate impact –"kiss and fly" trips that involve two return journeys by car (to drop off and pick up). Over the next ten years we estimate that daily road traffic will increase by no more than 1% per year. This means that the increase in capacity on the M23 will be sufficient to serve the airport and the surrounding region until at least the late 2030s.

4.4.32 Additionally, a higher percentage of future car journeys will be made by zero or low emission vehicles as a direct result of initiatives led by Gatwick. An agreement with our on-airport taxi provider will see them convert 100% of their fleet to fully electric or hybrid vehicles by 2020. We have also introduced an all-electric car hire scheme, a first for a UK airport, in partnership with BlueCity and we are supporting discussions with others to establish a wider, regional network of charging points..

4.4.33 Since 2012 we have completely updated our local road traffic modelling capability. New data has been incorporated to provide a robust and accurate model suitable for capacity planning and business case preparation. We have used the model to test the road network and based on these assessments, we are currently considering a range of improvements at North Terminal Roundabout, South Terminal

Roundabout and Longbridge Roundabout. The principles of the improvements are as follows:

- Signalisation of North Terminal and South Terminal roundabouts with vehicle actuated signal control with queue detection
- Increase in circulating capacity at North Terminal Roundabout
- Widening on approaches and exit lanes from roundabouts to increase capacity
- Revisions to lane marking and signs
- Dedicated "free-flow" lanes for individual movements where required

4.4.34 We are in the process of discussing these measures with Highways England, West Sussex County Council and Surrey County Council to develop the detailed design and programme for implementation. The capacity that these road improvements deliver is sufficient to cater for forecast airport and non-airport demand based on airport growth and DfT national traffic models.

M23 smart motorway scheme

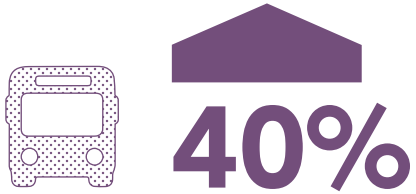
4.4.35 As part of Highways England's Road Investment Strategy, works to provide a fourth lane on the M23 between the M25 (M23 Junction 8) and Crawley (M23 Junction 10) have begun. The scheme will deliver an important boost to capacity, ensure reliable journey times, and benefit the whole region. Gatwick is working with Highways England and West Sussex County Council to determine the optimum approach to integrating works to North Terminal and South Terminal roundabouts with the M23 Smart Motorway project.

OTHER INFRASTRUCTURE

Bus and coach

4.4.36 To improve the customer experience at the airport, we have completed a new waiting area at South Terminal for bus and coach passengers. We are currently developing a project to increase the capacity of our bus and coach facilities on Furlong Way at the North Terminal by up to 40%. This will allow us to support future demand and increased services.

4.4.37 Our sustainable travel choices for staff include the extensive, 24 hour, local bus network around Gatwick provided by Metrobus. 2017 saw the introduction of another service stopping at both terminals, and the extension of other routes to serve the airport directly. These improve accessibility and reduce journey times for staff and passengers from the Crawley, Horley and Horsham areas. Gatwick will continue to invest to extend and improve local services using its Passenger Transport Levy to provide sustainable travel choices, especially in the evening, early morning and at weekends.



40%

BUS AND COACH FACILITIES



24hrs

LOCAL BUS NETWORK AROUND GATWICK PROVIDED BY METROBUS

Cycling and pedestrian access

4.4.38 There is a designated cycling and walking route serving Gatwick, Crawley and Horley, forming part of National Cycling Route 21 (London to Brighton), which offers a safe and sustainable travel option, particularly for airport-based staff. By replacing and enhancing the facilities we provide at each terminal we are starting to reverse a decline in staff cycling in recent years. Measures include secure cycle storage, located where it is most needed, and lockers, changing rooms and showers accessible at each workplace. We are delighted that there has been a very rapid uptake of these new facilities.

Car parking

4.4.39 Gatwick's approach to parking is closely linked to our Section 106 agreement with West Sussex County Council and Crawley Borough Council in regard to accommodating future demand growth on-airport while seeking to achieve mode share targets. Gatwick has increased the supply of parking spaces in recent years, in line with demand, and will continue to do so.

4.4.40 In summer 2010 there were 32,640 public spaces available on airport. By summer 2017, this had risen to 39,000, a growth rate of 19.5%.

4.4.41 Gatwick is intending to bring forward a number of projects to deliver increased on-airport parking capacity over the next five years. These are:

- 3,000 delivered by the new MSCP 7 at North Terminal.
- 3,500 spaces delivered by consolidation of our long-stay self-park product into one site and optimising the configuration of current storage areas.
- 1,500 spaces delivered by the new MSCP 4 at South Terminal.

4.4.42 In combination, these projects, together with the 1,565 spaces referred to in Section 2.4 above, deliver 9,565 extra spaces throughout the period, or an increase of 24.5% from 2017 capacity. This investment will ensure that enough parking is provided at the airport to meet the forecast increase in demand that is expected as passenger numbers grow, allowing for any changes in mode share.

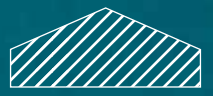
4.4.43 We will keep our car park plans under review as we monitor how emerging trends in car ownership, car usage and the application of new vehicle technologies, affect the long term demand for parking at the airport.



9,565
EXTRA CAR PARKING SPACES

AN INCREASE OF

24.5%



FROM 2017 CAPACITY

50% CARBON EMISSIONS REDUCTION

from our buildings and ground vehicles since 2010



4.5 SUSTAINABILITY PERFORMANCE

DECADE OF CHANGE STRATEGY

4.5.1 We launched our ten year 'Decade of Change' sustainability strategy in 2010. It set out our commitment to operate and develop Gatwick in a sustainable way, combining responsible environmental management with strong community programmes. We monitor and report on our performance every year and the latest annual report can be found here: https://www.gatwickairport.com/sustainabilityreport.

4.5.2 This strategy, which contains ambitious performance goals, will continue to guide the way we operate and develop the airport over the remainder of the current decade. We expect a new strategy, with updated performance goals, to be established by 2020 to continue this work into the next decade.

4.5.3 Gatwick's growth has been significantly higher than was predicted in 2010 when the Decade of Change performance goals were set. In 2010 we expected to reach approximately 40mppa by 2020 whereas now we expect to reach approximately 50mppa. Yet, despite this higher growth rate, our sustainability strategy has enabled us to reduce Gatwick's overall environment footprint substantially since 2010 and we expect to meet our Decade of Change goals for 2020.

4.5.4 Examples of this reduced footprint are that, since 2010, carbon emissions from our buildings and ground vehicles have reduced by 50%, potable water consumption by 25% and energy consumption by 12%. The airport is presently recycling or reusing 58% of operational waste, and has sent zero waste to landfill since 2015. Gatwick has become the first airport to hold both the Airport Carbon Accreditation at "Neutral" level (level 3+) and the Carbon Trust's Zero Waste to Landfill standard.

COMMUNITY

4.5.5 Our Decade of Change goal for Community is to share the benefits of Gatwick's growth, contributing to the social, environmental and educational development of our community.

4.5.6 Our strategies for delivering against this target are explained in Chapter 8. These have resulted in an increased level of community engagement in recent years, a level which we will maintain. Examples of our community engagement in 2017 include our sponsorship of 40 local events, provision of financial support to 173 local causes, broadcasting our 'Learn Live' programmes, viewed by 20,000 students, and hosting 'Discover Gatwick' tours for local and town councils and neighbourhood groups.

4.5.7 We will continue to prioritise engagement with communities, to keep them informed about what we are doing and listen to their concerns and ideas for improvements. We will also seek to develop long-term relationships and partnerships with business groups which can deliver lasting benefits across the region.

ECONOMY

4.5.8 Our Decade of Change goal for the Economy is to develop and fulfil our role as an economic driver of local, regional and national significance.

4.5.9 Our strategies for delivering against this target are explained in Chapter 7. Examples of our work in this area include research and stakeholder engagement on Gatwick's role in the national, regional and local economy. We have also sponsored local business events and launched a new jobs portal. In 2017 we spent £132.8m with local and regional suppliers[10].

4.5.10 We will continue to seek opportunities for collaborating with local businesses, provide training and apprenticeship programmes and promote awareness of job opportunities at the airport.

CARBON

4.5.11 Airports can play a significant role in supporting the UK's transition to a low carbon economy, by reducing or eliminating their direct greenhouse gas emissions, and by influencing indirect emissions related to airport operations - in particular from aircraft in take-off and landing stages.

4.5.12 Direct and indirect airport emissions are divided into three source categories in line with the Greenhouse Gas Protocol:

- **Scope 1.** Direct emissions from sources which we own or control (e.g. the use of fuel and gas at the airport).
- **Scope 2.** Indirect emissions from the generation of electricity which we purchase and use at Gatwick.
- **Scope 3.** Other indirect emissions at the airport, e.g. aircraft landing and taking off, third party tenants' energy and fuel use, passenger surface access and staff commuting.

4.5.13 Our Decade of Change goals for carbon are:

- to reduce our carbon emissions by 50% against a 1990 baseline (Scope 1 and 2 emissions) by 2020.
- to source 25% of our energy from renewable sources.

4.5.14 The carbon emissions produced by Gatwick in 2017, and for comparison, in 2010, are shown in Figure 4.3. The largest component is the Landing and Take-off (LTO) cycle which measures carbon produced by aircraft approaching or departing the airport, below an altitude of 3,000ft.

4.5.15 Despite the growth in passenger numbers at the airport, Scope 1 and 2 emissions are already 42% lower than our 1990 baseline as a result of fuel saving initiatives and the purchase of 100% renewable electricity since 2013/14. Therefore we are making good progress to meeting our Decade of Change target. We will continue our carbon reduction strategies which are outlined in Chapter 6 and, as a result, expect Scope 1 and 2 emissions to continue declining over the next five years.

4.5.16 Figure 4.3 shows that emissions associated with aircraft operations and surface access trips to and from the airport account for a very large part of the total Scope 3 emissions. While these have increased since 2010 Gatwick's total carbon per passenger, including Scope 3, has reduced from 23kg per passenger in 2010 to 16kg per passenger in 2017 which indicates the improvements in carbon efficiency that have been made.

IN 2017

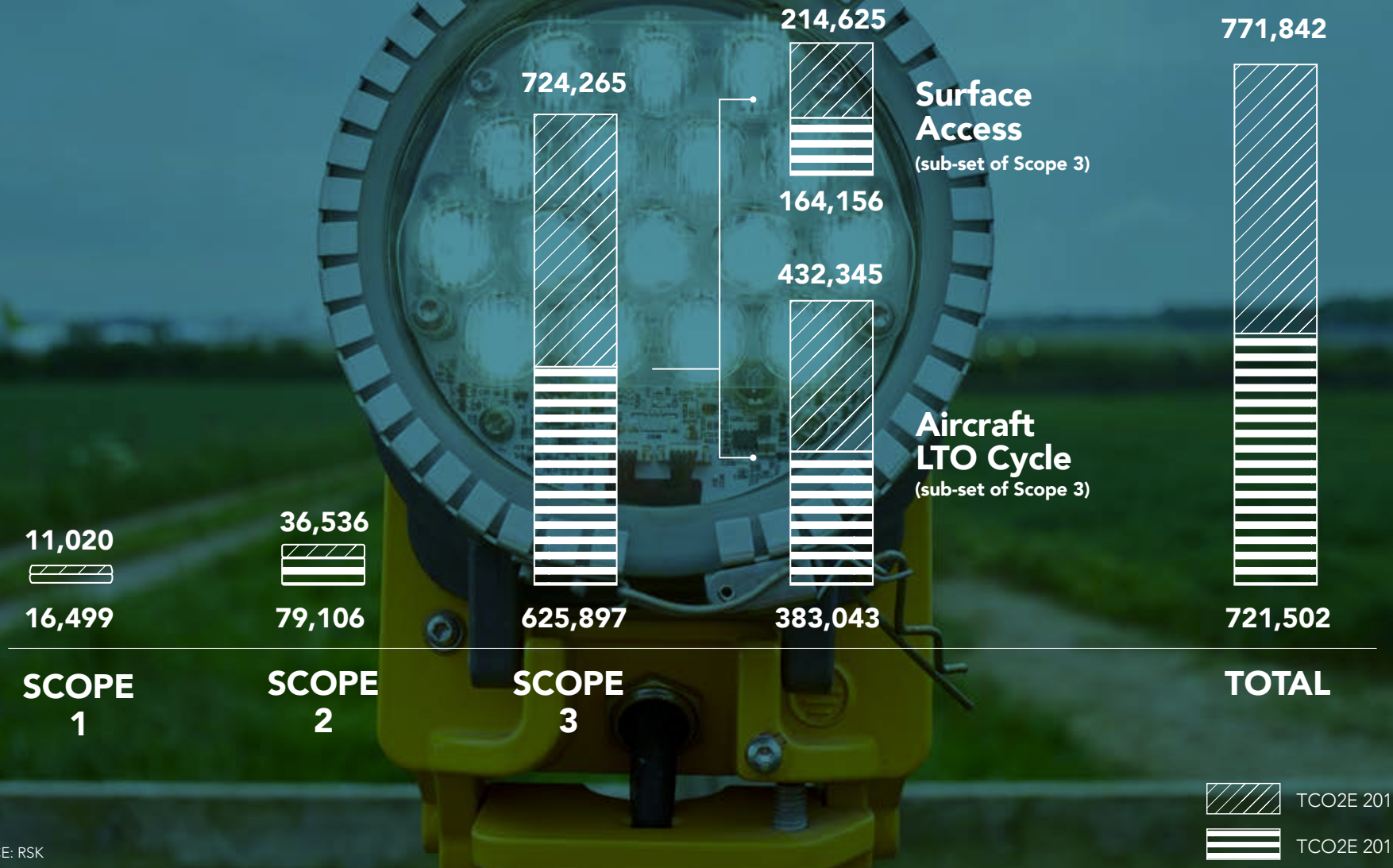
GATWICK AIRPORT LIMITED SPENT

£132.8m

WITH LOCAL AND REGIONAL SUPPLIERS

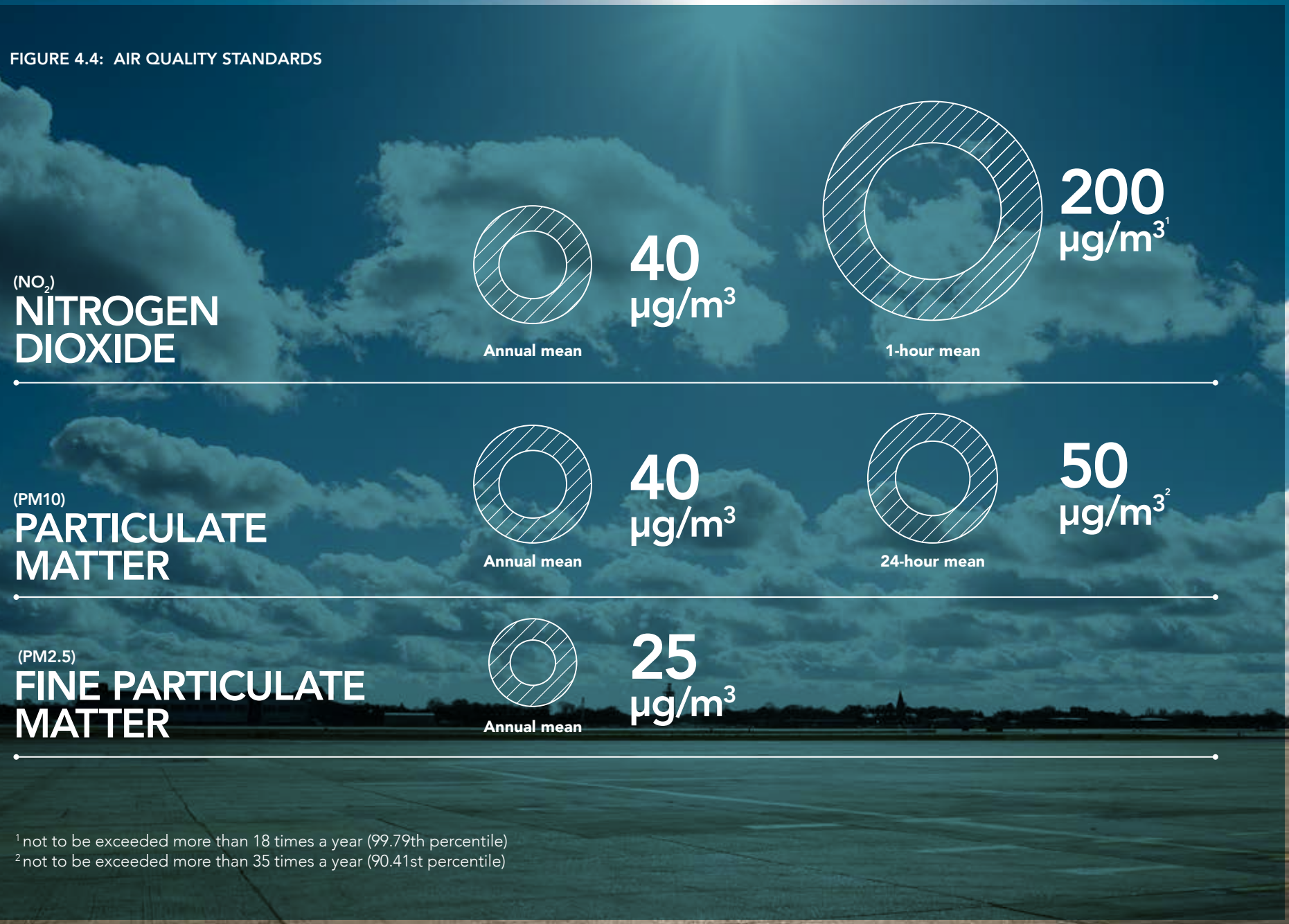
[10] *BN, CR, GU, KT, RH and TN postcodes*

FIGURE 4.3: GATWICK TOTAL GREENHOUSE GAS EMISSIONS 2010 AND 2017



SOURCE: RSK

FIGURE 4.4: AIR QUALITY STANDARDS



[1] not to be exceeded more than 18 times a year (99.79th percentile)
[2] not to be exceeded more than 35 times a year (90.41st percentile)

AIR QUALITY

4.5.17 Our Decade of Change goal for Air Quality is to reduce air quality impacts using new technology, processes and systems.

4.5.18 The most relevant EU air quality standards[11] for pollutants are shown in Figure 4.4. These show the maximum permissible annual mean concentrations of Nitrogen Dioxide (NO_2) and particulates (PM10 and PM2.5).

4.5.19 2017 data from Gatwick's real-time automatic monitoring station (LGW3) and four other permanent monitoring stations in close proximity to the airport (RG1, RG2, RG3 and CA1) show all applicable air quality objectives for Nitrogen Dioxide (NO_2) continue to be met both on and off airport (See Figure 4.5) and that current trends in concentrations show continuing improvements. Concentrations of fine particles and other pollutants also continue to be well below nationally set objectives.

4.5.20 As is the case in many UK towns and cities, localised air quality hotspots are sometimes identified where the 40 µg/m^3 maximum permissible annual mean concentration for NO_2 is exceeded. Two examples of this have been identified in the local area; at Hazelwick roundabout in Crawley and on the A23 Brighton Road in Horley. In the case of the former, monitoring shows that emissions from road traffic sources are still exceeding the air quality objectives for NO_2 along Crawley Avenue (A2011), which is the main route between the M23, the town centre and the Manor Royal business district. We are working with Crawley Borough Council to expand sustainable travel modes for the area, including rail, low emission buses and electric vehicle infrastructure. In the case of the latter, additional monitoring close to the junction of Massetts Road and the A23 in Horley recorded an annual average NO_2 concentration of 46 µg/m^3 in 2017. This is confined to a few residential properties near the road junction. Modelling indicates that, at this location, 22.9% of the NO_2 pollution is attributable to the airport's operation including associated road traffic. Reigate and Banstead Borough Council and Gatwick agree that this site needs further attention and potential mitigation measures are currently being explored and implemented with other partners.

FIGURE 4.5: CONCENTRATIONS OF NO_2 (ANNUAL AVERAGE MG/M^3) AT AUTOMATED MONITORING STATIONS AROUND GATWICK

SITE	NO_2 CONCENTRATIONS (MG/M^3)									
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
RG1 Horley	26.9	25.3	28.9	21.1	22.7	21.7	20.2	21.1	20.3	20.4
RG2 Horley South	32.4	31.3	31.2	28.8	31.2	28.5	28.5	26.4	28.6	26.7[1]
RG3 Poles Lane	18.9	18.2	20.5	17.8	23.2	19.3	17.5	14.0	16.7	13.9
CA2 Gatwick East	30	29	38[2]	(28)[2]	28	31	(26)[2]	22	29	29
LGW3 Gatwick Airport	34.8	34.3	36.8	32.3	33.4	32.0	30.6	28.2	29.8	29.5

[1] RG2 site relocated 44m in 2017 (to become RG6) so data not directly comparable
[2] Analyser failure – adjusted value in brackets taken from tri-located tubes
SOURCE: CA2 FROM 2017 AIR QUALITY ANNUAL STATUS REPORT, CRAWLEY BOROUGH COUNCIL, THE REMAINDER FROM AIR QUALITY MONITORING: JOINT REPORT BY RBBC AND GAL FOR 2017.

[11] *Directive 96/62/EC of 27 September 1996 on ambient air quality assessment and management*

4.5.21 We will continue to work with the local councils to monitor local air quality conditions and, through the strategies referred to in Chapter 6, and play our part in continuing to improve local air quality over time.

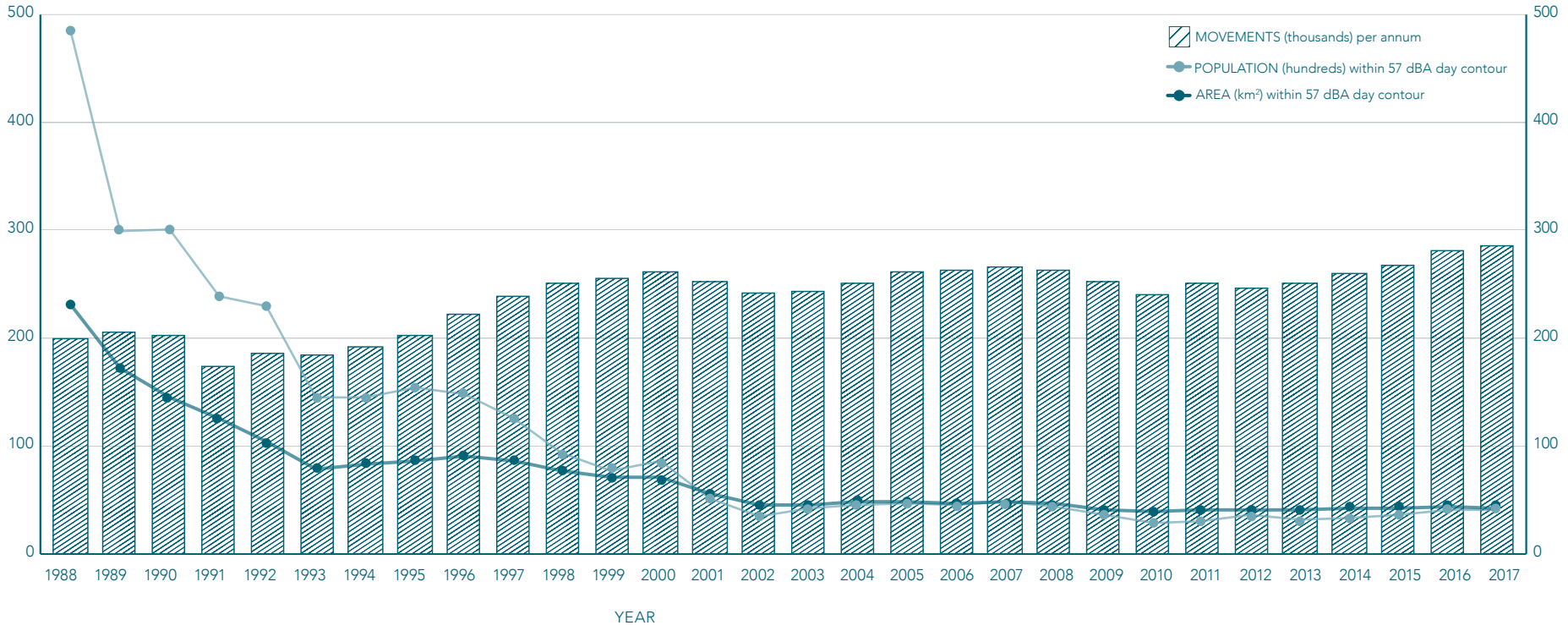
NOISE

4.5.22 Our Decade of Change goal for Noise is to reduce the impact of operational noise and;

- Implement Gatwick's European Noise Directive (END) Noise Action Plan
- Maintain Gatwick's position as 'best practice' for noise management
- Work with airlines and partners to reduce noise impacts on Gatwick's campus

4.5.23 Our current Noise Action Plan was formally approved by Government in 2013 and provides a comprehensive description of our noise management strategies. We have recently updated this with a new draft plan which is in the final stages of adoption.

FIGURE 4.6: GATWICK ANNUAL TRAFFIC AND SUMMER DAY NOISE CONTOUR TRENDS



SOURCE: CAA ERCD

4.5.24 In recent years we have seen a substantially increased level of engagement with local communities and industry stakeholders on management of air noise. This is explained in detail in Chapter 6, along with our strategies for reducing noise impacts.

4.5.25 Gatwick's noise footprint reduced sharply from the late 1980s to the early 2000s as shown in Figure 4.6. This resulted from the introduction of significantly quieter aircraft. Since then the overall trend has been for a gradual reduction in contour area despite an increase in annual aircraft movements, although both have fluctuated over this period.

4.5.26 The 'slowing down' of noise improvements since the early 2000s is partly because the noise footprint is now a fraction of what it was 30 years ago (the population in the 57dB contour is now less than 10% what it was in 1988) and partly because the oldest, noisiest aircraft have been removed from operations. However, we believe that we will see a continuation of the downward trend in noise footprint in the coming years, with the introduction of new quieter aircraft. For example, the 'A320 neo' and 'B737 Max' aircraft which are now entering service are about 4dB quieter on departure and 2dB quieter on approach compared to previous equivalent aircraft.

4.5.27 The most recent 2017 noise contours show a small reduction in size compared to the 2016 contours, despite a higher number of movements - again indicating the continuing benefit of quieter aircraft.

4.5.28 We have explored this trend further by commissioning air noise contours for 2022. The results from the 2022 noise contour modelling are compared with the 2017 contours in Figures 4.7 and 4.8. The 2022 noise footprint, in terms of population within the contours, is expected to be smaller than in 2017. Again this overall decrease results from the shift to quieter aircraft off-setting the increase in movements. There are some small changes in the shape of the contours which affect the populations recorded. This explains why the population in the 57dB summer day contour is predicted to increase by 200 people although its area is actually smaller than in 2017.

4.5.29 The summer day and summer night noise contours for 2017 are shown in **Plan 14** and **Plan 15** and the projected summer day and summer night noise contours for 2022 are shown in **Plan 16** and **Plan 17.**

FIGURE 4.7: SUMMER DAY NOISE EXPOSURE CHANGE FROM 2017 TO 2022

NOISE METRIC	POPULATION	
	2017 (Standard)	2022 Single main runway
Leq summer day 54dB	10,950	10,500
Leq summer day 57dB	3,400	3,600
Leq summer day 60dB	1,500	1,400
Leq summer day 63dB	550	500
Leq summer day 66dB	350	300
Leq summer day 69dB	150	100
Leq summer day 72dB	150	0

SOURCE: CAA ERCD

FIGURE 4.8: SUMMER NIGHT NOISE EXPOSURE CHANGE FROM 2017 TO 2022

NOISE METRIC	POPULATION	
	2017 (10 year average)	2022 Single main runway
Leq summer night 48dB	13,550	11,400
Leq summer night 51dB	6,650	5,200
Leq summer night 54dB	1,800	1,400
Leq summer night 57dB	750	500
Leq summer night 60dB	350	300
Leq summer night 63dB	200	200
Leq summer night 66dB	150	0
Leq summer night 69dB	0	0
Leq summer night 72dB	0	0

SOURCE: CAA ERCD

TRANSPORT

4.5.30 Our Decade of Change goals for ground Transport are:

- to achieve 40% public transport mode share for air passengers and staff by the time the airport reaches 40 million passengers per annum.
- Identify feasible measures to achieve a stretch target of 45% public transport mode share once the 40% target at 40mppa has been achieved.

4.5.31 Our strategies for promoting the use of public transport are captured in our Airport Surface Access Strategy (ASAS) which is described above. This shows that Gatwick's current public transport mode share for passengers is 44%, and we are very close to meeting our Decade of Change stretch target. For this reason our ASAS sets a new target of increasing our public transport mode share for passengers to 48% by 2022 and we have strategies in place to deliver this.

ENERGY

4.5.32 Our Decade of Change goal for Energy is to achieve a 20% reduction in energy against a 1990 baseline by 2020.

4.5.33 We have a number of strategies for reducing energy usage which are explained in Chapter 6. These include the replacement of plant and electrical equipment with more energy efficient technology. For example in 2017 we completed phase 2 of the South Terminal boiler plant decentralisation programme and three large scale terminal lighting upgrade projects. Through initiatives such as these we have seen our energy use reduce by 12.8% from our 1990 baseline.

4.5.34 The rapid growth in passenger throughput in recent years has meant that there has been a slight increase in overall electricity and gas consumption since 2015. However, through our energy efficiency improvements, total energy use per passenger has fallen by 40% since 2010.

4.5.35 Through our energy efficiency strategies we expect this trend of falling electricity and gas consumption per passenger to continue.

WASTE

4.5.36 Our Decade of Change goal for Waste is to generate no untreated waste to landfill and achieve a 70% waste recycling rate by 2020.

4.5.37 Our recycling rates have increased significantly since 2015 and in 2017 had reached 58%. This has been assisted through initiatives such as our improved recycling facility and collaboration with other airport organisations to improve waste sortation at source. We expect to have met our 70% recycling target by 2020.

4.5.38 Gatwick is the first airport to achieve the Carbon Trust Standard for Zero Waste to Landfill. This independent certification recognises organisations that take a best practice approach to waste management and actively divert all appropriate waste streams from landfill. The certification applies to Gatwick's operational and commercial waste.

Gatwick is the first airport to achieve the Carbon Trust Standard for

ZERO WASTE TO LANDFILL

TOTAL WATER CONSUMPTION 2010 TO 2017

25% **REDUCTION**

WATER CONSUMPTION PER PASSENGER 2010 TO 2017

48% **REDUCTION**

WATER

4.5.39 Our Decade of Change goals for Water are:

- to continually improve the quality of water leaving the airport.
- to achieve a 20% reduction in water consumption against a 2010 baseline with a stretch target of 25%.

4.5.40 Through our initiatives such as enhanced leak detection and improved metering, our 2017 total water consumption was 25% lower than 2010 levels. Water consumption per passenger was around 16 litres compared with 31 litres in 2010. Through our water reduction strategies outlined in Chapter 6 we expect to see consumption per passenger to continue to fall over the coming years.

BIODIVERSITY

4.5.41 Our Decade of Change goal for Biodiversity is to have an award-winning approach to biodiversity through achieving a nationally recognised award for ecological awareness.

4.5.42 Our strategies for managing our green spaces are described in Chapter 6 and these have helped us achieve accreditation of the Wildlife Trusts' Biodiversity Benchmark for the last four years. In addition, we received the Client Award in the CIRIA BIG Biodiversity Challenge in September 2016 for our management of the green spaces around Gatwick, for using volunteers and the local communities. In 2017 over 400 hundred people joined the Gatwick Greenspace Partnership as volunteers, helping to manage and improve the quality of the green spaces around the airport. Looking ahead our strategies will be enhanced by the development of a new, five-year biodiversity action plan, on which work has begun.

5 GROWTH SCENARIOS

LOOKING 5 TO 15 YEARS AHEAD

5.1	Introduction
5.2	Making best use of the existing main runway
5.3	Making best use of the existing standby runway
5.4	Safeguarding for an additional runway to the south
5.5	Key environmental impacts of the growth scenarios
5.6	Key economic impacts of the growth scenarios

5.1 INTRODUCTION

5.1.1 This chapter of the draft master plan looks ahead 5-15 years out to 2032. It considers three ways - used either separately or in combination - in which Gatwick could grow to meet the increasing demand for air travel:

1. one where it remains a single runway operation using the **existing main runway;**
2. one where the **existing standby runway** is routinely used together with the main runway, and;
3. one where we continue to **safeguard for an additional runway** to the south.

5.1.2 These scenarios are not exclusive choices. Gatwick could transition from one to another within the timeframes discussed in this draft master plan. For each of these growth scenarios, this chapter explains how the airport would operate, what level of traffic growth could be expected and the infrastructure improvements that might be required. It also provides information on potential key environmental and economic impacts.

5.2 MAKING BEST USE OF THE EXISTING MAIN RUNWAY

SCHEME DESCRIPTION

5.2.1 Under this growth scenario the airport would continue to have a single-runway operation, although the existing standby runway would be available for use when the main runway is temporarily closed. The overall layout of the airport would be largely unchanged and it would remain a two-terminal operation. However there would be some changes required to the infrastructure and these are highlighted below.

5.2.2 Beyond 2022, we expect to realise the full benefits of the planned improvements to air traffic management processes and technology described in Section 4.2. These will be introduced in a phased programme of works over the next few years. While there will be some immediate benefits, the full value of this programme should become apparent on its completion, expected in the early 2020s. Improvements will be seen in the predictability and resilience of the operation as well as increases in the peak capacity of the runway. This will enable us to extract the full potential of the existing main runway.

5.2.3 Because some of these initiatives are still at the development stages, there is uncertainty as to how quickly they can be introduced and the timing of any additional slot release that they make possible. If all the improvements deliver their expected potential, the scheduled runway movement rate could eventually increase from the current maximum of 55 movements per hour to around 60 movements per hour during peak periods.

TRAFFIC GROWTH

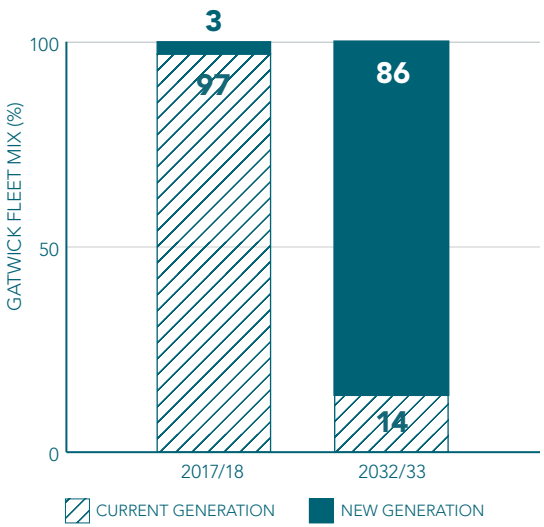
5.2.4 Figure 5.1 extends the traffic forecasts presented in the last chapter ahead for a further ten years to 2032. To reflect the uncertainty about the timing of additional peak runway capacity, a range is indicated, with the lower value representing peak scheduled flights maintained at the current level of 55 per hour, and the higher value representing growth to 60 per hour by the early 2030s.

FIGURE 5.1: GATWICK GROWTH WITH EXISTING MAIN RUNWAY

	2017/18 ACTUAL	2018/19	2019/20	2020/21	2021/22	2022/23	2027/28	2032/33
Passengers (m)	45.7	47.1	49.1	50.6	52.0	52.8	56 – 59	57 – 61
ATMs	280,790	284,270	289,770	294,490	297,670	300,000	315,000 – 325,000	315,000 – 340,000
Passengers per ATM	162.7	165.7	169.4	172.0	174.7	176.0	Around 180	Around 180

5.2.5 For the purposes of these forecasts it has been assumed that the planned third runway at Heathrow opens in 2030. The opening of this new runway is forecast to have a relatively minor negative impact on traffic at Gatwick for a few years. Therefore, if for whatever reason the third runway is delayed, the traffic at Gatwick in 2032 could be expected to be a little higher than indicated. The forecasts also assume that the levels of flying permitted by the DfT at Gatwick within the night quota period remain the same as today.

FIGURE 5.2: FORECAST CHANGES IN FLEET COMPOSITION



5.2.6 These forecasts for Gatwick reflect an increase in aircraft size but also an increasing number of 'new generation' aircraft which will have lower emissions and noise levels. Today just 3% of Gatwick's fleet are classified as new generation aircraft and this is expected to increase to 86% by 2032 as part of the normal airline process of aircraft replacement (see Figure 5.2).

5.2.7 Air cargo is forecast to continue growing strongly over this period, driven by the growth in long-haul services. Total tonnage is expected to increase from 102,000 tonnes today to around 220,000 tonnes by 2032/33..

Annual passengers will increase from
45.7M TODAY TO 57-61M BY 2032.

Passengers per aircraft movement will increase from
163 TODAY TO AROUND 180 BY 2032.

Cargo will increase from
102,000 TONNES TODAY TO AROUND 220,000 TONNES BY 2032

CAPITAL INVESTMENT

5.2.8 To support the growth of Gatwick making best use of the capacity of the existing main runway, with a throughput of around 60mppa, further investments will be required to ensure the infrastructure is adequate to meet our service standards and sustainability objectives. A significant element of this growth occurs through peak spreading, which means that the peak hour throughput will not grow at the same rate as annual passenger growth. We anticipate that the new infrastructure that will be required to accommodate this growth will be delivered through the standard Town and Country Planning Act processes, including the General Permitted Development Order and Environmental Impact Assessments processes where applicable.

5.2.9 The exact timing and scope of these investment projects will depend on how air traffic evolves over time. They will also be shaped by our ongoing consultation with airlines and other stakeholders and the design process for each project. The projects which are described below and illustrated in **Plan 18** are therefore indicative of the longer-term changes that we expect could take place by 2032, but are not definitive proposals.

Terminal improvements

5.2.10 The main processing elements of the terminals (e.g. check-in, security, baggage reclaim and border checks) are likely to require enhancements and we will continue to focus on technology and process improvements to achieve this. If increased floor space is necessary we will seek to provide this by reconfiguring existing terminal areas to use them more efficiently. If this is impractical then we will consider some form of terminal expansion.

5.2.11 One area that may require specific attention at the upper end of the forecast growth range is pier service levels, especially for long-haul passengers. We are in the early stages of investigating ways of adding long-haul gates, should these prove necessary. Three location options are shown in **Plan 18**. One option would add pier capacity to South Terminal through a western extension of Pier 3. The other two options are for remote piers in the western apron which would serve North Terminal. These remote piers would be accessed by a transfer bus service.

Operational Efficiency and Resilience

5.2.12 The runway and airfield technology and process improvements we plan to implement through our five year CIP will continue into this time period. Many of these will be associated with new IT systems, equipment and software to provide greater operational precision and predictability. They include the introduction of:

- GMAN – a new system that allocates aircraft parking stands dynamically at about 75 minutes from aircraft touchdown, as opposed to the current system of pre-allocation based on the schedule. This will enable the airport to increase operational stability and optimise stand utilisation.
- Automated Clearance Management – a new system that automatically provides departure clearance to aircraft flight decks. This will reduce flight deck and ATC workload.

5.2.13 We continually monitor and evaluate emerging process and technology developments that we believe could potentially offer operational improvements at Gatwick. We remain committed to implementing the SESAR[12] PCP (Pilot Common Project) requirements (such as enhanced information sharing between Gatwick and Eurocontrol) and are closely following developments of the SESAR 2020 Common Project requirements as they become defined.

[12] *Single European Sky ATM Research - a collaborative public-private partnership project to overhaul European airspace and its management.*

FIGURE 5.3: KEY PROJECTS 2022 TO 2032 (EXISTING MAIN RUNWAY)





Surface Access

5.2.14 Although the focus of our ASAS is the next five years, we have reviewed the action plans to allow for continued growth beyond this period. We have considered what further infrastructure improvements might be needed to support the airport's growth to around 60mppa, although further work will be needed to firm up these plans. Additional actions and measures may be developed and put in place to support expansion.

5.2.15 Our road modelling suggests that, with the improvements to North and South Terminal roundabouts planned for the next five years, and with the M23 Smart Motorway improvements underway, the local road network will be able to accommodate growth to around 60mppa without significant deterioration in performance. This allows for both airport and non-airport traffic growth but assumes that Gatwick will continue to be successful in reducing car trips to and from the airport in accordance with our ASAS objectives. Similarly the much improved rail station will be able to accommodate demand over this time period, even allowing for an increase in rail mode share to around 45%.

5.2.16 In terms of on-airport roads, we will explore further forecourt management initiatives for both terminals to improve the efficiency of the operation and the utilisation of the forecourts. While we want to provide direct vehicle access to the terminals for those who need it, we also need to consider how we can encourage airport users to choose sustainable transport modes and give appropriate priority to these.

5.2.17 It is possible that additional bus and coach station capacity may be required beyond the additional spaces planned in the current CIP, at either or both Terminals. The latest ASAS includes an action to establish the medium term need for bus and coach capacity such that any provision can be allowed for in future capital investment plans.

Car Parking

5.2.18 Additional car parking, or parking required to replace existing spaces lost owing to other developments, can be provided by decking more of the long stay car parks at North and South Terminals, as required. We are also exploring the use of machine assisted parking technology in the longer term to increase the capacity and utilisation of existing car parks.

5.2.19 In addition, we are considering the possibility of providing additional surface parking on two particular plots of land which are owned by GAL (see **Plan 18**). The first of these is located between the existing South Terminal long stay car park and the Balcombe Road. This site would be easily accessible from the existing public car parks and would not require an access from the Balcombe Road. The second site is located on the southern boundary of the airport, between the off-airport 'Purple Parking' site and the staff Car Park X. Both sites need further investigation to test their suitability for parking. The landscape, biodiversity and surface water drainage issues will also need to be considered in detail as part of any scheme development.

Commercial accommodation

5.2.20 Over the next fifteen years it is likely that we will see demand for further office and hotel capacity at the airport. The site occupied by South Terminal car rental parking, once it is no longer needed to support the construction of the station improvements, is one option. Another is the site currently occupied by staff car parking to the east of the Hilton Hotel at South Terminal. This area could be used more intensively by providing decked parking solutions, releasing development plots for new commercial premises.

5.2.21 It is possible that, within this timeframe, airlines and/or aircraft maintenance organisations may wish to construct an additional hangar at the airport. A potential site for this has been identified close to the Boeing Hangar (see **Plan 18)** on land currently occupied by car parking, which would need to be reprovided. At this stage we do not see a requirement for additional cargo sheds, as we believe that the forecast growth in cargo can be accommodated within the existing facility.

THE OVERALL DEVELOPMENT PLAN FOR A SINGLE RUNWAY AIRPORT

5.2.22 In this growth scenario, where Gatwick remains a single runway airport, we do not foresee any significant changes to the airport boundary or the configuration of the airport. It will remain a two-terminal operation and land use will be very similar to today.

5.2.23 **Plan 18** shows how we think the airport would appear in 15 years' time in this scenario. This shows that the projects described in our CIP for the next five years and the further improvements needed for the following 10 years could be accommodated within the land available, and without any major changes to the organisation of the airport estate.

5.3 MAKING BEST USE OF THE EXISTING STANDBY RUNWAY

5.3.1 While our work on the growth scenario which would make use of the existing standby runway is not fully completed, we have included a preliminary description of the scheme here to provide information on how it might affect Gatwick's operation and passenger throughput, how the airport infrastructure might need to change, and how it might affect the environmental footprint of the airport.

5.3.2 If it was decided to take this scheme forward in the form of a Development Consent Order application, this would be supported with a wide range of detailed information which would be subject to a full public consultation. If a decision to progress the scheme is taken at the end of 2018 this period of consultation and engagement would start in 2019 and, if the development consent was granted, the standby runway could be brought into use by the mid-2020s.

SCHEME DESCRIPTION

5.3.3 The previous section explained that Gatwick could grow to circa 60mppa over the next fifteen years with the existing single-runway operation, but this growth would eventually be constrained at that level by the limits on available runway capacity. Even with a third runway at Heathrow, the DfT is forecasting a shortfall in UK airport capacity in 2030 and this shortfall is predicted to increase over the following 20 years. Therefore it is highly likely that by 2032, capacity constraints across the London airport system will mean that some travel demand is unmet, and as a result the UK will lose valuable connectivity to international destinations and markets.

5.3.4 Our engagement with airlines, both those already operating at Gatwick and those that would like to do so, strongly indicate that the single runway cannot meet future, longer-term demand. We have therefore explored other ways of delivering additional capacity from Gatwick's existing infrastructure in order to meet the increasing demand for air travel. Specifically, we have been exploring the potential use of the existing standby runway in addition to the existing main runway.

5.3.5 The standby runway is located 198m to the north of the main runway and was granted planning permission in 1979. It provides an alternative runway for use when the main runway is closed for maintenance or as a result of an incident. One of the conditions of the planning permission was that it could not be used simultaneously with the main runway. The simultaneous use of both runways is also ruled out by our Section 52 Agreement with West Sussex County Council. However this agreement expires in 2019.

5.3.6 Having examined the feasibility of using the two existing runways together, we consider that there is a viable way of doing this which will maximise Gatwick's existing potential. This strategy aligns with the Government's policy of making best use of existing runways as outlined in its policy document 'The future of UK aviation: making best use of existing runways'[13].

5.3.7 Our aim would be for the new operation to be contained almost entirely within the existing airport land-take with as few changes to the airport as possible. However any such increase in capacity would mean that some improvements would be needed to supporting infrastructure and we would of course ensure that the airport, and its road and rail links, are not over-stretched.

[13] *DfT, 5th April 2018.*

5.3.8 We are still developing the details of this scheme. However we believe that, conceptually, the main runway would continue to accommodate all arriving flights, as it is fully instrumented for use in low visibility weather conditions and it would be difficult to provide the standby runway with this same capability. Departing flights would be split between the two existing runways. As the main runway is longer than the standby runway, we consider that all of the larger, wide-body aircraft would use that for take-off, and the standby runway would be used only for departing smaller aircraft, such as A320 and B737. The method of operation is illustrated in Figure 5.4.

FIGURE 5.4: THE USE OF BOTH EXISTING RUNWAYS FOR DEPARTURES



5.3.9 This method of using the runways would mean that there would no change to arrivals flight paths, although some departing flights would take-off slightly further to the north. Currently the centrelines of the main and standby runways are separated by 198m but we are considering widening the standby runway by 12m so that its centreline is separated by 210m to comply fully with international airport design guidance.

5.3.10 We do not consider that significant changes to Gatwick's departure and arrivals routes would be necessary to operate the standby runway in the method described. As is the case today, aircraft departing from the standby runway would be able to follow very similar flight profiles to those of aircraft departing the main runway. However, as explained earlier in Chapter 3, these flight paths may change in any case as part of a wider, government and CAA sponsored airspace modernisation programme called FASI(S). Our objective would be for any changes introduced as part of FASI(S) to be capable of supporting the standby runway scheme, as well as delivering operational and environmental benefits.

5.3.11 All passengers would be processed through the existing North and South Terminals. There would however need to be some reconfiguration of these terminals to enable them to accommodate the additional passengers and bags.

5.3.12 By operating the existing standby alongside the existing main runway, in the way described, we believe this would add approximately 10-15 movements per hour to the operation. This gain in capacity would permit more flights to be scheduled and would also add resilience to the operation.

TRAFFIC PROJECTION

5.3.13 Figure 5.5 presents the traffic forecasts for Gatwick with the standby runway in regular use. The indicated forecast range reflects that there is inevitable uncertainty on the precise capacity of this scheme 5-15 years hence. Under this scenario we believe the airport throughput would grow to 68-70 million passengers per annum by 2032, compared to 57-61 million passengers in the single runway scenario.

5.3.14 Air cargo is also forecast to grow strongly in this scenario. Total tonnage is expected to increase from 102,000 tonnes today to around 325,000 tonnes by 2032/33.

FIGURE 5.5: GATWICK GROWTH WITH STANDBY RUNWAY

	2017/18 ACTUAL	2018/19	2019/20	2020/21	2021/22	2022/23	2027/28	2032/33
Passengers (m)	45.7	47.1	49.1	50.6	52.0	52.8	65 – 67	68 – 70
ATMs	280,790	284,270	289,770	294,490	297,670	300,000	360,000 – 365,000	375,000 – 390,000
Passengers per ATM	162.7	165.7	169.4	172.0	174.7	176.0	Around 180	Around 180

ADVANTAGES OF THIS SCHEME

5.3.15 The strength of this scheme is that it would provide more flights, improved connectivity, more employment and economic stimulus to the local area, but with a much reduced scale of development and environmental impact compared to an additional runway to the south. It would require only minor changes to the airport boundary and would not result in the loss of any homes.

5.3.16 We do not consider it to be an alternative to a new runway, in the sense that it cannot provide the same level of long-term growth potential. The proximity of the main and standby runways means that their simultaneous use would add only 10-15 movements per hour to the operation, whereas the wide-spaced additional runway would add around 40-50 movements per hour (see below). However, this standby runway scheme would allow the airport to grow nearer-term whilst the longer-term opportunity of a totally new runway would still exist.

5.3.17 By facilitating this additional growth, Gatwick would provide further employment and training opportunities for local people as well as increasing the airport's overall contribution to the regional and UK economy (see Section 5.6).

5.3.18 The ability to use the main and standby runways simultaneously would also make the airport more resilient to disruption events, such as bad weather or delays caused by en-route airspace restrictions. For example, by bringing the standby runway into regular use we expect to reduce the number of departures on the main runway compared to the current operation. This should make the use of that runway more stable and reduce the number of go-arounds.

5.3.19 Furthermore, it would help preserve the competitive dynamic that has been recently introduced to the London airport system, to the clear benefit of both passengers and airlines. As well as Heathrow's third runway, Stansted, Luton and London City airports all have plans for expansion and this scheme would help Gatwick play its part in offering choice, driving down cost and driving up service levels.

5.3.20 We believe this scheme complements Heathrow's plans for a third runway. The Government's latest traffic forecasts show the capacity generated by Heathrow expansion being taken up very quickly and there is clearly a need for some expansion to take place at other London airports.

5.3.21 At the same time, we recognise that the additional flights generated by the two-runway operation would have some impacts on the environment and this is discussed in Section 5.5.

5.3.22 As the planning consent for the standby runway precludes its simultaneous use with the main runway, we would need to seek a new permission to operate this scheme. If we take this scheme forward, we would expect permission to be secured through the Development Consent Order (DCO) process, which is the planning route recommended for Nationally Significant Infrastructure Projects (NSIPs). Allowing for the time needed to secure planning permission and deliver the necessary infrastructure changes, we believe the standby runway could be brought into regular use by the mid-2020s.

FIGURE 5.6: KEY PROJECTS 2022 TO 2032 (EXISTING STANDBY RUNWAY)

	PROJECTS	PRIMARY PURPOSE
AIRFIELD	Reconfiguration of various elements of the airfield, e.g. : • Widening standby runway • Relocating Juliet taxiway • New resequencing area • Reconfigure RETs • End-around taxiways • Updated navigational aids	Capacity and resilience
	Surface water drainage	EHS, Resilience and Asset Stewardship
TERMINALS	Check-in and bag drop	Capacity and Service Quality
	Security search	Capacity and Service Quality
	Baggage reclaim	Capacity and Service Quality
	Borders	Capacity and Service Quality
	Departure lounges	Capacity and Service Quality
	Additional pier-served gates	Capacity and Service Quality
SURFACE ACCESS	Additional car parking	Capacity
	Road improvements	Capacity, Service Quality and Resilience
COMMERCIAL	Additional support accommodation, offices and hotels	Commercial revenue

CAPITAL INVESTMENT

5.3.23 While the standby runway already exists, substantial investment would still be needed to facilitate its simultaneous use with the main runway and to enable all aspects of Gatwick's operation to accommodate circa 70mppa.

5.3.24 This investment would be entirely privately funded and financed through the standard mechanisms of airport charges to the airlines and revenues raised through our commercial operation. Importantly, this could be achieved within the existing framework of airport charges applying at Gatwick, which Gatwick is proposing to airlines to extend for a further period through to the mid-2020s.

5.3.25 The main physical changes to the airport, beyond those described in the section above, are described below and are illustrated in **Plan 19.**

The airfield

5.3.26 The major part of the construction works would be to reconfigure the airfield. As well as widening the standby runway, to create the necessary separation between it and the main runway, we would expect to see a number of other changes to the airfield. The most significant would be:

CHANGES

The existing 'Juliet' taxiway located to the north of, and parallel to, the standby runway would be moved further to the north. The maximum adjustment would be 27m but it may not be necessary to move the whole length of the taxiway by this amount.

It may be necessary to construct a resequencing and holding area at the western end of Juliet taxiway for use when runways 08L and 08R are in operation. We would consider some form of new noise barrier around this holding area.

The existing Rapid Exit Taxiways (RETs) serving the main runway (in both the 26L and 08R directions) would need to be reconfigured and additional RETs may be required

It may be necessary to build a new taxiway around the western end of the main and standby runways to allow some aircraft to taxi between the main runway and Juliet taxiway without crossing the standby runway. Similarly the existing Yankee taxiway might be brought into regular use to perform the same function at the eastern end of the runways.

There would need to be modifications to the airfield ground lighting system and to some navigational aids.

We would need to consider improvements to the surface water drainage infrastructure in order to deal with the additional run-off caused by the new taxiways and to ensure there is no increase in flood risk either on, or off, airport. Initial investigations suggest that we would need to build a new, or enlarge an existing balancing pond.

Other airport infrastructure

5.3.27 Both terminals would require further internal modifications to provide the necessary processing capacity. Our focus for delivering this will be on the use of process and technology improvements and internal reconfiguration to make the most efficient use of the existing buildings. However it is possible that some form of expansion of one, or both terminals, may be necessary.

5.3.28 At the upper end of the forecast range, we believe it may be necessary to provide additional pier served stands. These could be provided in one of the three pier locations described under the existing main runway scenario and illustrated in **Plan 19.**

5.3.29 Additional, or replacement, car parking would be provided by the additional decking of surface parking areas or the provision of additional multi-storey car parks. As well as accommodating the additional demand for parking, these new spaces would replace any existing car parking lost as a result of the other infrastructure projects. Sites for additional offices and/or hotels could be provided in the staff car park area adjacent to the South Terminal Hilton Hotel.

Surface access

5.3.30 The local road network would require some further upgrades, most likely around the two main roundabouts serving North and South Terminals. We are considering options for enhancing road capacity where it may be required in line with anticipated growth. If the standby runway scheme is taken forward, the optimum highways solution would be identified through further road modelling and through discussion with Highways England and the Local Highway Authorities. It would also form the basis of a detailed Transport Assessment which would be a key input to a DCO application.

5.3.31 The Transport Assessment would also identify new mode share targets for the airport operating at the higher capacity generated by the standby runway scheme along with strategies for delivering these through improvements to infrastructure serving public transport/sustainable travel options.

5.3.32 Any improvements to surface access that are required for expansion under the DCO application would be covered by the Transport Assessment and will be paid for by Gatwick in accordance with the DfT's stated policy on funding surface access improvements necessary for expansion. We would work closely with Highways England, Network Rail and local highway authorities to ensure that any measures to support access to the airport also take account of the needs of non-airport traffic and are not detrimental to overall network performance

NEXT STEPS

5.3.33 If it is decided to progress this scheme, we would expect to start the process of consulting on a DCO application during 2019. As part of this DCO process we would be required to demonstrate that we have fully investigated all impacts of the scheme and ensured that these are adequately mitigated. This would involve a process of detailed engagement with all stakeholders as well as public consultation on the main features of the scheme.

5.3.34 Assuming that we start preparing a DCO consultation at the beginning of 2019, we would bring forward and consult on a wide range of information relating to this scheme during that year, prior to the submission of a DCO application which would probably follow in 2020. We would anticipate consulting on environmental mitigation and compensation measures at the same time.

Mitigation measures

5.3.35 At this early stage we have not completed enough work to firmly establish the environmental impacts of this scheme, although an early indication is provided in section 5.5 below. If we take this scheme forward, we would fully investigate, and consult on, the appropriate mitigation measures, once the environmental impacts are fully understood. This would include (but not be limited to) consideration of measures to reduce noise impacts, and to share the benefits of the airport's growth e.g. through education and training programmes.


2
GATWICK EXPRESS

5.4 SAFEGUARDING FOR AN ADDITIONAL RUNWAY TO THE SOUTH

5.4.1 Gatwick is no longer actively pursuing plans for an additional runway, but there nevertheless remains the possibility of building and operating one in the future. Should this, or a future, Government decide to support an additional runway at Gatwick, we would be ready to take this forward with a view to seeking development consent. Should such policy support materialise, then it would be feasible to open the additional runway towards the end of the 5 to 15 year period. It is for this reason that we have included the additional runway in this draft master plan.

5.4.2 Our proposal to the Airports Commission was for a full length runway, to be built parallel to, and 1,045m to the south of, the existing main runway. The resulting two-runway airport would be capable of handling around 98 aircraft movements per hour, compared with 55 today.

5.4.3 This runway spacing would allow a new terminal and apron zone to be developed between the two runways, which is the optimum location to minimise taxiing times to and from the runways. The new terminal and apron would have an ultimate capacity of around 50mppa and would be constructed in phases, in line with growing passenger throughput.

5.4.4 Gatwick's additional runway scheme is illustrated in **Plan 20**. Full details of this scheme, as submitted to the Airports Commission, can be viewed here: [redacted]

Traffic projection

5.4.5 An additional runway would add significant capacity to the existing airport, approximately doubling its size. The traffic forecasts we submitted to the Airports Commission in 2014 assumed it would open in 2025. That is now not possible. However an additional runway could be open in less than 10 years after receiving policy support from Government.

5.4.6 As there are no timescales for constructing an additional runway, we do not present traffic forecasts in this section. However, based on our submission to the Airports Commission, we are confident that within 5 years of its opening, the airport's throughput could have increased by an additional 20mppa. The eventual capacity of Gatwick with an additional runway would be around 95mppa which might be reached within 20 or 25 years from opening the additional runway

Capital investment

5.4.7 The addition of an additional runway to the south of Gatwick would require a significant investment in land and property acquisition, road and river diversions, airfield and terminal developments and supporting infrastructure such as car parking. Our proposal to the Airports Commission was costed at £7.6bn, with the first phase costing £3bn (in 2014 prices).

Surface access

5.4.8 Our transport studies for the Airports Commission showed that the already planned and funded rail and road upgrade programmes, along with further enhancements which would be paid for by Gatwick, such as the diversion and improvement of the A23, would enable the airport to meet all the passenger demands from an additional runway without any further taxpayer investment. The surface access improvements for the additional runway scheme are illustrated in **Plan 22.**

5.4.9 These planned improvements in rail, bus and coach infrastructure and services, would enable Gatwick to achieve a very high use of sustainable modes of transport. With the additional runway Gatwick would achieve a 60% public transport mode share for passengers and a 50% sustainable mode share for staff.

Land safeguarding

5.4.10 As required by Government, land is currently safeguarded for the additional runway. We work constructively with Crawley Borough Council to ensure that, in this safeguarded area, development does not take place which would be incompatible with the additional runway.

5.4.11 While we are not actively pursuing an additional runway at Gatwick we believe it is in the national interest to continue with this strategy of land safeguarding. This will preserve the option of building an additional runway in the future to meet the future airport capacity gap that the Government's forecasts indicate will occur even with a third runway constructed at Heathrow.

5.4.12 The area of land currently safeguarded for the additional runway was based on a much earlier scheme developed by the previous airport owners, BAA. This currently safeguarded area is illustrated in **Plan 21.** In developing our proposals for the Airports Commission, we sought to contain the development within this land boundary wherever possible. However, to meet operational requirements, we found it necessary to make some adjustments to this boundary. The revised land boundary for the additional runway is also shown in **Plan 21**. We recommend that the area safeguarded for the additional runway by the Local Planning Authorities, is modified to conform to this latest boundary.

5.4.13 Should Crawley Borough Council adopt our definition of the current airport boundary contained in this draft master plan (see Chapter 2), it would also be necessary to adjust the safeguarded land area so that it abuts the revised airport boundary.

Our pledges for the additional main runway

5.4.14 We recognised that the additional runway scheme would impact significantly on the local area and community in positive and negative ways. To offset these adverse impacts, Gatwick committed to a number of pledges including:

- £46.5m of funding to help local authorities deliver essential community infrastructure
- £3.75m of funding to help create 2,500 new apprenticeships for local people
- Increased compensation funds for those homeowners most affected by expansion
- A new Engagement Charter and dedicated team to help landowners and businesses
- Exploration of all potential noise management initiatives including international best practice
- A continuation of full compliance with all legal air quality standards
- A local roads fund (£10m), a contribution of circa £2m per annum to the Passenger Transport Levy and a world class 60% public transport mode share

5.4.15 Since 2005 we have had in place two blight schemes relating to the additional runway:

- The Property Market Support Bond (PMSB) is for those with homes which would need to be purchased to make way for the runway. The Bond allows owners to require GAL to acquire their property for its pre-scheme open market value, a home loss payment of 25% and costs. It becomes exercisable upon GAL confirming that GAL intends to apply for planning permission for the additional runway. It expires on 1st January 2020.
- The Home Owner Support Scheme (HOSS) is for those with homes newly affected by a high level of noise as a result of the additional runway. The HOSS scheme operates from the date GAL confirms that GAL intends to apply for planning permission for the additional runway. Homeowners can require GAL to acquire their property for its pre scheme open market value once GAL announces an intention to begin construction of the additional runway or earlier in certain circumstances.

5.4.16 We understand local residents will want to know whether we will be renewing the PMSB, and whether we will be introducing any additional schemes in relation to our other proposals for capacity enhancement. We confirm that we will be bringing forward new proposals for replacement schemes in due course.

5.5 KEY ENVIRONMENTAL IMPACTS OF THE GROWTH SCENARIOS

5.5.1 This section describes how the key environmental issues of carbon emissions, air quality and air noise would potentially vary under the three growth scenarios described above. It includes the best information available at the time of publication. However it should be noted that:

- We have not yet completed a full assessment of environmental impacts of the standby runway scheme. If a Development Consent Order (DCO) application for the standby runway scheme is brought forward then, as part of this, we would prepare a full Environmental Impact Assessment (EIA).
- If an additional main runway were to be taken forward in the future, the environmental impacts reported to the Airports Commission would have to be revisited and updated, to reflect the new development timescales and any other changes in the scheme. The environmental indicators shown below for the additional runway scheme are based on our 2014 submission to the Airports Commission. They relate to Gatwick with an additional runway operating in 2040 with a throughput of approximately 83mppa.

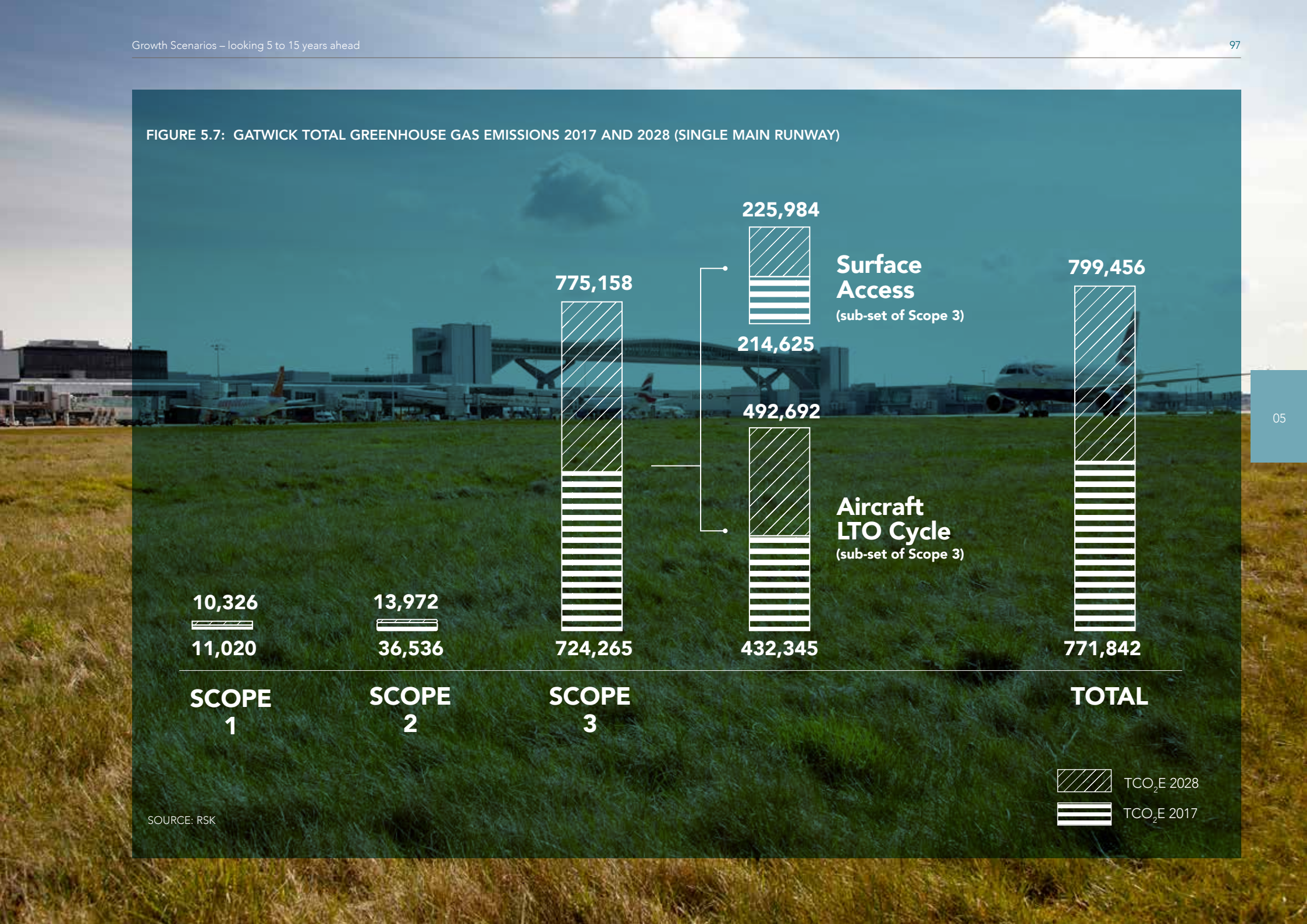
5.5.2 Chapter 6 provides more detail on our environmental management strategies and how we are working to limit the airport's environmental impacts.

CARBON EMISSIONS

The existing main runway

5.5.3 The carbon emissions produced by Gatwick in 2017, along with estimates for 2028, are shown in Figure 5.7. The largest component is the Landing and Take-off (LTO) cycle which measures carbon produced by aircraft approaching or departing the airport, below an altitude of 3,000ft. This and the passenger surface access elements account for the majority of Scope 3 emissions. (Scope 1, 2 and 3 emissions were explained in paragraph 4.5.12).

FIGURE 5.7: GATWICK TOTAL GREENHOUSE GAS EMISSIONS 2017 AND 2028 (SINGLE MAIN RUNWAY)



SOURCE: RSK

5.5.4 Figure 5.7 shows a small predicted increase in total carbon emissions as a result of the forecast increase in aircraft movements. However Scope 1 and 2 emissions are predicted to continue falling and by 2028 are expected to be 70% lower than the 1990 baseline. Separate modelling indicates that our Decade of Change target for carbon should be achieved by the end of 2020. This target is to achieve a 50% reduction compared to our 1990 baseline of 82,843 tCO_2e (Scope 1 and 2).

5.5.5 While Figure 5.7 indicates modest growth in Scope 3 emissions this projection does not incorporate reductions from known opportunities to achieve much lower emissions. Further efficiency improvements in the management of the airspace and airfield operation have the potential to deliver shorter flight-paths and reduced holding, both of which should reduce fuel burn and emissions. Accelerating the shift to public transport and the transition to electric and low-carbon vehicles would reduce surface access emissions. The Sustainable Aviation (SA) sustainable fuel road map also highlights the huge opportunity presented by sustainable aviation fuels. SA calculates that sustainable fuels could deliver up to 24% reduction in CO_2 emissions from UK aviation by 2050..

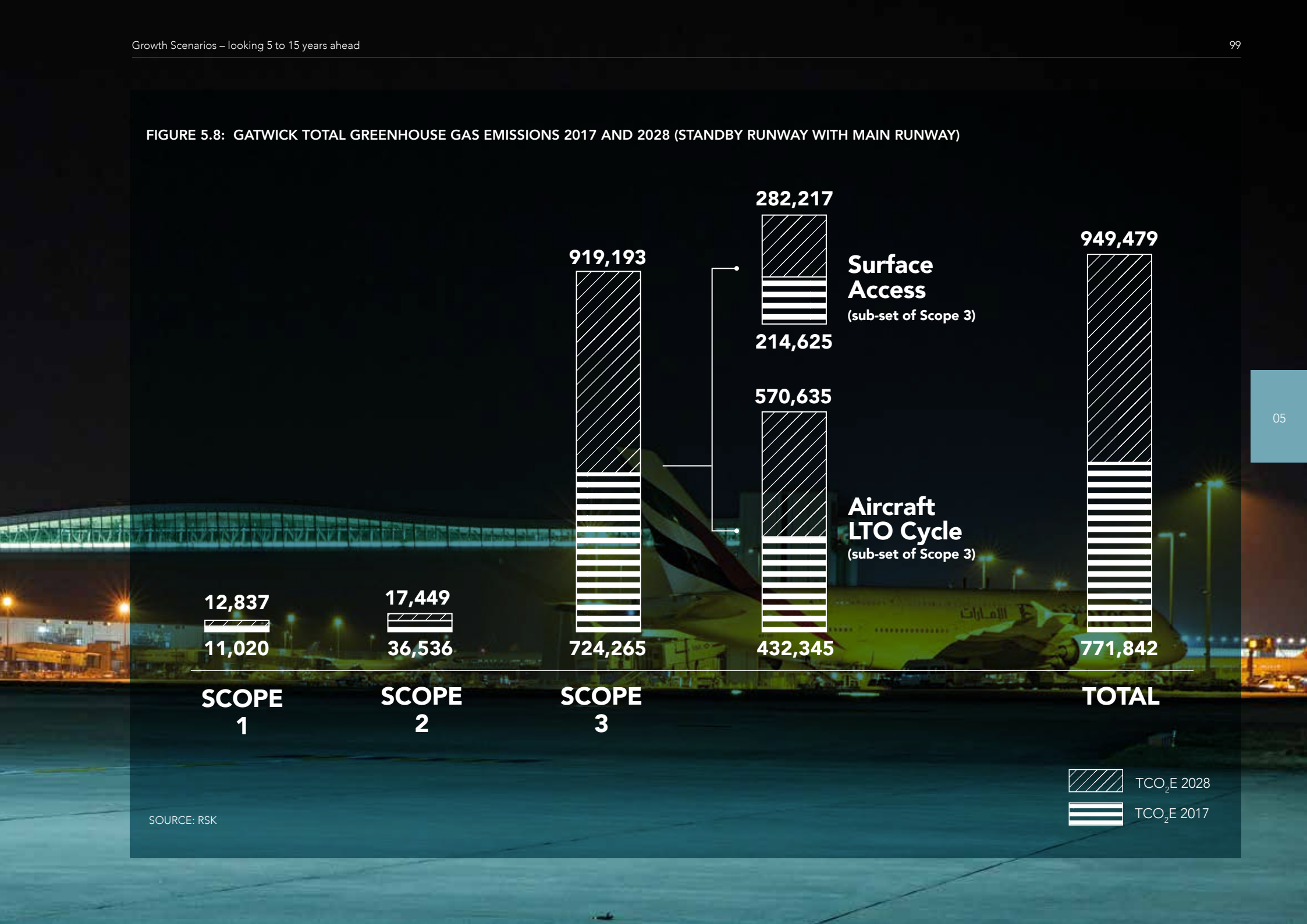
5.5.6 The Government has recognised these opportunities in its recent policy announcement on 'Making the Best Use of Existing Runways'. In this it presents analysis of the impacts of carbon emissions from airport growth, alongside the expansion of Heathrow. It concluded that measures such as uptake of renewable fuels and reduction of aircraft fuel use by operational measures, such as single engine taxiing, would be expected to enable the Committee on Climate Change's planning assumptions for total UK aviation emissions to be met.

5.5.7 Gatwick is closely involved in supporting these initiatives so that future greenhouse gas emissions are as low as possible.

The existing standby runway

5.5.8 We have also undertaken some provisional analysis of airport-wide carbon emissions in the event that the standby runway is used together with the main runway. The results are shown in Figure 5.8. The analysis indicates higher carbon emissions than with the existing main runway as a result of the greater passenger and aircraft throughput. However, as explained above, we are closely involved in key initiatives that provide opportunities for delivering a lower carbon footprint than that indicated.

FIGURE 5.8: GATWICK TOTAL GREENHOUSE GAS EMISSIONS 2017 AND 2028 (STANDBY RUNWAY WITH MAIN RUNWAY)



SOURCE: RSK

An additional runway to the south

5.5.9 Our additional runway proposals submitted to the Airports Commission included many initiatives designed to minimise the amount of carbon produced. These included:

- A compact airfield layout, designed to minimise taxiing distances and runway holding, in order to reduce fuel burn.
- A Surface Access Strategy designed to maximise the use of public transport and support wider sustainable travel patterns and low carbon modes of transport.
- Highly efficient building design, technology and management systems.
- A zero carbon energy strategy, including an integrated approach to managing airport energy, waste and water resources.

5.5.10 Our submission showed that future carbon emissions would increase as a result of an additional runway as shown in Figure 5.9. Note that the modelled year is 2040 which means the results are not directly comparable with the two tables above. The initiatives outlined above mean that emissions on a per passenger basis, would be lower than in a single runway scenario.

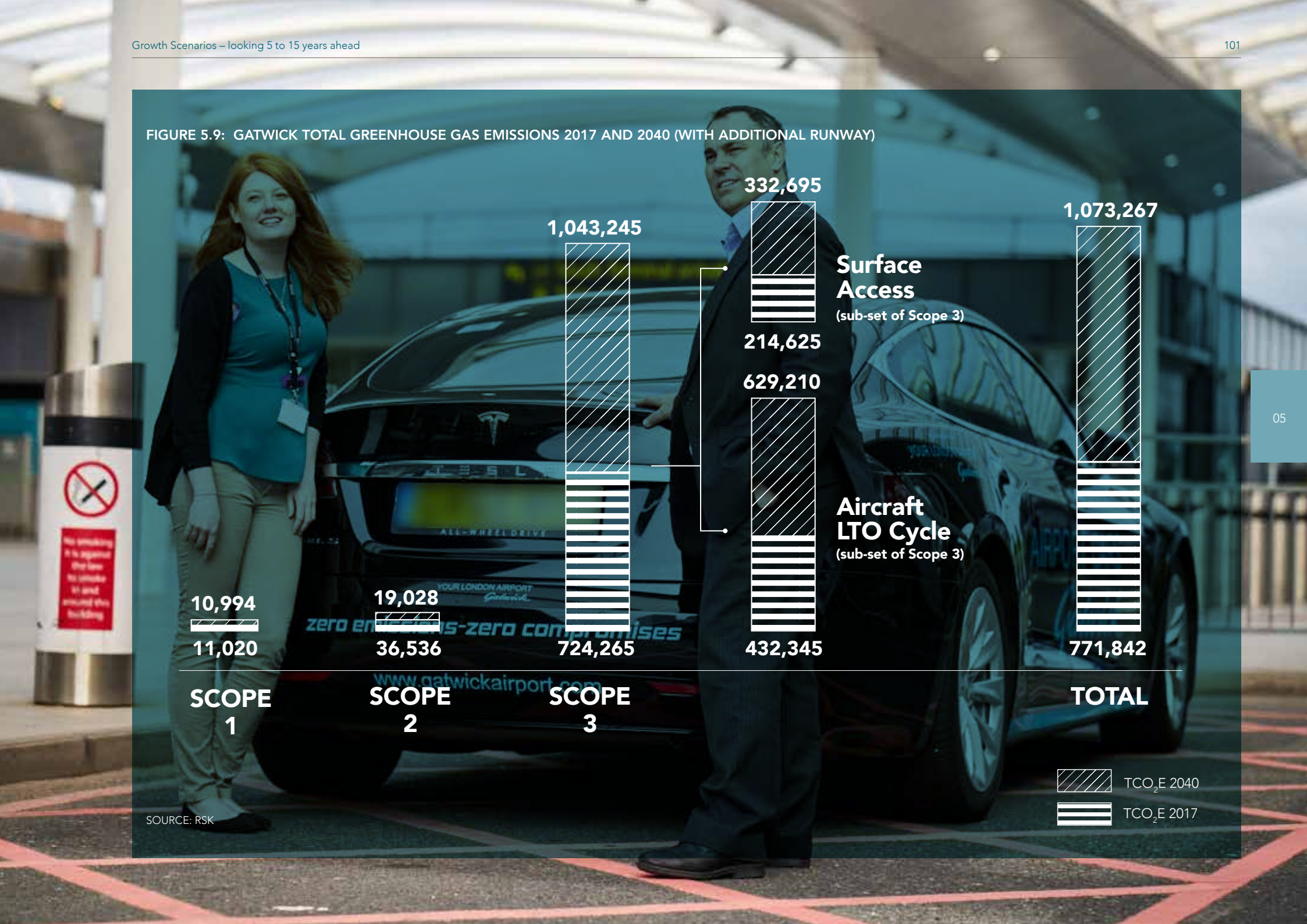
5.5.11 Our proposals also included strategies to minimise carbon during construction, drawing on experience of other major infrastructure projects such as the Olympic Park in London. These included minimising embodied carbon through a Sustainable Materials Strategy (e.g. the use of low carbon concrete mixes) and an innovative Construction Waste Management Strategy to optimise rates of re-use and recycling.

Sustainable Aviation calculates that sustainable fuels could deliver up to

24% REDUCTION IN CO_2

emissions from UK aviation by the 2050s

FIGURE 5.9: GATWICK TOTAL GREENHOUSE GAS EMISSIONS 2017 AND 2040 (WITH ADDITIONAL RUNWAY)



SOURCE: RSK

AIR QUALITY

The existing main runway

5.5.12 ARUP has updated the airport's five yearly emissions inventory and used this data to model the 2015 concentrations of pollutants at sensitive receptors in a 10km by 10km study area around the airport.[14] The assessment showed that total Gatwick emissions of NO_2, PM10 and PM2.5 in 2015 were lower than in 2010 when the previous emissions inventory was undertaken. All modelled concentrations of pollutants were below the specified limits identified in Figure 4.4. The highest modelled 2015 concentrations in the area around Gatwick were 33.3µg/m^3 for NO_2 (in Horley), 18.3µg/m^3 for PM10 (in Crawley) and 13.0µg/m^3 for PM2.5 (in Horley).

5.5.13 ARUP also ran the air quality model to test pollutant concentrations in 2028 with increased traffic volumes on the existing main runway. Again the results show no exceedances at any receptor location. The highest predicted values were 19.7µg/m^3 for NO_2 (in Horley), 16.6µg/m^3 for PM10 (in Crawley), and 12.0µg/m3 for PM2.5 (in Horley). The improvements compared to the 2015 results were largely the result of predicted cleaner engine technology for road vehicles.

The existing standby runway

5.5.14 Given the modelled results for the single-runway pollutant concentrations in 2028, and the mitigation options available to us, we do not believe that there will be any exceedance of local air quality limits caused by the standby runway scheme. We also know that detailed modelling of the airport with an additional runway to the south, which generated much higher levels of air traffic, showed no exceedances of these limits. This gives us confidence that Gatwick's growth with both the main and standby runways in simultaneous use would not cause any exceedances of air quality standards in the local area.

5.5.15 If this scheme is taken forward, we would carry out, and consult on, detailed air quality modelling as part of a full Environmental Impact Assessment, which would quantify the expected concentrations of NO_2, PM10 and PM2.5 in the area around Gatwick.

An additional runway to the south

5.5.16 As part of our work for the Airports Commission we commissioned detailed air quality modelling to test whether there would be any exceedances of the limits for pollutant concentrations in the area around Gatwick. This modelling showed that, while there would be additional emissions to atmosphere, notably of NO_2, PM10 and PM2.5, these emissions would have very little impact on local air quality in residential areas adjacent to the airport boundary. Importantly the annual average concentrations of NO_2, PM10 and PM2.5 in the area around Gatwick would be well within EU limit values.

FIGURE 5.10: SUMMER DAY NOISE EXPOSURE CHANGE FROM 2017 TO 2028 AND 2032 (EXISTING MAIN RUNWAY)

NOISE METRIC	POPULATION		
	2017 (Standard)	2028 Main runway	2032 Main runway
Leq summer day 54dB	10,950	9,000	8,000
Leq summer day 57dB	3,400	2,400	2,600
Leq summer day 60dB	1,500	1,200	900
Leq summer day 63dB	550	500	400
Leq summer day 66dB	350	200	200
Leq summer day 69dB	150	100	100
Leq summer day 72dB	150	0	0

SOURCE: CAA ERCD

[14] - Further refinement and sensitivity testing of the modelling will be undertaken to address some under-prediction of NO2 concentrations near Hazelwick roundabout and some over-predictions near the airport, when compared with 2015 local monitoring data

AIR NOISE

The existing main runway

5.5.17 The air noise footprint of Gatwick's operations is measured and reported annually in the form of noise contour reports. The CAA's Environmental Research and Consultancy Department (ERCD) has produced actual noise contours for 2017 and predicted contours for 2028 and 2032 with the existing main runway in use. The populations within these noise contours are shown in Figures 5.10 and 5.11.

5.5.18 Figures 5.10 and 5.11 show that noise levels with the existing main runway are expected to reduce by 2028 and the downward trend generally continues through to 2032. This reduction results from the introduction of quieter 'new generation' aircraft which will replace existing aircraft types over this period. In noise exposure terms this change in fleet mix is forecast to outweigh the effects of increasing flight numbers.

NOISE LEVELS ARE EXPECTED TO REDUCE

by 2028 and the downward trend continues through to 2032

FIGURE 5.11: SUMMER NIGHT NOISE EXPOSURE CHANGE FROM 2017 TO 2028 AND 2032 (EXISTING MAIN RUNWAY)

NOISE METRIC	POPULATION		
	2017 (10 year average)	2028 Main runway	2032 Main runway
Leq summer night 48dB	13,550	10,400	9,100
Leq summer night 51dB	6,650	4,500	4,600
Leq summer night 54dB	1,800	1,300	1,200
Leq summer night 57dB	750	500	400
Leq summer night 60dB	350	400	300
Leq summer night 63dB	200	200	200
Leq summer night 66dB	150	0	0
Leq summer night 69dB	0	0	0
Leq summer night 72dB	0	0	0

SOURCE: CAA ERCD

5.5.19 For example, the 'A320 neo' and 'B737 Max 8', aircraft that are expected to make up nearly 50% of the Gatwick fleet by 2028, will be about 4dB quieter on departure and 2dB quieter on approach compared to current equivalent aircraft. This is expected to reduce Gatwick's noise footprint despite increased movements.

5.5.20 It should be noted that these contours have been calculated using traffic data which is representative of the forecast ranges presented in Figure 5.1. The contours do not make any allowance for changes in the design of airspace which, as explained in Section 3.4, should create the opportunities for noise reduction initiatives.

5.5.21 Noise contours for the metrics identified above are illustrated in the following plans:

- **Plan 14:**
  2017 Average summer day Leq.
- **Plan 15:**
  2017 Average summer night Leq.
- **Plan 23:**
  2028 Average summer day Leq.
- **Plan 24:**
  2028 Average summer night Leq.
- **Plan 25:**
  2032 Average summer day Leq.
- **Plan 26:**
  2032 Average summer night Leq.

The existing standby runway

5.5.22 The potential air noise impacts of the airport using the existing main and standby runways simultaneously will naturally be a key focus for local communities. To address this important issue, we have investigated the possible scale of change that could occur as a result of this growth.

5.5.23 Figures 5.12 and 5.13 present the preliminary results of the initial analysis carried out to date. It shows how the populations within the different noise contours might vary between the single runway airport today and the airport with the main and standby runways operating together in 2028 and 2032.

FIGURE 5.12: SUMMER DAY NOISE EXPOSURE CHANGE FROM 2017 TO 2028 AND 2032 (MAIN AND STANDBY RUNWAYS)

NOISE METRIC	POPULATION		
	2017 (Standard)	2028 Main and standby runway	2032 Main and standby runway
Leq summer day 54dB	10,950	10,800	10,000
Leq summer day 57dB	3,400	3,900	4,100
Leq summer day 60dB	1,500	1,400	1,300
Leq summer day 63dB	550	600	500
Leq summer day 66dB	350	300	300
Leq summer day 69dB	150	200	100
Leq summer day 72dB	150	0	0

SOURCE: CAA ERCD

5.5.24 Figures 5.12 and 5.13 show that the number of people affected by day-time noise in 2028 and 2032, with the standby runway scheme in operation, should be broadly comparable to today. This means that, while there will be more flights, this will be balanced by the fact that aircraft will be quieter, resulting in little overall change in the number of people living within each Leq noise contour. There is a more apparent reduction in night-time noise as there is assumed to be no traffic growth in the night quota period and therefore the positive impact of quieter aircraft types is more pronounced.

5.5.25 Again, it should be noted that the noise results presented relate to aircraft movements which are representative of the forecast range shown in Figure 5.5. If we bring forward a DCO application for the standby runway scheme we will prepare a more detailed assessment of noise as part of the Environmental Impact Assessment (EIA).

5.5.26 A comparison of Tables 5.10/5.11 and 5.12/5.13 shows that the use of the standby runway will increase the 2028 and 2032 contour populations, compared to a single runway scenario in the same year. Where people do experience an increase in noise, compared to a single-runway scenario, we expect the increase to be less than 3dB in nearly all cases. In this scenario, the flight paths are expected to be very similar to the current ones meaning that there will be very few people newly affected by noise, unlike the additional runway scheme where the new runway 1km to the south of the existing airport would spread the noise footprint over a significantly wider area.

FIGURE 5.13: SUMMER NIGHT NOISE EXPOSURE CHANGE FROM 2017 TO 2028 AND 2032 (MAIN AND STANDBY RUNWAYS)

NOISE METRIC	POPULATION		
	2017 (10 year average))	2028 Main and standby runway	2032 Main and standby runway
Leq summer night 48dB	13,550	11,000	10,200
Leq summer night 51dB	6,650	4,900	4,900
Leq summer night 54dB	1,800	1,500	1,400
Leq summer night 57dB	750	600	500
Leq summer night 60dB	350	300	300
Leq summer night 63dB	200	100	100
Leq summer night 66dB	150	0	0
Leq summer night 69dB	0	0	0
Leq summer night 72dB	0	0	0

SOURCE: CAA ERCD


07L
25R
08R
26L
12
30

5.5.27 Noise contours for the metrics referred to above are illustrated in the following plans:

- **Plan 14:**
  2017 Average summer day Leq.
  (existing main runway)
- **Plan 15:**
  2017 Average summer night Leq.
  (existing main runway)
- **Plan 27:**
  2028 Average summer day Leq.
  (main and standby runway)
- **Plan 28:**
  2028 Average summer night Leq.
  (main and standby runway)
- **Plan 29:**
  2032 Average summer day Leq.
  (main and standby runway)
- **Plan 30:**
  2032 Average summer night Leq.
  (main and standby runway)

5.5.28 As explained in Section 5.3 above, if it is decided to progress this use of the standby runway, we would expect to start the process of preparing a DCO consultation during 2019. As part of this DCO process we will be required to demonstrate that we have fully investigated all air noise impacts of the scheme and ensured that these are adequately mitigated. This would involve a process of detailed engagement with all stakeholders as well as public consultation on noise impacts and appropriate noise mitigation measures.

An additional runway to the south

5.5.29 For our work for the Airports Commission we submitted, in 2014, detailed information on the noise impacts of the proposed additional runway as forecast at that time. The 2040 summer day contours are shown in Figure 5.14. This shows a much larger number of people affected by noise than the two other growth scenarios now being considered, as a result of the much higher number of aircraft movements with an additional runway.

5.5.30 The noise contours for the metrics identified above are illustrated in the following plans:

- **Plan 14:**
  2017 Average summer day Leq.
- **Plan 31:**
  2040 Average summer day Leq with additional runway

5.5.31 Note that while we produced a range of noise impact metrics for the additional runway which can be found at [redacted] we did not produce Leq contours for the 8-hour summer night period, hence their exclusion from this section.

FIGURE 5.14: SUMMER DAY NOISE EXPOSURE CHANGE FROM 2017 TO 2040 (WITH THE ADDITIONAL RUNWAY)

NOISE METRIC	POPULATION	
	2017	2040 Additional runway
Leq summer day 54dB	10,950	32,200
Leq summer day 57dB	3,400	15,400
Leq summer day 60dB	1,500	6,200
Leq summer day 63dB	550	1,400
Leq summer day 66dB	350	100
Leq summer day 69dB	150	<100
Leq summer day 72dB	150	0

SOURCE: CAA ERCD

5.6 KEY ECONOMIC IMPACTS OF THE GROWTH SCENARIOS

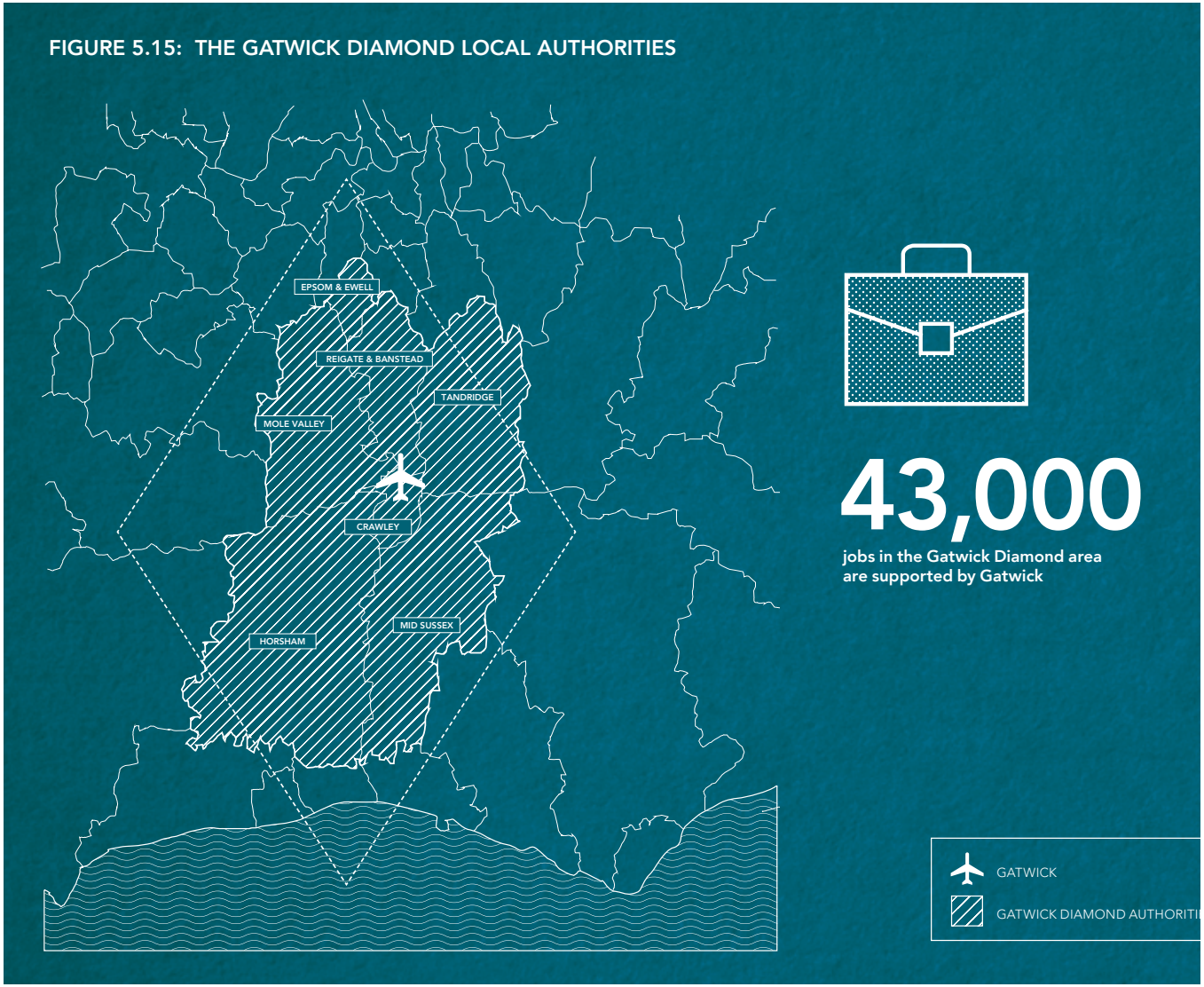
The existing main runway

5.6.1 Each year the UK aviation sector carries over 250m passengers and 2.5m tonnes of cargo. As the second busiest airport in the UK. Gatwick contributed a significant portion of this traffic and in doing so contributes substantial value to the UK economy. Oxera has calculated that Gatwick contributes £4.1bn to UK GDP.

5.6.2 Gatwick makes a significant contribution to the local economy. Nearly 24,000 people work at the airport and airport-based businesses purchase goods and services from a variety of local suppliers. GAL alone spent £133m with local businesses in 2017.

5.6.3 Oxera has examined the current and future (2028) economic contribution made by Gatwick to the UK and, in particular, the Gatwick Diamond area around Gatwick. The Gatwick Diamond is a business-led partnership established to improve the economic performance of the local area surrounding Gatwick, where the majority of the economic benefits of the airport are focused (see Figure 5.15).

FIGURE 5.15: THE GATWICK DIAMOND LOCAL AUTHORITIES



Gatwick's economic footprint

5.6.4 Gatwick's 2016 staff survey showed that 23,800 people are employed at the airport (direct on-airport employment). Oxera estimates that, through Gatwick's supply chain, a further 37,000 indirect jobs are created outside the airport boundary, along with a further 10,000 jobs through catalytic effects, generating a total of 71,000 jobs. By 2028 this is predicted to increase to 79,000 jobs with Gatwick operating with the existing main runway (see Figure 5.16).

5.6.5 Of this 2017 total of 71,000 jobs, Oxera estimates that 43,000 are in the Gatwick Diamond area.

5.6.6 The existence of these direct and indirect jobs contributes to the generation of economic value to the local and wider economy. This can be measured as 'gross value added' (or GVA) which is the total value of output from Gatwick, minus the value of inputs to its supply chain. Oxera estimate the 2017 GVA through Gatwick's activity to be around £1.5bn, rising to a total of £4.1bn once indirect off-airport activity and catalytic effects are accounted for. Oxera used the same methodology to calculate GVA in 2028. Both sets of results are shown in Figure 5.17.

FIGURE 5.16: TOTAL EMPLOYMENT SUSTAINED BY GATWICK

TYPES OF JOBS	NUMBER OF JOBS (ROUNDED) 2017	NUMBER OF JOBS (ROUNDED) 2028 (ESTIMATED)
Direct jobs	24,000	28,000
Indirect jobs	37,000	41,000
Catalytic jobs	10,000	11,000
Total jobs	71,000	79,000

SOURCE: GATWICK EMPLOYER SURVEY 2016 AND OXERA ANALYSIS

FIGURE 5.17: ESTIMATED GVA (UK WIDE) SUPPORTED BY GATWICK – 2015 AND 2028

	2017 GVA (£M)	2028 GVA (£M)
Direct footprint – GVA	1,495	1,848
Indirect footprint – GVA	2,050	2,559
Catalytic footprint – GVA	572	652
Total GVA	4,117	5,059

SOURCE: OXERA


GGS
TREPEL
GGS
alpha

The net economic and welfare effects

5.6.7 To understand the true economic value and benefit created by Gatwick, it is important to understand what would happen to the economy in the airport's absence. This process is described as calculating the net impact and it is the standard approach adopted by other organisations when assessing economic value. Oxera has calculated Gatwick's net impact by comparing differences in economic activity and welfare in the Diamond between the status quo in 2017, and a hypothetical situation without the airport. The same approach has also been taken for 2028.

5.6.8 For its assessment of these benefits, Oxera used a methodology consistent with that set out by the Department for Transport in its web Transport Analysis Guidance (webTAG)[14]. Amongst other considerations, the net economic impact takes account of current airport employees who might need to find a job in another area, or accept a less productive job in the Gatwick Diamond.

5.6.9 The methodology also considers the welfare benefits of Gatwick, including the shorter travel times to/from the airport for Gatwick Diamond workers and residents.

5.6.10 By following this approach Oxera calculates Gatwick's net economic benefit to the Diamond in 2017 was £1.44bn with a further welfare net benefit of £30m. For 2028 Oxera calculates that these will increase to £1.71bn and £44m respectively. These results are shown in Figure 5.18.

5.6.11 Looking beyond the Gatwick Diamond area, Oxera has made estimates of the economic benefits of Gatwick to the local counties and to the Coast to Capital LEP area, both for the situation in 2017 and 2028. The results are shown in Figure 5.19.

FIGURE 5.18: SUMMARY OF NET ECONOMIC IMPACT IN THE GATWICK DIAMOND AREA

	2017	2028
Net economic impact	£1,442m	£1,713m
Wider welfare impacts	£30m	£44m

NOTE: ALL VALUES IN 2017 PRICES
SOURCE: OXERA ANALYSIS

FIGURE 5.19: ECONOMIC BENEFITS OF GATWICK IN THE WIDER REGIONAL AREA

		2017	2028
East Sussex, West Sussex, Surrey, and Kent, and the unitary authority of Brighton and Hove	Residents employed at Gatwick	15,500	18,000
	Wages received	£417m	£527m
	Economic output supported by Gatwick supply chain	£1.4bn	£1.8bn
	Jobs supported by Gatwick supply chain	25,700	28,800
Coast to Capital LEP	Residents employed at Gatwick	14,500	17,000
	Wages received	£393m	£497m
	Economic output supported by Gatwick supply chain	£771m	£963m
	Jobs supported by Gatwick supply chain	13,900	15,600

NOTE: THE BENEFITS FOR THE LISTED COUNTIES AND FOR THE LEP ARE NOT ADDITIVE AS BOTH AREAS OVERLAP
SOURCE: OXERA ANALYSIS

[14]*Department for Transport (2016), 'Web Transport Analysis Guidance', 28 July https://www.gov.uk/guidance/transport-analysis-guidance-webtag.*

The existing standby runway

5.6.12 Oxera has also carried out some preliminary analysis of the economic benefits of Gatwick with both the existing standby runway and main runway in operation in 2028, using the same methodology as that set out above.

5.6.13 This indicates a total employment of 91,000, with both the standby runway and main runway in operation, compared with 79,000 with the main runway only.

5.6.14 Similarly, total GVA is estimated to be £5.79bn compared with £5.06bn.

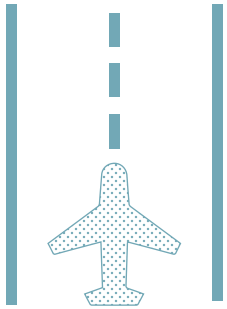
5.6.15 Net economic benefits in the Gatwick Diamond area are estimated to be £1.9bn compared with £1.7bn, and wider welfare benefits are estimated to be £60m compared with £44m.

5.6.16 This additional employment and economic activity generated by bringing the standby runway into regular use results from the higher capacity and passenger throughput it delivers along with associated increases in employment. We will carry out a more detailed assessment of these economic benefits of the standby runway scheme if it is taken forward to a DCO application.

An additional runway to the south

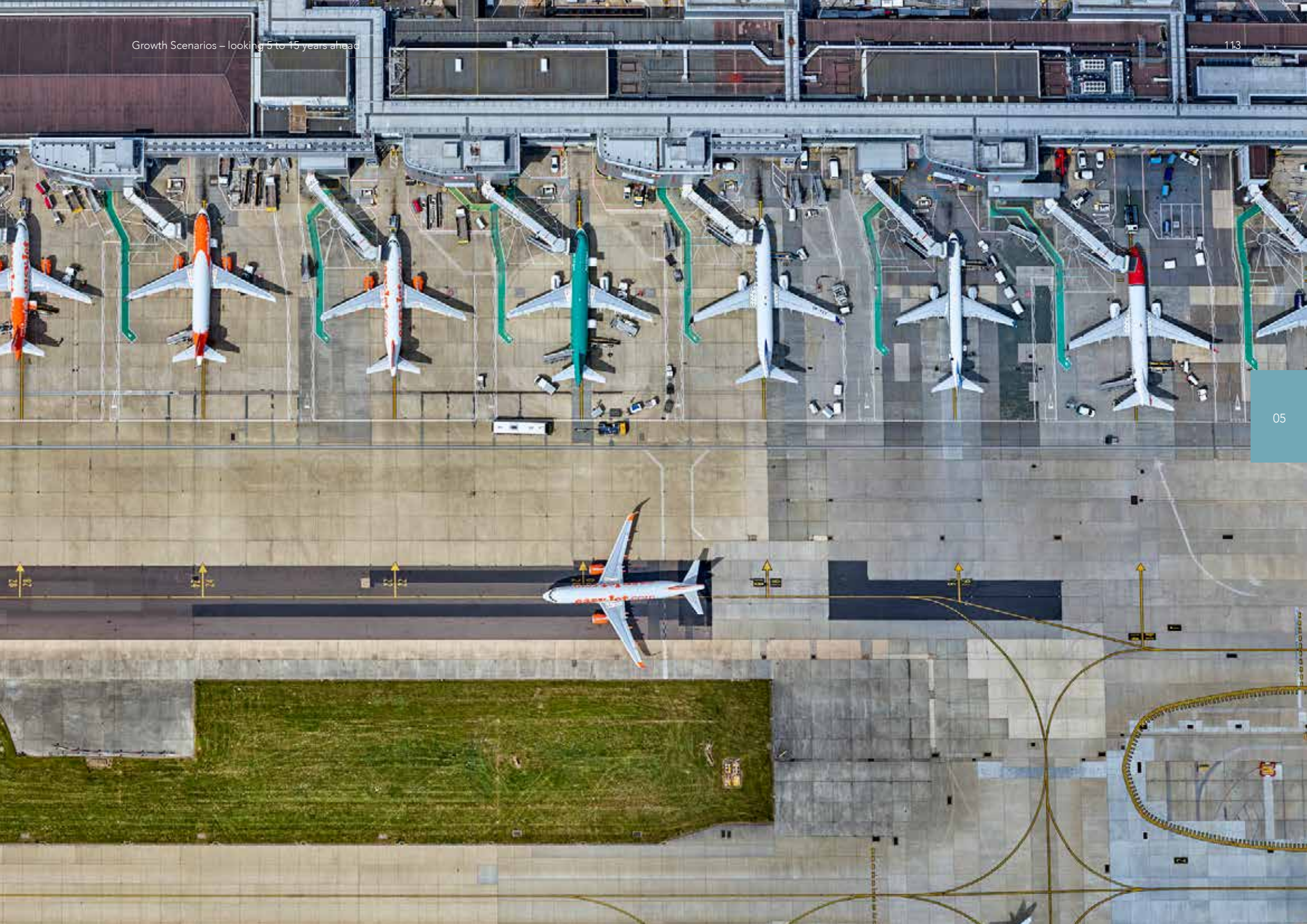
5.6.17 We commissioned an assessment of the economic benefits of adding an additional runway, as part of our work to assist the Airports Commission. This identified the following benefits:

- £79bn of economic benefits to the UK, in aggregate, over 60 year in present value terms, plus a further £10bn to 14bn of indirect competition benefits.
- £10bn to 14bn of benefits from direct competition resulting in lower fares, wider participation in the aviation industry, and greater levels of innovation from both airports and airlines.
- The revenue generated for the Exchequer, is expected to be £15bn of additional direct and indirect tax revenue at Gatwick. No Government subsidy is required for the additional runway.
- £28bn of wider economic benefits to the UK economy (i.e. benefits that are additional to the benefits to users and providers of aviation services). This value is considerably lower than benefits that have been attributed to the expansion of airport capacity by some other studies, principally because Gatwick has sought to avoid double counting any of the costs or benefits of additional airport capacity.
- In addition, the benefits from increased competition are likely to disperse throughout the London airport system, benefiting all passengers, even on routes where there is no direct competition.
- Employment at Gatwick is expected to grow based on an expanded volume of passenger traffic. With an additional runway the total projected airport employment would be 59,700.



59,700

total projected airport employment with an additional runway



6 ENVIRONMENTAL STRATEGIES

6.1 Introduction
6.2 Carbon and climate change
6.3 Air quality
6.4 Air noise
6.5 Ground noise
6.6 Waste
6.7 Energy
6.8 Water
6.9 Landscape and biodiversity

6.1 INTRODUCTION

6.1.1 In Chapter 4 we summarised briefly our Decade of Change sustainability strategy and goals, how these have improved our sustainability performance since 2010 and how we expect them to shape our performance over the next five years.

6.1.2. In Chapter 5 we explained how the key topics of carbon, air quality, air noise and economic benefits would be affected by three growth scenarios.

6.1.3. In this chapter we provide broader statements of current strategies for managing Gatwick's environmental impacts.

6.2 CARBON AND CLIMATE CHANGE

Our Carbon Reduction Strategies

6.2.1 Our current carbon-reduction priorities include:

- Continue the evaluation of solar power and additional waste-to-renewable energy systems
- Expand collaboration with airport partners on low carbon initiatives
- Identify local carbon offsetting initiatives to complement our current international scheme (see below)
- Minimise embodied carbon by expecting lower-intensity carbon specifications from our supply chain.

6.2.2 We continue to participate actively in Sustainable Aviation (SA) which brings together major UK airlines, airports, manufacturers and air navigation service providers to meet the challenge of ensuring a sustainable future for the industry.

6.2.3 Sustainable Aviation's Working Group on Climate Change maintains a roadmap for future CO_2 emissions from UK aviation and explains how government and industry can achieve the target of reducing absolute CO_2 emissions to 2005 levels by 2050. The roadmap shows that UK aviation could achieve this reduction while more than doubling passenger numbers through operational improvements, airspace reforms, next and future generation aircraft, sustainable fuels and market-based measures.

6.2.4 SA's updated CO_2 roadmap was launched in December 2016 and is available online at [redacted]. The next update is expected in December 2019.

Climate change

6.2.5 Climate change mitigation and adaptation continues to be a core consideration for all present and future planning at Gatwick. We will continue to review operational resilience procedures and contingency plans for incidents that may affect our services, including investment for severe weather events such as heavy rainfall, snow and ice. A range of risk reduction measures are available to address flood risk including the use of green drainage infrastructure (e.g. attenuation ponds, green roofs, etc.) to reduce run-off rates and volumes. These will be fully explored as projects are brought forward.

CLIMATE CHANGE MITIGATION AND ADAPTATION continues to be a core consideration for all present and future planning at Gatwick



6.3 AIR QUALITY

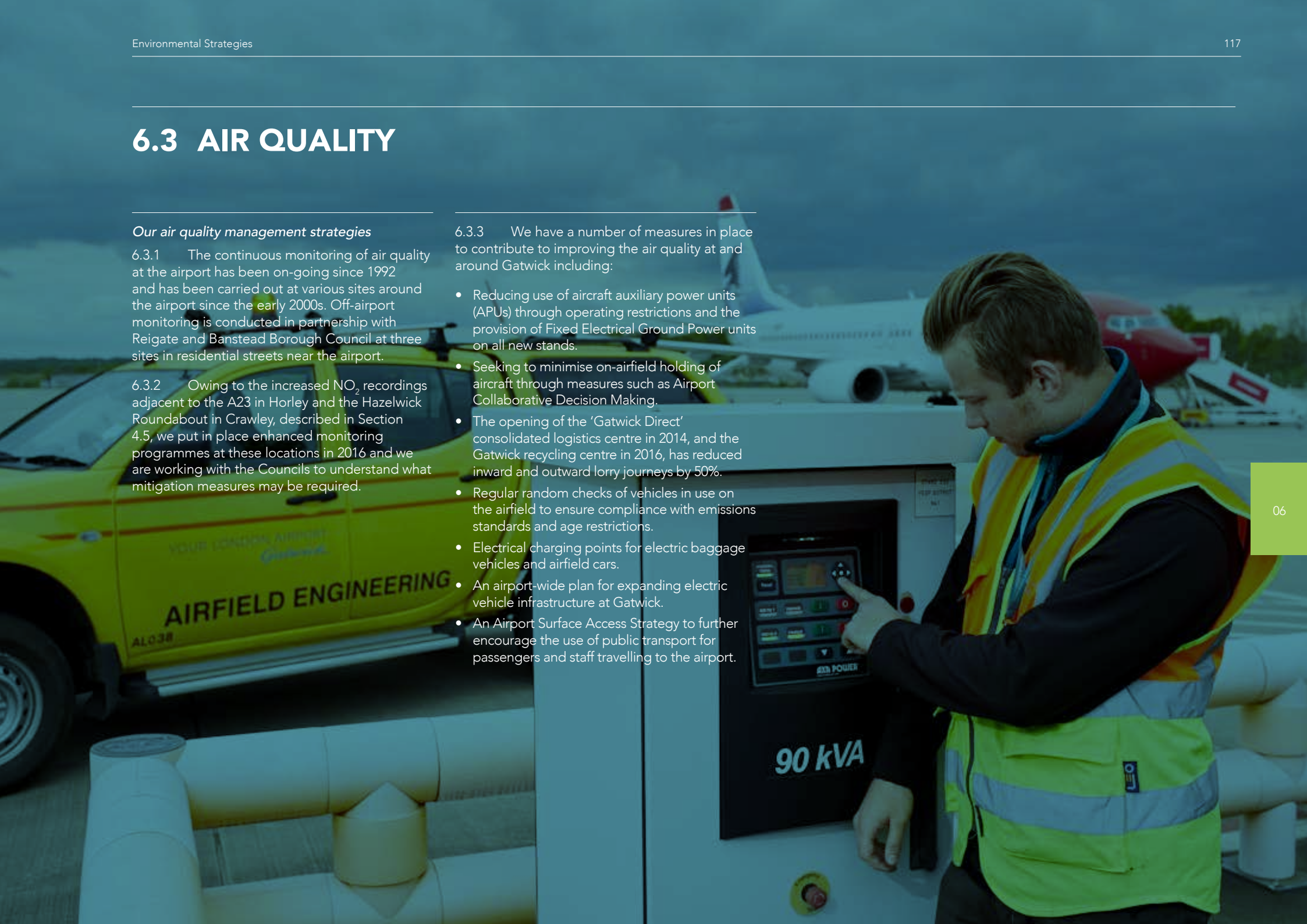
Our air quality management strategies

6.3.1 The continuous monitoring of air quality at the airport has been on-going since 1992 and has been carried out at various sites around the airport since the early 2000s. Off-airport monitoring is conducted in partnership with Reigate and Banstead Borough Council at three sites in residential streets near the airport.

6.3.2 Owing to the increased NO_2 recordings adjacent to the A23 in Horley and the Hazelwick Roundabout in Crawley, described in Section 4.5, we put in place enhanced monitoring programmes at these locations in 2016 and we are working with the Councils to understand what mitigation measures may be required.

6.3.3 We have a number of measures in place to contribute to improving the air quality at and around Gatwick including:

- Reducing use of aircraft auxiliary power units (APUs) through operating restrictions and the provision of Fixed Electrical Ground Power units on all new stands.
- Seeking to minimise on-airfield holding of aircraft through measures such as Airport Collaborative Decision Making.
- The opening of the 'Gatwick Direct' consolidated logistics centre in 2014, and the Gatwick recycling centre in 2016, has reduced inward and outward lorry journeys by 50%.
- Regular random checks of vehicles in use on the airfield to ensure compliance with emissions standards and age restrictions.
- Electrical charging points for electric baggage vehicles and airfield cars.
- An airport-wide plan for expanding electric vehicle infrastructure at Gatwick.
- An Airport Surface Access Strategy to further encourage the use of public transport for passengers and staff travelling to the airport.



6.4 AIR NOISE

6.4.1 Air noise is a term used to describe noise generated by aircraft that are either airborne or on the runway during the take-off or landing phases. Ground noise, which is addressed in the next section, deals with noise generated by aircraft when stationary or taxiing on the ground.

6.4.2 The management and control of air noise continues to be a high priority for us and over recent years we have evolved our approach to be more responsive to community concerns. Gatwick's independently-chaired Noise Management Board (NMB) is helping to shape our noise management strategy, through increased community engagement, and our Decade of Change target for noise is for us to be recognised as a best practice operator for noise management.

The Role of Government

6.4.3 The Government sets overall policy relating to the treatment of noise. The DfT's 'Consultation Response on UK Airspace Policy'[15] states the aim 'to limit and, where possible, reduce the number of people in the UK significantly affected by aircraft noise as part of a policy of sharing benefits of noise reduction with industry in support of sustainable development.' Over the coming months Government and the CAA will be consulting on aviation and airspace modernisation strategies, and this will provide further policy guidance for airports.

6.4.4 Gatwick is a designated airport under Section 78 of the Civil Aviation Act (1982 and 2006) which gives the Secretary of State direct responsibility for the control of air noise around Gatwick. One aspect of this control is the setting of limits around night flights.

6.4.5 Night flights are defined as those occurring between 2300 and 0700 hours[16]. At Gatwick they play an important part of our airlines' operating models. This is because they allow routes to be flown which wouldn't otherwise be viable, for example by allowing aircraft to make several return flights every day – a vital way of ensuring the economic viability of the airlines' operations.

6.4.6 The number of permitted night flights, and a noise quota count based on the noise level of each aircraft, in the summer and winter seasons are set by the DfT and we rigorously enforce and publicly report on these quotas. The DfT periodically reviews the night flight restrictions and quotas in place. The most recent review, including a public consultation on options, was concluded by the DfT in July 2017 and the new rules apply from October 2017 to October 2022. A new lower noise category has been introduced to capture aircraft types which were previously exempt from the quota, whilst the noise quota count limits themselves have also been reduced.

6.4.7 Another aspect of the Government's role is the establishment of Noise Preferential Routes (NPRs) designed to avoid the over-flights of built-up areas by departing aircraft. Gatwick's NPRs have been in their present locations since the 1960s, providing predictability of departure routes. There are five NPRs for aircraft departing to the west and four for aircraft departing to the east of the airport.

6.4.8 The Government sets additional noise abatement procedures designed to avoid over-flights of built up areas on departure, minimum heights over built-up areas during the arrivals phase and the avoidance of reverse thrust use on landing during night-time operations. These are set out in statutory notices and are monitored and reported on.

[15] *'Consultation Response on UK Airspace Policy A framework for balanced decisions on the design and use of airspace': October 2017*
[16] *All times quoted are local, e.g. British Summer Time in the summer and Universal Time Constant outside of the summer.*

6.4.9 There are a set of departure noise limits in place at Gatwick, set by the DfT in 2001, and measured on the extended runway centre line. These are 87dBA during the night quota period (2330-0600), 89dBA during the night quota shoulder periods (2300-2330 and 0600-0700) and 94dBA during the daytime (0700-2300).

The Role of Air Traffic Control

6.4.10 On 1st March 2016, Air Navigation Solutions Ltd (ANS) took over responsibility for the local air traffic control (ATC) service provision at Gatwick Airport from NATS. ANS has responsibility for controlling aircraft in the immediate environs of Gatwick but NATS continues to have overall responsibility for ATC for arriving and departing aircraft and handles aircraft en-route within UK airspace.

6.4.11 For departing flights, pilots are directed to follow the appropriate route depending on their flight plan and destination. Once the aircraft reaches 3,000ft or 4,000ft (depending on the route), at any point along the NPR, the aircraft may be 'vectored' (i.e. directed) by air traffic controllers onto a more direct heading for their onward journey. This flexibility allows ATC to ensure that safe separations between aircraft are always maintained and can enable an early climb and more direct route to be flown, thereby reducing noise and CO_2 emissions. Aircraft may also be vectored away from a route at an earlier stage for safety reasons such as avoiding other traffic or adverse weather.

6.4.12 All arriving flights are vectored onto the final glide-path which forms a virtual extension of the runway centreline from the touch down point at the runway threshold with an angle of approach of 3 degrees. The point at which the aircraft joins this glide-path, and the route taken to reach the joining point, depends on a number of factors. These include the approach direction, the weather and the location of other aircraft in the vicinity.

6.4.13 Continuous Descent Approach (CDA) is a technique for reducing the noise produced by arriving aircraft. It works by ensuring an optimal continuous descent rate, keeping aircraft at higher altitudes for longer and reducing the need for changes in thrust settings which can cause annoyance to people overflown. There is a voluntary code of practice for CDA, and levels of CDA compliance are publicly reported. Gatwick has seen CDA compliance levels of around 90% and is consistently one of the best performing airports in the UK.

6.4.14 A Gatwick Noise Management Board work plan action, and now a Sustainable Aviation (SA) led project, is to improve noise mitigation for arriving aircraft through the development of a low noise approach metric to complement the current CDA definition. This initiative can be delivered only with wholehearted cross-industry endorsement and with extensive support from the CAA to ensure effective engagement at both UK and European levels. It is expected that this will lead to the evolution of CDA procedures and reduce arrivals noise.

Gatwick has seen CDA compliance levels of around 90% and is consistently one of the best performing airports in the UK

Gatwick's Noise Action Plan

6.4.15 Under European law (Environmental Noise Directive (2002/49/EC)), Gatwick Airport is required to publish a Noise Action Plan every five years. This plan provides a detailed description of the statutory and voluntary noise management controls to manage noise issues and effects arising from aircraft departing from and arriving at the airport. Our current plan was published in 2013 and will be replaced by a revised plan – once it has been adopted by the Secretary of State – in 2019. Our performance against plan, the current 2015-2018 version of which is available via the Gatwick website, is assessed and reported quarterly and annually via the Noise and Track Keeping Monitoring Advisory Group (NaTMAG).

6.4.16 In finalising our latest draft Noise Action Plan, we consulted with GATCOM and our local authorities, and we also received feedback from our community noise groups represented on the NMB. The Noise Action Plan also now includes the contribution to noise management realised through the NMB and its work plan.

6.4.17 The Noise Action Plan gives a comprehensive description of the noise management strategies adopted by Gatwick. The draft Noise Action Plan is reflective of the feedback received during the consultative phase and pulls together Gatwick and NMB initiatives to form the core of the Plan. The activities included aim to reduce noise at source, mitigate the impact of noise on the ground and improve the availability of our noise information. Examples of these initiatives are:

- Implementing a voluntary ban on Quota Count 4 aircraft at night[17]
- Expanding the Community Noise Monitoring Scheme with additional noise monitoring terminals, the intention of which is to further aid our collective understanding of the noise climate around the airport.
- Reviewing our departure noise limits and increase the fines that are levied against airlines that breech these. All fines will be passed onto the Gatwick Airport Community Trust.
- Increasing the availability of airspace and noise information to the wider community by revising our website. Implementing a programme that will rank our airline partners in relation to their overall performance for a range of noise and any other appropriate topics.
- Aiming to develop new noise metrics and reporting to complement the current noise contours and measure our future noise performance. This work will be used to more precisely describe outcomes to support the END Noise Action Plan.
- Fully supporting the re-design of the London airspace to eliminate chokepoints, alleviate areas of intensive aircraft concentrations and reduce the number of people affected by noise. Whilst ensuring that local communities remain fully informed of the process.

6.4.18 A number of the Plan's actions will evolve over time but we are committed to continuing to work with our industry partners, community groups, elected representatives and the NMB to identify and implement measures intended to improve the noise climate for communities surrounding the airport.

Noise Insulation

6.4.19 Our Noise Insulation Scheme was updated in 2014 to increase the area in which noise insulation can be offered. Figure 6.1 shows the area of the scheme. The scheme is based on the Leq 16 hr 60dB noise contour but has been extended a further 15km further east and west beyond these contours. Over 2,000 homes are now covered by the scheme. Home owners can apply for up to £3,000 towards improved glazing for their windows and doors as well as loft insulation. The scheme goes well beyond the requirements of the APF and is more generous than those of many UK airports.[18] Nonetheless, our Noise Action Plan commits to a further review of the scheme, including the noise insulation package offered.

Local Noise Governance

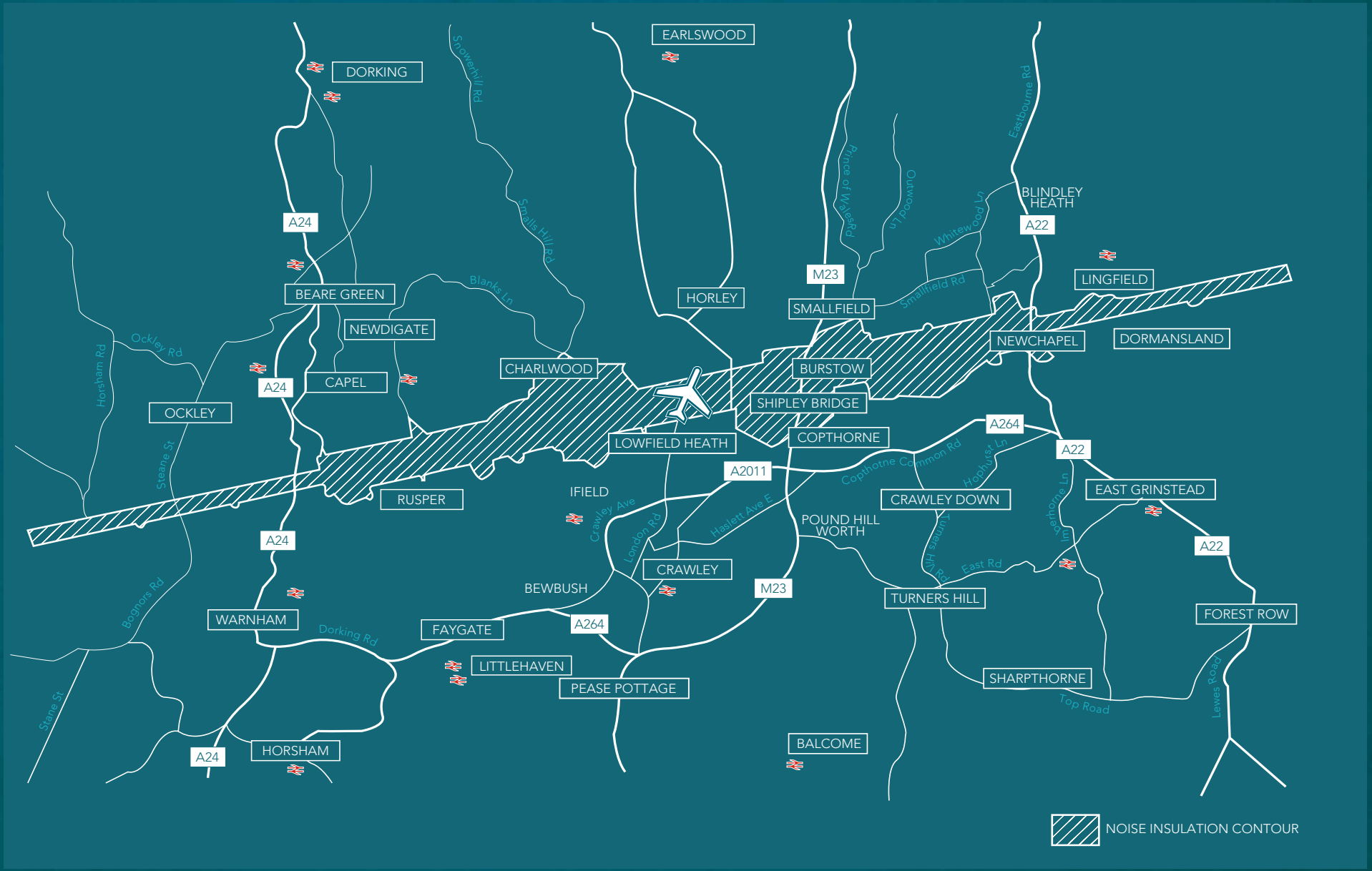
6.4.20 The Airports Act (1986) requires every UK airport to have an independent airport consultative committee; Gatwick's is known as GATCOM and meets quarterly in a public forum. There are also sub groups that deal with specific technical issues including noise management.

6.4.21 The Noise and Track Keeping Monitoring Advisory Group (NaTMAG) is a technical group that has responsibility for specific noise management issues and provides oversight of Gatwick's Flight Performance team. The group consists of representatives from NATS,

[17] *Quota Count 4 is a CAA definition for aircraft with a noise classification of between 96 and 98.9 EPNdB*

[18] *The APF requires noise insulation at Leq 16hr 63dB. The 15km extension of the qualifying zone includes homes at levels below Leq 16hr 60dB.*

FIGURE 6.1: GATWICK NOISE INSULATION SCHEME BOUNDARY



DfT, airlines, GATCOM and Local Authorities, including environmental health officials. It meets quarterly and reports to GATCOM on the environmental performance of the airport for each period.

6.4.22 The Gatwick Noise Monitoring Group (GNMG) is a sub-group of NaTMAG which deals specifically with all aspects regarding the airport's noise monitoring program. This includes the siting of mobile noise monitors, reviewing recorded data and reporting to NaTMAG on noise performance. The group meets quarterly and includes representatives from the Local Authorities.

6.4.23 The Noise Management Board (NMB) was established in spring 2016 to develop, agree, oversee and maintain a co-ordinated noise management vision and strategy for Gatwick. The NMB is made up of a wide range of industry experts and local stakeholders, under the guidance of an independent Chair. The initial focus of the NMB was the oversight of the implementation of the recommendations of the Independent Arrivals Review. The NMB scope of responsibility has since evolved and it now shapes its work plan to encapsulate arrivals and departures noise mitigation related activities. The Board meets quarterly and is complemented by NMB workshops at intervening 6 week intervals that focus on specific subjects that have been identified as priority issues by the NMB.

6.4.24 Each year we host a public Airspace/ NMB seminar that brings together Gatwick's management team with responsibility for airspace and noise and the NMB, along with representatives from NATS, ANS, airlines and industry experts to discuss with members of the public and community representatives a wide range of airspace and noise issues.

6.4.25 Our dedicated Flight Performance Team work closely with the various noise management fora and provide data to airlines and the public. The team also handles aircraft noise complaints and noise related enquiries. In support of its responsibilities the team manages a web based tool (http://noiselab.casper.aero/lgw/) which provides information to the public and industry on aircraft operations, noise monitoring data, and complaints and provides background material on aircraft noise and its management.

Conclusion

6.4.26 We have a mature and comprehensive approach to noise management that complies with Government guidance and aspires to be best in class. It is underpinned by a Section 106 Legal Agreement with West Sussex County Council and Crawley Borough Council, and laid out in more detail in the airport's Environmental Noise Directive Noise Action Plan[19].

6.4.27 In the last two years we have improved our engagement with noise-affected communities through the work of the Noise Management Board that draws together Community Noise Groups, elected representatives, the airport noise management team and industry representatives on a work programme steered by the NMB and reported openly through detailed documentation, presentations and working groups

6.4.28 Actions to reduce noise impacts can take time to implement, but two NMB activities have already significantly reduced noise impacts from arrivals: moving the Instrument Landing System joining point to increase dispersal, and encouraging the implementation of a Fuel Over Pressure Protector (FOPP) modification to Airbus 320s that has removed their distinctive whining noise.

6.4.29 The draft Gatwick Noise Action Plan provides a comprehensive view of our planned noise management mitigations. Our plans aim to reduce noise at source, mitigate the impact of noise on the ground and improve the availability of our noise information to our communities.

6.4.30 In the longer term, further and potentially significant noise reduction opportunities may result from projects being considered, and initiatives that may be pursued, under the CAA's Airspace Modernisation Strategy. When this is finalised, we will look to see how Gatwick can make full use of Government and CAA sponsored endeavours to make procedural and airspace design changes that secure noise benefits for local communities.

[19] *Gatwick Airport Environmental Noise Directive Noise Action Plan 2010-2015 (June 2010).*

6.5 GROUND NOISE

Our ground noise management strategies

6.5.1 There are a number of ways in which we are currently managing, and seeking to reduce the level of ground noise caused by the airport's operations.

- There are a number of noise bunds around the northern perimeter of the airport. They perform an important function in visually screening the airport but also provide a noise mitigation function. There is also a 'noise wall' to the north of Pier 3 which plays an important role in reducing noise levels in the nearby residential areas.
- Through our Decade of Change action plan, we install fixed electrical ground power (FEGP) services to all new passenger stands to provide an alternative to aircraft running APUs whilst parked on stands.
- The use of compliant, mobile ground power units (GPUs) is restricted to use only when FEGP services are unavailable.
- We have in place strategies to reduce the time spent by aircraft holding on taxiways, or on the runway, through initiatives such as Airport Collaborative Decision Making (ACDM). This will improve punctuality but will also reduce engine emissions and ground noise levels.
- We are also seeking to avoid, or reduce, congestion on the taxiways which will have a beneficial effect on ground noise.
- We seek to ensure that all fixed plant and machinery complies with the best available acoustics standards.
- There are special procedures in place to manage the ground testing of aircraft engines. This can be done only at designated locations, and the frequency of testing is carefully monitored.

6.5.2 We will continue to encourage airlines to operate the latest generation of aircraft which have been proven to be quieter in flight. While there is as yet insufficient data on their ground noise emissions to test how the ground noise footprint will be affected, it is likely that there will be positive benefits.

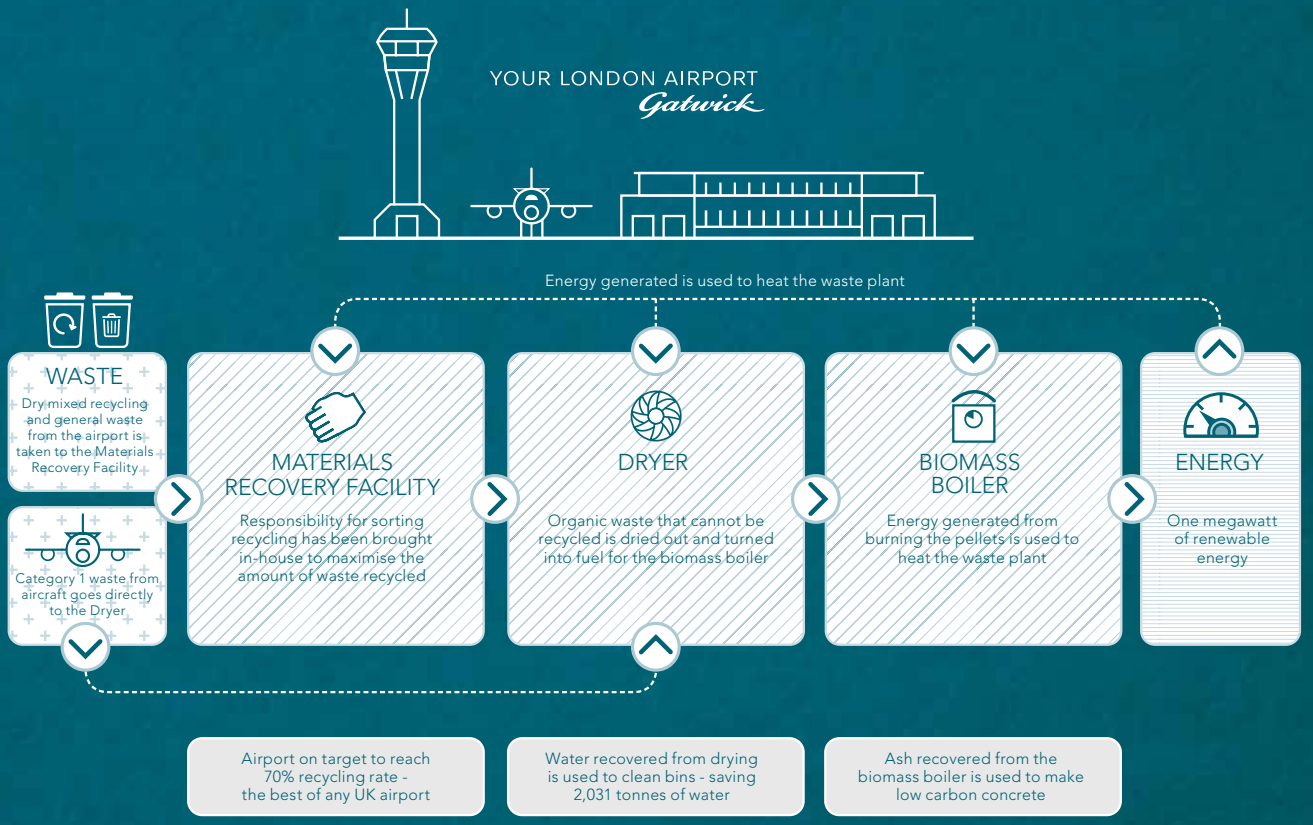
6.6 WASTE

Our waste management strategies

6.6.1 Following a review of the physical waste management processes across the airport, we know that our operational principles are working well to enhance our recycling efforts. Our most recent benchmarking analysis has shown that current waste figures are significantly lower than we forecast in our last master plan. This reduction in waste volume can be attributed to the success of our existing engagement programmes, and collaborative working practices with all stakeholders.

6.6.2 In 2016 we announced the world's first on-airport plant for processing aircraft cabin waste into renewable energy. This will help us reduce the amount of off-site incineration. Figure 6.2 highlights this new waste management process. It indicates how our recycling targets will be achieved with greater separation of general and mixed recyclable waste via the new picking line. As part of this process there are 50% fewer vehicle movements, thereby reducing carbon dioxide emissions. The condensate recovery process could reduce water consumption by 2 million litres per year and the residual biomass ash can be used to manufacture low carbon concrete. The biomass combustion system itself can generate up to 1 MW of renewable energy, which will be supplied directly to the airport.

FIGURE 6.2: GATWICK'S WASTE MANAGEMENT PROCESS



6.7 ENERGY

Our strategies for reducing energy consumption

6.7.1 A number of measures identified in our 2015 Energy Savings Opportunity Scheme (ESOS) report have been completed. This includes the completion of the work to upgrade all aircraft stand lighting to LED, the upgrade of all external car park lighting to high efficiency induction lighting, and the upgrade of North Terminal immigration hall lighting to LED.

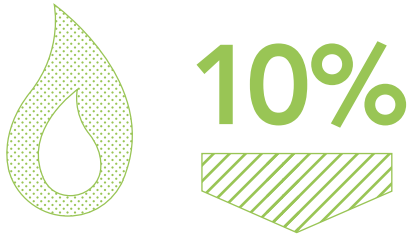
6.7.2 We have also introduced more energy-efficient lighting within the terminals. Both terminal's baggage reclaim halls and North Terminal check-in area were completed during 2017.

6.7.3 We will continue to explore the use of energy generation technology, and will consider proposals for off-site renewable electricity supplies with the potential to supply a larger proportion of our demand.

6.7.4 We have introduced an on-site energy from waste facility, which takes organic waste from the airport to be dried and processed to generate heat. We are evaluating the use of this heat for use within Terminal buildings and other facilities. The catering-waste boiler (Category 1 waste) will have a heat capacity of 800kWh and this could deliver approximately 3,000MWh of heat generation, further reducing gas demand at the North Terminal.

6.7.5 We are currently looking to de-centralise some of our central heating network. In 2014 the South Terminal was identified as a suitable scheme, and in 2016 gas infrastructure works were completed and the first de-centralised plant room was commissioned. Through boiler efficiency improvements alone this could deliver an estimated 10% reduction in gas consumption. We expect that further plant rooms will be de-centralised over the coming years.

6.7.6 Our Energy, Carbon and Metering (ECM) Standard, updated in 2016, sets out our expectations for how lower energy consumption is to be incorporated in all construction and asset replacement projects. For example all refurbishment or improvement projects are required to demonstrate a minimum of 20% reduction in energy consumption, with an objective of greater than 40% in the majority of cases.



Reduction in gas consumption through boiler efficiency improvements

6.8 WATER

Our water-use reduction strategies

6.8.1 We have introduced automatic read meters across the airport to improve our monitoring of water use. These meters record water consumption every 15 minutes over 97% of the airport, 24 hours a day. Consideration can also be given to improving the monitoring of wastewater flows in the main sewage pump stations and main gravity outfall sewer.

6.8.2 Gatwick has an ongoing programme to identify and stop leaks in the airport-wide water supply system and this has been the main contributor to the reduction in water consumption over recent years. Records show that these investigations can identify significant savings.

6.8.3 One of the main areas where recycled water is used, in place of potable water, is for the airfield fire ring main, which is filled with pressurised grey water from ponds D and E. Firefighting is generally undertaken using fire tenders which have potable water in their tanks. However grey water can be used to replenish the fire tenders should they exhaust on-board supplies.

6.8.4 Potable water is however used for aircraft de-icing and vehicle wash down. There is limited scope to use recycled water because good quality water is required for mixing de-icing sprays for aircraft, and similarly clean water is required for washing down. However in 2015 approximately 20% of water was recovered and re-used.

6.8.5 Although there are practical constraints to retrofitting rainwater harvesting into existing buildings, we look for opportunities to do this in new-build projects. For example the new Airfield Operations Building uses rainwater for toilet flushing and other uses, not requiring potable water.

Our water quality strategies

6.8.6 Gatwick's operation generates large quantities of wastewater which requires treatment and disposal. The airport also has the potential for producing large volumes of rainfall runoff from the paved surfaces such as the runway, taxiways and car parks. Accordingly we have controls in place to manage the risk of water course pollution or flooding. As a result, Gatwick has not been responsible for any compliance breaches during the Decade of Change period, nor has it been prosecuted for infraction of its discharge consent.

6.8.7 Foul water is sent directly to the Thames Water, Crawley Sewage Treatment Works (STW) to the south east of the airport or Horley Sewage Treatment Works (STW) to the north east of the airport. The key features of the Gatwick surface water management system are shown in **Plan 7**.

6.8.8 All rainfall runoff from Gatwick drains to one of three watercourses: Crawter's Brook, Gatwick Stream and the River Mole. Consent to make these discharges is granted by the Environment Agency. The quality of water that leaves Gatwick is monitored at 16 locations providing a clear understanding of the quality of water leaving the airport.

6.8.9 The two key factors that affect water quality are the amount of de-icer application (which is determined by the winter temperature) and the volume of rainfall. When colder weather predominates, more de-icer is applied but this can be treated and released off-site in a controlled manner.

6.8.10 The predicted increase in aircraft movements and the planned increase in the amount of airfield hardstanding is likely to increase the amount of de-icing chemicals used. A number of options are being considered to manage this, including:

- Increasing the recovery of used aircraft de-icer.
- Use of less polluting potassium acetate-based de-icers (ECO_2) instead of glycol-based de-icers (100% replacement).
- Increased capacity of pollution lagoons and on-site treatment.

6.8.11 All operational areas where other chemicals may be present, e.g. firefighting chemicals and rubber removal agents, drain to ponds where these pollutants can be intercepted and, where necessary, transferred to the Crawley STW for further treatment.

6.8.12 In order to reduce the risk of impacting water quality, we constructed a new pollution lagoon to increase the storage capacity for polluted water needing treatment by the Crawley STW by 50%. In addition, improvements were made to Pond D in 2014, preventing water from the River Mole entering the pond during high river flow conditions.

Our flood risk management strategies

6.8.13 We have undertaken hydraulic modelling of the surface water drainage and river network to better understand the risk of flooding. Based on this Gatwick is considered to be at risk of river flooding events that are predicted to occur on average once every 50-75 years. The location at greatest risk of river flooding is the South Terminal from the Gatwick Stream.

6.8.14 The airport is also at risk from surface water flooding events (e.g. those caused by heavy local rainfall) predicted to occur on average once every ten years with the location at highest risk being the North Terminal.

6.8.15 To address the risks of flooding we have undertaken a number of measures and projects that contribute to the mitigation of flood risk at Gatwick including:

- Upper Mole Flood Alleviation Scheme (UMFAS): A scheme to which we contributed approximately £4 million, which has reduced the flood risk to South Terminal and also protects around 1,300 local properties.
- Gatwick Stream Flood Alleviation Scheme (GSFAS): This provides off-line storage when the flow in the Gatwick Stream exceeds the capacity of the culvert adjacent to South Terminal. We invested approximately £12 million in 2014 to provide around 186,000m^3 of flood attenuation storage.
- The major refurbishment of Pond D and associated infrastructure was completed in 2014 including a new pollution lagoon near the Crawley STW, increasing the capacity of the surface water drainage system and reducing frequency of runoff discharging to the River Mole.
- Flood protection to key assets including sub-stations following the 2014 McMillan Report[20].
- Asset and condition assessments of key surface water systems have been completed and work programmes prioritised.

6.8.16 We are considering a number of further opportunities to manage flood risk at the airport and within the local community including:

- Flood defences to protect the airport and local community from flooding from the Gatwick Stream and the River Mole.
- Incorporation of surface water attenuation storage for all new development.
- A review of the operation of the surface water drainage network, to rationalise the system.
- Consideration of the use of SUDS measures, where compatible with aerodrome safeguarding, such as green roofs to reduce runoff from new development.
- Consideration of sacrificial storage of flood water above ground in non-critical areas of the airport.
- Collaboration with the Environment Agency to develop future flood alleviation schemes.
- Increasing the pump outputs from Pond D.

We invested approximately £12 million in 2014 to provide around 186,000m^3 of flood attenuation storage

[20] *Disruption at Gatwick Airport, Christmas Eve 2013, Report by David McMillan to the Board of Gatwick Airport Limited*

6.9 LANDSCAPE AND BIODIVERSITY

6.9.1 To manage, safeguard and protect our green spaces and to enhance the ecological quality of the overall estate, we implement Biodiversity Action Plans (BAP). These plans are verified by the Wildlife Trust Biodiversity Benchmark, and implemented through our landscape contractor and our close working relationship with the Gatwick Greenspace Partnership, which we support through our Section 106 agreement.

6.9.2 The Gatwick Greenspace Partnership plays an important role in our landscaping and biodiversity efforts. It works to benefit the countryside, wildlife and the people in communities around the airport. It aims to inform, educate and involve a diverse range of people and work with local landowners including the Forestry Commission, the Wildlife Trusts and the Woodland Trust, plus local authorities to support them in managing their land more sustainably and in partnership with others.

6.9.3 We recognise the educational and recreational opportunities created by our green spaces, hosting regular visits from universities and schools. We also hold family and staff events and provide volunteering opportunities for those wanting to assist in maintaining and improving the environment.

6.9.4 In 2016 Gatwick commenced the development of a Landscape Strategy to align with the requirements of our Section 106 agreement with the Local Authorities. This 5-year strategy, which includes a Landscape Character Assessment, covers all of the land owned by Gatwick including the two BAP areas. Its purpose is to inform future planning policies for airport development, provide recommendations for landscape management and to promote public and airport staff awareness of the landscape character and its importance for conservation.

Our strategies for mitigating the impacts of growth

6.9.5 We remain committed to maintaining and increasing the biodiversity value of the airport and will manage and mitigate the impacts of the developments contained in this draft master plan. As a result we will, as far as possible, design our projects to avoid impacts on the existing landscape and biodiversity assets while identifying opportunities to enhance these assets.

6.9.6 To minimise any adverse impacts, a number of strategic biodiversity and landscape objectives have been developed. These would be considered while taking into account airport safeguarding and other operational requirements. These include:

- Respecting the qualities of the biodiversity and landscaped areas and retaining assets where possible;
- Providing connectivity for habitats and continuity of the landscape framework around the airport;
- Providing a coordinated approach to the provision of green infrastructure to achieve biodiversity benefits; and
- Integrating green spaces and access opportunities, linking these where possible, to existing public rights of way.

6.9.7 Some specific examples of improvements which we will consider alongside the development proposals are shown below:

6.9.8 Planting within our green spaces should incorporate appropriate and predominantly native species. Where possible the planting should aim to link up green spaces within the airport and connect with off-airport road and rail corridors and the surrounding rural landscape. However in designing planting schemes it is important that we consider how the natural landscape could attract bird species that might endanger the safe operation of the airport.

6.9.9 There is potential to improve the physical structure of watercourses and related wildlife habitats and corridors, at the same time as increasing flood storage capacity. This could include the ongoing management of the River Mole to include native planting, removing invasive species such as Himalayan Balsam, and enhance the aquatic ecology and fish populations.

6.9.10 Retention, improvement and maintenance of the public right of way network will ensure that communities around Gatwick can continue to enjoy access to valuable landscape resources around the edge of the airport. In the design of public spaces, we believe that the use of appropriate materials and street furniture can help to enhance the experience of our passengers, staff and the local communities. Enhanced planting in built-up areas to improve biodiversity will be promoted through Gatwick's Landscape Strategy.

7 ECONOMIC AND EMPLOYMENT STRATEGIES

7.1 Employment and skills

7.2 Supporting local businesses and economic growth



7.1 EMPLOYMENT AND SKILLS

7.1.1 The primary factors that determine the scale of Gatwick's economic contribution are the number of aircraft and passengers that pass through the airport and the number of people employed in airport-related businesses. Our ambition to continue growing the airport is therefore the single most important way in which we can contribute to the economic prosperity of the region. However there are other ways in which we can help and these are described below.

7.1.2 Gatwick Airport, and the businesses operating there, are major employers in the South East region of the UK with around 24,000 people employed directly on the airport site. The airport generates a wide variety of job opportunities across a range of skill levels including airline operations, baggage handling, airport security and retail, air traffic control and aircraft maintenance.

7.1.3 GAL employs over 3,000 staff, and around 55% of these employees live locally (in RH postcodes). There are over 250 businesses operating from the airport in a wide range of sectors. In addition to those employed directly at Gatwick, many thousands of further jobs across the South East depend directly or indirectly on our activities.

7.1.4 We work closely with local authorities and education partners in the area to look at ways of promoting relevant employment opportunities and future needs associated with Gatwick. For example we work with the Gatwick Diamond Initiative, a strategic public/private partnership focused on creating the right conditions for growth for existing and new businesses in and around the airport. This involves investigating employment and skills development, as well as supply chain opportunities, international trade and inward investment

7.1.5 We actively seek opportunities to build relationships with a wide range of partnerships and organisations, particularly those which seek to increase employment opportunities and raise the level of skills among the local and regional workforce. These include the Coast to Capital Local Enterprise Partnership, focused on delivering growth for one of the UK's most commercially important areas stretching from Brighton to the Southern edges of London and supporting nearly two million people, 85,000 businesses, 776,000 jobs and 141,000 self-employed people.

EDUCATION

7.1.6 Our education programme aims to inform, inspire and invest in young people, opening up the world of opportunity that the airport offers to everyone and helping them to develop the right skills for the right job. For example our exciting new programme, Learn Live, broadcasts Gatwick Airport live into classrooms across the country, showcasing key airport themes and careers and providing a live question and answer session with airport colleagues. We also collaborate with other local programmes working with young people to raise aspirations and enable them to achieve their full potential.

7.1.7 Competencies in science, technology, engineering and maths are critical, not only to our business, but are seen as one of the accelerating forces for economic growth across the UK. We want to be at the forefront of inspiring young people to join us and to be part of our continuing future growth and success. For example our sponsorship and participation in Crawley STEMfest and the Big Bang South East, help us to reach 200,000 students across the region.

7.1.8 For many years we have enjoyed strong relationships with some of the principal higher education institutes across the South East region, in their role as potential providers of professional and technical staff from amongst their highly talented students. Gatwick continues to work with the University of Brighton, University of Sussex, University of London and Imperial College London to support their successful graduate engineer programme. Over the last 2 years, Gatwick has employed three graduates annually with the intake being increased to six in 2018. The graduates all work on a fully integrated programme gaining exposure to the programme of works in our Capital Investment Programme, including a mentoring programme which ultimately helps participants to reach chartered status while working at the airport.

7.1.9 Our engineering apprenticeship programme has been running for over 40 years and continues to provide outstanding opportunities for local people to enter a skilled career. Over the last 40 years, some 270 apprentices have been taken on at Gatwick. Many of these people still work at the airport in engineering roles or are now working in senior positions at the airport.

Our sponsorship of and participation in Crawley STEMfest and Big Bang South East, help us reach 200,000 students across the region

OVER THE LAST 40 YEARS SOME

270 APPRENTICES

HAVE BEEN TAKEN ON AT GATWICK

7.2 SUPPORTING LOCAL BUSINESS AND ECONOMIC GROWTH

7.2.1 As a major economic driver in the South East the airport has an important role to play in supporting local businesses either directly through its supply chain, or indirectly through initiatives which encourage business and economic growth.

7.2.2 Our business engagement programme includes memberships, partnerships and participation in regional activities, aimed at ensuring that Gatwick continues to play a positive, active and valued role in the regional economy. Throughout the year we participate in events and activities with local business and networking groups such as Gatwick Diamond Business and the Chambers of Commerce in Sussex, Surrey and Kent.

7.2.3 We support business innovation and excellence through sponsorship of awards programmes, for example the Gatwick Diamond Business Awards. We also seek opportunities to directly sponsor programmes which benefit local business growth, such as networking events and conferences. These events help to bring the business community together to network, share intelligence, debate key issues and generate new business. Examples include the Big Breakfast networking events which, in partnership with the Coast to Capital LEP been extended successfully from Croydon events into Sussex, Surrey and Kent. We have also sponsored and participated in regional business conferences such as the Gatwick Diamond Speakers Conference and the Sussex Economic Forum.

7.2.4 In recognition of the significance of Gatwick's role in the regional economy, we actively engage in local and regional public/private partnerships, such as Gatwick Diamond Initiative; the Coast to Capital LEP; and the Greater Brighton Economic Board. Such partnerships provide an important opportunity for us to understand local and regional issues and priorities, which helps to inform our activities. Where possible we will seek opportunities to support events and programmes of work with these partners such as the Gatwick Diamond Economic Growth Forum which Gatwick sponsor and provide senior level participation at in the form of keynote speakers and panel members.

7.2.5 We have also participated in Crawley Borough Council's Local Economy Action Group for over a decade. The Gatwick Growth Board commissioned research into Gatwick's role in the national, regional and local economy; its contribution to the visitor economy; to trade and investment; as well as to connectivity. This work, undertaken between 2016 and 2018, has helped to bring together local and regional partners around these issues, enabling us to identify areas of joint working, for example in supporting the growth of the visitor economy.

7.2.6 As well as the significant contribution that airport employment makes to the economy, the airport supply chain also plays a very important role. In 2017 we spent £132.8m with local and regional suppliers.[21] This reflects our active focus on improving opportunities for local business to supply to Gatwick.

7.2.7 We are sponsoring partners for the Gatwick Diamond 'Meet the Buyers' event, and have been actively involved since 2002, working collaboratively with regional partners to create new business opportunities for local companies. The programme provides opportunities for local suppliers to meet with larger buying organisations, supported by a programme of free seminars to help local businesses to develop and improve their skills and achieve successful sales outcomes.

7.2.8 As the second largest international airport in the UK, with a strong European route network and serving over 60 long-haul destinations, Gatwick provides a convenient and affordable gateway to trading opportunities for local businesses. We work with local and regional partners to support and encourage international trade. For example the Meet the Buyer Programme has been expanded to include an international trade element. We have also hosted Take Off 2017, a one-day conference bringing together a wide range of speakers to inspire and engage local businesses in how to grow their business abroad.

[21] *Suppliers within the BN,CR,GU,KT,RH,TN postcodes*

8 COMMUNITY ENGAGEMENT STRATEGIES

8.1.1 We value strong and constructive relationships with our neighbours in the local community and across the region, built on openness and trust. We therefore aim to keep these communities informed about what we are doing and listen to their concerns and ideas for improvements.

8.1.2 We recognise that for Gatwick to continue to grow in the future, strong relationships with local community organisations are fundamental. We believe that a transparent and inclusive approach on issues relating to the airport's operations is vital to ensuring that any concerns about future development can be addressed at the earliest opportunity. That said, we also recognise that the operation of a major international airport is always going to be unpopular with some people and that, despite our best efforts to engage with communities, Gatwick is no exception to this rule.

8.1.3 We are proud of our strong links, established over more than four decades, with a wide range of community organisations across London and the South East including many civic and regional bodies, residents and wider interest groups. These relationships are particularly important as Gatwick continues to grow.



HOW WE ENGAGE

8.1.4 One of the most important areas where we engage with local communities is on the issue of noise. We do this through a number of channels; our Consultative Committee (GATCOM) where we provide noise reports, briefings and workshops for members; the Noise Management Board (NMB) where we develop, agree and oversee strategic noise management initiatives; the Noise and Track Monitoring Advisory Group (NaTMAG) where we monitor and review noise performance; and additional meetings and briefing events, for example with local MPs and at our annual NMB and Airspace public meeting.

8.1.5 Through these many engagement events and meetings, we are better able to understand the noise issues which are of greatest concern and work with all external stakeholders on developing strategies to address them. This is done primarily through our Noise Action Plan and NMB action plan. We are committed to doing everything we can to address these issues and improve the noise environment around the airport..

8.1.6 In addition to specific engagement on noise issues we have a wider community engagement programme which is focused on building positive relationships, through listening, sharing information and playing an active role in events and programmes across the region.

8.1.7 There are a number of ways we achieve this. For example we engage directly, through our Discover Gatwick programme, which provides regular opportunities for community representatives to visit the airport, gain first-hand insights into the airport operation and how we are working to reduce our impacts and increase the benefits of the airport for the region.

8.1.8 We also actively participate in community debate through GATCOM, the airport's formal consultative body which meets quarterly. This body is chaired independently, with 32 committee members from groups across the region representing a wide range of interests including local communities across four counties, civil aviation, passenger service, business development, tourism and environmental issues.

8.1.9 Through our direct engagement with GATCOM, local councils and other groups we have identified the issues that are most important to local residents and businesses. These include education, employment and skills; local economy; environment; and local community support. We have prioritised our community investment programme in response to these issues and aim to develop long-term relationships and partnerships that can deliver lasting benefits across the region. Examples include direct engagement with young people through our Education Programme; our longstanding relationship with Gatwick Greenspace Partnership; and the more recent Gatwick Foundation Fund. In addition, our local charity partnerships and employee volunteering activities provide wider opportunities for face to face engagement and therefore further relationship building and mutual understanding.

8.1.10 Our programme of local community support includes sponsorship and participation in a wide range of local community events as well as larger scale regional events. These activities help to bring local residents together and give us an opportunity to connect with our neighbours. Wherever possible we use these events to raise awareness of Gatwick's business priorities such as sustainability, diversity and accessibility.

8.1.11 We also take an active role in the local and regional business community, through our membership of business groups and economic partnerships. This provides us with valuable opportunities to share information; gain insights into local challenges and opportunities; and directly support events and programmes that support local businesses and economic growth.

HOW WE INVEST

8.1.12 Our community investment programme includes charity partnerships, and direct funding to meet community needs and priorities.

8.1.13 We encourage all our staff to participate in fundraising activities with our charity partners, focused through two-year partnerships with local and airport charities. In addition we have a fund matching scheme in place which gives an extra financial boost to staff who are embarking upon their own charity fund raising efforts. We actively support the participation of all our staff in local initiatives and offer them the chance to take up to two volunteering days every year to get involved with organisations and projects which have a direct relevance to supporting or improving the communities they live in.

8.1.14 Through our Section 106 Agreement with West Sussex County Council and Crawley Borough Council we fund the Gatwick Airport Community Trust (GACT). GACT was first established in 2001 and is an independent trust supporting local charities. GACT supports schemes that are targeted towards the development of young people, the arts, sporting facilities, environmental improvement and conservation, improvements to community facilities, volunteering, the elderly and the disabled.

8.1.15 In addition to our funding to GACT we launched the Gatwick Foundation Fund in 2016, working in partnership with the Community Foundations in Kent, Surrey and Sussex to oversee £300,000 of annual grants for worthy causes across the region. These donations are divided equally between the Kent, Surrey and Sussex Community Foundations to make awards to non-profit organisations including charities, social enterprises, community groups and voluntary organisations which play an important role in the local community. The funding is used to promote employment, training and skills, support for families, the elderly and young people at a local level across the three counties.

8.1.16 Both the Trust and Gatwick Foundation Fund help ensure that as the airport continues to grow, funds are ploughed back in to the local communities most affected by the airport and its operations.

8.1.17 Environment and conservation is another area of investment highlighted as a priority by our local stakeholders. We have a long-standing association with the Gatwick Greenspace Partnership (GGP) which is one of the Sussex Wildlife Trust's Living Landscape projects, working across 200km² of countryside between Horsham, Crawley, Horley, Reigate and Dorking. Its aim is to inform, educate and involve a diverse range of people, working with local landowners, local authorities, the Forestry Commission, wildlife trusts and the Woodland Trust to support them in managing their land more sustainably. GAL finances a Learning & Engagement Officer who delivers community and environmental activities and facilitates opportunities for volunteers, of which there were more than 400 in 2017.



We encourage all our staff to participate in FUNDRAISING ACTIVITIES WITH OUR CHARITY PARTNERS, focused through two-year partnerships with local and airport charities.



A APPENDICES

A.1 PLANNING, REGULATORY AND LEGISLATIVE CONTEXT

A.1.1	Introduction
A.1.2	Local government planning policies
A.1.3	Airport safety and security
A.1.4	Economic regulation
A.1.5	Aerodrome safeguarding

A.1.1 INTRODUCTION

The day-to-day operation of Gatwick, and its longer-term development, is influenced, controlled and monitored by many different organisations and stakeholders. Legislation and best practice guidance means we must meet a wide range of prescribed and recommended criteria across all our activities.

The role of central Government and in particular its new Aviation Strategy, National Policy Statement and airspace modernisation programme are described in Chapter 3.

This chapter explains how our operation is currently affected by other forms of regulation and legislation which fall under the following headings:

- **Local government planning policies**
- **Airport Safety and Security**
- **Economic regulation**
- **Environmental controls**
- **Aerodrome safeguarding**

A.1.2 LOCAL GOVERNMENT PLANNING POLICIES

Gatwick is located within the administrative areas of Crawley Borough Council and West Sussex County Council. The airport also lies on the boundary with Surrey County Council to the north. Mole Valley, Reigate and Banstead, Tandridge, and Mid Sussex District Councils lie to the north west, north east, east and south east respectively. **Plans 2 and 3** show the airport in relation to these administrative areas.

CRAWLEY BOROUGH LOCAL PLAN

The plans and planning policies for the Crawley area are set out in the Crawley Borough Council Local Plan 'Crawley 2030' which was adopted in 2015. Chapter 9 of the Crawley Local Plan deals with Gatwick Airport and sets out the objectives, sustainable development approach, policies and matters related to safeguarding land for a possible additional runway. Of particular importance are two local planning policy statements GAT1 and GAT2.

GAT1

Within the airport boundary as set out on the Local Plan Map, the Council will support the development of facilities which contribute to the safe and efficient operation of the airport as a single-runway, two-terminal airport of up to 45 million passengers per annum, provided that:

i) The provided use is within the airport boundary and contributes to the safe and efficient operation of the airport

ii) Satisfactory safeguards are in place to mitigate the impact of the operation of the airport on the environment, including noise, air quality, flooding, surface access, visual impact, and climate change

iii) The proposed use would not be incompatible with the potential expansion of the airport to accommodate the construction of an additional wide-spaced runway

GAT2

The Local Plan Map identifies land that will be safeguarded from development, and which would be incompatible with expansion of the airport to accommodate the construction of an additional wide-spaced runway (if required by national policy), together with a commensurate increase in facilities contributing to the safe and efficient operation of the expanded airport.

Minor development within this area, for instance changes of use and small-scale building works such as residential extensions, will normally be acceptable. Where appropriate, planning permission may be granted on a temporary basis. The airport operator will be consulted on all planning applications within the safeguarded area.

Crawley Borough Council has also prepared supplementary planning guidance on Gatwick. Adopted in November 2008, the supplementary planning document 'Development at Gatwick Airport' provides additional detail on the way in which the Council will implement the core strategy policies in dealing with planning applications, consultations and other planning matters at the airport.

OTHER POLICIES

A number of the neighbouring local planning authorities also include policies that have an impact on our development. These plans recognise our importance as the main generator of economic growth in the region. There is acceptance of the principle that we will grow towards greater utilisation of the two terminal, single runway airport. The plans also acknowledges the environmental impact of the airport on the wider area and the development pressures it can create.

Some plans include policies to preclude airport-related development not owned or operated by Gatwick Airport, such as car parks in off-airport locations. We are keen to promote the use of sustainable modes of transport to and from the airport. Where passengers opt to travel by private car, we support the principle that the most sustainable option is to park within the airport boundary, so as to minimise any further journeys on local roads. Our parking capacity meets passenger demand and we do not support car parking located outside of the airport, which can impact local communities and countryside.

County councils are responsible for transport plans. The West Sussex Transport Plan 2011 to 2026 is of particular relevance to us. It sets out the strategy for guiding future investment in West

Sussex highways and transport infrastructure, and creates a framework for considering transport infrastructure requirements associated with future development across the county.

DEVELOPMENT MANAGEMENT

While many of our developments require planning permission, some operational developments which do not give rise to any significant environmental impacts benefit from Permitted Development powers conferred by the 2015 Town and Country Planning (General Permitted Development) Order. In cases where the Permitted Development powers are available, there is still a requirement to consult with Crawley Borough Council.

Some larger developments that could give rise to significant impacts on the environment require an Environmental Impact Assessment. This provides information on the likely environmental effects of the proposed development, for example around noise and air quality. In this case an application for planning permission is required.

Major airport developments that result in an increase in physical capacity of more than 10 million passengers a year, including new terminals, runways or developments, are defined in the Planning Act (2008 and 2016) as Nationally Significant Infrastructure Projects. These projects do not follow the usual local planning process but are administered by the Planning Inspectorate and require a Development Consent Order. Final decisions on such applications are made by the relevant Secretary of State.

SECTION 106 LEGAL AGREEMENT

We have a Section 106 Agreement with West Sussex County Council and Crawley Borough Council which runs to the end of 2018. This agreement outlines how our operation, growth and environmental impacts will be managed responsibly and underpins the important relationship between our owners and those local authorities with responsibility for planning, environmental management and highways.

The legal agreement contains far-reaching objectives and obligations. This legal agreement is also supported by a Memorandum of Understanding between the two principal local authorities as well as adjoining authorities, to ensure that the interests of these other bodies are taken into account.

The current agreement builds on the original ground-breaking agreement that began in 2001, bringing significant benefits to the airport and the communities we serve and affect. It demonstrates a desire to see Gatwick grow on a one-runway two-terminal configuration, while balancing our environmental impacts. This legal agreement continues to define our future and the role we play in local, regional and national economies.

The principal objectives contained in the legal agreement are:

- The desire to see the airport continue to grow on a one runway two terminal configuration;
- The need to ensure that as the airport grows measures are in place to minimise, so far as possible, its short and longer term environmental impacts;
- The importance of maintaining and enhancing the ways in which the parties to the agreement share information and work together and with other stakeholders to bring significant benefits to the airport and the communities it serves and effects.

We are currently working with West Sussex County Council and Crawley Borough Council on extending the agreement beyond its current expiry at the end of 2018.

A.1.3 AIRPORT SAFETY AND SECURITY

Airport security requirements are subject to statutory regulation. This ensures a range of measures are implemented across the operation of the airport to provide a multi-agency, layered approach to security delivery.

These measures include areas such as the screening and searching of passengers, staff, baggage, vehicles and goods entering the sterile cordon of the Security Restricted Area, as well as the delivery of staff recruitment, vetting, training and access control. These requirements can impact infrastructure development, influencing the form and character of airport facilities.

Both the Civil Aviation Authority and the Department for Transport are seeking to adopt a more risk-based approach to the enforcement of aviation security regulations. Their strategy includes the introduction of a performance-based system, focusing on clear security outcomes that would enable an airport operator to implement directed security measures in a manner that is both operationally viable, as well as mitigating the risk identified by the regulation. Historically, aviation security measures have been forensically inspected and measured by the regulator. Should the performance-based system be fully adopted by the industry, it is anticipated that a more flexible risk-based approach will be taken by the inspection teams.

A.1.4 ECONOMIC REGULATION

Airlines using Gatwick pay Core Service Charges. These contribute to our operating costs and finance a programme of capital investment in a way that satisfies user expectations.

On 1 April 2014 a new regulatory framework, based on commitments, backed by a licence granted by the Civil Aviation Authority (CAA) and supplemented by a monitoring regime, came into operation at Gatwick. This framework provides Gatwick with increased flexibility in its operations and enables normal commercial arrangements to be made between airport and airlines.

The commitments established by the framework are a set of legally enforceable undertakings made by Gatwick Airport Limited (GAL) to our airlines covering price, service, transparency, financial resilience, operational resilience and dispute resolution. The commitments also enable GAL to enter into a series of bi-lateral contracts incorporating price, service and duration, agreed on a contractual basis between GAL and individual airlines.

Among our commitments, we are limited to increasing our published airport charges (our "gross yield") over the commitments period, by no more than RPI (Retail Price Index) +1.0% per year (on average), and average prices (taking into account bi-lateral contracts) at RPI +0.0% per year (on average).

As part of the commitment we have undertaken to build and operate the airport to achieve a set of Core Service Standards. These range in output measures and include metrics such as security queue times, availability of escalators and passenger satisfaction scores. In delivering these outputs we also committed to undertake capital investment expenditure of at least £100 million per annum over the next seven years.

The CAA has set out its view of what it believes to be a fair price in the five years from 1 April 2014 of RPI -1.6% per year. The CAA also considered that GAL should undertake capital investment expenditure of at least £160 million per annum on average (using a 2011/12 price base). The CAA has stated that it will monitor GAL's pricing and other issues such as capital investment expenditure on an annual basis.

In granting GAL a licence, the CAA's decision includes a financial resilience condition. This requires us to produce a certificate of adequacy of resources which we must submit to the CAA on an annual basis. This condition also restricts the business of GAL to those businesses we were undertaking on 1 April 2014, including the ownership and operation of the airport. Any other new business activities require the written consent of the CAA. The financial resilience condition also requires undertakings from the ultimate holding company not to take any actions that would likely cause a breach of the licence and provide information requested by the CAA to enable us to comply with the licence.

Gatwick has also committed to consult annually on an Operational Resilience plan and Monitoring report. The CAA has also stated that as part of the monitoring regime, we should report to the CAA a shadow regulatory asset base (RAB) calculation. This is in case in the future the CAA should consider the interests of passengers would be better served by tighter regulation being introduced.

The Commitments expire on 31 March 2021. Gatwick has undertaken to notify the CAA and all operators at the Airport at least two years prior to the end of the term of its intentions with regard to the continuation of Commitments. In June 2018 the CAA published CAP 1684: "Future economic regulation of Gatwick Airport Limited: initial consultation."[1] This document consults on a possible CAA process to determine the regulatory arrangements for the period beyond the end of the current Commitments in 2021. The document is broadly supportive of Gatwick's favoured process of approaching the airlines directly with a commercial proposal, recognising this mechanism was embedded in the original Commitments. GAL intends to publish this autumn its proposals for extending commitments, including pricing, and to consult with airlines on these proposals.

All airport operators are also subject to aerodrome licensing under the Air Navigation Order 2009, which requires an airport operator to demonstrate that it is competent to conduct aerodrome operations safely. That licensing requirement is not affected by the Civil Aviation Act 2012.

[1] [redacted]

A.1.5 AERODROME SAFEGUARDING

Certain civil aerodromes, including Gatwick, are officially safeguarded and we have now gained European Aviation Safety Agency (EASA) certification, which sets out the aerodrome safeguarding requirements. This form of safeguarding concerns the protection of the safe operation of the airport and is entirely separate and additional to the land safeguarding for a second runway.

The EASA aerodrome safeguarding requirements are enshrined in Town and Country Planning law within ODPM/DfT circular 01/2003 'Safeguarding Aerodromes, Technical Sites & Military Explosives Storage Areas'. As GAL is a statutory consultee, local planning authorities consult with us on certain planning applications that have the potential to impact on the safety of aerodrome operations.

Aerodrome safeguarding is intended to:

- Ensure that no buildings or structures cause danger to aircraft, either in the air or on the ground; for example tall buildings which might infringe the airport's Obstacle Limitation Surfaces (OLS), which protect the airspace around the aerodrome.
- Prevent any proposed buildings and structures from impacting on navigational aids used by the airport and/or by aircraft. Potential issues can include, signal reflection/refraction, false plots and clutter on radar screens.
- Protect aeronautical ground lighting, such as approach and runway lighting, by ensuring that they are not obscured by any proposed development and that any proposed lighting schemes cannot be confused with aeronautical ground lighting patterns.
- Ensure that the wildlife strike risk to the aerodrome, in particular bird strikes, is not increased and where possible reduced as wildlife strikes pose a serious threat to flight safety. It is estimated that damage to aircraft and flight delays from wildlife strikes around the world cost more than a billion euros per year. All developments are assessed on a case by case basis.
- Ensure that no buildings or structures create any turbulence or wind shear which have the potential to affect aircraft taking off or landing at the aerodrome.
- Ensure that no buildings or structures impact on Instrument Flight Procedures (IFPs).
- Prevent any construction processes from interfering with aerodrome operations through the production of dust or smoke, temporary lighting or construction equipment impacting on radar and other navigational aids.
- Prevention of any glint and glare issues to pilots, aircrew and ATC from proposed lighting and other installations.

We make every effort to engage and work with developers and other third parties at an early stage to ensure that aerodrome safety is not compromised and to ensure that the aims of the development are still achieved where possible, for example landscaping schemes that result in biodiversity gains but do not increase the bird strike risk to the airport.

PUBLIC SAFETY ZONES

The risk of air accidents occurring at or within close proximity to airports is extremely low. However the use of land at the ends of the runway is restricted through the use of designated areas known as Public Safety Zones.

Through planning policy in DfT Circular 01/2010 Control of Developments in Airport Public Safety Zones, the Government aims to ensure that there is no increase in the number of people living, working or congregating in Public Safety Zones (PSZs) and that, over time, the number should be reduced as circumstances allow.

A.2 GLOSSARY OF TERMS

A320 Neo	New generation short-haul aircraft built by Airbus
A350	New generation long-haul aircraft built by Airbus
A380	Airbus A380. The largest passenger aircraft currently in service
ACDM	Airport Collaborative Decision Making
ANS	Air Navigation Solutions - the provider of ATC services at Gatwick
APF	2013 Aviation Policy Framework
APU	Auxiliary Power Unit
AQMA	Air Quality Management Area
ASAS	Airport Surface Access Strategy
ATC	Air Traffic Control
ATM	Air Transport Movement
B737 Max	New generation short-haul aircraft built by Boeing
B787	New generation long-haul aircraft built by Boeing
BAA	The former owners of Gatwick Airport
BAP	Biodiversity Action Plan
CAA	Civil Aviation Authority
Category 1 Airline Waste	Waste from non-EU flights comprising food waste, or anything mixed with it.
CDA	Continuous Descent Approach
CIP	Capital Investment Programme
CMA	Competition and Markets Authority
CTA	Common Travel Area – Ireland, Channel Islands and the Isle of Man
dB / dBA	Decibel - a measure of the intensity of sound levels / The 'A' weighting refers to a scale corrected for the way human ears perceive noise
DCO	Development Consent Order – planning consent process for Nationally Significant Infrastructure Projects
Decade of Change	Gatwick's 10-year sustainability strategy
DfT	Department for Transport
E-gates	Automated gates for checking machine-readable passports
EHS	Environmental, Health and Safety
ERCD	Environmental Research and Consultancy Department (of the CAA)
ETS	European Union - Emissions Trading Scheme
FASI(S)	Future Airspace Strategy Implementation (South) – programme to update and transform the airspace above south east England
FEGP	Fixed Electrical Ground Power
GACT	Gatwick Airport Community Trust
GAL	Gatwick Airport Limited - the company which operates Gatwick Airport
GATCOM	Gatwick Airport Consultative Committee
Gatwick Diamond	Business led private/public sector partnership promoting economic growth in a defined area between Croydon and Brighton. Part of the Coast to Capital Local Enterprise Partnership.
Gatwick Foundation Fund	A fund launched by GAL in 2016 to oversee the allocation of donations to good causes in the local area
GDP	Gross Domestic Product
GHG	Green House Gas emissions

GIP	Global Infrastructure Partners - manages 49.99% of Gatwick's shareholding
GPU	Ground Power Unit - to power aircraft systems when parked on stand
GVA	Gross Value Added
GWR	Great Western Railway
Ha	Hectares
HOSS	Home Owners Support Scheme
ICAO	International Civil Aviation Administration
'Kiss and Fly'	Passengers who are driven to or from the airport by private car
LAMP2	London Airspace Management Programme 2
LEP	Local Enterprise Partnership
Leq	Equivalent continuous noise level – a way of presenting a single decibel (dB) value for a period of time when sound levels vary.
LGW	Gatwick Airport
LTO	Landing and Take-off cycle
mppa	Million passengers per annum
MSCP	Multi Storey Car Park
NATS	The provider of en-route air traffic control and upper airspace management in the UK
NMB	Noise Management Board
NO_2	Nitrogen Dioxide
North West Zone	An area of the airport lying adjacent to the northern boundary, which contains the north west part of the airfield, the Virgin hangar, cargo sheds and long-stay car parking.
NPR	Noise Preferential Route for departing flights
NPS	National Policy Statement produced by Government
NSIP	Nationally Significant Infrastructure Project. Large scale projects as defined by the 2008 Planning Act.
NT	North Terminal
PEI	Preliminary Environmental Information – part of the DCO planning process
PINS	Planning Inspectorate
PM10	Airborne particles that have a median diameter of 10 microns
PM2.5	Airborne particles that have a median diameter of 2.5 microns
Quality Service Monitor (QSM)	A process GAL uses for measuring and monitoring passenger satisfaction performance
RBBC	Reigate and Banstead Borough Council
RET	Rapid Exit Taxiway
RPI	Retail Price Index
SA	Sustainable Aviation
Section 106 Agreement	2008 Section 106 legal agreement between Gatwick Airport, West Sussex County Council and Crawley Borough Council
Section 52 Agreement	GAL's 1979 legal agreement with West Sussex District Council regarding the provision of additional runway capacity
ST	South Terminal
Stand	Aircraft parking position on the apron
STEM	Science, Technology, Engineering and Maths
STW	Sewage Treatment Works
SUDS	A sustainable drainage system designed to treat and discharge surface water in a more sustainable way than traditional systems.
tCO2e	Tonnes of carbon dioxide equivalent – a measure for comparing all greenhouse gas emissions
WSCC	West Sussex County Council
08R/26L	The primary runway at Gatwick
08L/26R	The standby runway at Gatwick



A

PLANS

Plan 1
Global Destinations

Plan 2
Gatwick's location in the region

Plan 3
Local Council administration

Plan 4
Location plan

Plan 5
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Land use

Plan 7
Surface water drainage features

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Air Noise Map.
Leq Contours – Summer Day – 2017

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Leq Contours – Summer Night – 2017

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Plan 17
Air Noise Map.
Leq Contours – Summer Night – 2022

Plan 18
Airport Layout. Main runway - 2032

Plan 19
Airport Layout.
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Plan 20
Airport Layout. Additional runway

Plan 21
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Plan 23
Air Noise Map. Main Runway –
Leq Contours – Summer Day – 2028

Plan 24
Air Noise Map. Main Runway –
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Plan 25
Air Noise Map. Main Runway –
Leq Contours – Summer Day – 2032

Plan 26
Air Noise Map. Main Runway –
Leq Contours – Summer Night – 2032

Plan 27
Air Noise Map. Standby and Main Runway –
Leq Contours – Summer Day – 2028

Plan 28
Air Noise Map. Standby and Main Runway –
Leq Contours – Summer Night – 2028

Plan 29
Air Noise Map. Standby and Main Runway –
Leq Contours – Summer Day – 2032

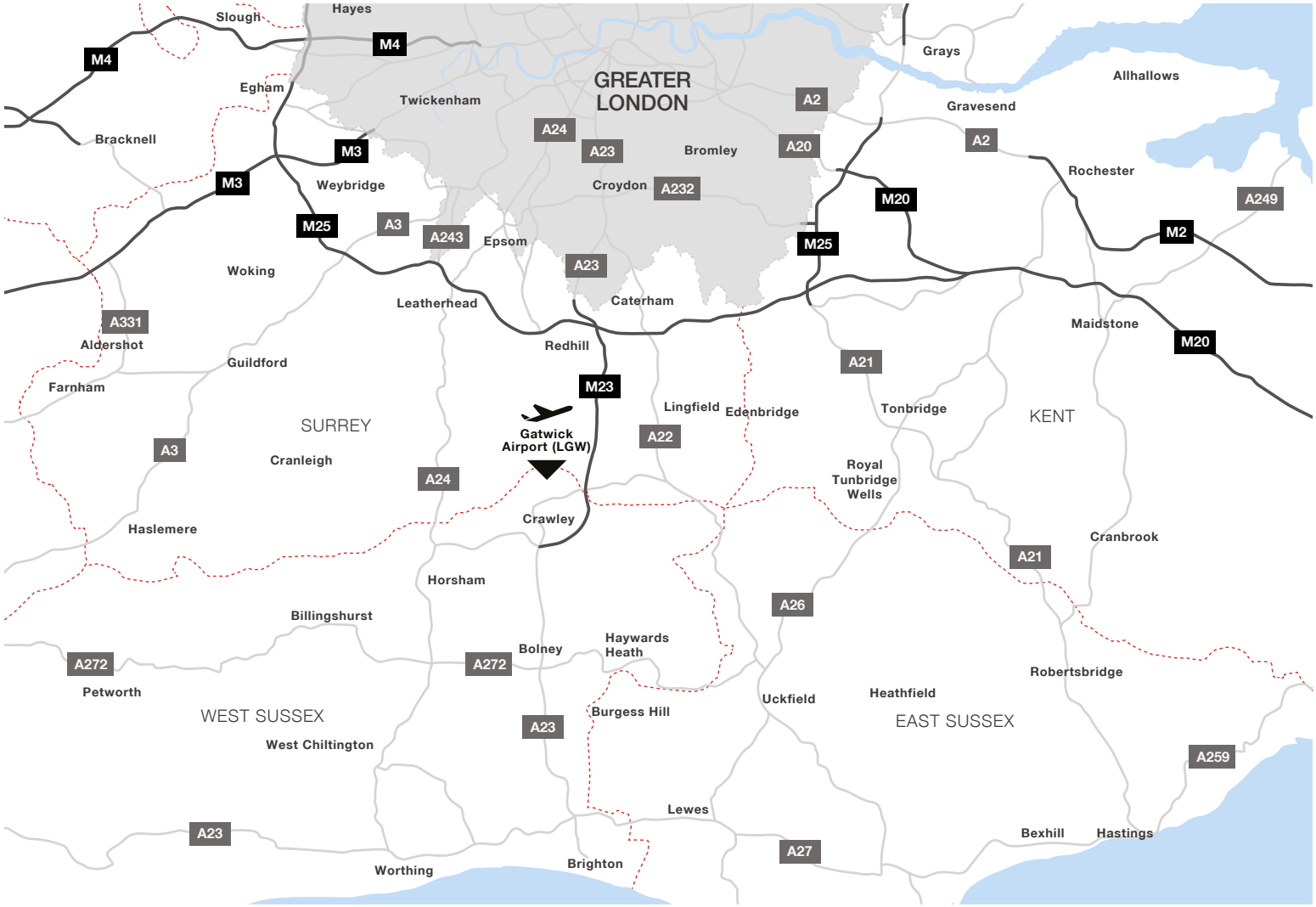
Plan 30
Air Noise Map. Standby and Main Runway –
Leq Contours – Summer Night – 2032

Plan 31
Air Noise Map. Additional Runway –
Summer Day - 2040



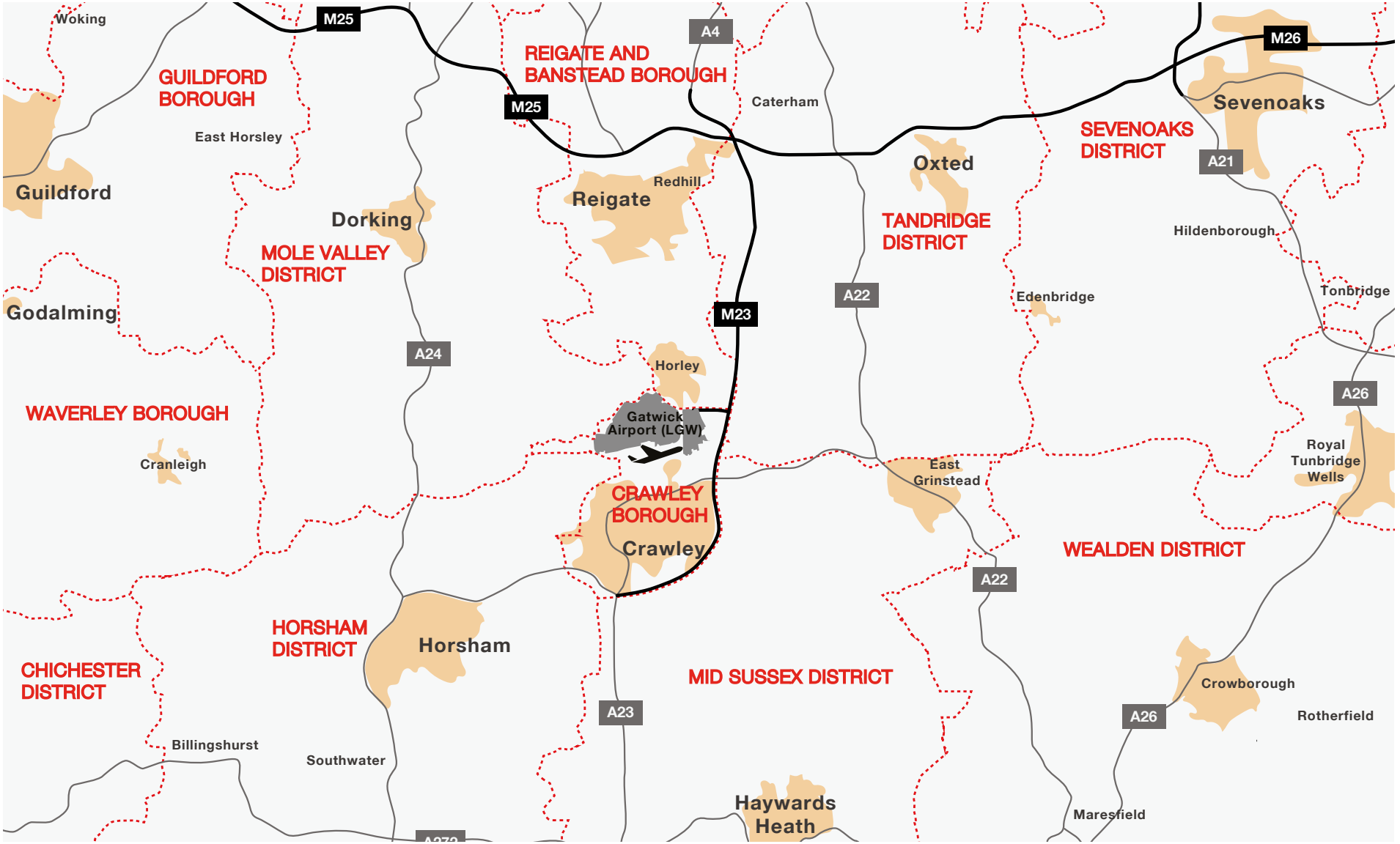
PLAN 1 - Global Destinations

Destination Airport



PLAN 2 - Gatwick's location in the region

Motorways
A Roads
Gatwick Airport
County Boundaries
N

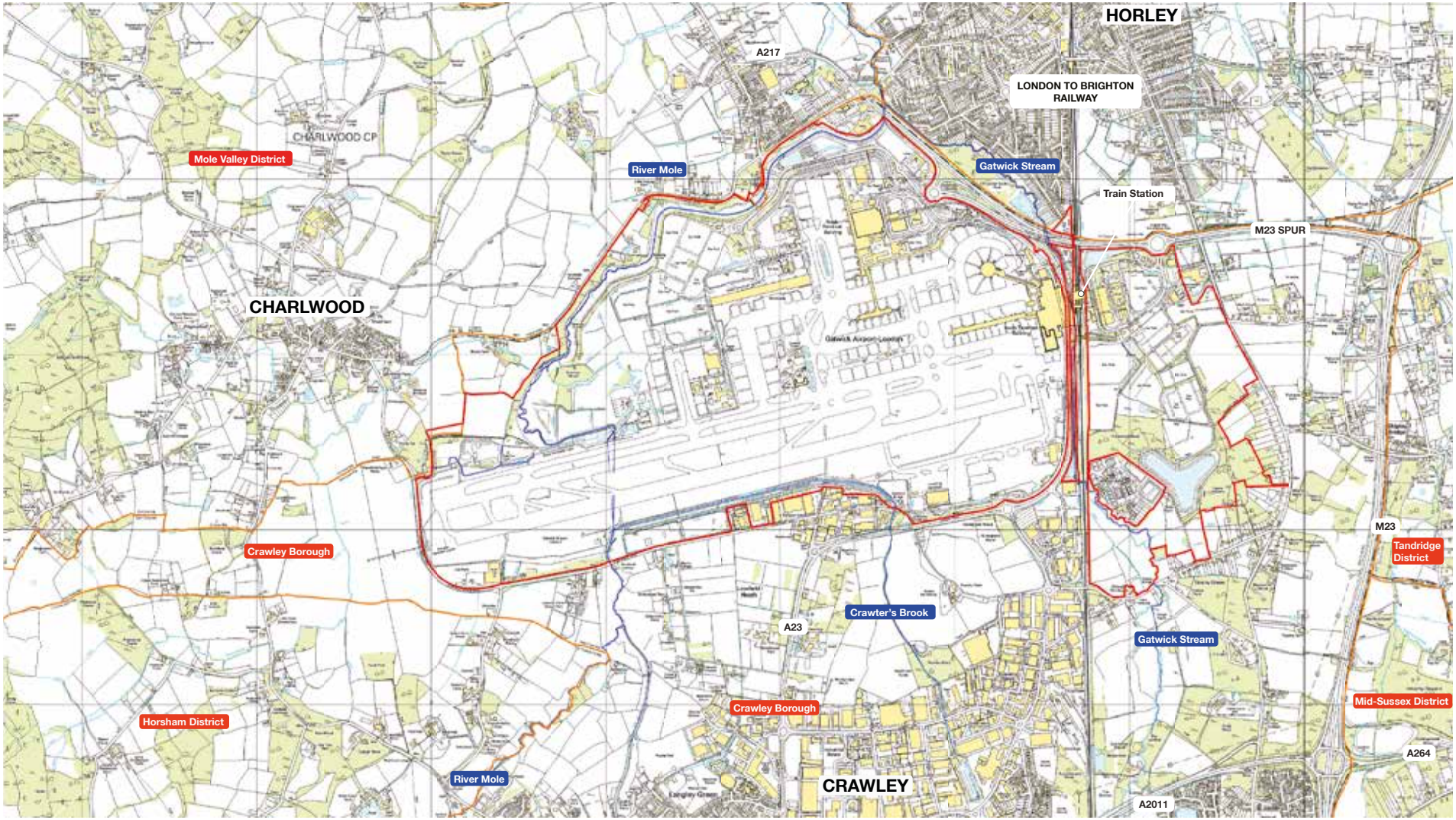


PLAN 3 - Local Council Administration

Gatwick Airport

Local Authority Boundaries

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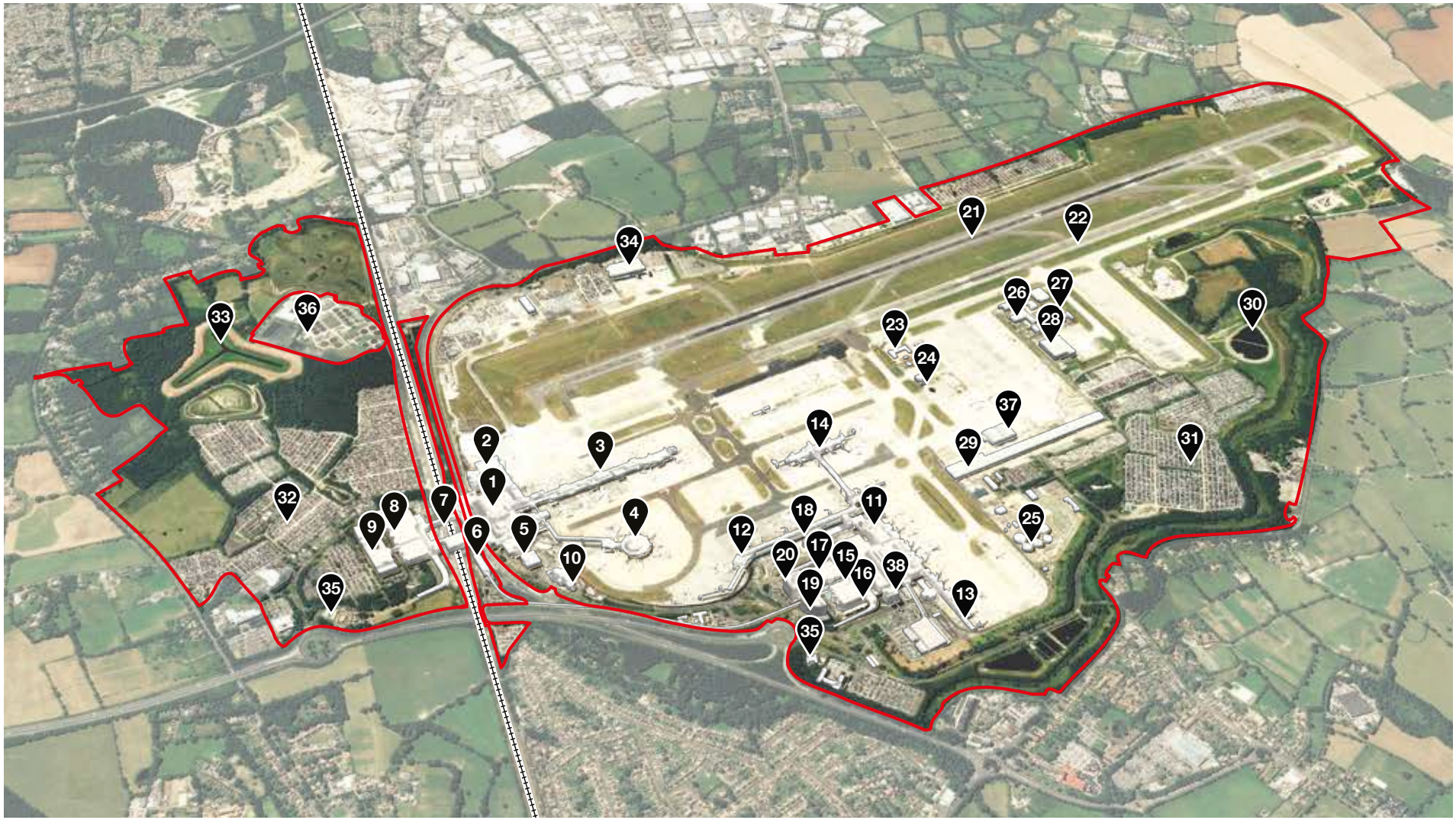
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Local Authority Boundaries

Airport Boundary

N

PLAN 4 - Location Plan

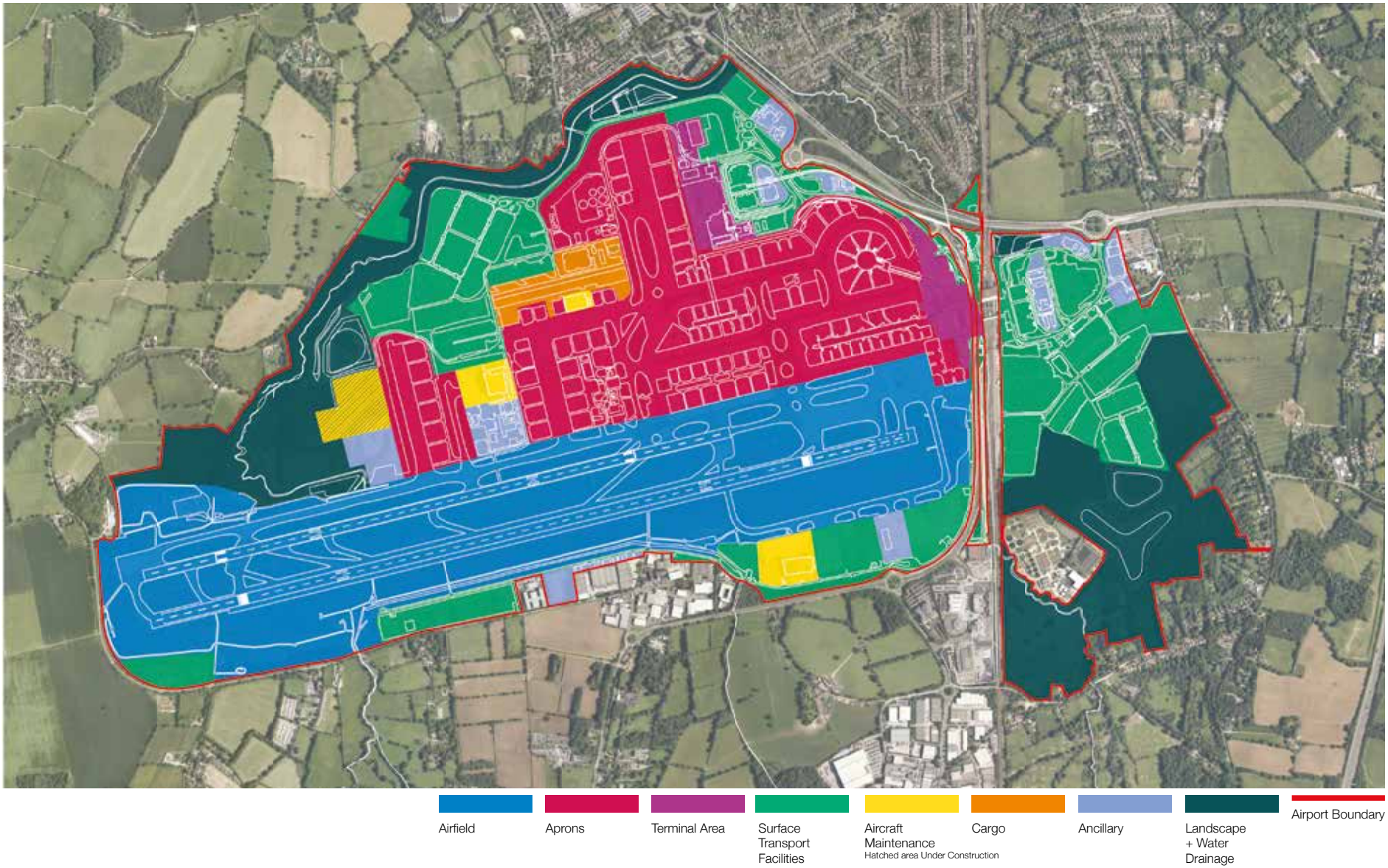


PLAN 5 - Key Features

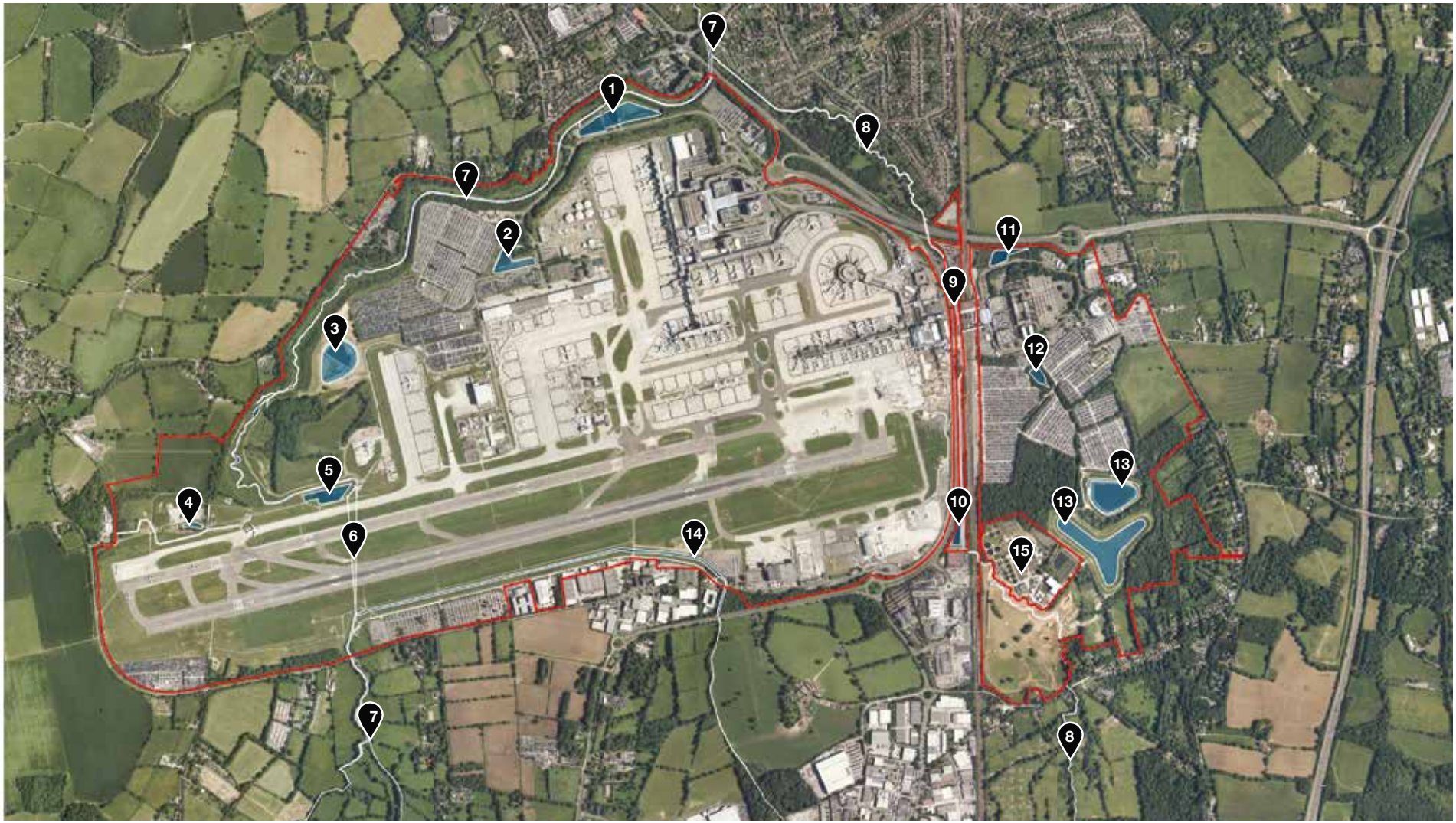
1 South Terminal
2 Pier 1
3 Pier 2
4 Pier 3
5 Ashdown House
6 Shuttle Station
7 Rail Station
8 Short Stay Car Park
9 Hilton Hotel
10 Atlantic House
11 North Terminal
12 Pier 4
13 Pier 5
14 Pier 6
15 Shuttle Station
16 Short Stay Car Park
17 Short Stay Car Park
18 Jubilee House
19 Premier Inn
20 Sofitel Hotel
21 Primary (08R/26L) Runway
22 Standby (08L/26R) Runway
23 Fire Station
24 Primary Air Traffic Control Tower
25 Fuel Farm
26 Vehicle Maintenance
27 Standby Air Traffic Control Tower
28 Virgin Atlantic Maintenance Hangar
29 Cargo
30 Balancing Pond
31 Long Stay Car Park (North)
32 Long Stay Car Park (South)
33 Pollution Lagoon
34 British Airways Maintenance Hangar
35 Filling Station
36 Crawley Sewage Works
37 Easy Jet Hangar
38 Hamilton By Hilton

Airport Boundary

N



PLAN 6 - Land Use

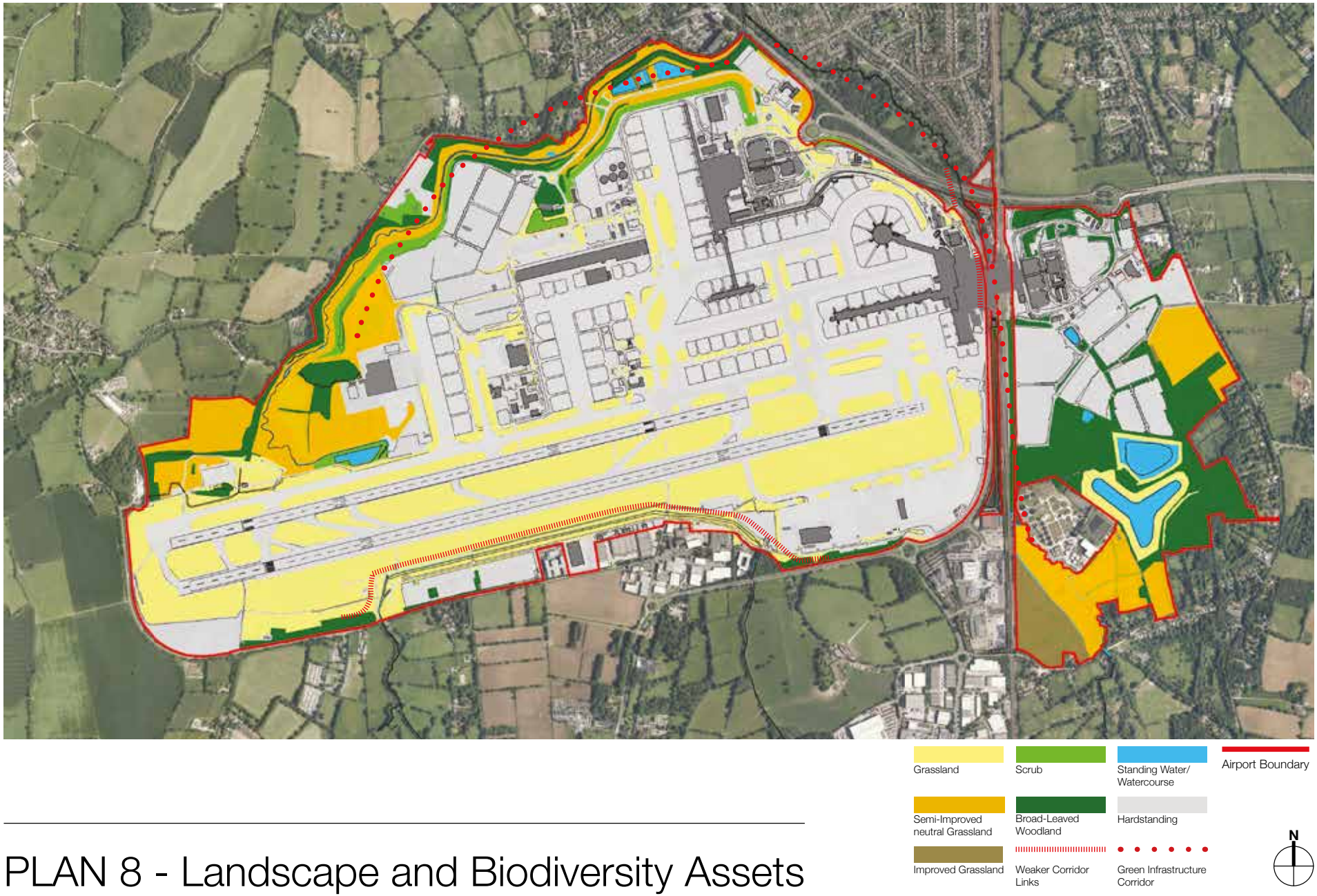


1 Pond D
2 Dog Kennel Pond
3 Pond M
4 Pond H
5 Pond A
6 River Mole Culvert and Siphon
7 River Mole
8 Gatwick Stream
9 Gatwick Stream Culvert
10 Pond E
11 Pond F
12 Pond G
13 Pollution Lagoon
14 Crawter's Brook
15 Crawley sewerage Treatment Works

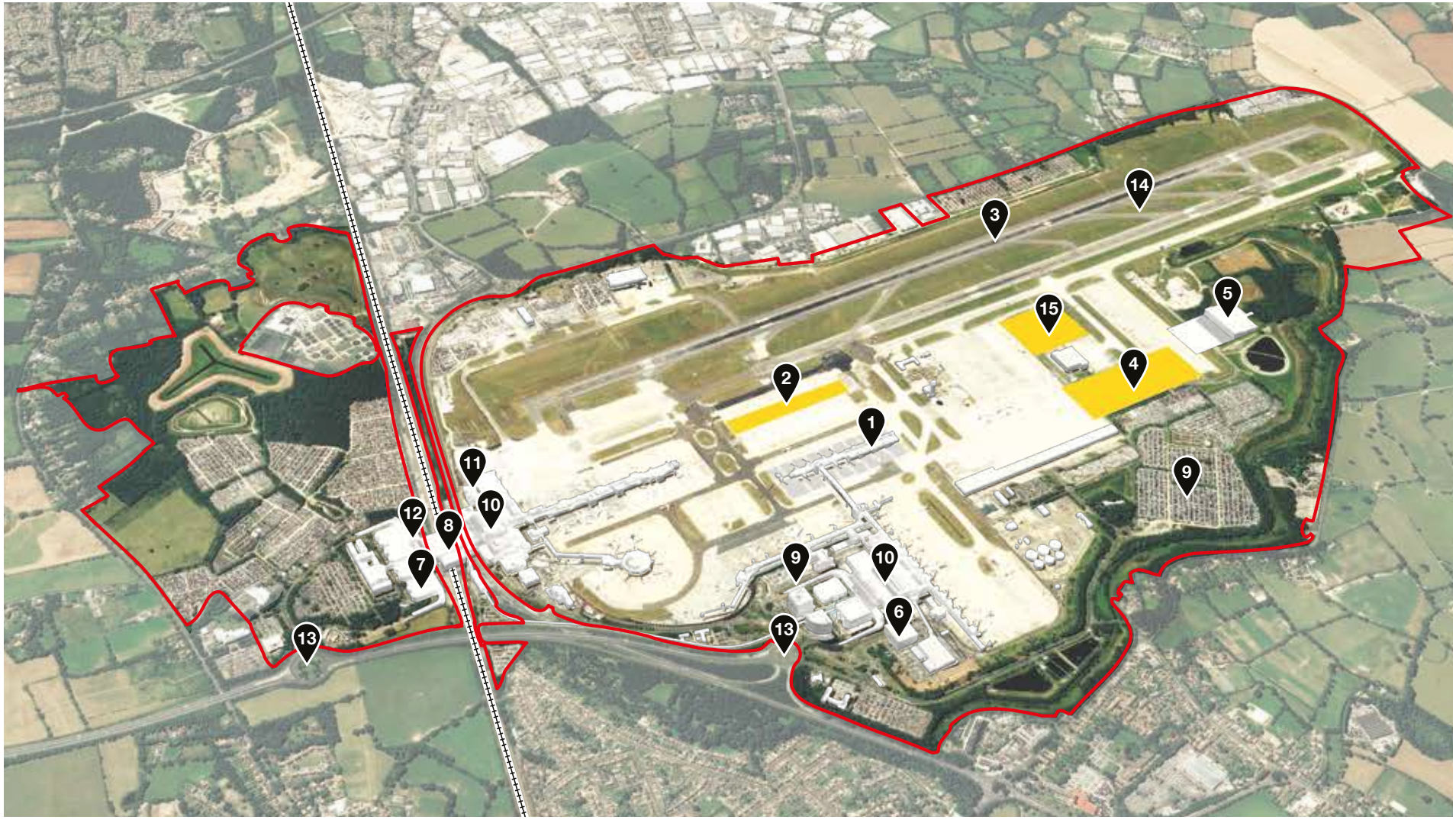
Airport Boundary

N

PLAN 7 - Surface Water Drainage Features



PLAN 8 - Landscape and Biodiversity Assets



Planned or anticipated developments

Under construction

1 Pier 6 Extension
2 'Push and Hold' Stands
3 Runway resurfacing
4 Lima taxiway extension
5 Boeing Hangar
6 Multi Storey Car Park 7
7 Multi Storey Car Park 4
8 Improved Railway Station
9 Bus and coach facilities
10 Terminal improvements including departures lounges and bag-drop
11 New domestic baggage reclaim for South Terminal
12 Car rental facilities
13 Road junction improvements
14 Potential new Rapid Exit Taxiway
15 Addition remote aircraft parking stands

Airport Boundary

N

PLAN 9 - Airport Layout - 2022

(Additional infrastructure compared to today)

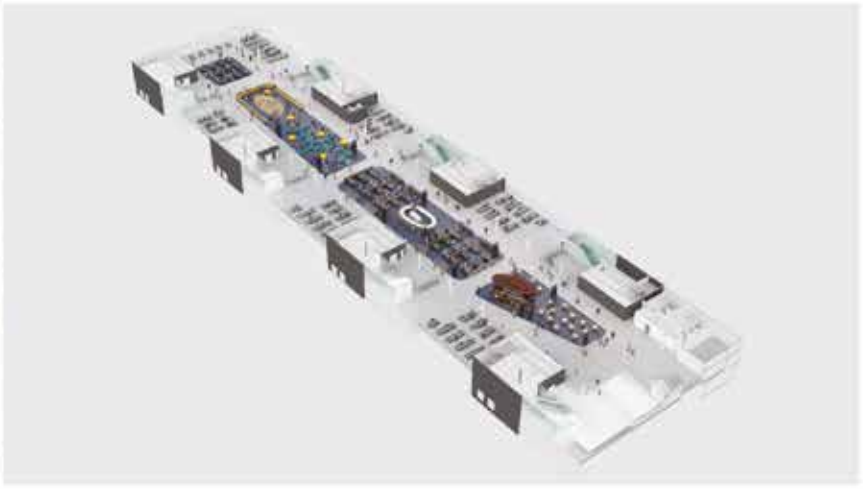


PLAN 10 - Planned Developments Boeing Hangar

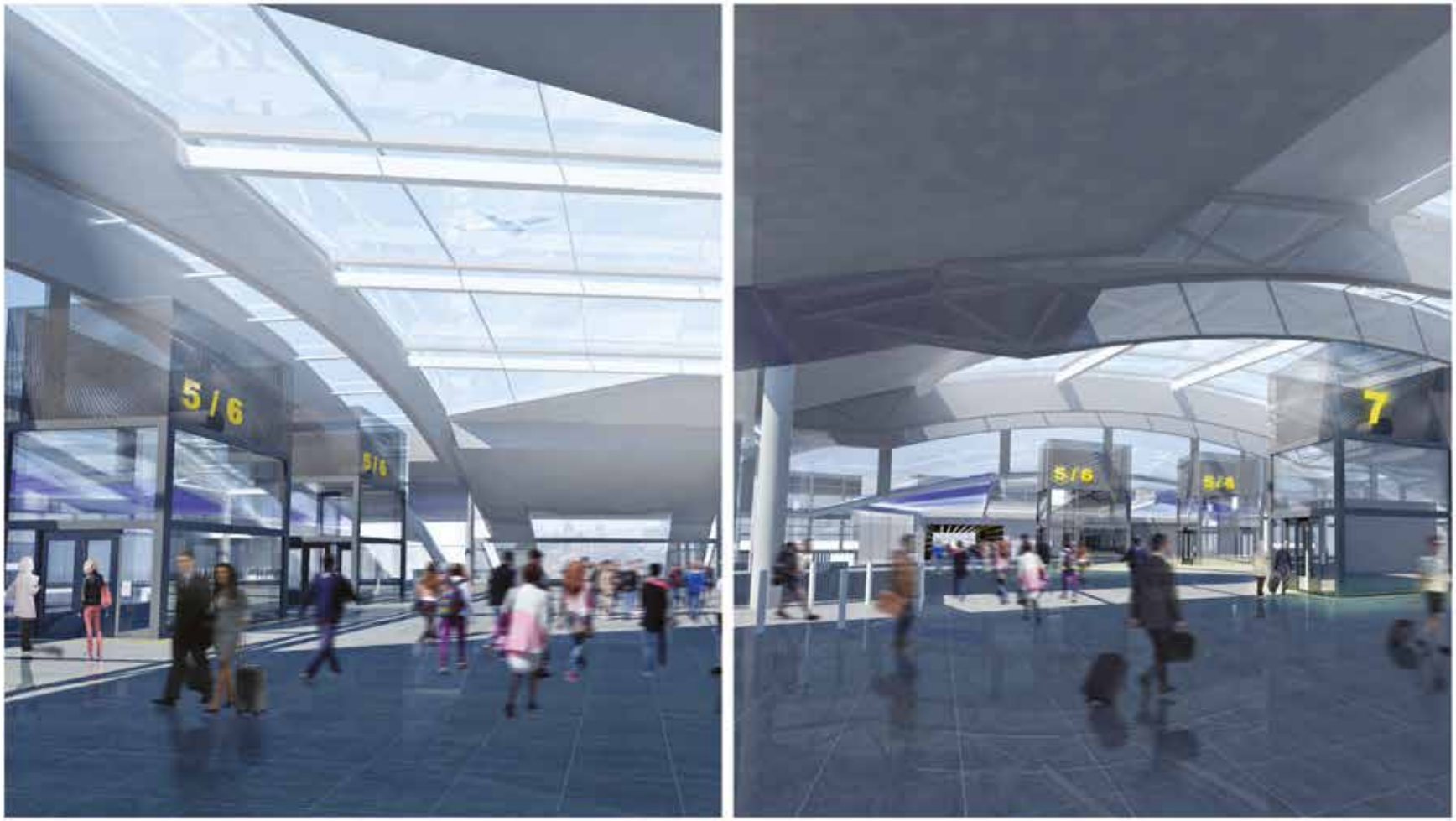




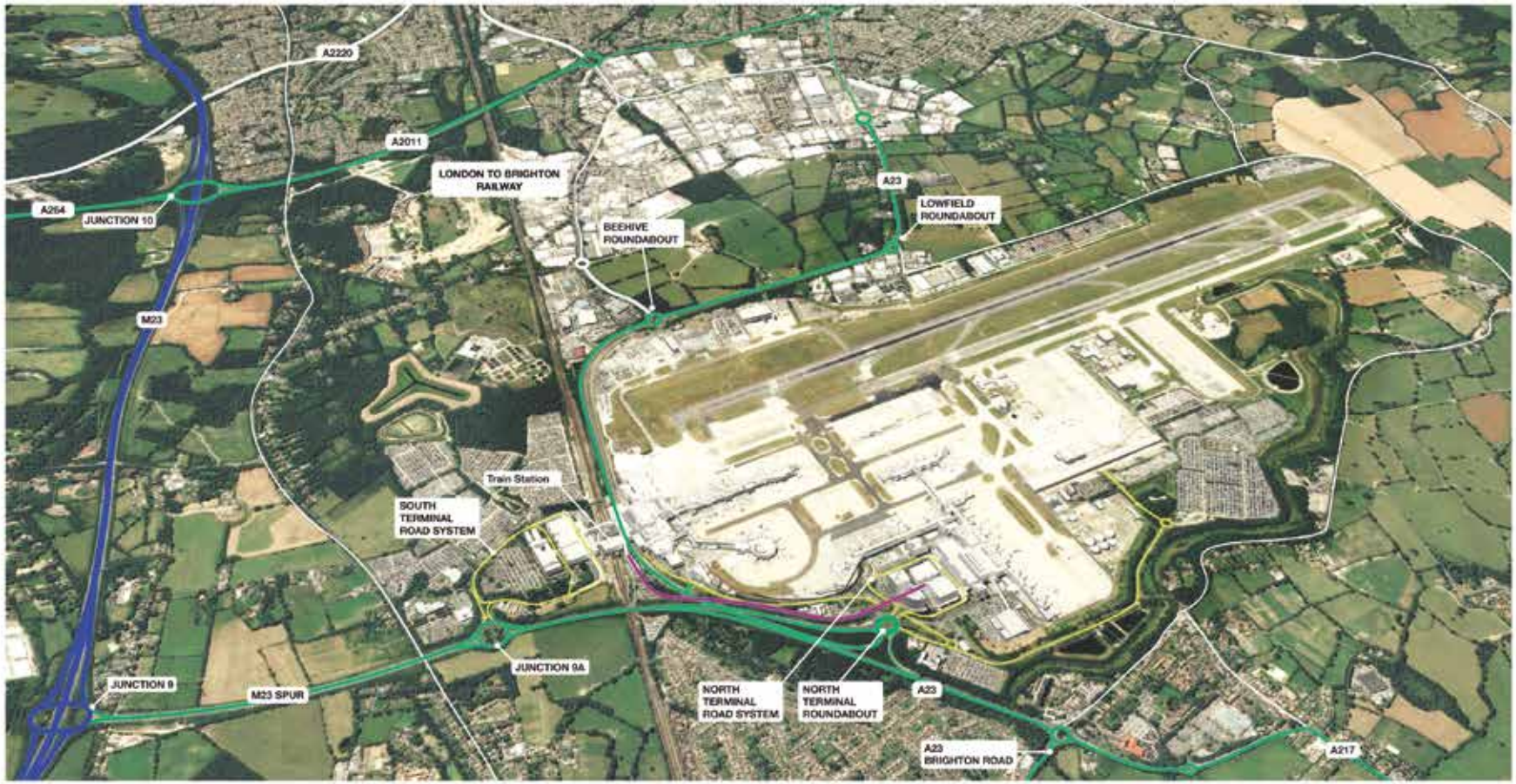




PLAN 11 - Planned Developments Pier 6 Extension



PLAN 12 - Planned Developments Gatwick Station

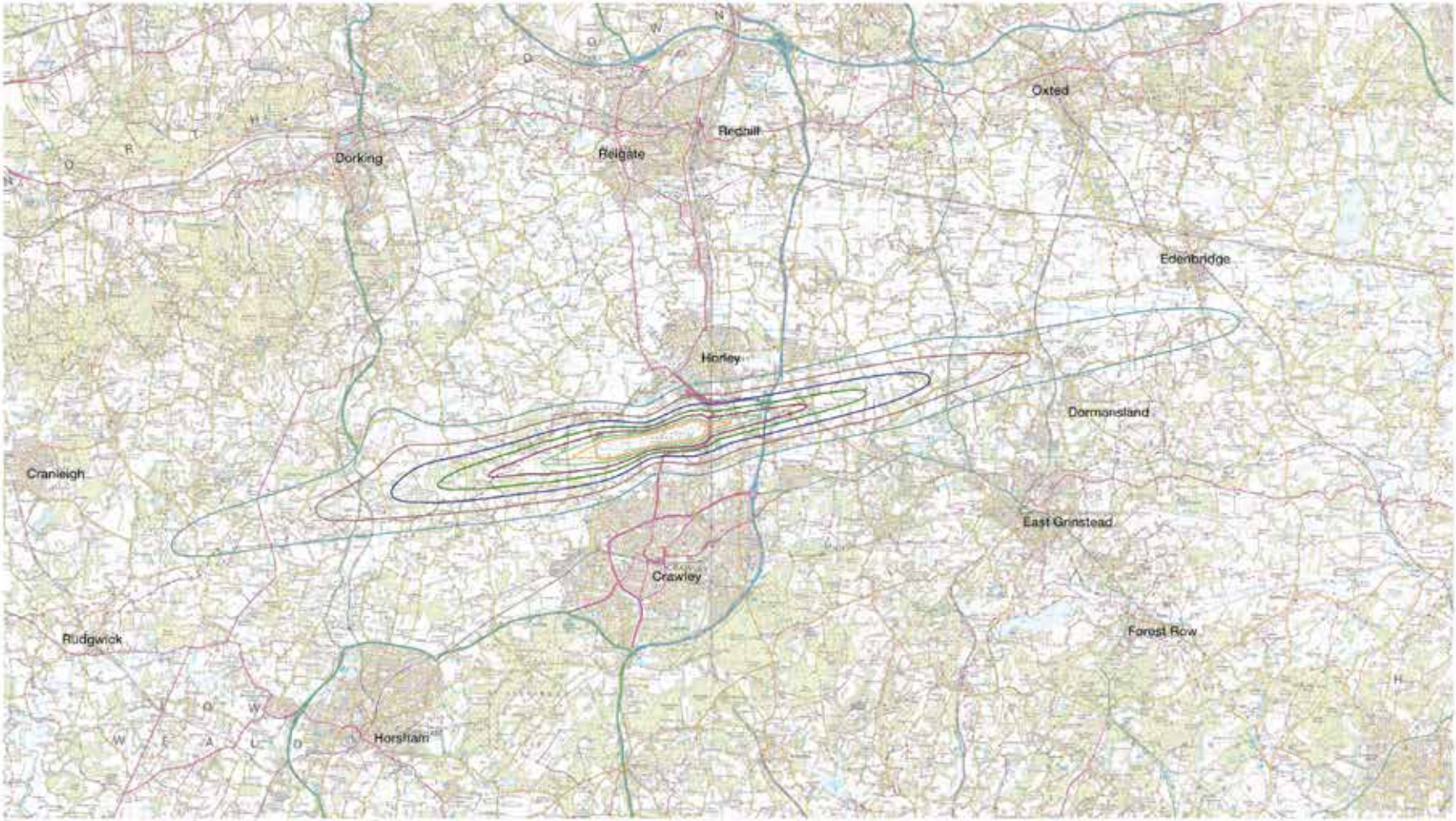


PLAN 13 - Surface Access Key Features

Motorway M23 | Main roads | On Airport Roads | Terminal Shuttle

N

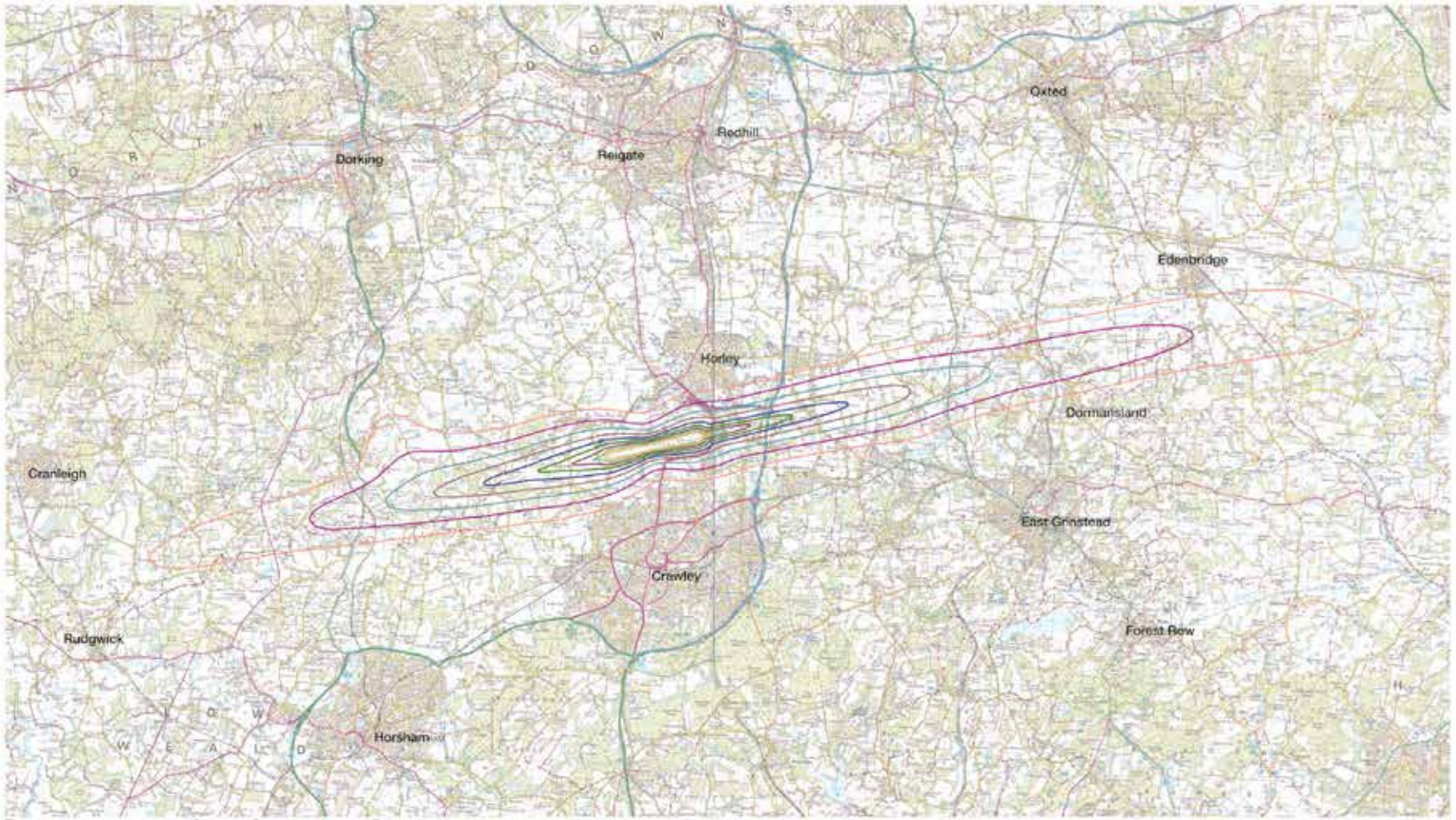
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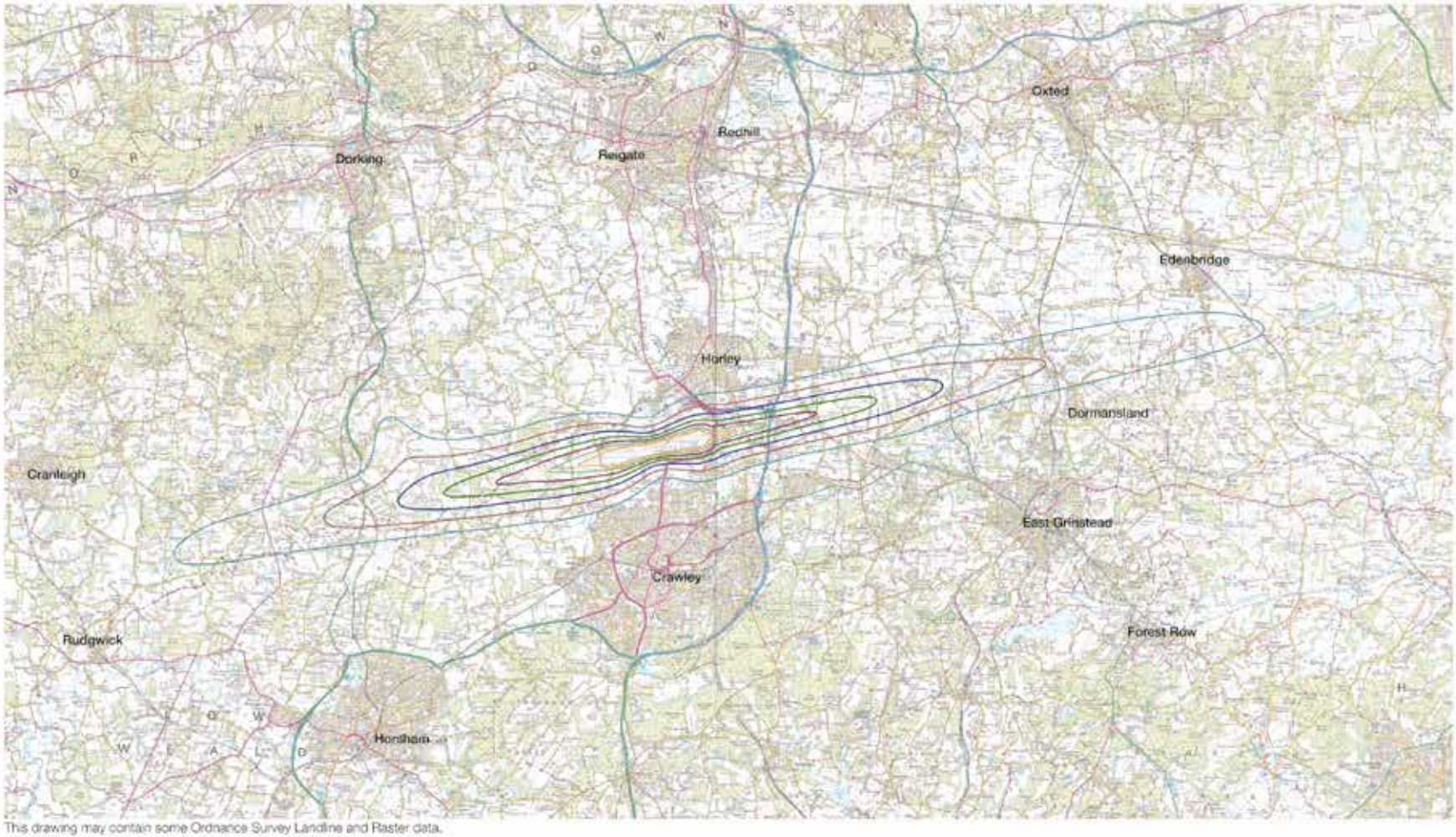
PLAN 14 - Air Noise Map. Leq Contours - Summer Day - 2017



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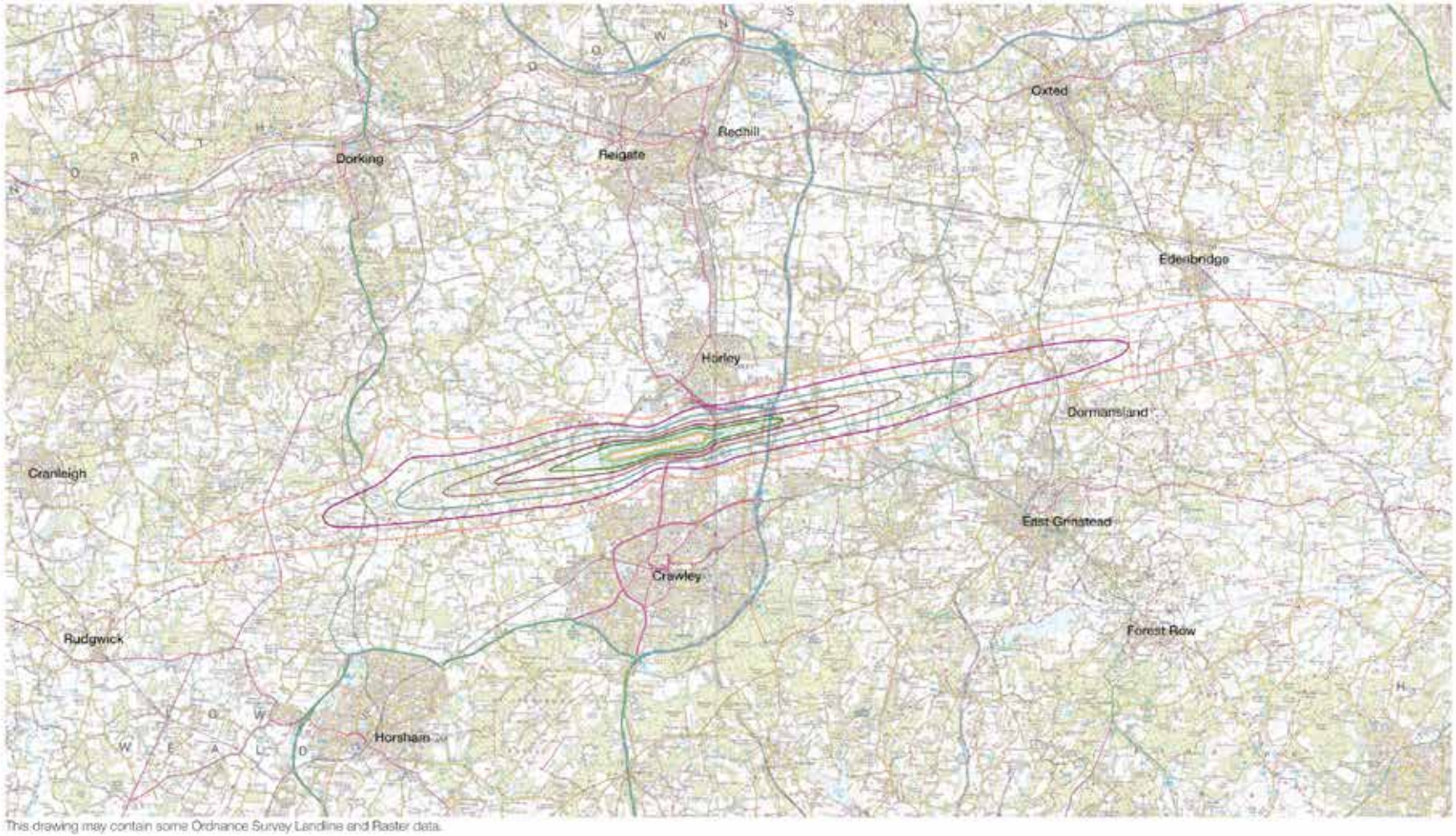
PLAN 15 - Air Noise Map. Leq Contours - Summer Night - 2017



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PLAN 16 - Air Noise Map. Leq Contours - Summer Day - 2022



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PLAN 17 - Air Noise Map. Leq Contours - Summer Night - 2022



PLAN 18 - Airport Layout Main Runway - 2032

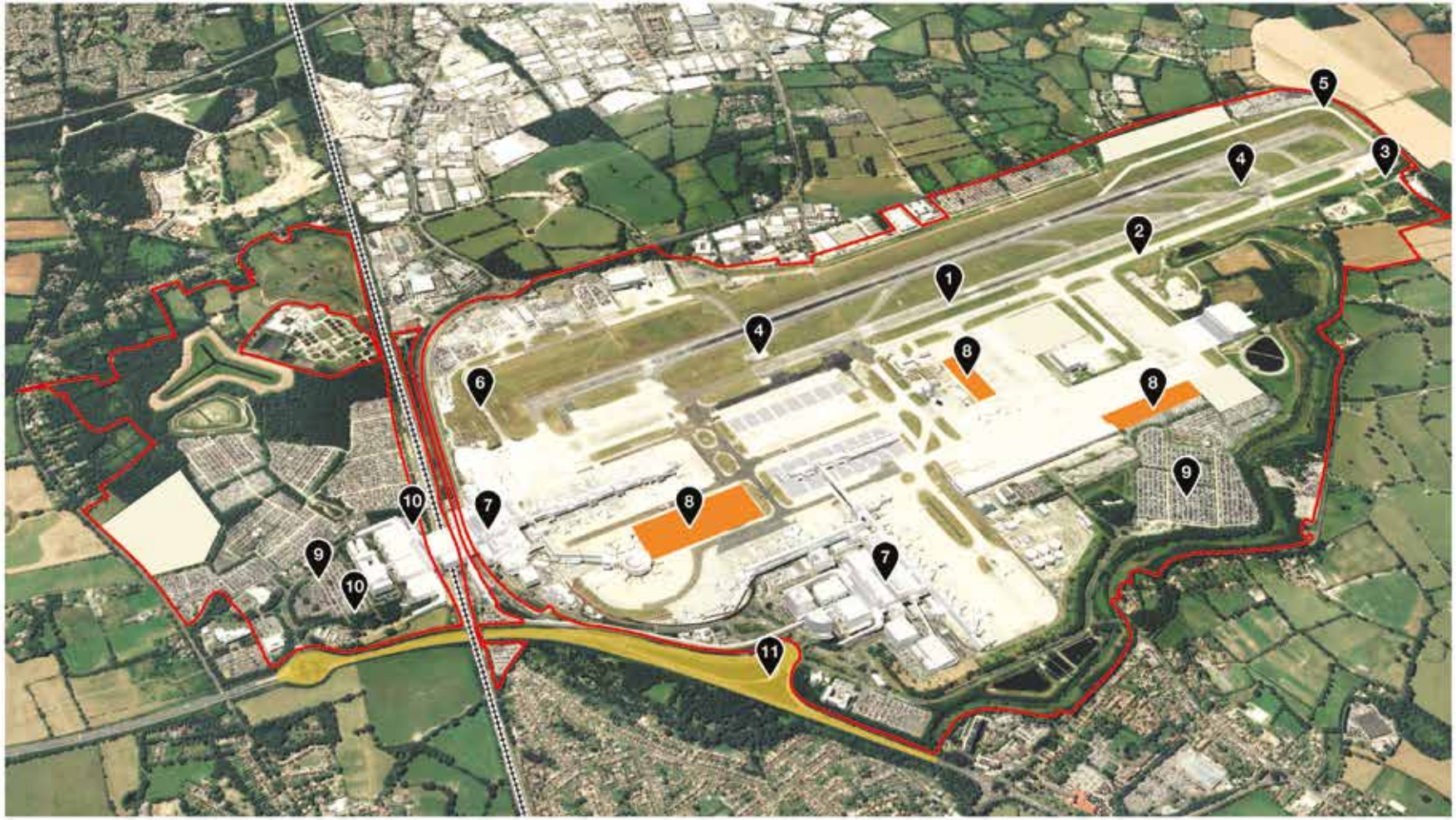
(Additional infrastructure compared to 2022)

Anticipated or potential developments

1 Terminal improvements including security and bag-drop
2 One pier project in one of the three location options shown
3 Forecourt improvements
4 Additional bus/coach station capacity
5 Partial decking of surface car parking
6 Robotic parking technology
7 Additional car parking area
8 Additional car parking area
9 Office / hotel development
10 Site for new hangar

Airport Boundary

N



PLAN 19 - Airport Layout Standby and Main Runway - 2032

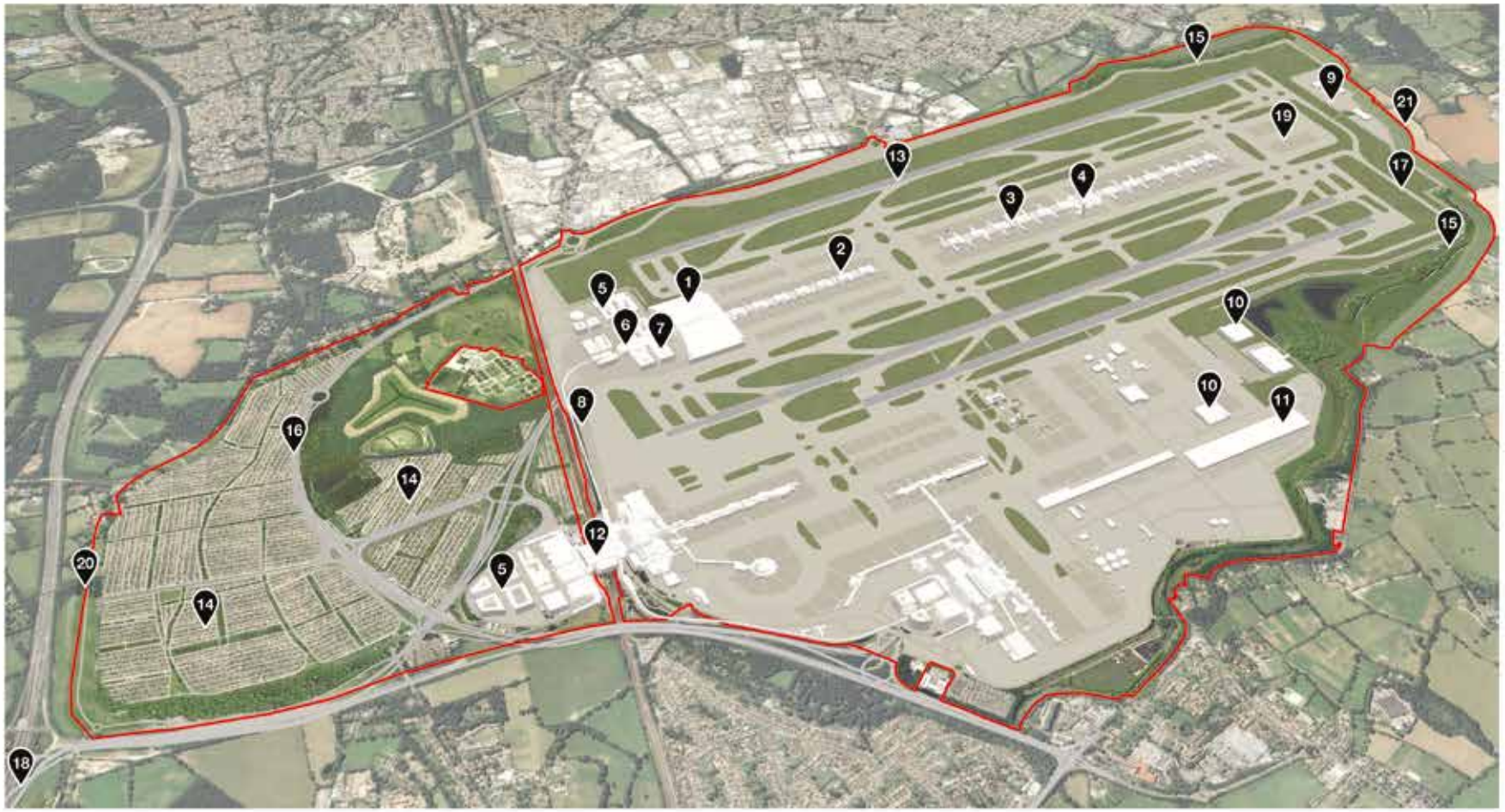
(Additional infrastructure compared to 'main runway only' in 2032)

Anticipated or potential developments

1 Widen existing standby runway
2 Relocate Juliet taxiway
3 New reserquencing/holding area
4 Reconfigure existing Rapid Exit Taxiway
5 New end-around taxiway
6 Existing taxiway used as end-around taxiway
7 Terminal improvements
8 One further pier project (in one of the three location options shown)
9 Additional decked/MSCP parking
10 Additional hotel/office development
11 Additional road improvements

Airport Boundary

N

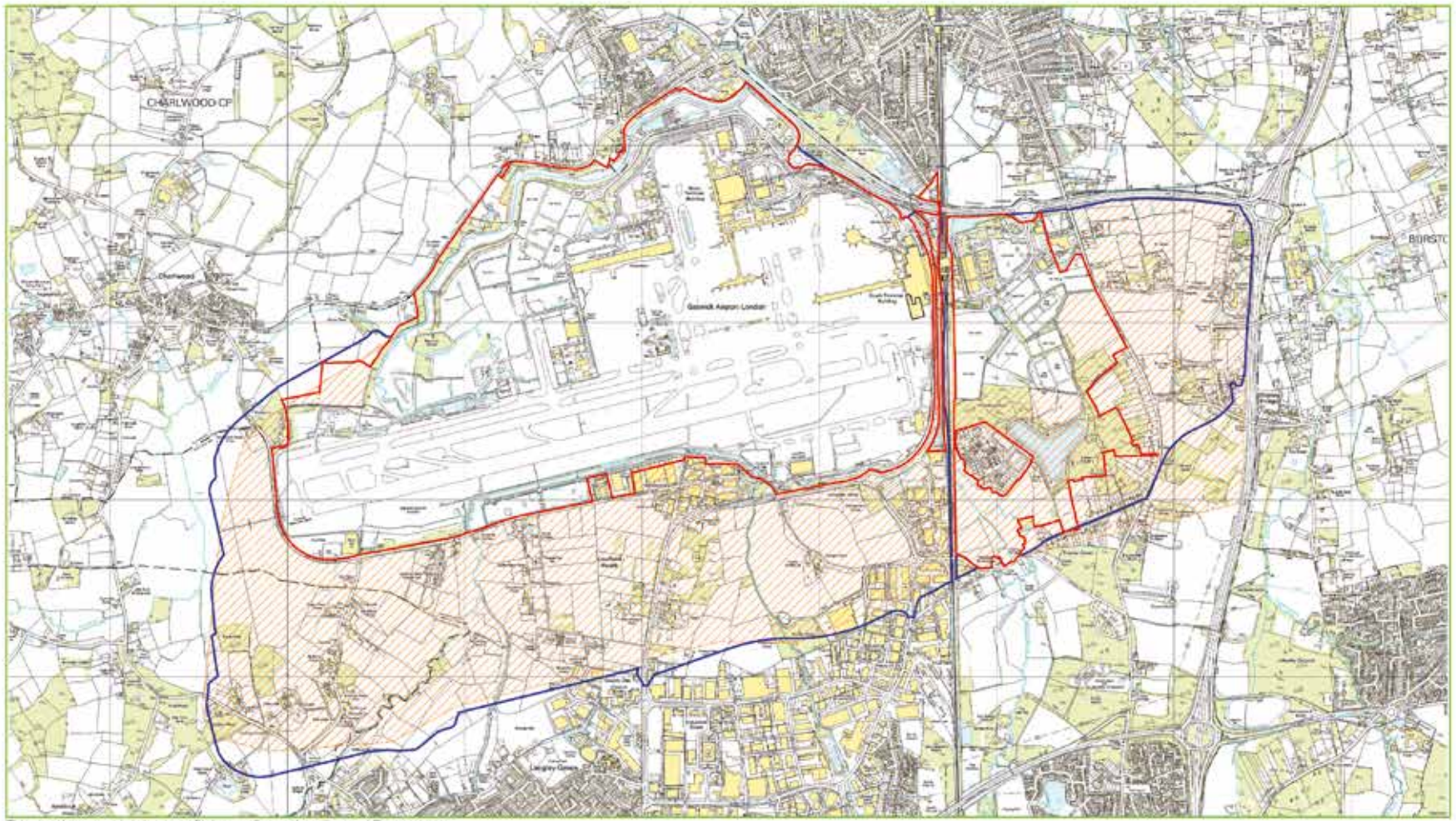


1 New Terminal Building
2 Contact Pier
3 Remote Pier
4 New Control Tower
5 Offices
6 Carpark
7 Hotels
8 People Mover System
9 Support Accomodations
10 New Hangar
11 New Cargo
12 Gatwick Gateway
13 New South Runway
14 Long Stay Car Parks
15 New Noise Bund
16 A23 Diversion
17 End Around Taxiway
18 New M23 Sliproad
19 New Remote Stands
20 Balcombe Road diversion
21 River Mole diversion

Airport Boundary

N

PLAN 20 - Airport Layout Additional Runway



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PLAN 21 - Safeguarded land Additional Runway

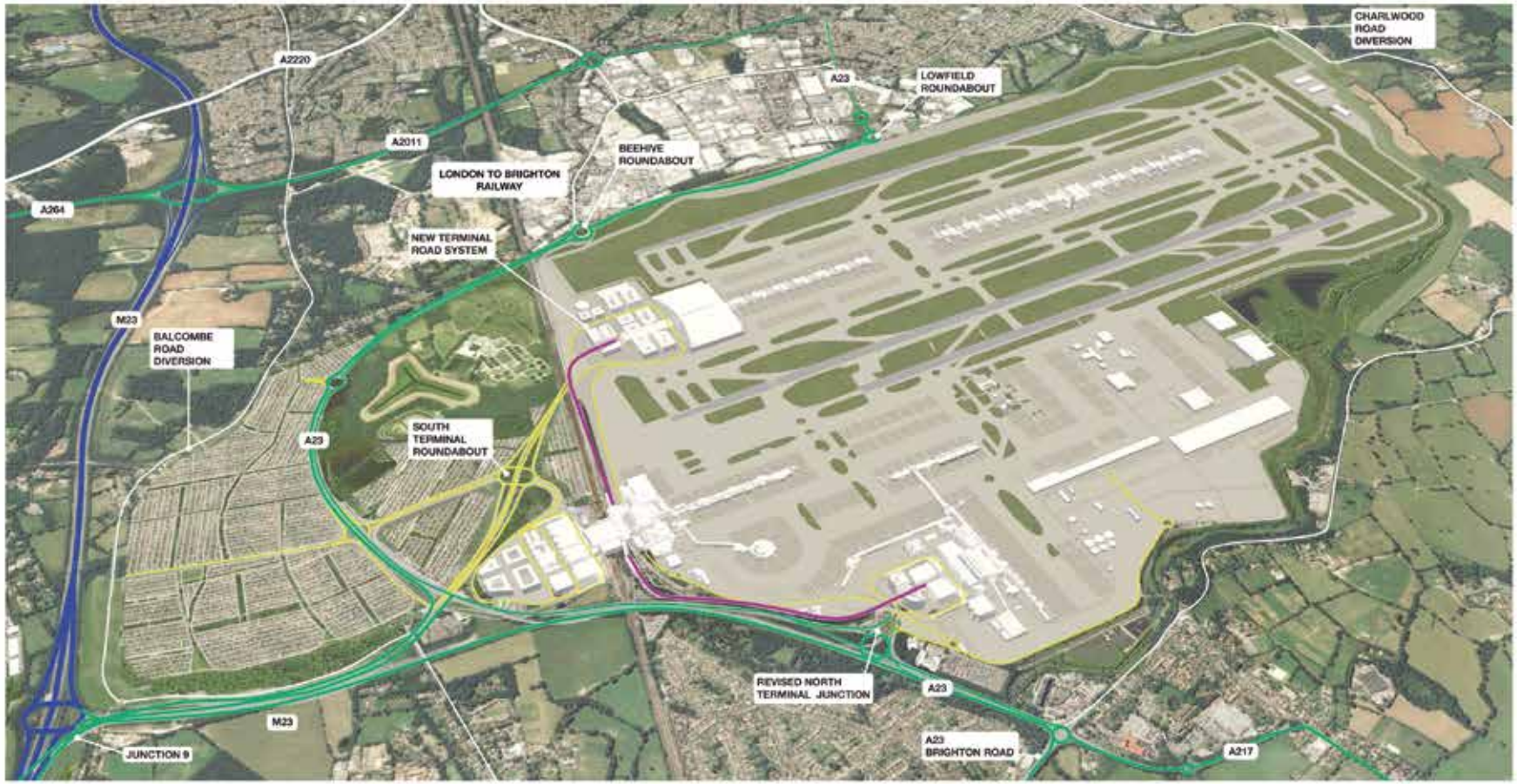
Existing Airport Boundary

Proposed Additional Runway Airport Boundary

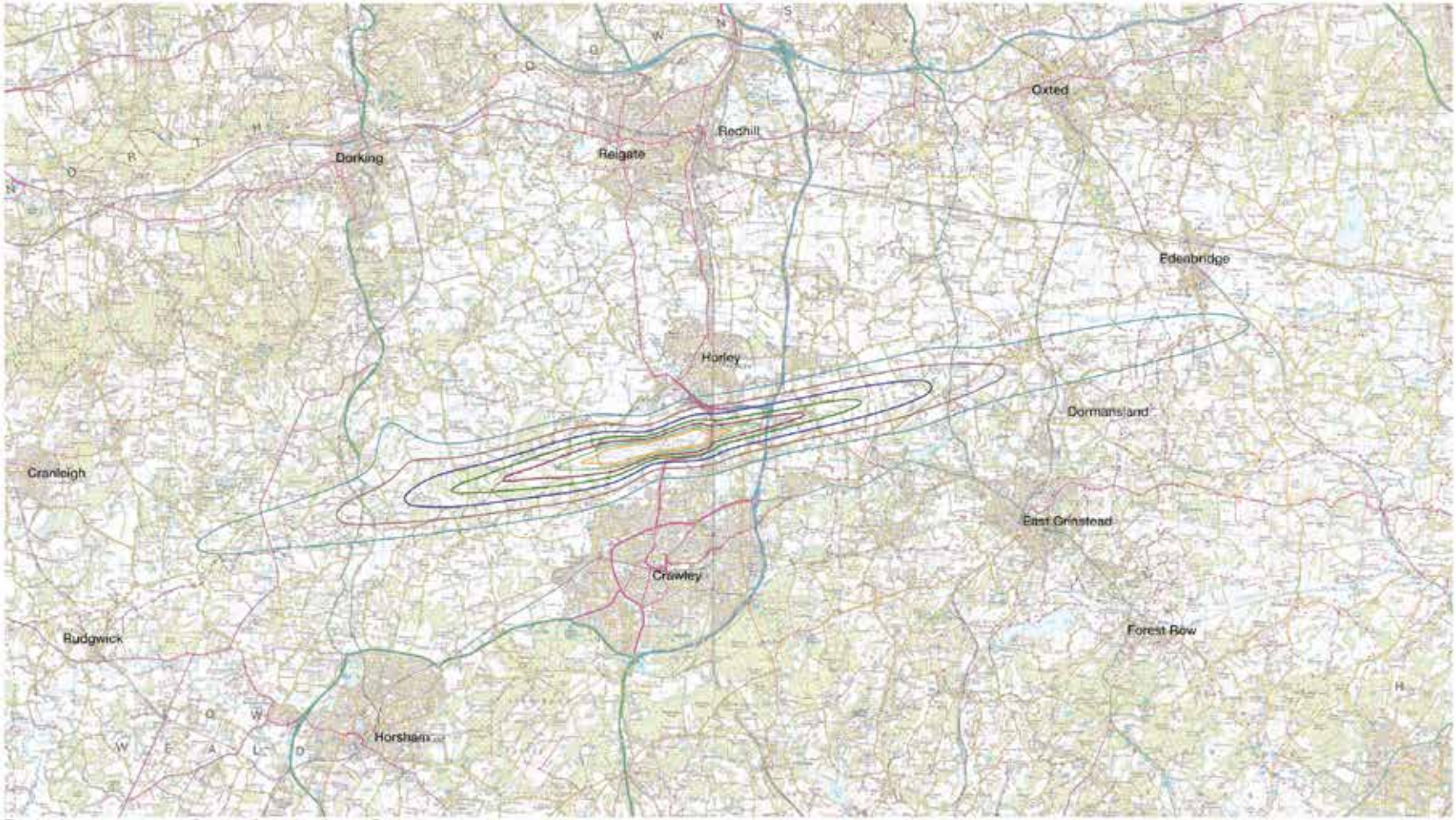
Land Currently Safeguarded For The Additional Runway

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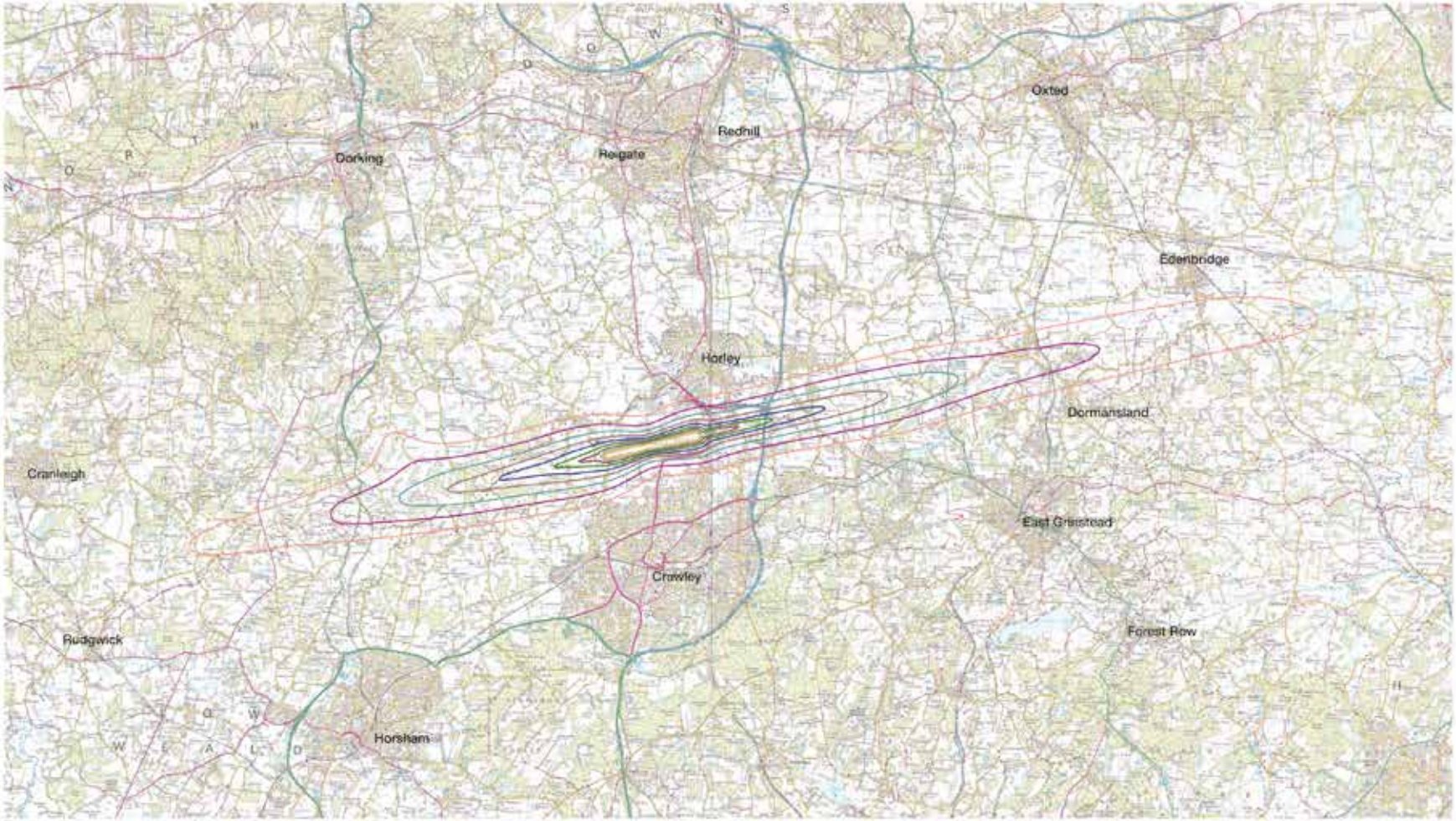
PLAN 22 - Surface Access Additional Runway



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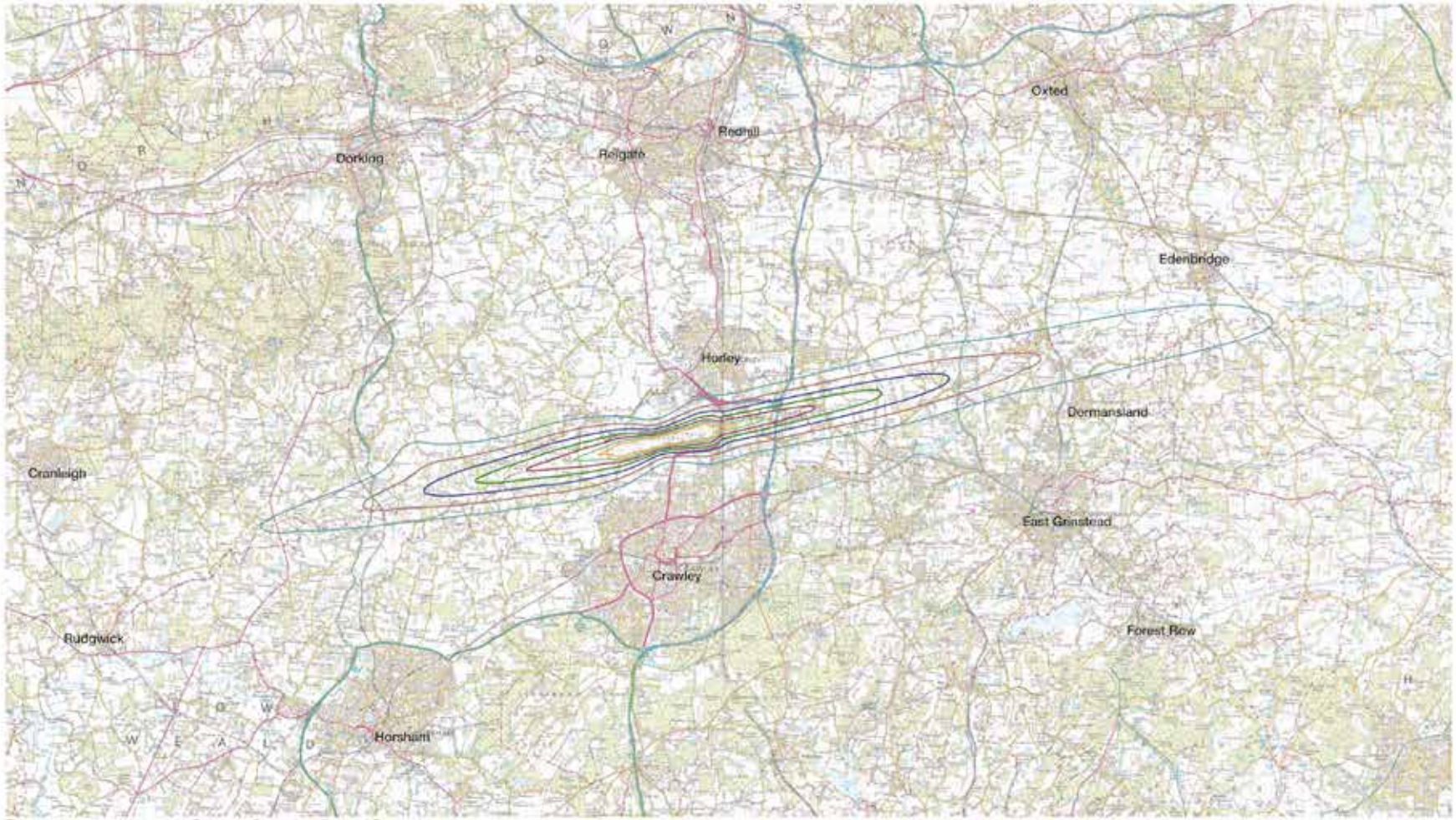
PLAN 23 - Air Noise Map. Main Runway - Leq Contours - Summer Day - 2028



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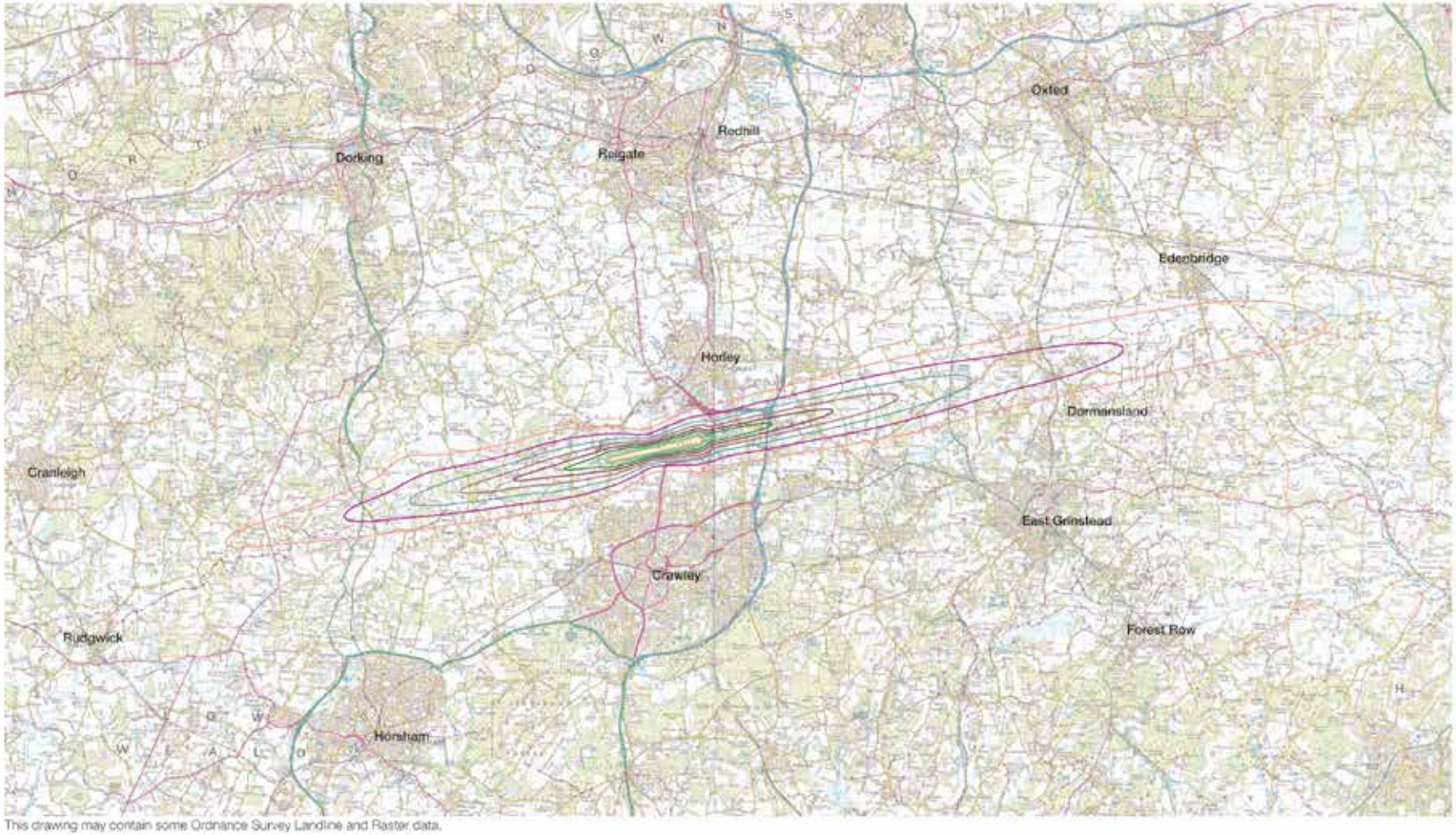
PLAN 24 - Air Noise Map. Main Runway - Leq Contours - Summer Night - 2028



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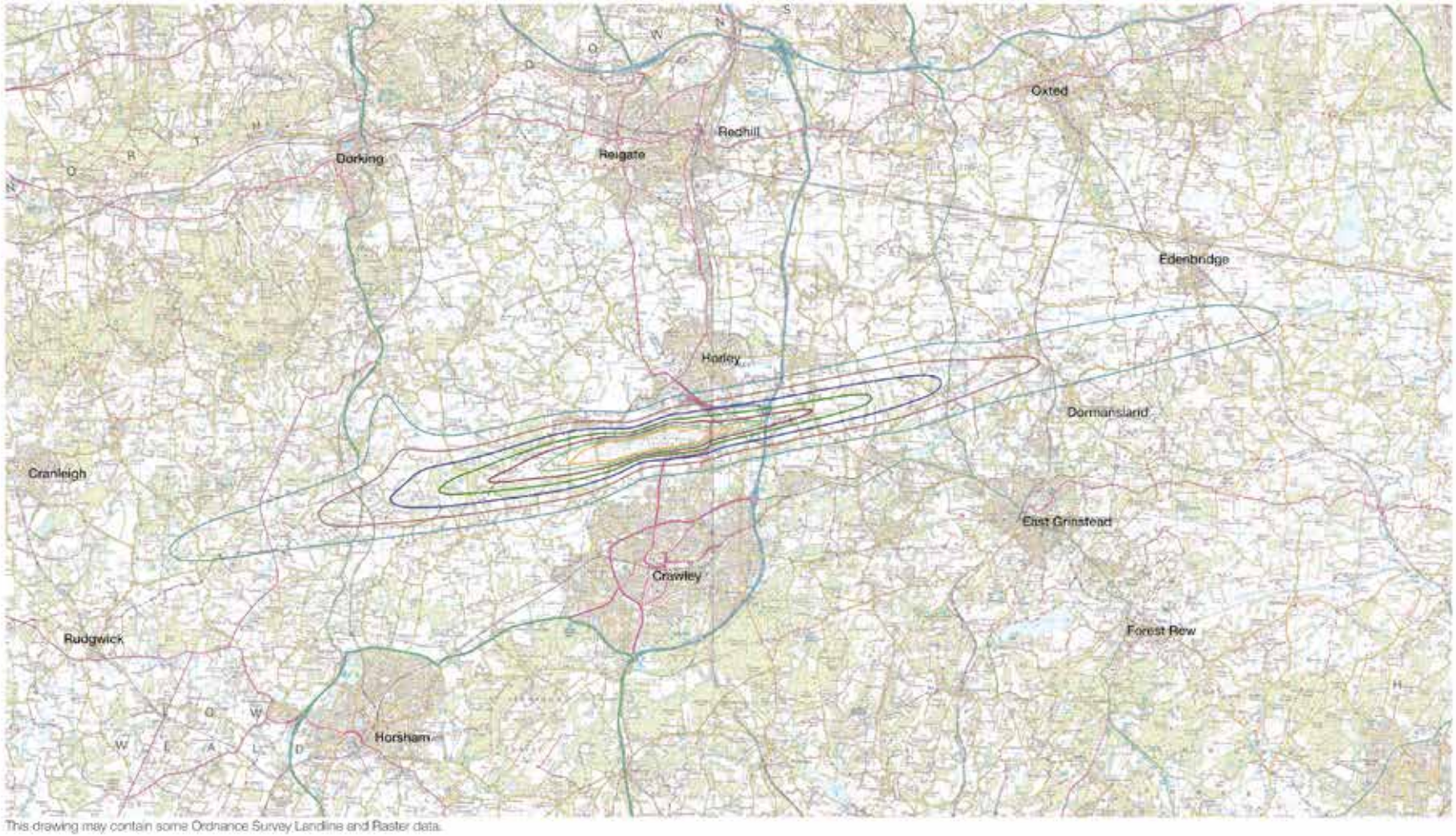
PLAN 25 - Air Noise Map. Main Runway - Leq Contours - Summer Day - 2032



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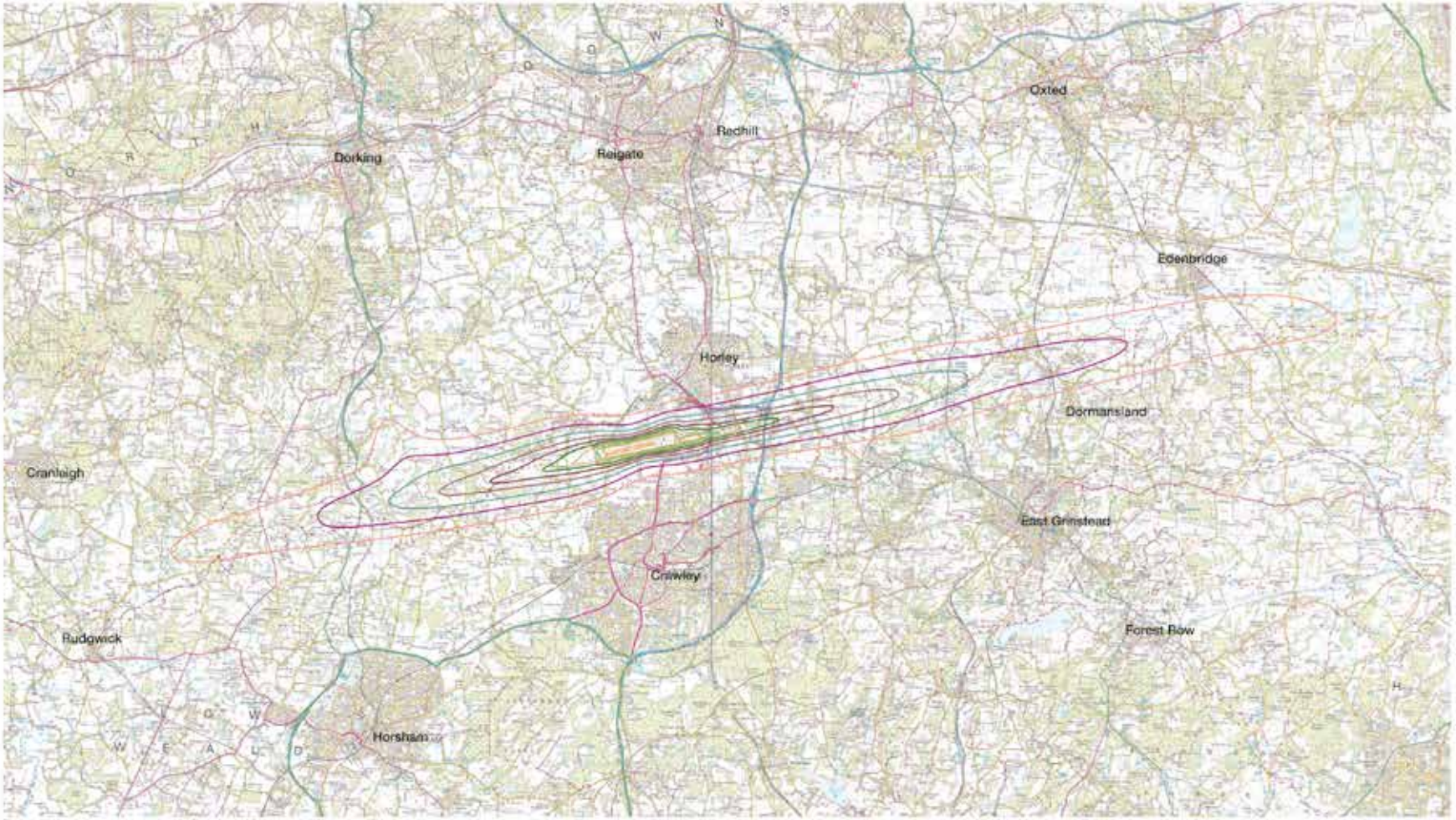
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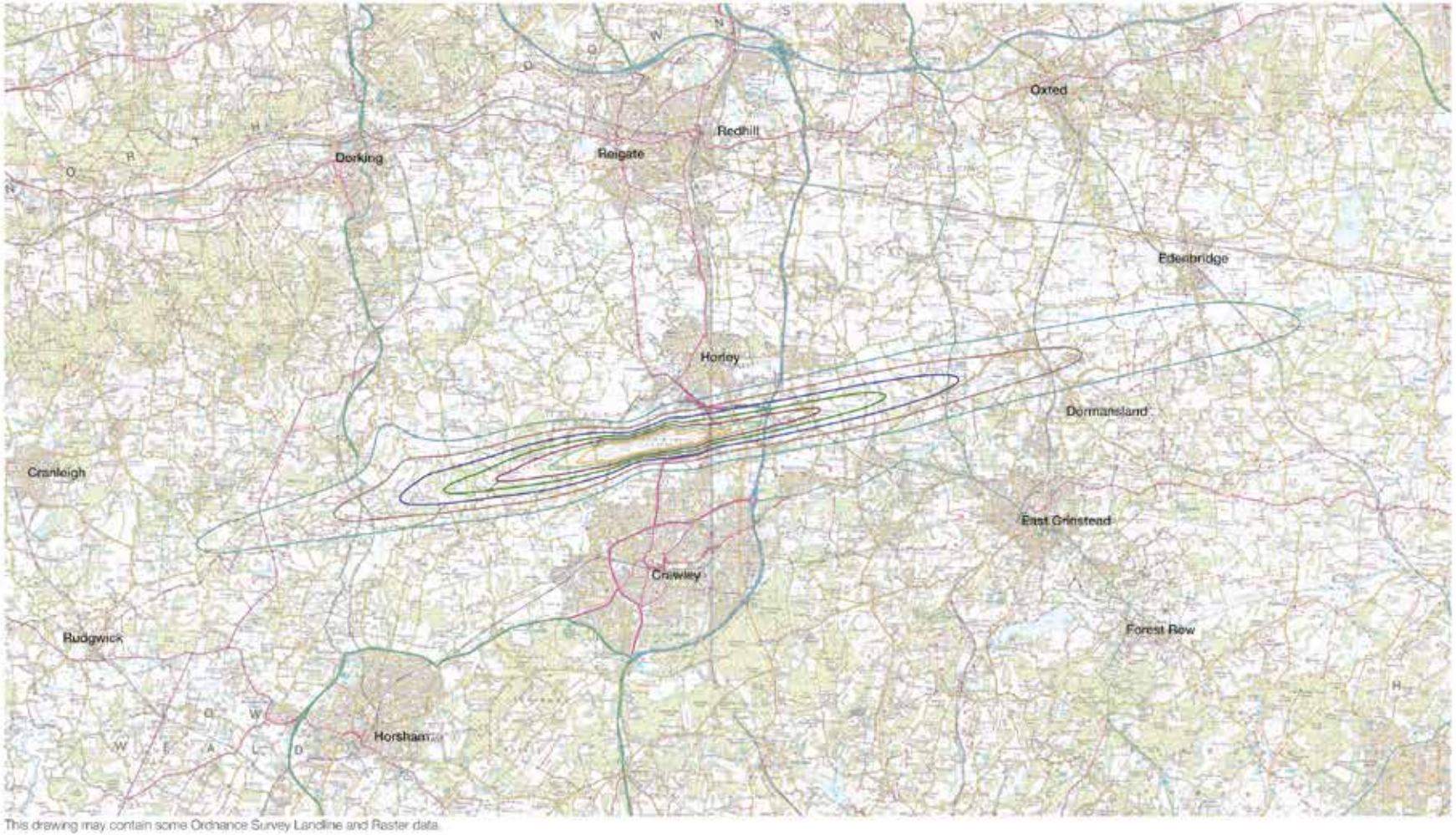
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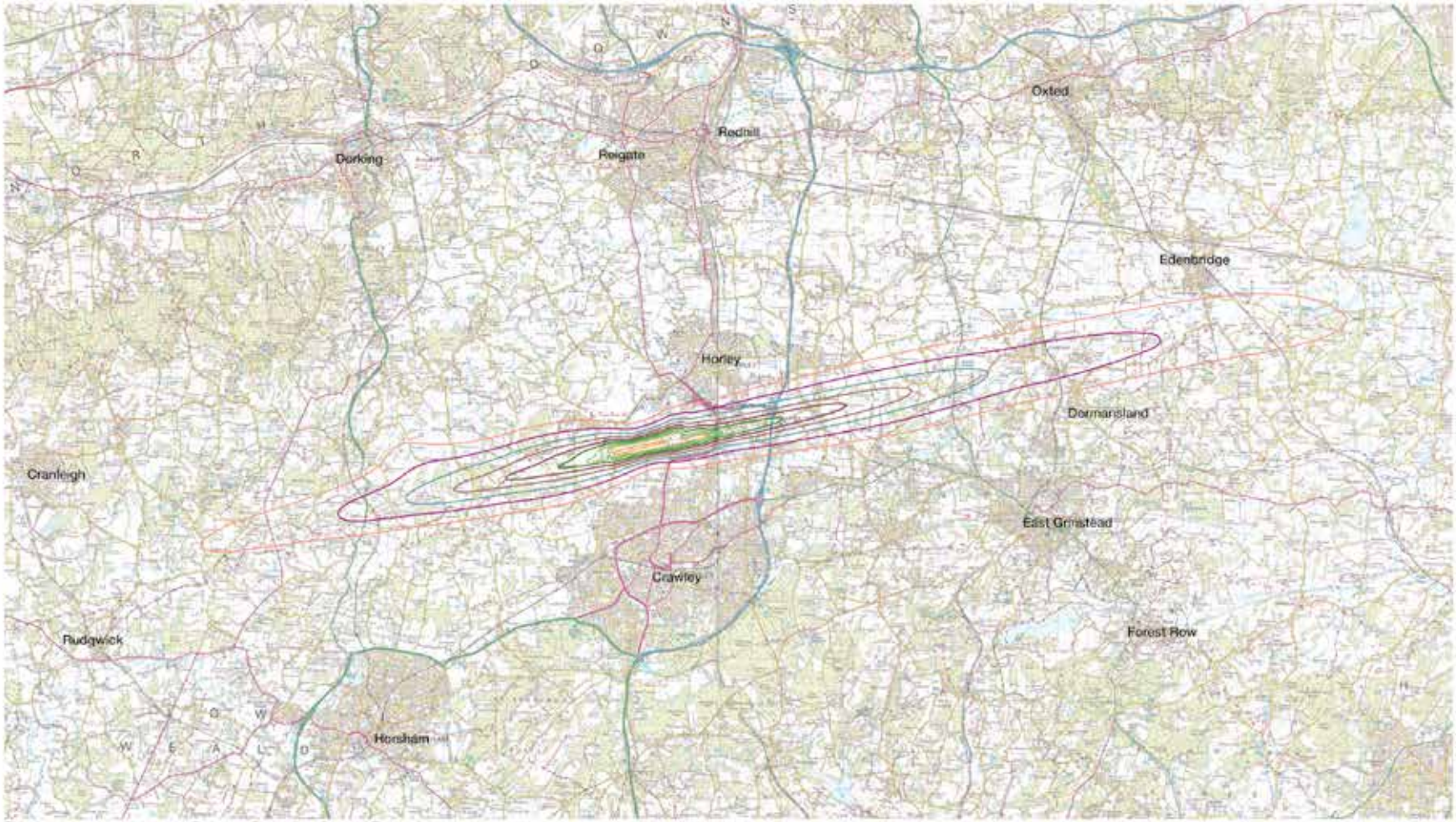
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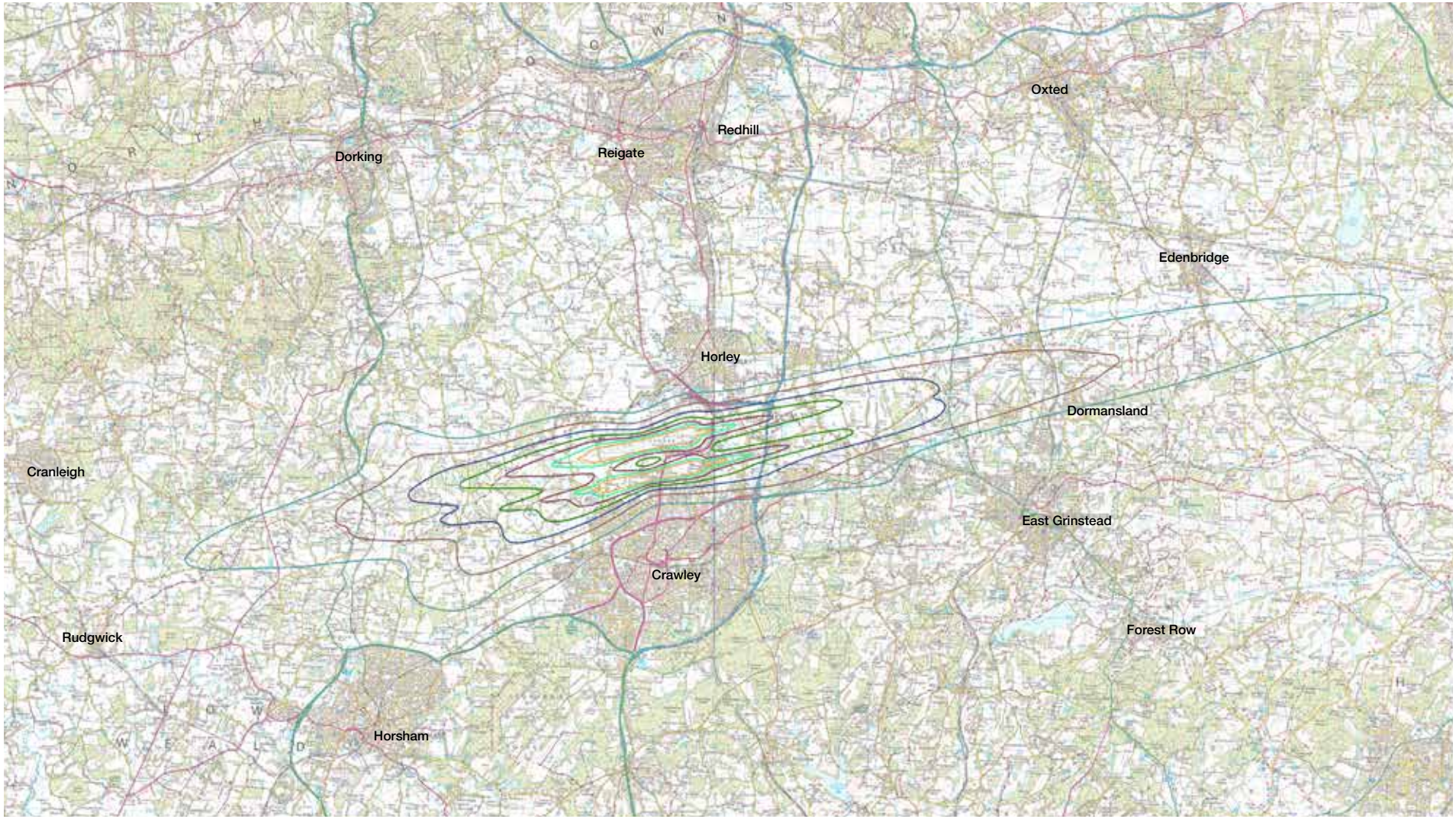
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PLAN 30 - Air Noise Map. Standby and Main Runway - Leq Contours - Summer Night - 2032



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54 dB
57 dB
60 dB
63 dB
66 dB
69 dB
72 dB

N

PLAN 31 - Air Noise Map. Additional Runway - Summer Day - 2040

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YOUR LONDON AIRPORT
Gatwick

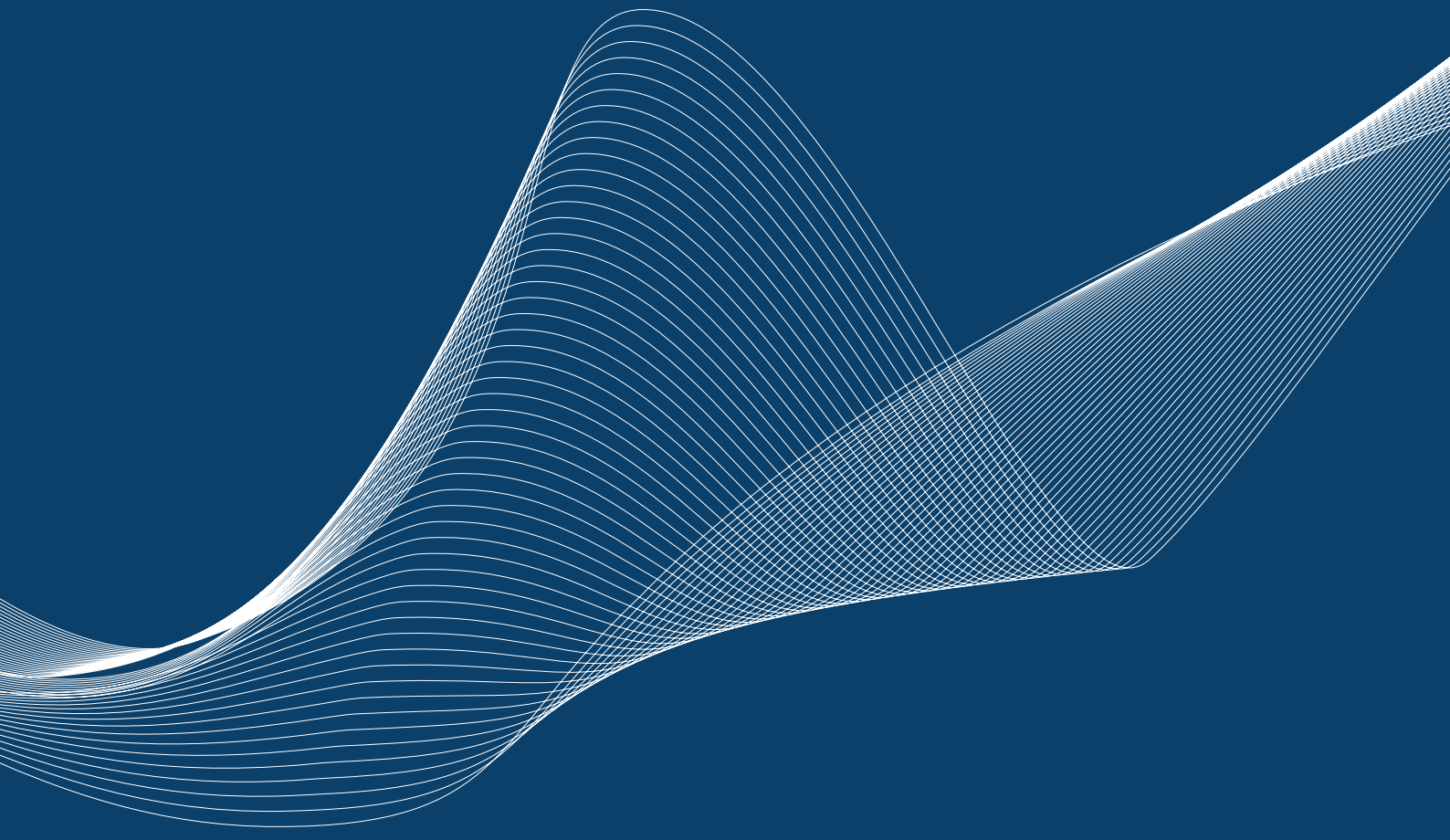
London Luton Airport Ltd
A Luton Council company

Luton Airport Expansion Project

London Luton Airport Limited (LLAL)

February 2019

Sift 2 Report, Final



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Please note, this document (February 2019) is the final version of the Sift 2 Report, and is an update of the draft report published as part of the Non-statutory Consultation in June 2018. Paragraph 1.4.3 outlines the scope of the changes to the previous draft.

1 INTRODUCTION

1.1 Project overview

1.1.1 In 2014, planning permission was granted to London Luton Airport Operations Ltd (LLAOL) to increase the capacity of London Luton Airport (LTN) to 18mppa (million passengers per annum). It was forecast at the time that this would be achieved by 2026/27 at the earliest. Since then, passenger numbers have increased by around 1mppa in each of the last four years. Capacity is now expected to be reached by 2020/2021.

1.1.2 Set against this context for growth, and with recent Government reaffirmation of the importance of the aviation sector to the UK economy, LLAL believes that London Luton Airport (LTN) has the potential to become the airport of choice for north London and England's economic heartland, and has prepared a business case to support further growth. There is an opportunity for LTN to play a substantially bigger role in the UK aviation market, notwithstanding the potential opening of the Heathrow third runway. Our assessments for LTN showed that the full potential of LTN's existing runway, all other things being equal, is up to 36-38 mppa, or in the region of 240,000 aircraft movements per year (which is in line with the assessment in the Aviation White Paper from 2003).

1.1.3 There is therefore a clear need to plan for LTN's long-term future to ensure the regional economy can enjoy the benefits of this expected growth and it is LLAL's responsibility to deliver this to the best of its ability. LLAL has started to plan for this growth and publicly launched its vision statement in December 2017:

> *"To make the best use of the existing runway at LTN to provide the maximum benefit to the local and sub-regional economy; to deliver good levels of service; and to actively manage environmental impacts at the local and wider levels in line with our commitment to responsible and sustainable development." (Ref 1.1)*

1.1.4 LLAL has commissioned a consultant team to prepare a strategy for growth for LTN, including an application for a Development Consent Order (DCO). Under the Planning Act 2008 an increase of airport capacity by 10mppa or more is automatically considered to be a Nationally Significant Infrastructure Project (NSIP) and as such it is mandatory that this is authorised by a DCO.

1.1.5 Part of the preparation for the DCO application involves developing a proposal for the Project having regard to potential impacts on, for example, the environment, community and highways. This includes a process to develop alternative options for the Project taking account of Government Aviation

Policy, the vision for LTN and the full range of economic, social, environmental and physical factors relevant to the expansion of the airport.

1.1.6 The option appraisal process draws on inputs from the full range of technical specialists to create plans and drawings showing alternative options for how the different elements of an expanded airport could be configured and developed at LTN. The different elements shown in the options will include the terminal building(s), aprons and taxiways, support facilities such as fuel farms, parking and servicing areas as well as highways, public transit systems and other new, retained or relocated facilities and uses such as commercial development, open space, recreational areas and agricultural land.

1.1.7 The alternative options are 'sifted' using a multi-stage appraisal methodology to identify options that are unlikely to deliver the project vision, those that are more preferred and which should be developed further and ultimately to arrive at a preferred proposal for the Project. This sifting process is described further in **Section 1.2** below.

1.2 Overview of the sift process

1.2.1 The DCO process will require robust evidence to demonstrate that a range of options and their potential impacts have been considered, assessed, and then either discontinued or refined and progressed. As such, the sift process adopted here is a type of appraisal process which is based on the following key principles:

- There must be a clear rationale for any option and it must be based on a presentation of opportunities and challenges that arise from the options which meet the case for growth at LTN;
- There must be consideration of genuine, discrete options with a range of proposals and configurations;
- There should be a well-documented process with a clear audit trail which identifies how the best performing options were scored and which ones should be taken forward for further assessment; and
- The sift process should feed in where appropriate to the consultation taking place as part of the DCO application process.

1.2.2 For this Project, a structured, multi-stage process of option sifting has been developed to help identify which options should be taken forward or no longer considered.

1.2.3 We currently see this as a three stage process as follows:

- **Sift 1** - the purpose of the first sift was to undertake an initial appraisal of the long list of options to produce a short list of preferred options to recommend to the LLAL Board. Options were considered against a set of high level, qualitative criteria chosen to meet key Project objectives - strategic, economic, social, environmental, surface access, deliverability, operational viability and cost - and either recommended for further consideration and design development, or discontinued to avoid abortive work. This stage has been completed and is covered within the Sift 1 report.
- **Sift 2** - the purpose of the second sift was to appraise the options which remained under consideration after Sift 1. These options have had the benefit of further research and understanding and there has been some initial design development in order to inform the optioneering process, with some additional informational available for each option. As such, the appraisal process has been designed to an improved level of detail than in Sift 1, but not as detailed as intended for the Sift 3 process. As with Sift 1, the options that perform most strongly against a range of criteria (based on the Sift 1 criteria with further refinement) after Sift 2 will be presented as the preferred options for non-statutory consultation during the summer of 2018. This stage has now been completed and is covered in this report.
- **Sift 3** – following non-statutory consultation and consideration of stakeholder and community feedback, it is proposed that a third round of the sift process will be undertaken to identify the preferred option to take forward in the DCO application.

1.3 Outcome of Sift 1

1.3.1 Sift 1 was undertaken in the autumn of 2017 and appraised seven options against a set of high level, qualitative criteria. One of these option families consisted of a two terminal option with either: a realigned (3a); extended (3b); or additional (3c) runway. The option 3 family was not considered to be consistent with the emerging Government policy to make the best use of existing runways. In addition, all option 3 sub-options also performed very poorly on deliverability in relation to financial and technical viability on account of delivering capacity ahead of demand (second runway) and the large amount of earthworks required. The latter also increases the estimated cost of the project, as does the fact that the second runway and realigned runway sub-options both require acquiring significant areas of land outside of LLAL ownership.

1.3.2 As a result of the factors listed above, the option 3 family was discontinued at that stage. The four remaining options – two single terminal building options and two double terminal building

options - were considered as being more aligned with the overall project vision and objectives, including complying with emerging Government policy, and were therefore developed further for Sift 2.

1.4 Purpose of this report

1.4.1 The purpose of Sift 2 was to undertake an integrated and multi-criteria appraisal of the shortlisted options from Sift 1 and to produce a proportionate level of evidence required to understand the potential benefits and impacts of each option, and to support the case for the identification of a preferred option or options.

1.4.2 This report covers the process and findings from Sift 2 (undertaken during winter 2018/spring 2019) and documents how the options remaining after Sift 1 have been appraised, and how and why options have been recommended to be progressed or discontinued.

1.4.3 This Sift 2 Report (February 2019) represents an updated version of the June 2018 version published as part of the Non-Statutory Consultation. As part of Sift 3, the Sift 1 and 2 appraisals were back-checked to confirm that those appraisals remain valid in the light of consultation feedback and additional information arising from further technical work. This has resulted in some minor changes to scoring and criteria used in Sift 2 as compared to those set out in the draft Sift report published in June 2018. This Report incorporates those changes and also clearly identifies where such changes have been made to the previous draft. Other minor amendments to the previous draft have been made including updating references (e.g. to policies which have changed since the draft report), typographical changes and minor textual clarifications.

1.5 Structure of this report

1.5.1 This report is structured as follows:

- **Chapter 1** sets out an overview of the context behind the project, an overview of the sift process and the purpose of this report;
- **Chapter 2** outlines the methodology adopted for Sift 2;
- **Chapter 3** covers the criteria, sub-criteria and scope of appraisal;
- **Chapter 4** summarises the key issues considered in the appraisal and describes the options appraised with a narrative on how they have developed since Sift 1;
- **Chapter 5** provides a synthesis of the appraisal rationale for each criterion; and

- **Chapter 6** outlines the outcomes of the Sift 2 process.

2 METHODOLOGY

2.1 The options under consideration at Sift 2

2.1.1 Following Sift 1, it was agreed that the four remaining options should be taken forward for further consideration. These would then be developed further and refined in design terms – this is set out in more detail in **Chapter 4**. As design work has continued on the options which remain under consideration, further technical information has become available to the technical team which has informed both the design and the appraisal processes.

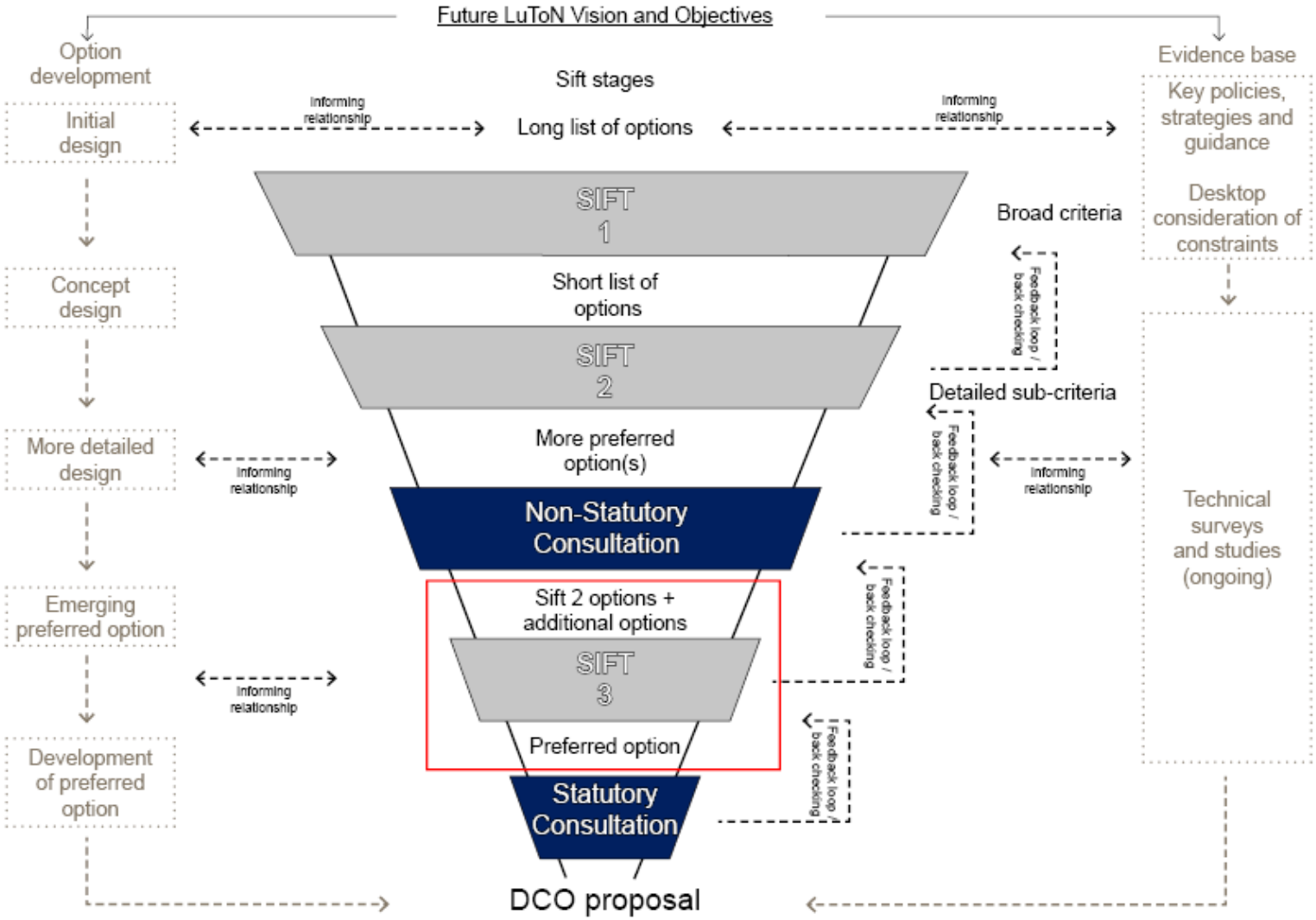
2.1.2 The following four options were appraised during Sift 2:

- **Option 1a** – two terminals to the north of the runway;
- **Option 1b** – a single terminal to the north of the runway, located to the west of the site;
- **Option 1c** – a single terminal to the north of the runway, located to the east of the site; and
- **Option 2** – second terminal to the south of the runway.

2.2 Our approach to Sift 2

2.2.1 Following on from Sift 1, the process for Sift 2 has sought to build upon and refine the criteria identified previously, based on a more detailed understanding of the baseline position and options, and additional technical evidence. This has enabled a robust appraisal of the options to be undertaken, to incorporate moderation and back-checking during the sift process. It has also informed the on-going development of the options, detailed design and technical work by ensuring an integrated approach to considering the potential impacts.

Figure 2.1: Sift components, and the relationship with the wider project (Please note this figure has been updated from the draft version)



2.2.2 **Figure 2.1** shows the components of the sift process. For Sift 2 this involved:

- development of the sift criteria and collating evidence;
- testing and agreeing the approach (including checking consistency of scoring and application of assumptions and back-checking); and
- appraisal of the options.

2.2.3 Each of these components is set out below in more detail.

2.3 Development of the Sift criteria and collating evidence

2.3.1 The first step was to refine the sift criteria from Sift 1 and develop more detailed sub-criteria, to reflect the greater level of detail in the information available for the options during Sift 2, primarily because of further technical baseline and continuing design work. A summary of baseline constraints considered within the option appraisals is contained in **Section 4.2**.

2.3.2 As part of this step, standard proforma templates were prepared and each technical lead asked to complete them, covering: suggested sub-criteria; interdependencies/impacts on other criteria/disciplines; key relevant policies and guidance; baseline conditions; and key constraints and opportunities. The sub-criteria were developed by the technical leads based on their professional judgement, experience and knowledge of the specific context and technical field.

2.3.3 These proformas were shared with the rest of the team with the aim of ensuring a common understanding of the baseline and criteria in the round, and to allow peer review and moderation. These were reviewed at a workshop, as discussed below.

2.4 Testing and agreeing the approach

2.4.1 The approach to the Sift 2 appraisal was refined prior to the appraisal of the four options, in a collaborative workshop environment involving the different technical disciplines.

2.4.2 At the review workshops, the technical team:

- Refined wording of the criteria and sub-criteria to more accurately reflect the level of technical information available at the time and as considered appropriate for this level of design, and to remove areas of overlap with other interdependent criteria to avoid the potential for 'double-counting'. The criteria were also revised to ensure they accurately reflected LLAL's strategic objectives for the Project. In Sift 2 for example, it was considered that additional deliverability and operational viability criteria should be included, compared with Sift 1.

- Agreed a set of common assumptions upon which the technical leads would appraise the options, supplemented by specific technical assumptions where applicable.
- Revised the assessment levels to include an eighth level of distinction of 'Currently Unworkable' (see below for further detail).
- Identified which other disciplines they would need to liaise with to ensure that their appraisals were based on the relevant information.

2.4.3 The development of the criteria and sub-criteria are set out in Chapter 3 in more detail.

2.4.4 Sift 2 was conducted on the basis of the following assumptions:

- All options to assume a capacity of up to 36-38mppa, based on information available at the time of the sift process, and required infrastructure to support this capacity.
- All options to focus on containing as much of the future development and impact within the area of LLAL land ownership.
- All options assumed to include reasonable embedded and good practice mitigation (e.g. a code of construction practice), but not additional mitigation (for example, new link roads on land outside of LLAL ownership) for the purposes of this sift.
- Land within LLAL ownership also includes the new business park development proposed at New Century Park which is assumed to be built out according to the current planning application (application ref. 17/02300/EIA).
- For the purposes of the Sift 2 appraisal, all options were assumed to receive the benefit of an extension to the recently consented Luton Direct Air-Rail Transit (DART) system from Luton Airport Parkway Station which is now under construction. Any extensions to the current DART route which would be needed to serve each option could be materially different for each option and will be considered further in Sift 3.
- However, renewable energy sources (photovoltaics, etc.) would not be shown on the drawings as it is assumed the effect would be the same for all options.

2.4.5 As with Sift 1, an evaluation system with seven levels of distinction of 'red amber green' (RAG) was applied, adapted from the Department for Transport's (DfT) Analysis Guidance (WebTAG) (Ref 2.1). This has been modified for Sift 2 to include an eighth level of distinction reflecting a score of 'Currently Unworkable' where the potential impact of an option on a criterion is deemed to be greater than a 'Large Adverse'

scoring, and where the impact cannot be mitigated or be worked around given current constraints. Any option which is appraised with one or more 'Currently Unworkable' scores would be discontinued and no longer pursued for further consideration. Any option which is discontinued could still be revisited at a later date if current constraints are removed (e.g. change in planning policy) or if the shortlisted options remaining after Sift 2 or Sift 3 are deemed to be unworkable once further work on them has been undertaken.

2.4.6 In addition, numerical values were assigned to each appraisal level, as shown in **Table 2.1**. These numerical values were used to support the qualitative assessment of options by enabling the aggregation of the criteria being assessed and facilitating comparison between options. Whilst the cumulative scores are not definitive, they are considered more appropriate for Sift 2 compared to Sift 1 given the greater level of detail being considered, the greater granularity of assessment being undertaken and the need to be able to assess finer distinctions between the performance of the different options.

Table 2.1 Appraisal levels

Appraisal Level	Scoring
Large Beneficial	20
Moderate Beneficial	10
Slight Beneficial	5
Neutral	0
Slight Adverse	-5
Moderate Adverse	-10
Large Adverse	-20
Currently Unworkable	-20

2.5 Appraisal of the options

2.5.1 The technical leads responsible for each of the sift criteria undertook a qualitative appraisal, utilising their professional judgement, of the four options based on information available at the time of Sift 2. This included conceptual layouts and a characteristics grid setting out the physical attributes of each option (see **Chapter 3**).

2.5.2 Each technical lead appraised each of the options, assessing them as one of the eight appraisal levels identified in **Table 2.1** based on their professional judgement of how the option performed against the defined sub-criteria, and in comparison to the other options. Each family of options would be compared against the base case scenario and where appropriate, against each other to establish relative performance and ensure consistency in the appraisal process.

2.5.3 The appraisal rationale for each criteria and option are set out in **Chapter 4**, culminating in overall outcomes in **Chapter 5** with recommendations on which options should be progressed or discontinued.

2.6 Consideration of alternative approaches to scoring

2.6.1 It was agreed by the team that weighting of criteria would not be adopted as part of the sift process. The agreed set of criteria and sub-criteria were carefully selected and worded to ensure that they fully represented the breadth of LLAL's strategic objectives (i.e. in relation to economic, social, sustainability and environment, surface access, deliverability, operational viability and cost factors) without the need to include weighting in the process, which could be deemed to be subjective during the appraisal process.

2.6.2 In terms of the appraisal itself, the team considered giving each individual sub-criterion an appraisal level, rather than an overall judgement on the overarching criteria as a whole, but this was considered too detailed an approach for this stage of the sift process and inappropriate for the level of information available at the time in terms of detailed design.

2.6.3 It was also agreed by the team that professional judgement would be the most appropriate method for deciding which level of RAG should be attributed to each criterion, as this differs for each technical discipline, and sub-criterion, rather than predetermining what should constitute a 'Large Beneficial' or 'Large Adverse' for example. The basis for the professional judgement applied to each criterion is included in the summary of the rationale for the appraisal of each option against the relevant criteria in **Chapter 5.**

3 CRITERIA DEVELOPMENT

3.1 Overview

3.1.1 This section sets out the agreed criteria and sub-criteria and the scope of each appraisal.

3.2 Criteria and sub-criteria

3.2.1 As stated in the Sift 1 report, a number of key aviation documents and LLAL's Vision Statement have informed the development of the sift process. These included documents setting out the Government's current and emerging policies for aviation and additional guidance on the appraisal of aviation proposals as follows:

- Aviation Policy Framework 2013 (Ref 3.1) – including guidance to make better use of existing runway capacity at all airports;
- Aviation Strategy, Call for Evidence July 2017 (Ref 3.2) – including a requirement for more intensive use of existing airport capacity and minded to be supportive of all airports who wish to make best of use of their existing runways; and
- Draft Airports National Policy Statement (NPS) October 2017 (Ref 3.3) – including reference to best use of existing airport infrastructure and supportive of all airports who wish to make best use of their existing runways, a policy confirmed in the subsequent Airports NPS June 2018 (Ref 3.4).

3.2.2 The Airports Commission Appraisal Framework (Ref 3.5) and guidance document on sift criteria sets out the importance of taking an integrated approach to the development of growth options for airports which considers the full range of relevant factors. This includes economic, social, environmental and operational issues and the potential effects of aviation connectivity and infrastructure at a range of spatial levels. Further detail is set out in the Sift 1 Report.

3.2.3 **Table 3.1** overleaf sets out the agreed sift criteria for Sift 2 and how they relate to the strategic objectives as agreed at Sift 1, before going on to explain the rationale of selection and the scope of appraisal for each criteria. **Appendix A** outlines the refinement made to the criteria following Sift 1, responding to the additional information available at the time of Sift 2.

Table 3.1 Strategic objectives and criteria and sub-criteria for Sift 2

	Strategic Objective	Sift Criteria number	Sift Criteria	Sub-Criteria
Strategic fit	O1: Compliance with Government Aviation Policy	S1	Consistent with making best use of the existing runway	• Does the option use the existing runway or propose a new runway? • Does the option require modifications to the existing runway – alignment or length? • Would the option have implications for the deliverability of the proposed Northwest runway at Heathrow as supported by Government policy (NPS)? • Would the option support the Government's consumer objectives? • Would the options support the delivery of a competitive aviation sector?
	O2: To identify a scheme that is likely to be capable of being consented and secured through a DCO	S2	In broad conformity with national and local town planning policies and capable of attracting the consents required	• Does the proposal meet National Planning Policy and Local Planning Policy sufficiently to support the grant a DCO, having regard to s104 of the Planning Act 2008, and the need to have regard to the Local Impact Report(s) and all relevant matters, including National and Local planning policies.
	O3: To provide additional capacity and connectivity in line with the assessment of need	S3	Increase capacity both airside and landside to achieve target increase up to 36-38mppa	• Capacity to be provided in each subsystem: – Runway – Apron – Terminal • Ability to phase in line with demand will be a key consideration.
Economic	O4: To maximise the potential economic benefits to the regional, sub-regional and local economies	S4	Deliver economic benefits nationally and regionally	• Benefits to Users (journey time and air fare savings due to availability of choice and more routes) known as Transport Economic Efficiency • Producer Benefits (increased income to airlines, airport operators) • Wider Connectivity Benefits (trade, tourism, inward investment) via improved road and rail infrastructure

	Strategic Objective	Sift Criteria number	Sift Criteria	Sub-Criteria
		S5	Increase job opportunities for the people of Luton and the surrounding areas	• How many jobs could be created regionally, sub-regionally (three counties) and locally (Luton)? • What type of jobs could be created and retained – skilled jobs (higher paid) in Luton (permanent jobs)?
Social	O5: To maintain and where possible improve the quality of life for Luton's residents and the wider population	S6	To promote quality of life and minimise adverse impacts on communities	• Does this option improve quality and choice of employment and training opportunities? • Does this option reduce adverse effects of unemployment, low income and job insecurity? • Does this option avoid direct impacts on, and maintain access to, existing community facilities? • Does this option preserve the amenity of residential areas and enjoyment of community facilities and outside spaces? • Does this option protect and promote public services that support quality of life and wellbeing? • Does this option promote positive equality impacts and minimize the potential for adverse equality impacts for groups with protected characteristics or communities that experience high levels of socio-economic deprivation?
Sustainability and Environment	O6: To minimise environmental impacts and, where practicable, to actively mitigate and manage any potential environmental effects	S7	Noise impact	• Does this option minimise the number of people exposed to the adverse impacts of noise? Including consideration of: – Site preparation noise and vibration – Construction noise and vibration – Noise from HGV traffic associated with site preparation and construction phases – Aviation noise (aircraft approaches and departures) – On-site ground noise (i.e. aircraft taxiing, on-site road infrastructure, parking facilities etc.)
		S8	Air quality	• Is this option likely to cause an exceedance of any air

	Strategic Objective	Sift Criteria number	Sift Criteria	Sub-Criteria
				quality objective? • Is this option likely to delay compliance with EU limit values as calculated by the government using the PCM model? • Will this option have adverse or beneficial impacts on human receptors? • Does this option minimise the number of people exposed to poor air quality? • Will this option have adverse or beneficial impacts on ecological receptors?
		S9	Natural habitats and biodiversity	• Are there any internationally, nationally or locally protected/designated nature conservation sites affected? • Will priority habitats identified in national legislation and local policy/guidance be impacted? • To what extent are populations of protected/notable species likely to be affected? • To what extent can effects be managed and mitigated? • What opportunities are likely to improve ecological connectivity and provide enhancements?
		S10	Carbon emissions	• Does this option minimise the GHG emissions from the proposed project (against the current status) during its construction, in its operation and its surface access with a focus on: – The loss of a carbon sink due to land use change; – Construction activities and embedded carbon in materials; – Airport buildings and infrastructure operations i.e. energy consumption, water supply, waste water, waste disposal; – Airport operated vehicles including those owned by third party operators (airside/landside); – Surface access journeys (passengers, freight, employees); and

	Strategic Objective	Sift Criteria number	Sift Criteria	Sub-Criteria
				– Aircraft (during landing take-off cycle, cruise emissions).
		S11	Water Resources	• Does the option have any direct/indirect impacts on water quality in surrounding watercourses, particularly where Water Framework Directive status may be compromised? • Does the proposed option have the potential to affect any groundwater receptors, such as through dewatering or impacts on groundwater quality? • Will the option have any direct/indirect effects on water abstractions (Groundwater and surface water) and Source Protection Zones?
		S12	Flood risk	• Does the option encroach on any areas at risk of flooding from surface water, rivers, artificial water bodies or groundwater? • Does the option have the potential to pose any increase in flood risk to receptors located in the vicinity of the site? • To what extent can any potential impacts on flood risk be appropriately managed?
		S13	Cultural Heritage	• Does the option seek to minimise adverse effects on the significance of internationally and nationally designated heritage assets and their settings? • Does the option affect other heritage assets? • To what extent can effects potentially be managed and mitigated?
		S14	Landscape and visual impact and environmental land use	• Does this option impact, protect or enhance designated landscapes or townscapes? • Does this option affect the visual amenity of potentially sensitive visual receptors (e.g. those recreating in the surrounding landscape; those visiting historic buildings; etc.)? • Does this option affect locally sensitive landscape features (e.g. ancient

	Strategic Objective	Sift Criteria number	Sift Criteria	Sub-Criteria
				woodlands, historic hedgerows, etc.) or contributors to landscape value (e.g. public access, etc.)? • Does this option affect the character of the landscape/townscape or the perceptual characteristics of surrounding landscape/townscape character areas? • To what extent can effects on landscape or visual amenity be managed and mitigated? • Is this option likely to result in the loss or damage to best and most versatile agricultural land (i.e. ALC Grades 1, 2 or 3a)? • Does this option affect local farm businesses (effects on sustaining a rural economy and on individual farmers and their farming operations)? • Does this option affect soil (inc. topsoil and subsoil) as a finite resource? • Does this option affect rural land designations (e.g. Agri-Environment Schemes or Nitrate Vulnerable Zones)? • To what extent can effects on land use be managed and mitigated?
		S15	Climate change	Climate Change Resilience: Does this option reduce the following climate change risks related to the proposed project during its construction, its operation and its surface access? • Impact of extreme high temperature leading to damage of buildings/infrastructure and interruption of activities during construction and operation • Impact of increased number of heavy precipitation events leading to flash flooding events/surface water issued during construction and operation • Impact of increased flood risk associated with land use changes and number of heavy precipitation events

	Strategic Objective	Sift Criteria number	Sift Criteria	Sub-Criteria
				• Impact of increase in intensity and occurrence of storms/extreme weather events (including extreme wind) leading to damage of buildings/infrastructure and interruption of activities during construction and operation • Impact of increased seasonality (e.g. wetter winters, drier summers) • Impact of increase in mean temperatures For the purpose of Sift 2, In-combination Climate Change Assessment (ICCA) has not been evaluated due to insufficient information available from the interdependent criteria
Surface Access	O7: To maximise the number of passengers and workforce arriving at the airport on public transport	S16	Public transport modal share	• Can the Luton DART be extended to increase modal share? • Can bus services be increased to accommodate a larger PT modal share? • Can more coach services be accommodated to increase PT modal share? • Can walking and cycling be accommodated to increase modal share? • Can landside forecourt layout provision accommodate all traffic increase – PT and others? • What is an appropriate PT modal share target/ aspiration?
	O8: To minimise new build highway requirements	S17	Requirement for additional highway infrastructure	• Are new highways needed to accommodate the proposals generated traffic? • What is the magnitude of these highway proposals? • Can forecourt highway links be accommodated in an efficient manner? • How well can it link with proposed new highway solutions in the vicinity?
	O9: To minimise impact on the wider highway network	S18	Impact on wider highway network	• Will highway capacity show problems in accommodating additional traffic levels before mitigation? • Can mitigation be provided within highway or airport owned land, or do areas of mitigation require third party land? • How many links and

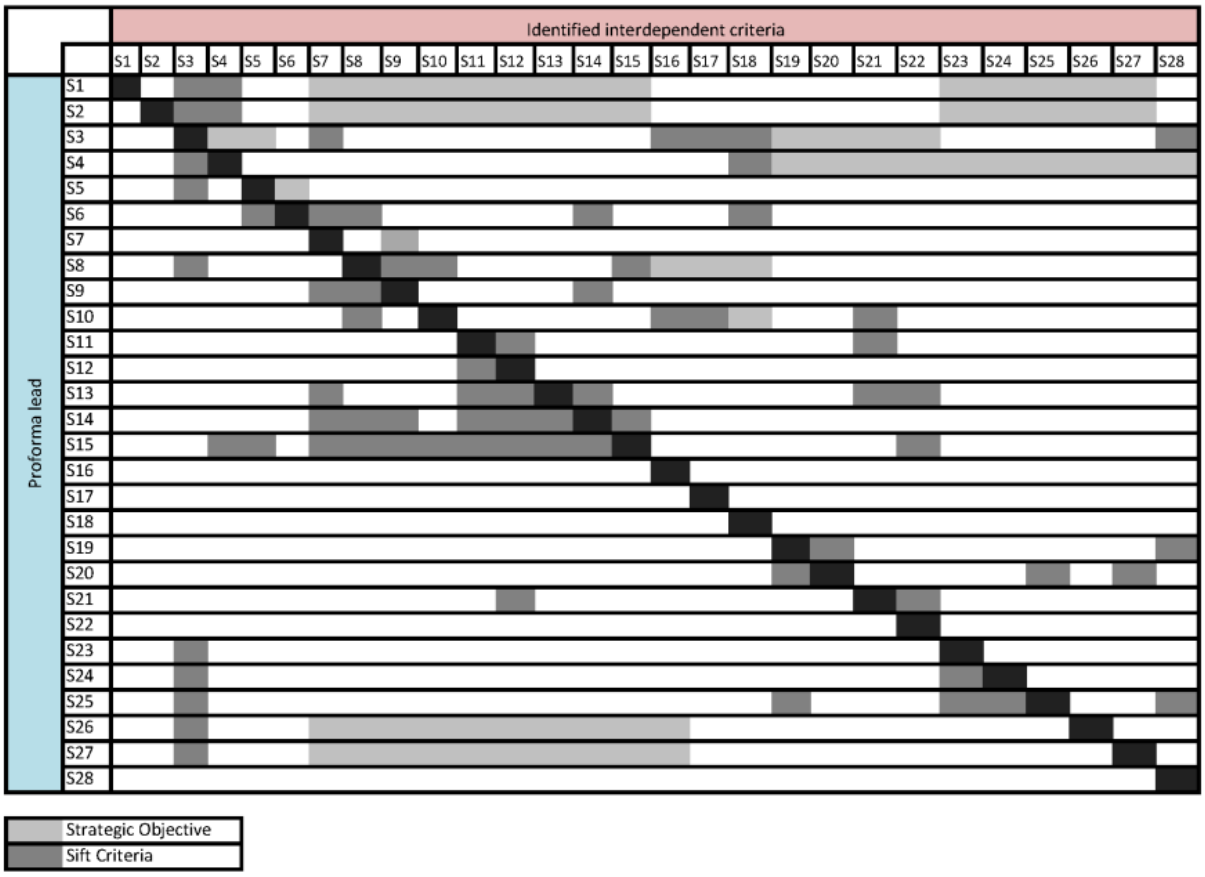
	Strategic Objective	Sift Criteria number	Sift Criteria	Sub-Criteria
				junctions might require mitigation • Can car parking be accommodated on airport land?
	O10: To be technically viable, taking account of the needs of airport users, operators and phasing	S19	Deliverable within the context of the current concession to 2031	• Deliverable without impacting substantially on current concession boundary • Impact on additional land leased by LLAOL • Can the option be phased so as to meet demand until a new concession is in place
		S20	Attractive to future concessionaires	• Cost of works and timing relative to income • Can the option be phased to align with income • Opportunities for additional revenue generation, e.g. from Maintenance, Repair and Overhaul (MRO), Business Aviation, ancillary facilities • Does the scheme provide sufficient flexibility from a design and operational perspective, for future concessionaires and airlines
		S21	Feasibility of landfill, earthworks and ground conditions	• What extent does this option use geological resource i.e. aggregate? • To what extent does this option present a potential pollution risk to water or soil quality? Can this be mitigated? • To what extent does this option require landfill waste to be excavated • To what extent does this option reuse excavated materials? • Does this option improve the contamination conditions of soil/groundwater? • Extent of construction risks to environment and health of local residents? • Does this option generate large volumes of waste or problematic waste (e.g. hazardous or landfill waste) in construction, operation and decommissioning that cannot be effectively managed locally? • To what extent does it rely on large volumes of non-

	Strategic Objective	Sift Criteria number	Sift Criteria	Sub-Criteria
				renewable materials for its construction? • How do each of the options relate to waste operations?
		S22	Additional land required beyond current LLAL holdings	• Does the proposed layout and the earthworks needed to support it directly occupy land not owned by LLAL • Will the earthworks required to win material involve land not owned by LLAL • Do the proposed access routes and the earthworks needed to support them directly occupy land not owned by LLAL
Operational Viability	O11: To enhance LTN's system efficiency and resilience	S23	Operational effectiveness	• How efficient is the layout • Delays to airlines • Passenger experience
		S24	System resilience	• Resilience to operational disruption • Resilience in the broader infrastructure (road and rail) • Extent of resilience improvement
		S25	Attractiveness to airline operators	• Impact on airline delays • Impact on airport charges and cost of operation • Resilience to operational disruption • Attractiveness to passengers • Flexibility to adapt to airlines changing requirements • Flexibility to adapt to airline operational requirements (ie parking/offices) • Ability to accommodate based carriers
		S26	Safeguarding for expansion	• Flexibility in expansion • Safeguarding for requirements past 2040
		S27	Safeguarding existing levels of MRO, Business, Aviation and Cargo activity	• Maintain slots and land for MRO, business aviation and cargo to minimise disruption and maintain existing operations
Cost	O12:To be affordable including any public expenditure that may be required and taking account of the needs of airport	S28	Estimated cost benefit	• Capex expenditure • Affordability of scheme

	Strategic Objective	Sift Criteria number	Sift Criteria	Sub-Criteria
	users and operators (Value for Money)			

3.2.4 The interdependencies between the criteria set out in **Table 3.1** are highlighted in **Figure 3.1** overleaf which was intended to enable cross-cutting criteria to take into consideration other criteria during the appraisal process. This Interdependency Matrix was also used to help prevent overlap between the criteria, such as groundwater pollution risks associated with the landfill, to minimise double counting.

Figure 3.1 Interdependencies between criteria



3.2.5 As stated in **3.2.3,** the section below will explain the rationale of selection, the general scope of appraisal for each criterion and the sub-criteria identified by the technical leads. For clarity, this is set out under each strategic objective, with the key policies, strategies and guidance referenced in **Appendix B.** More specific detail or assumptions is included with each appraisal table where necessary in **Chapter 5**.

Strategic Objective O1: Compliance with Government Aviation Policy

3.2.6 The Airport NPS (June 2018) stated in Paragraph 1.37 that the Government "was minded to be supportive of all airports who wish to make best use of their existing runways". This policy built on the 2003 Future of Aviation White Paper which first outlined, *"the first priority is to make the best use of the existing runways, including remaining capacity at Stansted and Luton",* the 2013 Aviation Policy Framework, and more recently DfT's paper 'The future of UK aviation: Making best use of existing runways' published in June 2018.

3.2.7 As a consequence, sift criterion *S1: Consistent with making best use of the existing runway* sought to identify whether the option family required modification, whether to alignment or length, of the existing runway. Based on the strategic objective to be compliant with Government aviation policy, criterion S1 also considered the implications of the deliverability of the project against the proposed northwest runway at Heathrow, the Government's consumer objectives and the overall support the option provided to the delivery of a competitive aviation sector.

Strategic Objective O2: To identify a scheme that is likely to be capable of being consented and secured through a DCO

3.2.8 Sift criterion *S2: In broad conformity with national and local town planning policies and capable of attracting the consents required* appraised each option family's conformity with National and Local Planning polices to the extent that they could sufficiently support the grant of a Development Consent Order. Criterion S2 therefore considered the Luton Local Plan (2017); The North Hertfordshire and Central Bedfordshire Local Plans; Green Belt Policy in the National Planning Policy Framework (NPPF) and the "very special circumstances" Green Belt test.

Strategic Objective O3: To provide additional capacity and connectivity in line with the assessment of need

3.2.9 The Business Case for the Future LuToN project focuses on increasing the capacity of LTN to 36-38mppa. Sift criterion *S3: Increase capacity both airside and landside to achieve target increase up to 36-38mppa* focused on the ability of the option

families to be phased to provide this additional capacity in line with demand. The overall capacity assessment was based on the IATA Airport Development Reference Manual and using Simulation modelling with standard 10 minute delay criterion adopted for scheduling purpose, and looked into identified capacity in each of the Runway, Apron and Terminal subsystems.

Strategic Objective O4: To maximise the potential economic benefits to the regional, sub-regional and local economies

3.2.10 Sift criterion *S4: Deliver economic benefits nationally and regionally* derived its sub-criteria on the metrics used to assess wider economic impacts developed by the Airports Commission and based on Aviation WebTAG. As a result, the criterion focuses on: benefits to users, producer benefits (increased income to airlines, airport operators) and wider connectivity benefits via improved road/ rail infrastructure. This criterion is separate from S5 as it considers the wider economic benefits of the airport expansion rather than the local economic impact considered in the latter. The sub-criteria for sift criterion *S5: Increase job opportunities for the people of Luton and the surrounding areas* were therefore based on the principles of Economic Impact Assessments, such as the forecast impact of a project compared to a counterfactual 'base case', the Luton Skills and Employability Policy/Luton Investment Framework and the SEMLEP Economic Strategy. As a result, the sub-criteria include consideration of how many jobs and of what type are likely to be created and retained during the expansion.

Strategic Objective O5: To maintain and where possible improve the quality of life for Luton's residents and the wider population

3.2.11 Sift criterion *S6: To promote quality of life and minimise adverse impacts on communities* responded to the strategic objective to maintain, and where possible improve, the quality of life for Luton's residents and the wider population. The criterion appraised the extent to which the option families: improve the quality and choice of employment and training opportunities; reduce adverse effects of unemployment, low income and job insecurity; preserve the amenity of residential areas; and promote the access and enjoyment of community facilities. The sub-criteria also included specific consideration of the potential equality impacts for groups with protected characteristics and communities that experience high levels of socio-economic deprivation. The sub-criteria responded to the Infrastructure Planning (Environmental Impact Assessment) Regulations (2017) and the requirement to consider the direct and indirect significant effects of projects on 'population and human health', alongside Luton Borough Council strategies such as the Health

Inequalities Strategic Plan (2015-2020) and the Skills and Employability Strategy (2016-2020) amongst others.

Strategic Objective O6: To minimise environmental impacts and, where practicable, to actively mitigate and manage any potential environmental effects

3.2.12 Strategic objective O6 focused on the environmental impacts of the four option families and is comprised of nine sift criteria. These include consideration of potential impacts on: noise; air quality; natural habitats and biodiversity; carbon emissions; water resources; flood risk; cultural heritage; landscape and visual impact and environmental land use; and resilience to climate change. As a strategic objective therefore, the set of criteria are largely informed by the likely scope of the Environmental Impact Assessment (EIA) to be undertaken as part of the DCO process, with each criterion defined by the respective technical discipline.

3.2.13 With reference to the LTN Noise Action Plan 2013 – 2018 and the DfT's TAG Unit 3, Environmental Impact Assessment guidance, sift criterion *S7: Noise impact* sought to minimise the number of people exposed to the adverse impacts of noise. This process included consideration of noise and vibration stemming from: site preparation, construction, heavy good vehicle (HGV) traffic, aviation and other on-site ground activities.

3.2.14 Sift criterion *S8: Air quality* appraised each option for its likelihood of causing: an exceedance of any air quality objective; delayed compliance with EU limit values (Pollution Climate Mapping – PCM - model calculated); or an adverse or beneficial impact on human and ecological air quality receptors. The appraisal therefore makes reference to Defra's policy and technical guidance, Institute of Air Quality Management (IAQM) guidance on assessment and the Airport Commission Appraisal Framework.

3.2.15 Sift criterion *S9: Natural habitats and biodiversity* looked at the extent to which protected and notable species, as well as internationally, nationally and locally protected/ designated nature conservation sites, are likely to be impacted in the four option families. The criterion makes reference to the Chartered Institute of Ecology and Environmental Management (CIEEM) (2016) Guidelines for Ecological Impact Assessment in the UK and Ireland, national policies and local biodiversity action plans and the ODPM Circular 06/2005 – Biodiversity and Geological Conservation.

3.2.16 Sift criterion *S10: Carbon emissions* appraised the estimated Greenhouse Gas emissions during the construction and operational phases of the four option families. The sub-criteria

are based on the IEMA "Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emission and Assessing their Significance"; the 2017 revised EIA requirements for climate change assessment; and the WebTAG: Tag unit A5-2 aviation appraisal.

3.2.17 Sift criterion *S11: Water resources* sought to appraise the four option families' direct and indirect impacts on: surrounding watercourses; groundwater receptors and quality; water abstraction and dewatering. It also covered Source Protection Zones and the impact of abstraction of groundwater in the area, making reference to the Luton Local Plan Policy LP36, preliminary Flood Risk Assessments and the Luton Surface Water Management Plan and Water Cycle Strategy.

3.2.18 Sift criterion *S12: Flood risk* aimed to consider the options' encroachment on any areas at risk of flooding from surface water, rivers, artificial water bodies or groundwater, and the extent to which they pose a risk to receptors located in the vicinity of the site. As a result, the criterion built on a similar body of policies, strategies and Guidance to S11.

3.2.19 Sift criterion *S13: Cultural heritage* looked at the potential effect of options on internationally and nationally designated heritage assets and their settings. The appraisal also considered the extent to which their impact can be mitigated or managed using benchmarks derived from the Planning Practice Guidance, NPPF and the Ancient Monuments and Archaeological Areas Act, alongside Historic England's preservation principles and Good Practice Advice.

3.2.20 Sift criterion *S14: Landscape and visual impact and environmental land use* appraised the four options for their impact on designated landscapes or townscapes, sensitive visual receptors and landscape value features. The criterion also appraised the options relative impact on agricultural land, including soil and rural land designations, and the extent to which both environmental land use and landscape impacts can be mitigated. It is therefore influenced by guidelines for Landscape & Visual Impact Assessment (GLVIA3), the Ministry of Agriculture, Fisheries and Food Agricultural Land Classifications, Natural England's Technical Information Note 049 (2012) Best and Most Versatile Agricultural Land and the Soil Action Plan for England. There is a link between Criteria S21 and 22, which considered land in the environmental and planning sense respectively.

3.2.21 Sift criterion *S15: Climate change* considered the extent to which the options reduce climate change risks during construction, operation and surface access phases. These risks included the impact of extreme high temperatures; increased heavy precipitation events and flash flooding; land use associated flood risk; increased intensity and occurrence of

extreme weather events; increase in mean temperatures and seasonality. The appraisal was influenced by the IEMA guide to climate change resilience and adaptation, Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment, the Climate Change Act and the fifth carbon budget for the UK and the LTN Climate Change Adaptation Report.

Strategic Objectives O7-O9: To maximise the number of passengers and workforce arriving at the airport on public transport; To minimise new build highway requirements; and To minimise impact on the wider highway network

3.2.22 An increase in capacity at LTN impacts the existing surface access arrangements of the airport and is a significant consideration in the selection of a preferred option. Strategic objectives 7, 8 and 9 therefore considered the potential public transport access opportunities in each option, the impact on the wider highway network and the magnitude and scale of new build highway requirements.

3.2.23 Sift criterion *S16: Public transport modal share* appraised the options on their public transport accessibility and their anticipated walking/ cycling modal share. The criterion therefore responds to local planning policies and aspirations, the DfT Transport Assessment Guidance (TAG) and the Manual for Streets.

3.2.24 Sift criterion *S17: Requirement for additional highway infrastructure* and *S18: Impact on wider highway network* also made reference to key policies, strategies and guidance but were also informed by the technical lead's knowledge and previous experience of working in the area, including knowledge of the airport and its adjoining highway network. This included knowledge on peak hour constraints and potential increases in airport volumes to help generate the view on additional highway infrastructure which was taken as part of this appraisal. In addition, some limited Junction 10 modelling was undertaken to assist, with Criterion S18 seeking to minimise the impact that proposal-generated traffic would have on the wider highway network, including consideration of overall capacity, parking and the level of mitigation required on third party land.

Strategic Objective O10: To be technically viable, taking account of the needs of airport users, operators and phasing

3.2.25 Sift criterion *S19: Deliverable within the context of the current concession to 2031* and *S20: Attractive to future concessionaires* aimed to ensure the options were deliverable without impacting substantially on the current concession boundary and prevent potential undue complexity for the new

concessionaire by being phased to meet demand until a new concession is in place. As a result, the two criteria are focused on delivery and split to appraise the suitability of the options to the two groups of current and future concessionaires.

3.2.26 These criteria therefore considered the boundaries, rights and liabilities in the current concession agreement and other areas leased by LLAOL.

3.2.27 When the current concession comes to an end in 2031, a new agreement will be formed and sift criterion S20 appraised the attractiveness of the four option families to any future concessionaires. The sub-criteria of this criterion focused on the appropriate phasing and cost of construction relative to income, alongside any opportunities for additional revenue generation through maintenance, repair and overhaul (MRO), business aviation and other ancillary airport facilities.

3.2.28 As highlighted in the consideration of Criterion S15 above, the four option families require differing levels of earthworks, with considerations including the feasibility of building on landfill and the implications on ground conditions. The sub-criteria for *Criterion S21: Feasibility of landfill, earthworks and ground conditions* therefore include, amongst others, the quantum of landfill waste to be excavated, the re-use of aggregates and the extent of construction risk to the environment. The criterion builds on standards and guidance, with respect to earth works design, from EU landfill directives; Environment Agency Principles; Defra and CI:AIRE guidance; and the British Standard Code of practice for the investigation of potentially contaminated land. Sift criterion *S22: Additional land required beyond current LLAL holdings* also considers land and complements the land-based sub-criteria in S17 by identifying the elements of the proposed layouts, including the earthworks needed to support it and access routes, which occupy land not owned or optioned by LLAL.

Strategic Objective O11: To enhance LTN's system efficiency and resilience

3.2.29 One of the strategic objectives supported in Luton's vision statement is to improve the system efficiency and operational effectiveness of LTN. Criteria S23, 24 and 25 targeted an International Air Transport Association (IATA) level of service C (or equivalent, denoting a good Level of Service, conditions of stable flow, acceptable delays and good levels of comfort) to reduce delays to airlines, improve passenger experience and ensure efficient operations in the future through the spatial distribution of the airport.

3.2.30 Each Criterion took a different aspect of this, with Criteria S23 and 24 focusing on operation effectiveness and system resilience respectively, both in absolute terms and compared to

the existing scenario. *Criterion S25: Attractiveness to airline operators* considered the attractiveness of options to passengers, airport charges and the cost of operation.

3.2.31 The final criteria under strategic objective 11 focused on safeguarding for the future. The Aviation Strategy Call for Evidence (2017) envisages longer term growth to 2050 and beyond, with paragraph 2.10 stating that "the Aviation Strategy will consider how the need for further growth should be treated beyond the additional runway that is required by 2030." Sift criterion *S26: Safeguarding for expansion* therefore recognises the need to safeguard for airport requirements beyond 2040, with S27 focused on retaining existing levels of MRO; Business Aviation and Cargo activity in the future airport layout. These activities both facilitate the airport and provide additional sources of revenue for future airline operators and local employees and are important considerations in the Future LuToN project.

Strategic Objective O12: To be affordable including any public expenditure that may be required and taking account of the needs of airport users and operators (Value for Money)

3.2.32 The final strategic objective considered during Sift 2 process was an initial and indicative appraisal of the relative cost benefit relationship of the proposed options, given information available at this stage, incorporating: the likely relative level of investment required; impact of each option family on operational costs; and the likely comparative derived qualitative and quantitative benefit.

4 OPTION DEVELOPMENT

4.1 Overview

4.1.1 Following Sift 1, the options remaining under consideration were developed further by the design team. The appraisals in Sift 2 therefore respond to a greater level of design information available. This chapter starts with a recap of the common policy and spatial issues as set out previously in the Sift 1 report, before describing the four refined options as appraised in Sift 2.

4.2 Summary of policy and spatial issues

4.2.1 There are a range of spatial and policy issues which have informed the appraisal of options for LTN, aside from the complex design requirements of new airside and landside facilities. Whilst the specific requirements of designing an airport have not been covered in this report, they have underpinned the development of the option families as described later in this chapter.

4.2.2 We have summarised below the most relevant spatial issues in relation to the appraisal for the sift process, to provide an overview of the context for the appraisal rationales as set out in the following chapter. It is important to note that all of the spatial issues are interlinked and interdependent, so the role of the sift process is to synthesise these issues for the purposes of appraisal. The main spatial issues are described and illustrated on **Figure 4.1** overleaf, but this is not intended to be an exhaustive list or diagram.

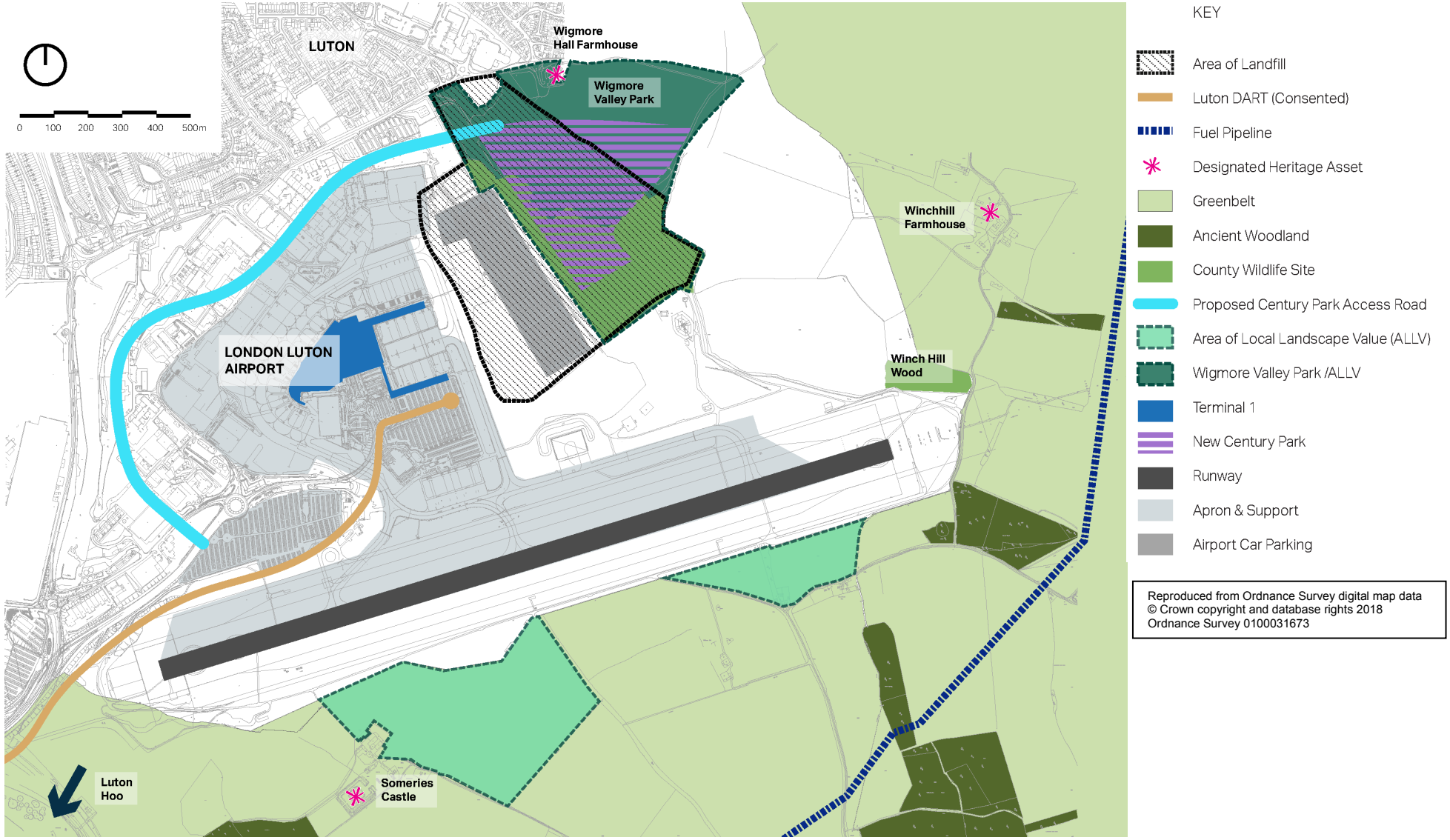
Policy

4.2.3 The issues here relate in particular to our 'Strategic Fit' criteria which focus on fit with Government Aviation policy (S1), national town planning policy (S2) and capacity of options (S3).

4.2.4 In local planning policy terms, the Luton Local Plan 2011-2031 (Ref 4.1) defines a strategic policy boundary for the growth of the Airport (Policy LLP6) which seeks to make provision for the airport, safeguarding its "key sub-regional economic contribution to jobs and wealth creation while setting a clear environment and transport framework with which to regulate future growth" (paragraph 4.5.1).

4.2.5 The Local Plan allocation is broadly contiguous with the start of the Green Belt, which applies to the south and east of the Airport, as shown in **Figure 4.1** overleaf.

Figure 4.1 Illustrative key site issues map



4.2.6 The Government attaches great importance to preserving Green Belts, with the fundamental aim of the policy being that of prevention of urban sprawl from large built up areas and safeguarding the countryside between neighbouring towns. Development of the type envisaged by this Project should not be approved on any Green Belt unless very special circumstances can be demonstrated (paragraph 143 of the NPPF 2019, Ref 4.2).

Economic and social

4.2.7 Issues which relate to economic and social criteria (S4 to S6 inclusive) are closely related to environmental and surface access issues (see below), in terms of the potential impacts on health, wellbeing, access to employment and training opportunities and leisure opportunities. As such, they are not mapped separately on **Figure 4.1**.

Environment

4.2.8 The issues here relate in particular to our sustainability and environment criteria (S7 to S15 inclusive).

4.2.9 There are a wide range of environmental factors which have informed the appraisal of options, including but not limited to the following:

- *Natural habitats* - such the Wigmore Park County Wildlife Site (CWS), Winch Hill Wood CWS and Local Wildlife Site, Ancient Woodland, as shown on **Figure 4.1** and other known habitats such as badger setts and bat roosts (not shown on Figure 4.1);
- *Designated heritage assets* – including Someries Castle (Scheduled Monument); Wigmore Hall Farmhouse and Winchhill Farmhouse (Grade II listed buildings) as shown on **Figure 4.1** and Luton Hoo (Grade 1 listed building)(outside of the area shown on Figure 4.1), as well as areas of high archaeological potential to the north-east of the site. The potential visual impact of development on the setting of these heritage assets and others needs to be carefully considered;
- *Earthworks and landfill* – this is relevant as the impact of building over landfill (piling would be required within landfill) and creating an earthworks platform needs to be considered in terms of costs, and because disturbance to landfill can potentially increase the risk of groundwater pollution. The area of landfill is shown on **Figure 4.1**. A range of earthwork activities will need to be carried out regardless of the chosen option but sourcing the earth required will be the main issue; and

- *Locally and nationally designated landscape areas* – including locally designated Areas of Local Landscape Value (ALLV)(shown on **Figure 4.1**) or Areas of Great Landscape Value (AGLV) and designated Areas of Outstanding Natural Beauty (Chilterns AONB)(both outside of the area shown on Figure 4.1). The landscape and visual impact of development on these areas needs to be considered, as does the effect on open space green infrastructure and the Green Belt. There may also be a number of visual receptors susceptible to change in views and visual amenity.

4.2.10 There are other considerations which are not mapped here such as noise and air quality receptors (proximity to), which were also part of the appraisal process and which will also influence the appraisal of social criteria.

Surface access

4.2.11 The issues here relate in particular to surface access criteria (S16 to S18 inclusive). There are existing surface access issues and there are also proposed projects which need to be taken into consideration during the appraisal as they impact on the options.

4.2.12 In terms of existing surface access, the main priority is to make the best use of existing highways infrastructure, providing improvements to mitigate any identified airport expansion impacts, and to assess the need for new highway links and junctions. Roads infrastructure will need to be provided on the site with improvements to some local roads and junctions.

4.2.13 Looking to the future there is a need to consider how the options affect the potential to introduce measures to boost the share of airport associated trips by means other than the private car, with a particular emphasis on increased travel by public transport, both rail and road based.

4.2.14 In terms of forthcoming surface access projects already proposed, there are two which need to be considered and which are mapped on **Figure 4.1**:

- *Century Park Access Road (CPAR*) – Century Park is an undeveloped site adjacent to and east of LTN that is identified as a major site for employment development with Luton Borough Council's (LBC) Local Plan. It was acquired by LLAL in 2015. The CPAR is a proposed new road around the airport to support the proposed development at New Century Park.
- *Luton Direct Air-Rail Transit (DART)* – Luton DART will be a new fully-automated transport system, approximately 2.1km in length, to move passengers between Luton Airport Parkway station and the airport terminal. The system is

scheduled to become operational by 2021. It is envisaged that this would need to be extended and linked to the new terminal, whichever option is developed, and its alignment interface with proposed airfield and terminal options needs to be considered.

Operational

4.2.15 The issues here relate in particular to our deliverability, operational viability and cost criteria (S19 to S22 inclusive).

4.2.16 LLAL – which is in turn wholly owned by Luton Borough Council - owns LTN. The airport is operated under a concession agreement, until 2031, by LLAOL. The boundaries of the land owned or operated by each entity is an important consideration in the development and appraisal of options as it affects a range of cross-cutting and interdependent issues, including:

- *Deliverability* – where development is proposed on site, or how it might be phased, could impact upon the existing concessionaire and the running of its operations;
- *Land ownership* – if development is proposed on land owned by LLAL, there would be a lower risk and cost to the Project, whereas if land needs to be acquired for development this could have financial and social implications. If development is proposed on land operated by the concessionaire, this could impact upon operational viability;
- *Operational viability* – depending on where development is proposed on site, it could impact on the operational efficiency and resilience of the airport. Construction phases could affect existing levels of service in the airport for some time for example, but new terminal buildings could offer enhanced levels of service in the future. Having more than one terminal building could enhance operational resilience in the event of a major incident, but could impact on efficiency if operations have to be split across multiple buildings; and
- *Cost* – there are a range of costs to consider: firstly, if land needs to be acquired for development, this would impact on the cost and financial viability of the overall Project. Secondly, options need to be operationally and financially attractive to the concessionaire. In addition, construction costs and phasing could ultimately reduce benefits to users and producers, including the airlines.

Proposed development

4.2.17 As discussed above, LLAL acquired the adjacent Century Park site in 2015 and has applied for planning permission for New Century Park (shown in outline on **Figure 4.1**), a mixed-use commercial development on Wigmore Valley Park. The scheme

will include employment space, new infrastructure (the CPAR as discussed above) and a new public park and amenities in order to mitigate the loss of part of the existing Wigmore Valley Park – which is being used to deliver the commercial development.

4.3 Options appraised in Sift 2

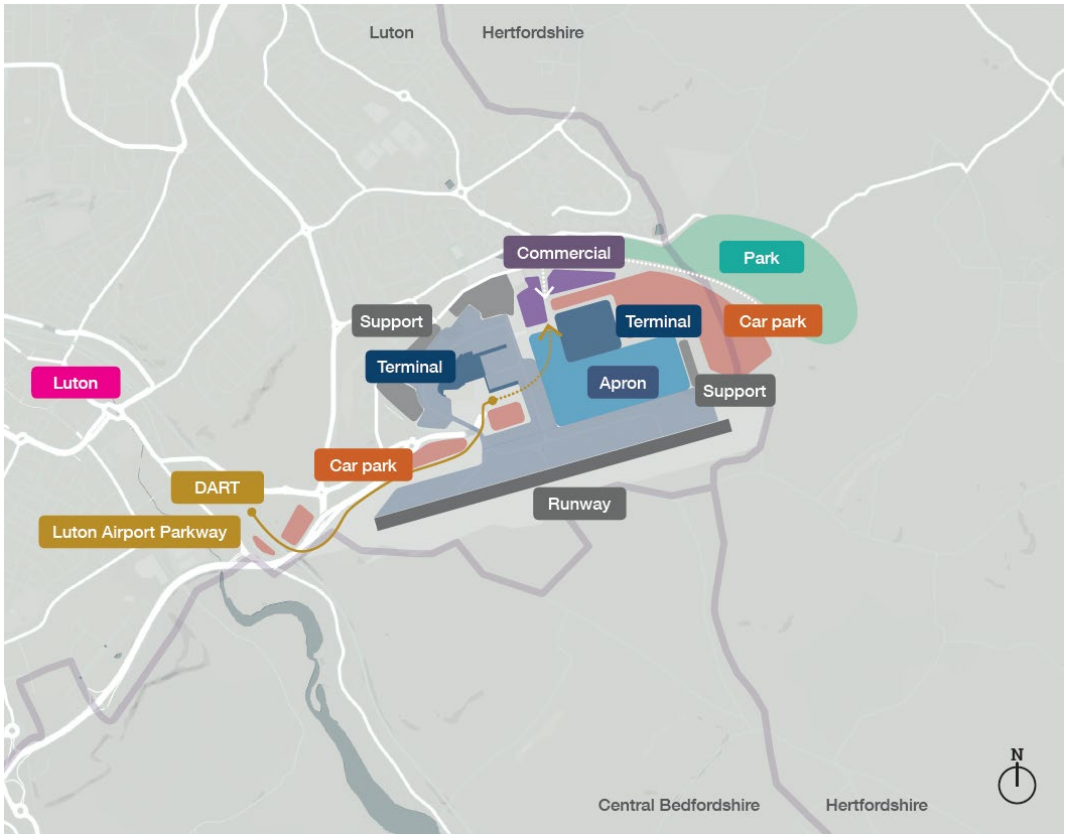
4.3.1 As stated in **Paragraph 2.1.2**, the following four options were appraised during Sift 2:

- Option 1a (**Figure 4.2**)– new terminal and apron capacity to the north of the runway, resulting in two terminals north of the runway;
- Option 1b (**Figure 4.3**)– a single terminal complex to the west of the site
- Option 1c (**Figure 4.4**)– a single terminal complex to the east of the site; and
- Option 2 (**Figure 4.5**) – new terminal and apron capacity to the south of the runway, with two terminals; one north and one south of the runway.

4.4 Option 1A

4.4.1 This option would comprise two terminals north of the runway, retaining the existing terminal and with a new terminal on part of the existing Wigmore Valley Park, which could be replaced further to the east.

Figure 4.2 Option 1A



4.4.2 This option looks at providing a second 20mppa terminal building on land to the north of the runway. It could be built in a phased approach in line with passenger demand. Unlike options 1b and 1c, the construction of a second terminal builds on the existing capacity of 18mppa of the current terminal building (T1), bringing the overall potential capacity to a maximum 36-38mppa between the two terminals. It is anticipated that T1 would in time be refurbished or possibly reconstructed in a phased approach.

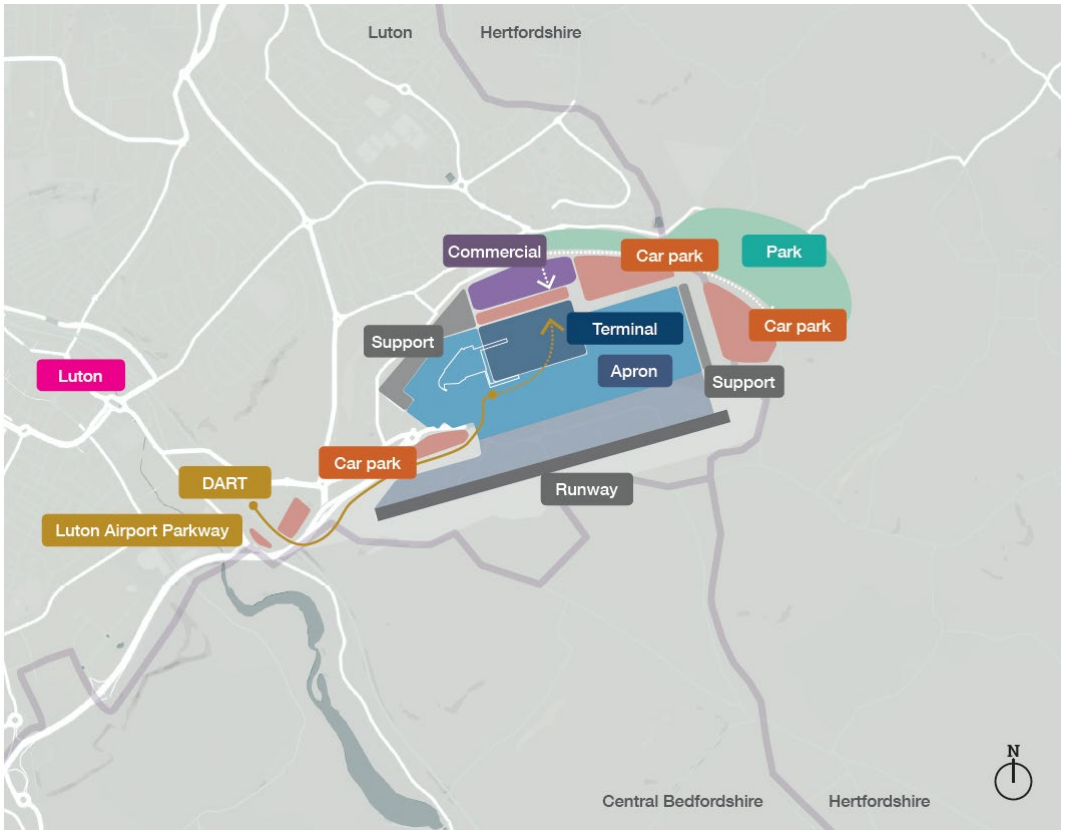
4.4.3 As well as the development of the terminal buildings, the option covers the concurrent development of the airfield infrastructure, the associated surface access enhancement into the airport, the necessary enabling works and extension to the mass transit system. This option aims to contain the airport as far as practical within the current LLAL limits of ownership.

4.4.4 With this option, Wigmore Valley Park could be reprovided to the east.

4.5 Option 1B

4.5.1 This option 1b would comprise a single new terminal option north of the runway on the long stay car park and part of Wigmore Valley Park phased over time to incorporate or replace the existing terminal. This terminal could be located as far west as possible and expand eastwards as required.

Figure 4.3 Option 1B



4.5.2 The phased terminal development would be progressed in line with passenger demand, to ultimately a potential single terminal of up to 38 mppa capacity. During the development of the new terminal building (T2), operations would run out of the existing T1, which would maintain the operational airport capacity of 18mppa. Decommissioning/ demolition/incorporating of the existing T1 would be in line with sufficient development of T2 to accommodate passenger demand.

4.5.3 The single terminal scheme would need to be sized both for the forecast increase in demand and also to allow migration of operations from the existing 18mppa T1. It would subsequently be phased to deliver increasing capacity to satisfy the ongoing growth of the airport.

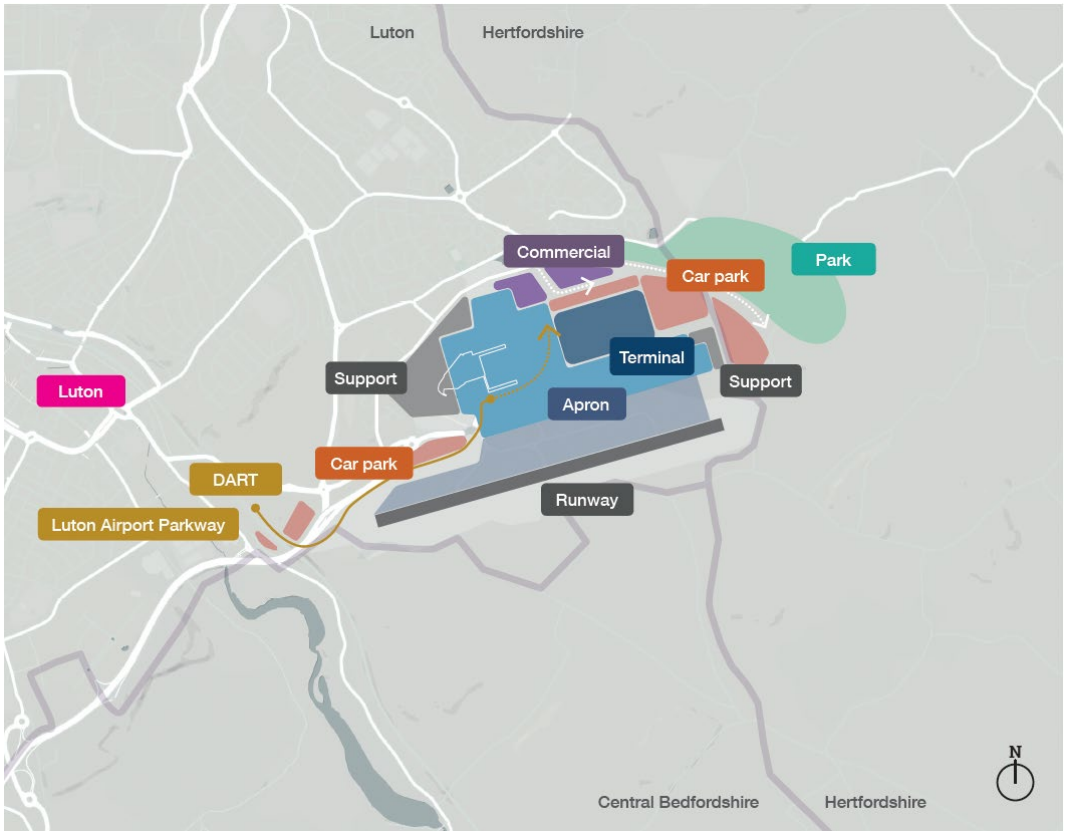
4.5.4 As well as the development of a single main terminal building, the option covers the concurrent development of the airfield infrastructure, the associated surface access enhancement into the airport, the necessary enabling works and extension to the mass transit system. This option also aims to contain the airport as far as practical within the current LLAL limits of ownership.

4.5.5 As with option 1a, Wigmore Valley Park could be reprovided to the east in this option.

4.6 Option 1C

4.6.1 This option would comprise a single new large terminal north of the runway on Wigmore Valley Park. This terminal could expand westwards as required.

Figure 4.4 Option 1C



4.6.2 This option is similar to option 1b, with the key difference that in option 1c is that the terminal would be developed from the east towards the west in a phased sequence towards the existing terminal building. In this option, the resulting terminal would be distant from the existing Terminal and the latter would not be incorporated into the new terminal. The decommissioning/demolition of the existing T1 would occur as sufficient accommodation is developed within the new Terminal.

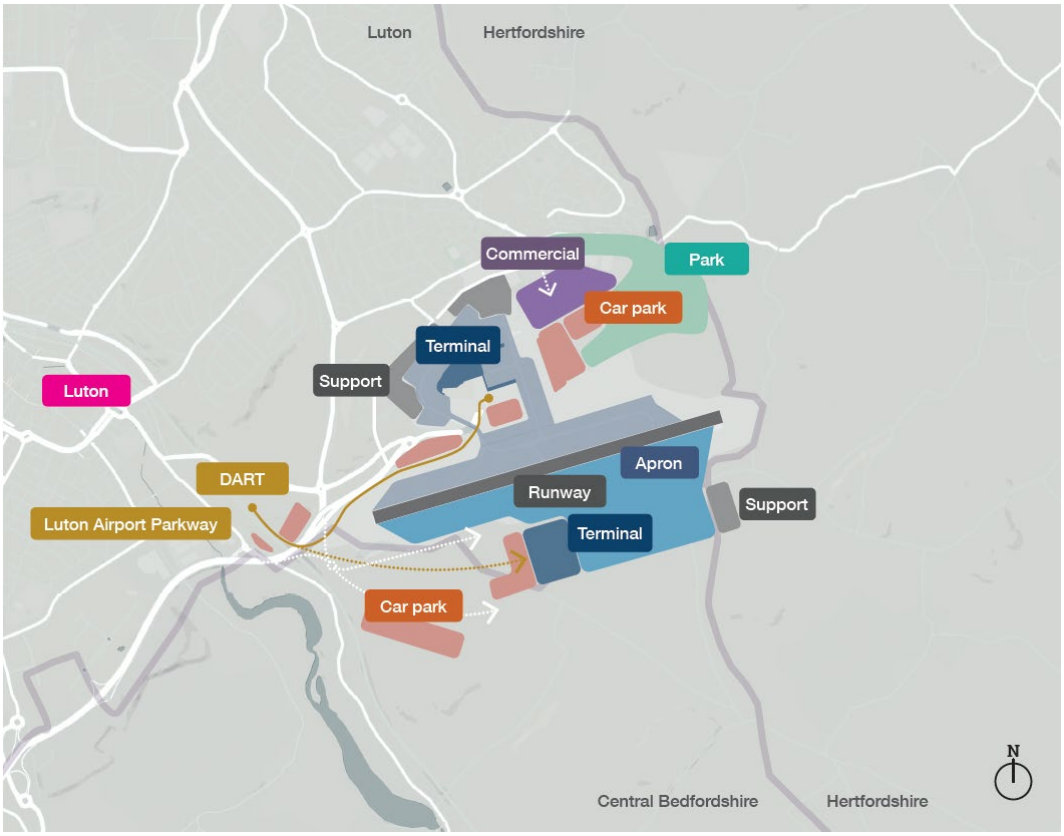
4.6.3 As well as the development of a single main terminal building, the option covers the concurrent development of the airfield infrastructure, the associated surface access enhancement into the airport, the necessary enabling works and extension to the mass transit system.

4.6.4 As with option 1b, this option aims to contain the airport as far as practical within the current LLAL limits of ownership, and Wigmore Valley Park could be reprovided to the east.

4.7 Option 2

4.7.1 This option would comprise a two-terminal solution, retaining the existing terminal with a new terminal south of the runway.

Figure 4.5 Option 2



4.7.2 Similar to option 1a, this option is based on utilising the existing 18mppa terminal and the construction of a new terminal building of up to 20mppa capacity but south of the existing runway giving a potential 36-38mppa capacity.

4.7.3 The additional work is similar to the other options, though in this option the associated works required for extending the mass transit system and the surface access are significant in comparison to the other options. The mass transit system would need to branch to the southern side of the runway, significantly increasing the length of the system and civil engineering works in comparison with the other options. Significant road enhancement will need to be provided with a new dual carriageway system connecting the southern terminal building to the existing road network.

4.7.4 With associated taxiways, aprons, stands and airport support facilities located with the terminal, the development would mirror that on the north side of the runway to a significant extent.

4.7.5 A larger proportion of option 2, compared to the other three options, falls outside the current LLAL ownership and would require acquisition of a significant area of additional land.

4.7.6 In this option, it is anticipated Wigmore Valley Park could significantly remain where it is proposed to be located under the planning application for New Century Park.

5 APPRAISAL RATIONALE

5.1 Overview

5.1.1 This chapter sets out a summary of how the options were appraised under each of the 28 sift criteria, as previously described in **Chapter 3.**

5.1.2 The sift criteria have been grouped by the strategic objective to which they relate. For each criterion, we have set out below summary tables which present the results of the appraisal for each option family against each of the relevant sub-criteria, and the rationale for the overall appraisal level in each case. Each table also includes a general summary on the respective performance of the options for that sift criterion.

5.1.3 The chapter concludes with an overview of the overall results of the appraisal.

5.2 Strategic Objective O1: Compliance with Government Aviation Policy

5.2.1 **Table 5.1** below sets out how the options performed against the relevant criterion and its sub-criteria, examining whether they are consistent with Government Aviation policy in relation to: proposed use or modification of existing runway; implications for Heathrow Airport expansion; support for consumer objectives and the delivery of a competitive aviation sector.

Table 5.1: S1 Consistent with making best use of the existing runway

S1 Consistent with making best use of the existing runway				
Sub Criteria	Option Family			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
Does the option use the existing runway or propose a new runway?	All four option families appraised were considered capable of delivering at least 50 aircraft movements per hour, which has been assessed as the operational capacity to deliver best use of the single runway at LTN. Hence, achieving this hourly movement rate is a benchmark representing 'best use' consistent with aviation policy such as the NPS and Aviation Strategy Call for Evidence. The capacity target is consistent with 2003 Future of Aviation White Paper which supported expansion of capacity at LTN up to 240,000 aircraft movements a year with the existing runway.			
Does the option require modifications to the existing runway – alignment or length?	None of the options propose a new runway or modifications to existing alignment and it has been assumed that an emergency runway, if included in future detailed design, would not constitute a breach in policy.			
Would the option have implications for the deliverability of the proposed Northwest runway at Heathrow as supported by emerging Government policy (Draft NPS)?	There would be no impact from any of the options on deliverability of the Northwest runway at Heathrow as airspace is being redesigned to ensure that there are no airspace conflicts and Government policy supports other airports making best use of their runways alongside the third runway at Heathrow.			
Would the option support the Government's consumer objectives?	For all options, expanding the airport to 'best use' will deliver connectivity and consumer benefits consistent with broader Government policy objectives.			
Would the options support the delivery of a competitive aviation sector?	Increased capacity will enhance competition between airports in the South East of England and aid airline competition in support of broader Government policy objectives.			
Appraisal level	20	20	20	20
Summary	All four option families were considered to be Large Beneficial, with no clear differentiating factors between the four options relating to this criterion.			

5.3 Strategic Objective O2: To identify a scheme that is likely to be capable of being consented and secured through a DCO

5.3.1 **Table 5.2** below sets out how the options performed against the relevant criterion and its sub-criteria, considering their alignment with planning policies at the national and local level.

Table 5.2: S2 In broad conformity with national and local town planning policies and capable of attracting the consents required

S2 In broad conformity with national and local town planning policies and capable of attracting the consents required				
Sub Criteria	Option Family			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
Does the proposal meet National Planning Policy and Local Planning Policy sufficiently to support the grant a DCO, having regard to s104 of the Planning Act 2008, and the need to have regard to the Local Impact Report(s) and all relevant matters, including National and Local planning policies?	Options 1a, 1b and 1c are within the Strategic Allocation outlined in the Luton Local Plan Policy LLP6. The indicative option designs indicate that there is a potential requirement to place some, comparatively minor, development within the Green Belt (limited to facilitating development such as surface level car parking). However, in taking forward the northern options, it is anticipated that a key requirement of the ongoing design development will be to seek to avoid such development in the green belt by exploring alternative surface access strategies, arrangements and layouts. If this is not possible on the basis of design constraints, economics or viability, then a very special circumstances case would need to be presented and balanced against any potential harm to the openness of the Green Belt. On the above basis, the option families have been appraised as Moderate Beneficial.			The second terminal and all associated buildings and structures south of the runway would be outside of the Strategic Allocation outlined in the Luton Local Plan Policy LLP6. This option also places all built development including significant terminal structure and a new access road within land designated as Green Belt. This option is unlikely to meet the 'very special circumstances' Green Belt test as long as the other three options remain viable alternatives, hence being appraised as Currently Unworkable.
Appraisal level	10	10	10	-20 Currently Unworkable
Summary	The three options focusing development north of the runway – options 1a, 1b and 1c - perform equally well, whereas Option 2 is considered to be Currently Unworkable given current policy constraints.			

5.4 Strategic Objective O3: To provide additional capacity and connectivity in line with the assessment of need

5.4.1 **Table 5.3** below sets out how the options performed against the relevant criterion and its sub-criteria, taking into consideration their ability to provide additional capacity in the runway, apron and terminal subsystems, and to phase this capacity in line with projected demand.

Table 5.3: S3 Increase capacity both airside and landside to achieve target increase up to 36-38mppa

S3: Increase capacity both airside and landside to achieve target increase up to 36-38mppa				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
What is the capacity to be provided in each subsystem : – Runway? – Apron? – Terminal?	Simulation modelling has demonstrated that all options could deliver 50 movements per hour on the runway. Provision of a second full parallel taxiway could enable a higher runway movement rate to be delivered (c.52 movements per hour), subject to other constraints. The two terminals could provide capacity for up to 36-38mppa with the potential for 20mppa in the new terminal building.	Simulation modelling has demonstrated that all options could deliver 50 movements per hour on the runway. Provision of a second full parallel taxiway could enable a higher runway movement rate to be delivered (c.52 movements per hour), subject to other constraints. Sufficient apron could be provided to accommodate 220,000 passenger ATMS a year and the required space for cargo, MRO and business aviation activity. The single terminal buildings in Options 1b and 1c could provide capacity for up to 36-38 mppa.		Please see appraisal for option 1a.
What is this option's ability to phase in line with demand?	Development can be phased to meet demand in option1a, whereas this is problematic for options 1b and 1c.	Some capacity constraints during the phased implementation of a single terminal (see S19) due to limited apron expansion area available. Unlikely to deliver capacity in time to meet demand and may result in reduced capacity during initial reconfiguration works to the T1 area after 2031. There	Additional apron and terminal capacity will need to be provided at an early date to allow aircraft and passengers to be partially decanted from T1 to T2 to enable reconfiguration of the T1 area after 2031. Due to phasing issues, phased delivery will not be straightforward.	Development can be phased to meet demand in option 1a, whereas this is problematic for options 1b and 1c.

S3: Increase capacity both airside and landside to achieve target increase up to 36-38mppa				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
		could be some complications of rebuilding T1 and the potential for substantial new capacity to have to be built ahead of demand.		
Appraisal level	20	-5	10	20
Summary	Both two-terminal options – Option 1a and 2 - performed better overall due to their ability to phase development than Options 1b and 1c.			

5.5 Strategic Objective O4: To maximise the potential economic benefits to the regional, sub-regional and local economies

5.5.1 This strategic objective covers two criteria:

- S4 Deliver economic benefits nationally and regionally; and
- S5 Increase job opportunities for the people of Luton and the surrounding area.

5.5.2 **Table 5.4** and **5.5** below sets out in more detail how the options performed against the two criteria and their sub-criteria, focusing on the options' abilities to: deliver benefits to users, producer benefits and wider connectivity benefits (S4); and increase job opportunities for those living in and around Luton (S5).

Table 5.4: S4 Deliver economic benefits nationally and regionally

S4 Deliver economic benefits nationally and regionally				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
What are the benefits to users (journey time and air fare savings due to availability of choice and more routes), known as Transport Economic Efficiency?	User benefits will arise from savings to journey times compared to alternative airports and air fare benefits from LTN's low fare offer (subject to scheme cost and affordability O12) and these would be the same for all options.			
What are the producer benefits (increased income to airlines, airport operators)?	Option 1a is considered to be capable of delivering the same Producer Benefits as the single terminal options, without experiencing the same phasing/capacity issues.	Phased construction of this option is likely to be very difficult and costly due to disruption to T1 operations, resulting in a capacity restriction during reconfiguration of T1 area. It may also require new capacity to the east to be built ahead of need so increasing the costs of the construction. As a consequence, producer benefits will be substantially lower than the other options, although it would still provide	Requirement for delivery of apron capacity at an early date to allow decanting of traffic from T1 will reduce producer benefits (to the airport), compensated to some extent by efficiencies delivered from a single terminal. As a consequence, producer benefits will be slightly lower than the two terminal options 1a and 2 (but better than option 1b), although it would still provide increased capacity provided	Please see appraisal for option 1a.

S4 Deliver economic benefits nationally and regionally				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
		increased capacity and deliver potential efficiencies from a single terminal in the longer term. To the extent that higher costs translate to higher prices to airlines, there would be loss of airline producer benefits and/or consumer benefits such that these costs are passed on through higher airfares with a potential consequential impact on the timescale over which 36- 38 mppa would be achieved.	and deliver potential efficiencies from a single terminal in the longer term. As with option 1b, higher costs could translate to high prices to airlines and therefore loss of airline producer benefits and/or consumer benefits.	
What are the Wider Connectivity Benefits (trade, tourism, inward investment) via improved road and rail infrastructure?	Wider benefits are proportional to the capacity delivered. All four options could be capable of achieving up to 36-38 mppa and delivering large benefits to users and airlines, and supporting GVA growth in the surrounding areas by attracting additional investment. Detailed assessments have yet to be carried out so initial judgements are made and, prima facie, these benefits would be considered to be substantial.			
Appraisal level	20	5	10	20
Summary	Given that the user and wider connectivity benefits are considered equally beneficial in all options, the differentiating factor is the options' performance against the producer benefits, where the two-terminal options 1a and 2 perform better in terms of phasing and capacity.			

5.5.3 It should be noted that producer benefits are derived from the profitability of the investment – see O12 To be affordable including any public expenditure that may be required and taking account of the needs of airport users and operators (Value for Money).

Table 5.5: S5 Increase job opportunities for the people of Luton and the surrounding areas

S5 Increase job opportunities for the people of Luton and the surrounding areas				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
How many jobs could be created regionally, sub-regionally (three counties) and locally (Luton)?	Local employment is envisaged to be proportional to capacity and through put of the airport, with growth to 38 mppa supporting a sizeable increase in jobs; provisionally of the order 16,000 new jobs (direct, indirect and induced, equivalent to 800 per mppa growth) in the sub-region (three counties) and £1.5bn uplift in GVA directly from the operation of the Airport. There may be slightly higher direct employment with two terminals in this option compared to one terminal in options 1b and 1c.	As for option 1a although there may be slightly lower direct employment with one terminal in these options.		Please see appraisal for option 1a.
What type of jobs could be created and retained – skilled jobs (higher paid) in Luton (permanent jobs)?	Jobs at the Airport and in the supply chain will be at a range of skills and wage levels and include apprenticeship opportunities for local people (it is expected that this requirement will be included in the new concession agreement) and linked to the Luton Skills and Employability Strategy. Maintaining land available for MRO in all options could also help to maximise contribution to the creation and retention of skilled jobs.			As with options 1a, 1b and 1c, option 2 would create a similar range of jobs for local people. However, local access to may be more difficult for low wage/low skill employees from Luton to the south side location of one of the terminal buildings, as public transport is likely to be less frequent and journey times lengthier.
Appraisal level	20	20	20	10
Summary	Overall, all four options could increase the number and type of job opportunities for people in and around the Airport, with the three options which focus development north of the runway (options1a, 1b and 1c) scoring higher, in part due to relative ease of access by public transport, compared to option 2 where one terminal building would be south of the runway.			

5.6 Strategic Objective O5: To maintain and where possible improve the quality of life for Luton's residents and the wider population

5.6.1 **Table 5.6** below sets out in more detail how the options performed against the relevant criterion and its sub-criteria, focusing on their ability to maintain and improve the quality of life for those living in and around Luton.

5.6.2 It should be noted that the appraisals for a number of the sub-criteria appear identical for several or all options because some elements are non-spatial. For example, with regard to the first two sub-criteria (improving the quality and choice of opportunities and reducing adverse effects of unemployment, low income and job security), the assessments are based on job generation and the type, quality and number of opportunities. This does not vary between spatial options, wherever the terminal buildings and associated facilities are located. Similarly, for the fifth and sixth sub-criteria which seek to protect and promote quality of life and positive equality impacts, the appraisals do not vary between the spatial options as the potential will be very similar if not identical for all four options.

5.6.3 With regard to the third and fourth sub-criteria, in relation to impacts on existing community facilities and residential amenity, the appraisals are very similar for all the northern options (1a, 1b and 1c). The loss of less formal areas of open space within Wigmore Park and re-provision to the east of the existing parkland is common to all the northern options, and the impacts on the amenity of residential areas is likely to be similar if not identical for all northern options during construction given that the relationship of the construction areas and access routes to residential areas is very similar.

Table 5.6: S6 To promote quality of life and minimise adverse impacts on communities

S6 To promote quality of life and minimise adverse impacts on communities				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
Does this option improve quality and choice of employment and training opportunities?	As noted above in relation to criterion S5, provisionally around 16,000 new jobs in the three counties (direct, indirect and induced, equivalent to 800 per mppa growth) could be created. Direct job creation would range from highly skilled to low and unskilled, with the largest proportion assumed to be in the latter categories. This would result in a significant increase in availability and choice of employment both within Luton and across the region, and the potential for training and skills benefits associated with this. Appointment of the construction contractors would include assessment of their commitment to upskilling the local workforce as part of the evaluation in line with LLAL's commitment to social values. Development of the terms of the concession would include partnership obligations to deliver key criteria included within the Luton Investment Framework 2015 - 2035, which is focused on improving life chances for local people.			

S6 To promote quality of life and minimise adverse impacts on communities				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
Does this option reduce adverse effects of unemployment, low income and job insecurity?	The increased passenger numbers would provide a basis for negotiating a new concession agreement. This will contain improved terms which would permanently benefit direct employees in the airport and increase the proportion of jobs taken by hard to reach groups. It will also seek to target the benefits of employment and training to those most in need via a range of potential approaches. These could include working with LBC to integrate measures to support the Luton Investment Framework, Skills and Employment Strategy and Health Inequalities Strategic Plan, and to set ambitious targets within its construction supply chain contracts. The appraisal here has been made based on the DART project's assumptions with social value criteria forming part of the contract selection process. It is considered that there is a potential for a large beneficial effect with regard to this sub-criteria; however there is insufficient detail at this stage to definitively comment.			
Does this option avoid direct impacts on, and maintain access to, existing community facilities?	Wigmore Park currently covers approximately 40ha, including a small children's play area, allotments, a skate park and extensive areas for 'country walks'. The northern-most area of parkland closest to residents in Wigmore will remain, and would include the improved facilities proposed within the New Century Park application, namely improved children's play space and an improved skate park. The allotments will also remain. The less formal area of open space will be lost, and re-provided, to the east of the existing parkland. This will make this part of the open space less accessible to much of the population it currently serves, based on criteria set out in the LBC Green Space Strategy Review (1.2km walking or 2km cycling) including future residents in proposed developments east of Wigmore. The new parkland would also be closer to North Hertfordshire villages, such as residents of Darley Road immediately north, and Breachwood Green 300m to the east. The increase in highway traffic movements along the A1081 from the M1 could result in increased congestion and delays, which could create a barrier between people trying to access facilities, communities and employment opportunities outside of Luton. Movement within Luton would be reasonably unchanged from changes to traffic volumes. Improvements to public transport to allow more people to access jobs at the airport could also improve access between communities and to wider community facilities within Luton.			Many of the potential impacts for option 2 are similar to options 1a, 1b and 1c. However, the re-provision of the less formal area of open space directly adjacent to the east of the existing parkland will make this part of the open space less accessible to only *some* of the population it currently serves (compared to options 1a, 1b and 1c), but will bring it closer to future residents in proposed developments east of Wigmore. This option does not see the increase in highway traffic movement along the A1081, unlike 1a, 1b and 1c.
Does this option preserve the amenity of residential areas and enjoyment of community facilities and outside spaces?	There are likely to be temporary adverse construction impacts on the amenity of residential areas in south-east Luton from construction and earth-moving works associated with the earth platform excavation, from demolition of the existing airport buildings and infrastructure, and construction of the new terminal building and car parks. These activities are also likely to impact the amenity of users of the improved open space facilities (children's play space, skate park etc.) in Wigmore Park, and Wigmore Pavillion.			There is potential for temporary adverse construction impacts on the amenity of residents in small rural hamlets and isolated dwellings south of Luton.

S6 To promote quality of life and minimise adverse impacts on communities				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
	Potential for permanent adverse impacts on the amenity of residents and community facilities to the immediate north of the airport, due to additional aircraft movement noise due to the increase in passenger numbers, additional traffic from surface transport accessing the airport, and the visual element of a new car park and airport related buildings; such as the parkland at community centre at Raynham Way. . The increase in aircraft movements is likely to increase impacts on amenity on those residential areas and community facilities already located under existing flight paths, such as Surrey Street Primary School and The Linden Academy to the west; Breachwood Green JMI School, Breachwood Green Baptist Church and Breachwood Green Village Hall / playing fields to the east.			The potential for adverse impacts on the amenity of residents and the increased aircraft movements for this option is the same as for 1a, 1b and 1c.
Does this option protect and promote public services that support quality of life and wellbeing?	For all options, any increase in airport growth is likely to increase LLAL's continued contributions to local services. With profits made by LLAL payable to LBC as a dividend due to their role as sole shareholder, this money is used to maintain the statutory and discretionary services provided by LBC. As the dividend increases, this may provide further opportunities for further contributions to local services. In addition, LLAL maintains a Corporate Social Responsibility (CSR) Fund with money allocated each year to different organisations and activities in line with the priority outcomes derived from the Luton Forum Sustainable Community Strategy 2008-2026. This includes a range of local and regional initiatives, primarily Active Luton, which provides leisure facilities, and Luton Culture which manage sites including Stockwood Discovery Centre and Wardown House as well as arts provision across the borough.			
Does this option promote positive equality impacts and minimize the potential for adverse equality impacts for groups with protected characteristics or communities that experience high levels of socio-economic deprivation?	As set out above, the potential for equality groups to benefit from the employment opportunities will depend on the implementation of measures to ensure the benefits reach relevant groups. Adverse impacts on local residents arising from construction and operation, as discussed above, could have the potential for adverse effects for people from equalities groups living in these areas who may be more sensitive to environmental impacts such as noise, air quality and changes to the visual environment.			
Appraisal level	5	5	5	5
Summary	Given the need to balance the beneficial impacts of access to employment (with an estimated 16,000 new jobs created across the three counties) with the externalities highlighted above, and assuming that each option is delivered in line with employment strategies to maximise the benefits, all four option families are therefore appraised as Slight Beneficial.			

5.7 Strategic Objective O6: To minimise environmental impacts and, where practicable, to actively mitigate and manage any potential environmental effects

5.7.1 This strategic objective covers nine criteria:

- S7 Noise;
- S8 Air quality;
- S9 Natural habitats and biodiversity;
- S10 Carbon emissions;
- S11 Water resources;
- S12 Flood risk;
- S13 Cultural heritage;
- S14 Landscape and visual impact and environmental land use; and
- S15 Climate change.

5.7.2 **Table 5.7** below sets out in more detail how the options performed in relation to the potential noise impact from site preparation, construction and operation.

Table 5.7: S7 Noise impact

S7 Noise impact				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
Does this option minimise the number of people exposed to the adverse impacts of noise? Including consideration of: • Site preparation noise and vibration	Noise and vibration generated during site preparation and construction will take place east of the existing terminal. During site preparation, substantial earthworks will be undertaken to level the ground, potentially resulting in adverse impacts at receptors in the residential area north of Eaton Green Road. The temporary nature of the works and the potential for implementing mitigation and adopting a methodology that implements best practicable means provides a basis for the		Option 1c is almost identical to option 1a and 1b with regard to noise impacts. The one difference is that aircraft stands will be closer to receptors to the north of Eaton Green Road. Consequently, it is considered	The main site preparation and construction works will be south of the runway, in the area designated for new terminal infrastructure, with potentially significant impacts on the nearby Copt Hall Cottage receptors. Given the

S7 Noise impact				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
	likely impacts to be reduced or offset.		that option 1c performs marginally less well than option 1a and 1b; however, the difference between the options in terms of noise impacts is likely to be indistinguishable.	small number of receptors that are located at Copt Hall Cottages, it may be possible to offset significant impacts; however, as the level of mitigation cannot be guaranteed at this stage of the project, it is considered that site preparation and construction works could result in adverse impacts.
• Construction noise and vibration • Noise from HGV traffic associated with site preparation and construction phases	During construction, works will be more confined to the area directly to the north of the runway, but the likely scale of works mean that adverse impacts may occur at receptors in the residential areas to the north of the site. As with site preparation works, the likely impacts could be controlled to some extent. Substantial levels of HGV movements are anticipated during the site preparation and construction works phase. The level of impacts will be dependent on the haul route selected; however, it is anticipated that traffic could access the site using the A1081, which has an existing high density of road traffic flows. Consequently, it is unlikely that the magnitude of HGV movements on main roads will be high enough to result in a perceivable change in noise and site preparation/construction traffic.			As with options 1a, 1b and 1c, construction traffic will likely access the site via the A1081 which already experiences high density road traffic movements. To access the works site to the south of the runway, a temporary haul road will need to be constructed, potentially on the alignment of the new southern link road to allow road traffic access to the new terminal from the A1081. HGV movements on this haul route would adversely impact Copt Hall Cottage receptors; however, when considered in the context of the baseline noise conditions, the impacts may be considered no worse than slightly negative.
• Aviation noise (aircraft approaches and departures)	As factors affecting airborne aircraft noise (i.e. air traffic movements, aircraft variants, runway use and airspace design) are unlikely to change for each option, the impact of airborne aircraft noise will be the same for all options. Given the considerable increase in aircraft movements due to the expansion, there is potential for significant adverse impacts to occur. However, there is			

S7 Noise impact				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
	the prospect that the level of impact will be reduced through changes in aircraft type, further improvements in aircraft technology, management of night-time flights and other mitigation/compensation measures.			
• On-site ground noise (i.e. aircraft taxiing, on-site road infrastructure, parking facilities etc.)	In comparison to the existing layout, it is likely that the option 1a, 1b and 1c layouts will be an improvement on the current situation as taxi-routes will be shortened and aircraft will spend less time spent idling as they queue for a stand. Additionally, building layouts are aligned with the runway and may result in increased screening of ground based noise sources for residential areas to the north of the airport. However, any benefits may be offset by increases in ground activity. Receptors to the south of the site will experience an intensifying of ground noise from airport activities; however, given that noise due to ground activities are likely to be lower than airborne aircraft noise, potential impacts on receptors to the south are unlikely to be significantly impacted when taken in context with baseline noise levels. Road traffic will access the airport via the A1018 and an upgraded New Century Park access road. Due to the existing high density of road traffic on the A1081, it is unlikely that increases in road traffic will be of a magnitude to result in a substantial negative impact. As New Century Park is part of LTN Enterprise Zone, it is anticipated that any future development will be future- proofed against road traffic noise impacts; however, as the New Century Park is likely to be completed and occupied prior to full capacity at LTN being reached, it is considered reasonable to assume there could be slight negative impacts.			The option 2 layout would provide increased separation distance between new airport operations on the south side of the runway and sensitive receptors to the north. However, communities to the south of the runway e.g. Copt Hall Cottages, Chiltern Green, Peters Green would experience higher levels of noise due to the proximity of airport activities. Whilst receptors to the south may benefit from screening from the new southern terminal building, the new terminal will still represent an intensification of activities closer to those. The majority of road traffic is likely to access the airport via the A1081 for option 2. A new link road connecting the terminal with the A1081 will be constructed to provide access, passing adjacent to Copt Hall Cottages. These communities are not currently subject to high levels of road traffic noise, so there is potential for notable impacts to occur. Mitigation may be implemented into the design; however, given the magnitude

S7 Noise impact				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
				of change in noise (albeit to a limited number of receptors), it may not be possible to mitigate noise from road traffic entirely.
Appraisal level	-10	-10	-10	-20
Summary	Given the considerable increase in aircraft movements due to the expansion, there is potential for Large Adverse impacts to occur. However, there is the prospect that the level of impact will be reduced through changes in aircraft type, further improvements in aircraft technology, management of night-time flights and other mitigation/compensation measures. Until further work has been undertaken to better understand how these measures may offset the growth in number of aircraft movements, it is considered appropriate to judge the potential impact of options 1a, 1b and 1c as Moderate Adverse. The provision of a southern link road in option 2 with the potential to significantly impact nearby communities, and receptors located to the south of the site with potential to experience significant increases in ground noise (compared to the baseline), suggest that option 2 is considered to have a greater adverse impact than options 1a, 1b and 1c.			

5.7.3 **Table 5.8** overleaf sets out in more detail how the options performed with regard to their potential effects on air quality and sensitive receptors.

Table 5.8: S8 Air quality

S8 Air Quality				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
Is this option likely to cause an exceedance of any air quality objective?	The additional road traffic in the vicinity of the airport, additional flights and associated activity on the airport may cause an adverse impact on current and future receptors in the vicinity of the airport and may adversely affect the nearby Air Quality Management Areas (AQMAs), notably the Luton town centre AQMA, in all four options.			
Is this option likely to delay compliance with EU limit values as calculated by the government using the PCM model?	If the decrease in concentrations due to national level improvements does not outweigh the increased activity due to the development, exceedances of the annual mean NO2 air quality objective in the AQMAs may be worsened which could be a constraint. After 2025 the proposed development would not be expected to exacerbate exceedances in the AQMAs as by that time the national improvements should cause a decrease in concentrations, using professional judgment based on the predicted change in emission factors (Defra's Emissions Factor Toolkit).			
Will this option have adverse or beneficial impacts on human receptors?	The additional road traffic in the vicinity of the airport, additional flights and associated activity on the airport may cause an adverse impact on current and future receptors in the vicinity of the airport and may adversely affect the AQMAs, the town centre AQMA in particular.			
Does this option minimise the number of people exposed to poor air quality?	Without data on the increase in surface access and the data for aircraft and other airside activity the increase in concentrations cannot be quantified. It is likely that the scheme will not cause adverse effects on current residents close to the Airport, using professional judgment based on the relatively low monitored NO_2 levels near to the airport currently. It is however likely to increase concentrations in all three AQMAs. It is hard to determine the impact on future receptors as they may be closer to the increased airport activity than the current receptors, and therefore may be subject to higher concentrations. For (future) non-residential receptors the hourly NO_2 air quality objective is most relevant and is unlikely to be exceeded.			The spread of airport activity, and therefore emissions to the south, envisaged in option 2, in particular the location of car parks to the south and the splitting of the surface access traffic between M1 Junction 10 and M1 Junction 11, is likely to reduce impacts on current and future receptors in the vicinity of the airport compared with options 1a, 1b and 1c.
Will this option have adverse or beneficial impacts on ecological receptors?	On the basis of currently available data the impact on ecological receptors cannot be quantified. The proposed development is not likely to cause an adverse impact on ecological Receptors, using professional judgment, based on distance of the ecological receptors from the Airport (over 5km).			
Appraisal level	-10	-10	-10	-5
Summary	All options will introduce additional emission sources due to increased capacity and activity (i.e. road vehicle emissions at additional car parks and aircraft emissions at additional stands). However, option 2 spreads airport activity and sources of emissions to the south, away from existing residential areas north of the airport. Therefore, option 2 is likely to have a reduced			

S8 Air Quality				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
	impact on existing receptors compared to the other options.			

5.7.4 **Table 5.9** sets out in more detail how the options performed with regard to their potential effects on existing natural habitats and biodiversity.

Table 5.9: S9 Natural habitats and biodiversity

S9 Natural habitats and biodiversity				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
Are there any internationally, nationally or locally protected/designated nature conservation sites affected?	No significant impacts to internationally or nationally designated sites are envisaged as part of the proposed works at this stage in options 1a, 1b and 1c. However, further information regarding impacts such as potential air quality changes as a result of increased traffic will be required to establish the zone of influence of the proposed development. Acoustic impacts on wildlife receptors will also need consideration. Much of Wigmore Park County Wildlife Site (CWS), a non-statutory designated site, would be affected by the proposed works, but would in part be re-provided to the east (see mitigation below). In addition, the works are likely to impact on Winch Hill Woods CWS, which comprises ancient woodland, located to the east of the existing runway. The loss of Wigmore Park CWS is likely to require the creation of compensatory habitat through collaboration with the local wildlife trust and LBC. Compensation would also be required for any degradation caused to the ancient woodland within Winch Hill Wood CWS; with any loss to this habitat being essentially irreplaceable. Other CWSs may also be impacted by changes in air quality and disturbance.			Similar impacts as for options 1a, 1b and 1c, although the Wigmore Park CWS would only be partially affected by the proposed works rather than substantially affected. (Note that in this option, it is anticipated Wigmore Valley Park could significantly remain where it is proposed to be located under the planning application for New Century Park).
Will priority habitats identified in national legislation and local policy/guidance be impacted?	Potential impacts to habitats include habitat loss, fragmentation, degradation and disturbance. The most significant losses will be areas of lowland calcareous grassland and broadleaved woodland, both of which are Section 41 priority habitats (Natural Environment and Rural Communities (NERC) Act 2006) and therefore of principal importance to the conservation of biodiversity in England. In addition, the loss of arable field margin habitats such as set-aside, hedgerows and mature trees will result in fragmentation at a landscape scale.			Similar impacts envisaged to 1a, 1b and 1c although the most significant loss here would be areas of ancient woodland (Winch Hill Woods CWS) and calcareous

S9 Natural habitats and biodiversity				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
				grassland (Wigmore Park CWS) due to landscaping for the proposed public park and result in an adverse residual impact for biodiversity.
To what extent are populations of protected/notable species likely to be affected?	Based on current site understanding, the works would impact on at least two known bat roosts (common species in low numbers) and three main badger setts, resulting in species mortality in the absence of mitigation. Previous surveys have also identified the presence of a small population of reptiles (slow worm), Roman snail and an assemblage of common farmland birds, which may be impacted by the proposed development. Additional impacts on fauna include reduced foraging resource, disturbance and fragmentation.			The presence/absence of protected/notable species is largely unknown to the south of the existing runway, having not previously been surveyed. However, there are known bat roosts (small numbers of common species) along the eastern boundary of the airport and Roman snail to the south of the runway. Local records data also indicate the presence of common reptile species south of the runway. These species are likely to be displaced from their current habitats under this option.
To what extent can effects be managed and mitigated? What opportunities are likely to improve ecological connectivity and provide enhancements?	At this stage, it is considered that the above impacts could be mitigated effectively through well thought out licence applications and habitat management planning including additional (compensatory) planting and parkland to retain and enhance connectivity with the wider landscape and compensation for loss of ancient woodland and habitats within Wigmore Park CWS that could be lost as part of the development.			
Appraisal level	-10	-10	-10	-10
Summary	In all option families, there are likely to be potential impacts to Section 41 priority habitats – areas of lowland calcareous grassland and broadleaved woodland – and the loss of arable field margin habitats. At this stage, it is considered that the above impacts could be mitigated effectively, hence all four Option families are currently appraised as Moderate Adverse due to their negative impacts on features of medium value.			

5.7.5 **Table 5.10** sets out in more detail how the options performed with regard to carbon emissions.

5.7.6 In the Sift 1 report, it was highlighted that carbon emissions, the largest greenhouse gas impacts caused by the expansion project, would increase in line with the increased air traffic movements (ATM). The Sift 1 appraisal originally excluded ATMs as it was considered to remain the same for all options and was an issue which is dealt with at the national scale instead of being specific to LTN. At Sift 2, the approach to appraisal for this criterion has been refined to include all potential impacts, and therefore ATMs, in line with the approach to be adopted in the Environmental Impact Assessment (EIA). In doing so, the results of the Sift 1 report have been updated to be consistent with the Sift 2 methodology.

Table 5.10: S10 Carbon emissions

S10 Carbon emissions				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
Does this option minimise the GHG emissions from the proposed project (against the current status) during its construction, in its operation and its surface access with a focus on: • The loss of a carbon sink due to land use change;	Option 1a will have an increase in emissions as a result of land use change, as with 1b and 1c, but the building of T2, forecourt and multi-storey car parks (MSCPs) on closed landfill could reduce the carbon emissions from land use change.	Both these options will lead to an increase in emissions as a result of land use change due to the expansion of the airport site and subsequent excavation of soil/vegetation in this area.		With this option, minimal building over the closed landfill and converting of greenfield land south of the airport for the development will lead to increased emissions from land use change.
• Construction activities and embedded carbon in materials	Option 1a and 2 will require less demolition, more reuse of existing assets, less construction of buildings and infrastructure assets – all corresponding to a lower increase in carbon emissions from embedded carbon in materials required and diesel consumption for construction activities compared with option 1b and 1c. This option, along with 1b and 1c, requires significantly more	Options 1b and 1c will require more demolition work, less reuse of existing assets, and construction of larger buildings and infrastructure assets compared to the two-terminal options, 1a and 2. This could lead to a larger increase in carbon emissions due to embedded carbon in materials used and diesel consumption for construction activities. Options 1b and 1c (and 1a) require significantly more land clearance than option 2.		Similar to option 1a, however option 2 will also require the construction of additional infrastructure such as roadway, junction, Luton DART, etc. Option 2 requires much less land than the other three options, corresponding to a reduced increase in diesel consumption for construction activities.

S10 Carbon emissions				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
	land clearance than option 2, resulting in an increase in diesel consumption from increased construction activities.			
• Airport buildings and infrastructure operations i.e. energy consumption, water supply, waste water, waste disposal;	Both two-terminal options, options 1a and 2, are likely to require additional demand in potable water and grey water, and marginally higher generation of foul water and energy demand compared to single terminal options 1b and 1c. According to S21: Feasibility of landfill, earthworks and ground conditions, these two options are likely to generate more waste than options 1b and 1c as waste management areas would need to be duplicated.	Options 1b and 1c are likely to have a lower demand for potable water and grey water, and potentially a marginally lower generation of foul water and energy demand compared to the two-terminal options 1a and 2. According to S21: Feasibility of landfill, earthworks and ground conditions, these two options are also likely to generate less waste during operation than 1a and 2 since a single terminal option is assumed to be better than two terminals as it allows for economies of scale through a single waste management area.		Please see appraisal for option 1a.
• Airport operated vehicles including those owned by third party operators (airside/landside);	Option 1a will likely have a marginally smaller increase in carbon emissions from landside/ airside vehicles compared to option 2 due to compact site; and a marginally larger increase in carbon emissions from landside/ airside vehicles compared to options 1b/1c due to having two terminal buildings (potentially leading to increased journeys, distance to travel, etc.)	Option 1b and 1c will have a marginally smaller increase in carbon emissions from landside/airside vehicles compared to option 1a and 2 due to a more compact site.		Option 2 will have a marginally higher increase in carbon emissions from landside/airside vehicles compared to 1a; and a marginally larger increase than options 1b/1c due to a second terminal building.

S10 Carbon emissions				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
• Surface access journeys (passengers, freight, employees); and	S16 Public transport modal share states a range of 50%+ public modal share is targeted in all options.			
• Aircraft (during landing take-off cycle, cruise emissions).	There will be a similar increase to aircraft taxi times from each option compared to the baseline. The increase in aircraft cruise emissions will be the same across all four options; this will be the largest impact on the carbon footprint and will need further consideration.			
Appraisal level	-20	-20	-20	-20
Summary	For any option by far the most significant GHG emissions impact will be from aircraft cruise emissions i.e. emissions from aircraft over 3,000ft. As a result every option is judged to have a Large Adverse impact over the baseline. Emissions from the landing take-off (LTO) cycle of aircraft, while not as large as cruise emissions will also be important. For the sift process it has been assumed that the increase in cruise emissions, once the airport is operating at a maximum capacity of up to 36-38mppa, will be the same for each scheme. The rate at which this maximum capacity is reached, and therefore the associated GHG emissions arising, will vary over time depending on which option is selected. However at this stage there is insufficient information available to quantify this impact and hence all are presented as Large Adverse.			

5.7.7 The results of the appraisal in relation to water resources are set out below in **Table 5.11**. It should be noted that the existing surface water flow paths that cross the existing airport and the proposed development site will have to be taken into account through the development proposals. It is assumed the development process can preserve existing surface water connectivity maintaining existing surface water feeds to local receptors.

Table 5.11: S11 Water resources

S11 Water Resources				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
Does the option have any direct/indirect impacts on water quality in surrounding watercourses, particularly where Water Framework Directive (WFD) status may be compromised?	These three options would require piling through an existing landfill on a Principal Aquifer and therefore poses the risk of creating pathways for potentially contaminated water to reach the groundwater. However, it is assumed that this risk can be managed appropriately via the implementation of appropriate mitigation measures. As the Principal Aquifer underlying the site is classified as a WFD waterbody, the Upper Lea chalk, a WFD compliance assessment may be required to determine whether these options would affect the current WFD groundwater body status.			This option would entail a small area of piling and excavation of the existing landfill. Underlying clay deposits will help to protect the chalk aquifer. A WFD compliance assessment may be required as per options 1a, 1b and 1c.
Does the proposed option have the potential to affect any groundwater receptors, such as through dewatering or impacts on groundwater quality?	These options have the potential of having a large adverse impact on groundwater receptors. During the design process however, it is likely that impacts can be mitigated and reduced, ensuring that any material effects are limited in extent and duration.			This option involves the use of minor earthworks which has the potential to have a minor impact on the Principal Aquifer, SPZ and abstraction. However, as it is not anticipated to have an impact on the use and/or integrity of the Principal Aquifer, SPZ and abstraction, or quality of groundwater.
Will the option have any direct/indirect effects on water abstractions (Groundwater and surface water) and Source Protection Zones (SPZ)?	The proposed excavation on the eastern side of the site is within a groundwater SPZ (Zone 3) and could affect groundwater levels and quality, therefore also affecting the groundwater regime and the abstraction of groundwater in this area, depending on the depth of excavation. A quantitative assessment has not been carried out at this stage but it is possible that the impact on groundwater levels could be large. However, it is assumed that the risk can be managed appropriately via the implementation of appropriate mitigation measures to ensure that any measurable impacts are limited in extent and duration.			
Appraisal level	-5	-5	-5	0
Summary	Options 1a, 1b and 1c require piling through an existing landfill site on a Principal Aquifer, therefore potentially creating pathways for contaminated water to reach the groundwater. However, it is assumed that the potential risk can be managed appropriately via the implementation of appropriate mitigation measures to ensure that any measurable impacts are limited in extent and duration, and these options are therefore appraised as Slight Adverse. In comparison, Option 2 is considered to have a Neutral impact as the scale of earthworks would be smaller and is therefore not anticipated to have an impact on the use and/or integrity of the Principal Aquifer, SPZ and abstraction.			

5.7.8 The results of the appraisal in relation to flood risk are set out below in **Table 5.12**. Whilst the airport site and immediate surrounding area are not considered to be at risk of fluvial flooding (Environment Agency Flood Map for Planning, Ref 5.1; LBC Preliminary Flood Risk Assessment, Ref 5.2; and North Hertfordshire Preliminary Flood Risk Assessment, Ref 5.3), there is an area at risk from surface water close to the existing terminal building with flow paths to the east flowing down Winch Hill, representing the upper catchment of the River Mimram.

Table 5.12: S12 Flood risk

S12 Flood Risk				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
Does the option encroach on any areas at risk of flooding from surface water, rivers, artificial water bodies or groundwater?	There are parts of the existing airport site that are shown to be subject to high risk from surface water flooding and several surface water flow paths crossed by the access road associated with all four options which will need to be taken into account in the development proposals.			
Does the option have the potential to pose any increase in flood risk to receptors located in the vicinity of the site?	It is assumed that the development process can appropriately manage surface water flood risk via the implementation of an appropriate drainage design to ensure no adverse effects on nearby receptors. The site extent associated with this option is of low susceptibility to groundwater flooding and will therefore not result in any impacts on groundwater flooding.			
To what extent can any potential impacts on flood risk be appropriately managed?	It is assumed that any potential impacts on surface water flood risk can be appropriately managed via drainage design.			
Appraisal level	0	0	0	0
Summary	On the basis that any potential impacts on surface water flooding are managed via the implementation of an appropriate drainage design, all four options will not result in any impacts to loss of flood storage or increase in flood risk and are therefore considered to be Neutral.			

5.7.9 The results of the appraisal in relation to potential effects on assets of cultural heritage are set out below in **Table 5.13.**

Table 5.13: S13 Cultural heritage

S13 Cultural Heritage				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
Does the option seek to minimise adverse effects on the significance of internationally and nationally designated heritage assets and their settings?	In options 1a, 1b and 1c a large area of new surface car parking may be visible from Wigmore Hall, a Grade II Listed building, and the new terminal building will probably be visible beyond this. However, the setting of Wigmore Hall has already been compromised as it is oriented to face onto Eaton Green Road and a housing estate now forms its principal view.			Under this option the new airport infrastructure, including taxiways and aprons would be located closer to the boundary of the Someries Castle Scheduled Monument. This would introduce new elements in terms of buildings to the east and apron areas and would be a change to the setting of a Scheduled Monument. The impact on the setting of Luton Hoo Registered Park and Garden and the Grade I listed Luton Hoo House as well as other listed structures within the park will require careful assessment; key potential impacts are noise, light pollution and visual impact.
Does the option affect other heritage assets?	The excavation of the earthwork platform is likely to require the demolition of Winch Hill Farm House, a Grade II Listed building. The development on the New Century Park site (currently Wigmore Valley Park) will require evaluation trenching to determine the impact on the Iron Age/Romano British site.			There is the site of an Iron Age enclosure known from aerial photographs and retrieval of finds on land south west of Chiltern Hall, and an unknown potential for the preservation of archaeological sites across the land to the south of the airport.
To what extent can effects potentially	Where archaeological deposits are shown to be preserved within the area that will be affected by			The introduction of new tree

S13 Cultural Heritage				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
be managed and mitigated?	the earthworks the impact will require mitigation by excavation/ preservation by record). The visual impact of the new buildings and car parking and other surface structures can be mitigated by the introduction of bunding and screening to reduce the visual impact.			planting to the south east of Someries Castle Scheduled Monument would alter the setting in terms of its intervisibility, particularly from Luton Hoo because it was originally conceived to be a landmark.
Appraisal level	-5	-5	-5	-20
Summary	For all options, the impact on the setting of Luton Hoo Registered Park and Garden and the Grade I listed Luton Hoo House as well as other listed structures within the park will require careful assessment; key potential impacts are noise, light pollution and visual impact. The western side of the airport has already been subject to ground levelling for previous development. This has reduced the likelihood of pockets of shallow archaeology surviving across the site, apart from a small area at the north western extent beyond the end of the runway (coinciding with the route of the Luton DART) which may have some potential for the preservation of archaeological deposits. The possible visual impact on the setting of Someries Castle Scheduled Monument is much more significant in option 2 and the introduction of new tree planting to the south east of the Scheduled Monument would alter the setting in terms of its intervisibility, particularly from Luton Hoo because it was originally conceived to be a landmark.			

5.7.10 The results of the appraisal in relation to landscape and visual impact, and environmental land use, are set out below in **Table 5.14.**

Table 5.14: S14 Landscape and visual impact and environmental land use

S14 Landscape and visual impact and environmental land use				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
Does this option impact, protect or enhance designated landscapes or townscapes?	The Chilterns Area of Outstanding Natural Beauty (AONB) is located to the west (beyond the M1 motorway) and north of Luton. It is not considered that the airport development proposed within these three options would be discernible from the AONB, although associated development, over-flying aircraft and light pollution may be visible and may impact the tranquillity of people in the AONB to some extent. The earthworks and built development proposed under these options would have a substantial impact on the 'Wigmore Rural' designated Area of Local Landscape Value (ALLV), and the Dane Street Farm ALLV.			Development would not be discernible from the AONB, but associated development, over-flying aircraft and light pollution may be visible and may impact the tranquillity of people in the AONB to some extent. The airport expansion would substantially affect the Dane Street Farm and Someries Farm ALLVs and Hyde designated Area of Great Landscape Value (AGLV).
Does this option affect the visual amenity of potentially sensitive visual receptors (e.g. those recreating in the surrounding landscape; those visiting historic buildings; etc.)?	These three options could affect the visual amenity and tranquillity of people using Wigmore Valley Park and walkers using public rights of way (notably users of the Chiltern Way long distance footpath) to the east and northeast of the airport. Operations within the airport, associated developments and night-time effects of lighting, may impact amenity of some residential properties, particularly those within Luton and adjoining LLAL's land ownership to the east of the airport (Century Park) and the Option Land.			Option 2 could affect walkers using public rights of way south of the airport and visitors to Someries Castle and Luton Hoo, as well as the visual amenity of some residential properties.
Does this option affect locally sensitive landscape features (e.g. ancient woodlands, historic hedgerows, etc.) or contributors to landscape value (e.g. public access, etc.)?	There would be substantial alteration to landform and the removal of several blocks of woodland and historic hedgerows within LLAL's land ownership to the east of the airport. Development would affect a designated County Wildlife Site and District Wildlife Site (east and west of the airport respectively), as well as a number of rights of way, and require substantial	Similar to option 1a, although 1b would not affect designated Ancient Woodland.	Please see appraisal for option 1a.	Option 2 necessitates the removal of several hedgerows (some mature) and woodland blocks to the south of the existing airport. Historic road alignments to the south of the runway would need to be realigned, and a number of rights of way would need to be stopped up or redirected.

S14 Landscape and visual impact and environmental land use				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
	alteration to Wigmore Valley Park. This option would also affect an area of designated Ancient Woodland, directly to the east of the airport would need to be removed to accommodate the extended taxiways.			
Does this option affect the character of the landscape/townscape or the perceptual characteristics of surrounding landscape/townscape character areas?	The earthworks operations and commercial development proposed within these options would substantially affect the physical character of the landscape, directly affecting three Landscape Character Areas. The reconfiguration of the airport and construction of taxiways would impact to some extent (particularly to its north) the landscape character and perceptual characteristics of Character Area 14: Luton Airport, shown in the Luton Landscape Character Assessment. Increased air traffic is considered to affect the perceived tranquillity experienced from seven surrounding Landscape Character Areas for these three options and option 2 as well. The replacement open space in North Hertfordshire is an appreciable distance from the existing area of parkland and users, and is considered to be incongruous to the existing landscape character within its surrounding area.			The new terminal and its access road would substantially affect the physical landscape of the three Landscape Character Areas, whilst the CPAR and reconfiguration of built form would impact the landscape characteristics of Character Area 14: Luton Airport.
To what extent can effects on landscape or visual amenity be managed and mitigated?	There is modest opportunity to mitigate or enhance the affected areas of landscape within LLAL land in these options. Hedgerow reinstatement and strategic woodland planting at the perimeter of LLALs land ownership to the east of the airport (Century Park) and the Option Land would assist in screening the development to some extent. Varying the gradation and including planting on the slope to the perimeter of the proposed platform and structural planting within the parkland and to the perimeter of drainage water bodies and car parks would also help to mitigate the visual impacts. These options would require some 'off-site' landscape compensation and strategic planting to screen affected views and to mitigate for affected valued landscape elements that cannot be compensated within the LLAL's ownership.			This option offers less opportunity than 1a, 1b and 1c to mitigate or enhance the affected areas of landscape without the use of third party land. Option 2 could require a large amount of 'off-site' landscape compensation for strategic woodland planting to screen affected views/ night-time effects from the surrounding areas (e.g. views from Luton Hoo) and could require specific lighting measures in order minimise night-time impacts.

S14 Landscape and visual impact and environmental land use				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
Is this option likely to result in the loss or damage to best and most versatile agricultural land (i.e. ALC Grades 1, 2 or 3a)?	It is reasonable to predict that these three options will affect agricultural land which is approximately a mixture of 50% Subgrade 3a (i.e. Best and Most Versatile land - BMV) and 50% Subgrade 3b (not BMV). The quantum of agricultural land affected (of which it is estimated 50% will be BMV) under any of these three options would appear to be broadly similar.			Major development and highways proposed to the south of the airport is likely to affect the most BMV agricultural land.
Does this option affect local farm businesses (effects on sustaining a rural economy and on individual farmers and their farming operations)?	Local farm businesses east of the airport could be affected by these three options.			Option 2 is likely to have the greatest effect on local farm businesses as it affects the largest area of agricultural land. It also affects a higher number of holdings than the other options.
Does this option affect soil (including topsoil and subsoil) as a finite resource?	The effects on soil (including topsoil and subsoil) are likely to be substantial as all four options will involve extensive earthworks. At this stage it is difficult to quantify the effects on soil and therefore establish whether any option is more or less favourable than the others in terms of effects on soil.			
Does this option affect rural land designations (e.g. Agri-Environment Schemes or Nitrate Vulnerable Zones)?	The likely effects on rural land designations appear to be broadly similar for all three options where development is focused north of the runway.			Option 2 will have a greater effect on rural land designations as two areas of agricultural land nearby have been entered into the Entry Level Stewardship scheme (or higher).
To what extent can effects on land use be managed and mitigated?	These options would involve substantial alteration to existing agricultural land and soils, affecting local farm businesses and BMV land. By using appropriate soil management regimes and minimising the footprint of any earthwork activities, effects on soils as a finite resource could be minimised.			In addition to those impacts identified for 1a, 1b and 1c, the area of landscape affected by option 2 is considered to be greater in scale; broadly of similar overall value and sensitivity; and more problematic in land use terms to that affected by options 1a, 1b and 1c.
Appraisal level	-10	-10	-10	-20

S14 Landscape and visual impact and environmental land use				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
Summary	Options 1a, 1b and 1c are considered to be broadly similar in effect, which whilst potentially more significant during construction, are also considered to have greater potential for being mitigated in the longer term. The area of landscape affected by option 2 is considered to be greater in scale; broadly of similar overall value and sensitivity; and more problematic in land use terms to that affected by any of the other options which focus development north of the runway.			

5.7.11 The results of the appraisal in relation to climate change are set out in **Table 5.15.**

5.7.12 In undertaking the appraisal for this criterion it was assumed that the appropriate engineering responses to climate change will be incorporated into the design of the project, such that all four options would be as resilient to climate change as far as practicable. In turn, the degree of complexity of the engineering response depends on each option's circumstances and design. The design of the airport infrastructure and associated surface access routes, drainage, material selection, all have an influence on the climate change resilience of the scheme. For all options, the engineering response will have to consider the following in particular when addressing climate change resilience:

- building on closed landfill – contamination, remediation, earthworks, etc;
- hard standing surface area – this refers to apron, forecourt drop off area, short stay car park, terminal footprint, etc. The amount of hard standing affects surface water run off impacts during extreme weather events, increased precipitation and flash flooding; and
- the urban heat island – this may impact on the operation of buildings (increasing energy demand for example) through increased temperatures and changes in seasonality.

5.7.13 In addition, the project site is not located near a water course or flood plain. Therefore any increased flood risk would be as a result of increased heavy rainfall events leading to flash flooding – this should also be addressed through engineering responses.

5.7.14 It is important to note here that as a result of the additional information available at the time of Sift 2, the appraisal levels contained within **Table 5.15** are therefore more positive than Sift 1 as the technical lead had further detail and

confidence in the ultimate construction methods of the proposed terminals. Please note the scoring for this criterion has been updated from the draft Sift 2 report. Paragraph 4.4.2 of the Sift 3 Report explains the basis for this change.

5.7.15 For the purposes of this sift, another sub-criterion (which looked at the impacts on environmental receptors when considered in combination with climate change) has not been evaluated due to insufficient information available from the interdependent criteria; the required information is anticipated to become available during the EIA process when it will become possible to fully determine the in-combination impacts of the project and future climate change on surrounding environmental receptors.

5.7.16 However, based on professional judgement at this stage is appears unlikely that there will be any significant in-combination impacts on cultural heritage, social value and economic benefits, but there may be some in-combination impact from the project and future climate change on water resources and habitats and biodiversity.

Table 5.15: S15 Climate change

S15 Climate Change				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
Climate Change Resilience: Does this option reduce the following climate change risks related to the proposed project during its construction, its operation and its surface access? • Extreme high temperature • Heavy precipitation • Flood risk • Damage to building/ infrastructure • Increased seasonal events • Increase in mean temperature	All options represent an increase in hard standing area compared with the existing airport. Although some options, such as options 1b and 1c require a higher volume of hard standing than others, the engineering and drainage solutions will be designed appropriately for the corresponding sizes of the respective options. As a result, the layouts will mitigate the risks associated with climate change to the same level for each option.			
Appraisal level	5	5	5	5
Summary	All options were appraised to have a beneficial impact in terms of their resilience to climate change in comparison to the existing airport. It is assumed that any new assets and infrastructure would be engineered to current design and building specifications therefore making them more resilient to the predicted impacts of climate change.			

5.8 Strategic Objective O7: To maximise the number of passengers and workforce arriving at the airport on public transport

5.8.1 Strategic objective 7 sought to maximize the number of airport passengers and workforce arriving at the airport on public transport, with **Table 5.16** appraising the options on their public transport accessibility and their anticipated walking/ cycling modal share.

Table 5.16: S16 Public transport modal share

Sub Criteria	Option Family			
	Option 1a	Option 1b	Option 1c	Option 2
Can the Luton DART be extended to increase modal share?	The Luton DART could be extended (subject to detailed design) but the provision of two stations, one for each terminal, will lead to increased complexity, less frequent services and longer journey times.	The Luton DART can be extended (subject to detailed design). With option 1b the distance would be marginally closer but not significant.		This may be difficult to achieve with this option given the terminal building south of the runway. It is also likely that it will be more expensive than the Luton DART solution for options1a, 1b and 1c
Can bus services be increased to accommodate a larger PT modal share?	Bus services could be increased but they may be less attractive to airport employees if they stop at the existing terminal prior to the new terminal.	Bus services could be increased, with the added attractiveness of the drop off areas / pick up areas being close to the urban conurbation in these two options, so no duplicate services would be required.		Bus services could be increased, but it is unlikely that the same buses would be able to serve both terminals without restrictive time penalties. This would predominantly affect airport employees rather than passengers.
Can more coach services be accommodated to increase PT modal share?	More coach services could be accommodated but they would be less attractive due to dwell time at two terminals (i.e. added journey time). This can be somewhat overcome by having a single terminal area for coaches and then a	There is sufficient space for a public transport interchange to be accommodated. However, a split level solution might be more appropriate which is more expensive.		With the provision of a new terminal there is sufficient space to accommodate a PT interchange and to include more coach services. However, journeys between the two terminals may be seen as negative.

Sub Criteria	Option Family			
	Option 1a	Option 1b	Option 1c	Option 2
	transfer onto Luton DART.			
Can walking and cycling be accommodated to increase modal share?	For staff, these options are attractive in terms of their proximity to the urban conurbation of Luton; therefore take-up of walking and cycling should be healthy.			For staff, as the new terminal building is not close to residential / built up areas, walking and cycling will not be as attractive as in option 1a, 1b and 1c.
Can landside forecourt layout provision accommodate all traffic increase – PT and others?	A split level solution is most likely for the new terminal based on early layouts produced, but is considered more expensive.	Landside forecourt layout provision could accommodate the increase but early layout configurations suggest a split level solution would be required to accommodate passenger drop off, short stay parking and public transport interchange.		There is sufficient space to accommodate traffic increases.
What is an appropriate PT modal share target/ aspiration?	A range of 50-60% is targeted. However, a phased approach is envisaged as the later years up to 2042 would be largely aspirational as there is currently no binding agreement from stakeholders such as Network Rail; with some of the proposals that might come forward being completely out of LLAL's control.			Up to 50% is targeted, less than for options 1a, 1b and 1c.
Appraisal level	5	10	10	-5
Summary	Options 1b and 1c are appraised as Moderate Beneficial because: the Luton DART could be extended in these options more easily than for option 1a and option 2; they are closer to the conurbation (increasing take-up of walking and cycling and attractiveness of bus services); and they have the potential to achieve a higher target of 50-60% for public transport modal share. Whilst option 1a also has the higher target of public transport modal share, it is considered Slight Beneficial due to the need to serve two terminal buildings, impacting on the attractiveness of bus and coach services. Option 2 is considered Slight Adverse due to the difficulties of extending the Luton DART and the increased journey times for buses and coaches required to serve both terminal buildings.			

5.9 Strategic Objective O8: To minimise new build highway requirements

5.9.1 Sift criterion S17 appraises the potential magnitude and scale of additional highway infrastructure required to service the four option families. **Table 5.17** below sets out the results of the appraisal.

Table 5.17: S17 Requirement for additional highway infrastructure

S17 Requirement for Additional Highway Infrastructure				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
Are new highways needed to accommodate the proposals generated traffic?	Yes, amendments to junctions and potential sections of the CPAR will be required in option 1a. Grade separation may be required at Airport Way and major changes to Junction 10 of the M1 (scale as yet unknown).	A higher magnitude of upgrade of CPAR would be required; however it may not be necessary to grade-separate the junction with Airport Way.		New highways are required including a further key road link connecting to Airport Way. As with options 1a, 1b and 1c, the vicinity around Junction 10 will need to be improved (scale unknown but major). CPAR in present format should be adequate.
What is the magnitude of these highway proposals?	The CPAR junction with Airport Way will need to be grade separated, and the junction to the north of the GKN Plc building may require significant amendments. As with options 1a and 1b, the scale of changes required at Junction 10 are as yet unknown.	Major (new build) with potential additional lanes and new junction configurations required, suggesting that the nature of the CPAR may/will change. In addition, the M1 by Junction 10 will also require changes; the scale is currently unknown but is subject to the success of PT modal share increases.		Major (Junction 10). Difficult and challenging new links to Airport Way will be required to provide access to the southern terminal locations.
Can forecourt highway links be accommodated in an efficient manner?	A split level solution will be required at the new terminal building. Car parking at surface level for long stay will be pushed further into Century Park.	Yes, however split level activities are most likely to be required based on early designs. It may also be difficult to achieve grade-separation given the distance between the proposed terminal and CPAR.		The site is unconstrained and as such an efficient highway layout could be provided (assuming a split level forecourt).
How well can it link with proposed new highway solutions in the vicinity?	The proposed terminal builds on the CPAR provision. As with options 1b and 1c, it	Although it links up with CPAR, major reconfiguration and changes to the CPAR are required. It could link up well with the A505 if pursued, but could potentially have major impacts on		New, independent highway solutions are required.

S17 Requirement for Additional Highway Infrastructure				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
	could link up well with the A505 if pursued, but could potentially have major impacts on Junction 10 of the M1 and its vicinity.	Junction 10 of the M1 and its vicinity.		
Appraisal level	-10	-20	-20	-20
Summary	Due to the need to upgrade the CPAR, therefore requiring major highway interventions, options 1b and 1c are appraised as Large Adverse. Option 2 is also appraised as Large Adverse as a new link road is required to serve the southern terminal. Although major new build infrastructure may be required, in comparison with the other options, the impact of option 1a is likely to be the lowest in magnitude/scale so it is considered to be Moderate Adverse.			

5.10 Strategic Objective O9: To minimise impact on the wider highway network

5.10.1 **Table 5.18** below sets out an overview of how the options could impact on the wider highway network.

Table 5.18: S18 Impact on wider highway network

S18 Impact on wider highway network				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
Will highway capacity show problems in accommodating additional traffic levels before mitigation?	Yes, around M1 Junction 10, motorway and link roads to the airport with the CPAR less affected, compared to options 1b and 1c.	Yes, around M1 Junction 10 and motorway links, and the CPAR, as well as local junctions in the built up conurbation. Early studies suggest the M1 may be able to cater with around 50% increases in airport traffic beyond 18mppa. Thus more PT modal share and traffic management interventions will be required.		Yes, the motorway link around Junction 10.
Can mitigation be provided within highway or airport owned land, or do areas of mitigation require third party land?	Significant off site highway works will likely be required and would require third party land in some instances.			The new link road to Airport Way will require third party land.
How many links and junctions might require mitigation?	Approximately 20 (subject to model confirmation).	Approximately 25 (subject to model confirmation). Major grade separation is likely to be required.		Whilst this option would affect less than 10 (this is a high level estimate subject to model confirmation), the need for a new road link and the environmental issues and costs that result weigh against this option.
Can car parking be accommodated on airport land?	Likely, however this is subject to detailed work. However, surface level parking for long stay may require further land beyond airport control.			No. The southern terminal and its environs are located on land beyond LLAL's ownership.
Appraisal level	-10	-20	-20	-20
Summary	Significant additional public transport modal share and traffic management interventions will be required for all options. Options 1b and 1c are considered to have a Large Adverse impact on the wider network and 25 links/junctions could require mitigation (subject to model confirmation). Option 1a requires less mitigation on airport and third party land than 1b and 1c, hence the Moderate Adverse rating. Whilst option 2 requires less mitigation again than option 1a, the need for a new road link and the resultant environmental issues and costs has led to a Large Adverse rating.			

5.11 Strategic Objective O10: To be technically viable, taking account of the needs of airport users, operators and phasing

5.11.1 **Table 5.19** below focuses on the deliverability of the options.

Table 5.19: S19 Deliverable within the context of the current concession to 2031

S19 Deliverable within the context of the current concession to 2031				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
Deliverable without impacting substantially on current concession boundary	Construction should be capable of being managed without impacting on the current concession.	A second terminal starting west of the existing taxiway network cannot be constructed without impacting on the operation of the existing terminal and concession area which runs until 2031. This option could only realistically be delivered if the existing concession was terminated early or other agreement reached with the concessionaire to reconfigure the existing terminal area at an early date.	This option will be difficult to deliver within the context of the existing concession boundary and without impacting on the operation of Terminal 1. The location of the terminal would need to be to the east of the existing taxiway network and existing cargo facilities would need to be relocated.	It is technically feasible to construct option 2 without impacting on the existing concession and only with minimum interface to the existing operation (runway tie-ins only).
Impact on additional land leased by LLAOL	T2 would require relocation and replacement of long stay car parks on land leased by LLAOL but the impact is expected to be manageable.	T2 would require relocation and replacement of long stay car parks on land leased by LLAOL.	T2 would require relocation and replacement of long stay car parks on land leased by LLAOL.	No impact.
Can the option be phased so as to meet demand until a new concession is in place?	Yes, construction can be phased, with a minimum first phase of 10-12 mppa.	In order to enable reconfiguration of Terminal 1, Terminal 2 would need to have capacity for 16-20 mppa by 2033 (i.e. more than would be required in a freestanding second terminal) in order to allow for decanting of traffic	In order to enable reconfiguration of Terminal 1, Terminal 2 would need to have capacity for 16-20 mppa by 2033 (i.e. more than would be required in a freestanding second terminal) in order to allow for decanting of traffic	Please see appraisal for option 1a.

S19 Deliverable within the context of the current concession to 2031				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
		from T1. Phasing construction would be complex, even assuming 50% of T1 traffic could be decanted.	from T1. Phasing construction would be complex, even assuming 50% of T1 traffic could be decanted. Even then, it is not clear how the operation could be maintained at an acceptable level of service during the reconstruction process.	
Appraisal level	10	-10	-5	20
Summary	Delivery of option 1b, although not impossible, would be extremely challenging both in terms of managing capacity, meeting customer expectations and without substantial contractual issues, and is therefore considered Moderate Adverse. Option 1c is considered Slight Adverse due to the potential to disrupt the operation of T1 under the current concession. Option 1a is considered Moderate Beneficial compared to options 1b and 1c due to its limited impact upon the current concession's operations. Option 2 could provide the largest beneficial impact of all the options due to its ability to largely be constructed without impacting on the existing concession.			

5.11.2 **Table 5.20** overleaf looks at how attractive each option would be to a future concessionaire coming into LTN in terms of investment, revenue and operations.

Table 5.20: S20 Attractive to future concessionaire

S20 Attractive to future concessionaire				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
Cost of works and timing relative to income	This is likely to be the most cost effective option as it allows a smaller scale of initial build relative to the overall capacity required at the airport. In addition, this option maintains the existing MRO and maintenance areas, therefore preserving existing revenue streams.	It is unclear how this would be constructed due to the interaction with the existing concession. Contractual complexities are unlikely to be attractive to a new concessionaire as this would add substantially to the risk.	This option requires a larger earthworks platform. Unlikely to be attractive to incoming concessionaire due to high cost.	Like option 1a, this option can be phased and also maintains the existing MRO and maintenance areas. It minimises earthworks due to the southside alignment, but also has potentially high costs with the opening up of the site south of the runway and new infrastructure.
Can the option be phased to align with income?	Both options 1a and 2 would allow phasing aligned to demand, therefore minimising early concessionaire expenditure.	This would require a very large first phase built to allow reconstruction of T1 and is unlikely to be attractive to incoming concessionaire due to the high cost.		Please see appraisal for option 1a.
Opportunities for additional revenue generation, e.g. from MRO, Business Aviation, ancillary facilities	This option potentially minimises the earthworks platform but the extended platform could offer additional opportunities for MRO and Business Aviation to enhance revenue.	This option reduces land for Business Aviation and MRO unless the earthworks platform is extended.	This option potentially maintains large areas of land for MRO and Business Aviation, allowing more opportunities for additional revenue than option 1b.	Please see appraisal for option 1a.
Does the scheme provide sufficient flexibility from a design and operational perspective, for future concessionaires and airlines?	Two-terminal operation north of the runway is likely to be more cost efficient than a split operation across the runway (as in option 2), therefore reducing concessionaire operation costs, but at the expense of the loss of some flexibility due to split terminal operations.	Single terminal could be more cost efficient in operation and provide for some flexibility in use by airlines.		Southside operations (cross runway) may result in inefficiencies (see strategic objective O11), higher operating costs for the concessionaire and lower commercial income compared to a single terminal solution.

S20 Attractive to future concessionaire				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
Appraisal level	20	-5	5	20
Summary	Options 1b and 1c are likely to encounter challenges in phasing which reduces option 1c to Slight Beneficial, with option 1b appraised as Slight Adverse due to the additional reduction in the amount of land for Business Aviation and MRO. Overall, both options 1a and option 2 are appraised as Large Beneficial given the flexibility they provide to future concessionaires and the ability to phase delivery in line with demand.			

5.11.3 As highlighted in S15, some options involve occupying part of the area underlain by the landfill and would require earthworks to create a platform at an appropriate level. The costs and logistical difficulties involved in these works could be significant to the viability and deliverability of the Project so it will be important to keep them in view throughout the development of the design. **Table 5.21** below provides an overview of the appraisal of the options with regard to the feasibility of the landfill, earthworks and ground conditions.

Table 5.21: S21 Feasibility of landfill, earthworks and ground conditions

S21 Feasibility of landfill, earthworks and ground conditions				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
What extent does this option use geological resource i.e. aggregate?	At least 4.4million m^3 of fill would be needed to create the platform.	At least 1.6million m^3 of fill would be needed to create the platform for the airfield area. The fill material could all be sourced from the option land to the east.	At least 4million m^3 of fill would be needed to create the platform for the airfield area.	At least 0.5million m^3 of fill would be needed to create the platform. Fill material could all be sourced from the development area and a cut/fill balance achieved.
To what extent does this option present a potential pollution risk to water or soil quality? Can this be mitigated?	As with options 1b and 1c, but the area involved and extent of disturbance is likely to be greater.	These options include excavation of a considerable volume of waste and the construction of piles through the landfill to support the stands and buildings. This could create pathways that impact on site users and controlled waters. Mitigation will be possible but the scale of the disturbance of the landfill may make it difficult to avoid short term impacts.		Very low risk that could be mitigated. Development will be underlain by clay deposits that will protect the chalk. Desk study has not identified any potential contamination sources.
To what extent does this option require landfill waste to be excavated?	Excavation for this option would be greater than for 1b and 1c.	These options include a considerable area of stands on the landfill - the enabling works to allow this will result in the excavation of similar amounts of waste to in both options 1b and 1c.		Possible small area of excavation to enable new taxiway.
To what extent does this option reuse excavated materials?	Yes - there are carparks on the landfill - this will provide an area to reuse waste generated by the enabling works.			Yes - a cut/fill balance is likely to be possible.
Does this option improve the contamination conditions of soil/groundwater?	Yes - the mitigation measures that will be necessary will result in a reduction of risk in the long term. There may be an increase in risk in the short term however - see above.			No current impacts are likely in the terminal/stands area.
What is the extent of construction risks to environment and health of local residents?	Movement, processing and disturbance of large volumes of waste have the potential to cause gas, dust and odour impacts to local residents. Very careful management of this will be needed.			Low risk due to significant distance to populated area – emissions are likely to be lower than other options.
Does this option generate large volumes of waste or problematic waste (e.g. hazardous or landfill waste) in construction, operation and decommissioning that cannot be effectively managed locally?	Yes - some of the waste excavated will not be suitable for reuse and will have to be taken to an off- site repository.	Please see appraisal for option 1a.	As with options 1a and 1b but option 1c will also include the demolition of existing buildings, leading to the generation of residual non-recyclable materials.	No.

S21 Feasibility of landfill, earthworks and ground conditions				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
To what extent does it rely on large volumes of non-renewable materials for its construction?	Approximately 4.4 million m^3 of fill will be needed to create the platform for this option. The fill material can all be sourced from the development area and a cut/fill balance achieved.	Approximately 5million m^3 of fill will be needed to create the platform. The fill material can all be sourced from the option land to the east of the development area.	Approximately 4million m^3 of fill will be needed to create the platform for this option. The fill material can all be sourced from the option land to the east of the development area.	Approximately 0.5million m^3 of fill will be needed to create the platform for this option. The fill material can all be sourced from the development area and a cut/fill balance achieved.
How do each of the options relate to waste operations?	A two-terminal option is assumed to perform less well than a single terminal option as waste management areas would need to be duplicated and this would not deliver the same economies of scale. The dual north option is assumed to perform better than a north/ south option because some collocated facilities could be included.	A single terminal option is assumed to be better than a two-terminal option as it allows for economies of scale through a single waste management area		Please see appraisal for option 1a.
Appraisal level	-20	-20	-20	-5
Summary	Options 1b and 1c were appraised as Large Adverse because: obstructions in the landfill may make piling difficult; a large earthwork platform would be required; and construction will be dependent on earthworks weather (restricted to building in the summer earthworks season). The impacts of option 1a are also considered to be Large Adverse for the same reasons as 1b and 1c, but also because the large area of stands on the landfill will require many piles or a compromise on stand reliability/maintenance. In comparison, Option 2 is considered relatively straightforward with regard to the earthworks required, with possible minor work to mitigate soft spots.			

5.11.4 Sift criterion S22 considers the elements of the proposed layouts, earthworks and access routes, and whether they occupy land owned or optioned by LLAL. The results of the appraisal are shown in **Table 5.22**. As part of the back-checking process undertaken to finalise this report, it was identified that additional work undertaken to inform the earthworks solution had an impact on the appraisal contained in the draft Sift 2 Report. It is now clear that some of the options being considered would involve isolated pockets of land ownership outside of LLAL's current holdings.

Paragraph 4.4.4 of the Sift 3 Report provides further explanation. Therefore, a conservative approach has been taken to assume that all options which could potentially use one of those landform options considers this additional information as part of the Sift 2 appraisal. This has resulted in the Large Beneficial appraisal levels in the draft Sift 2 report being reduced to Moderate Beneficial in Table 5.22.

Table 5.22: S22 Additional land required beyond current LLAL holdings

S22 Additional land required beyond current LLAL holdings				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
Does the proposed layout, and the earthworks needed to support it, directly occupy land not owned by LLAL?	LLAL generally own or have an option on all the land envisaged at this stage to be required.			Yes a large area of additional land is required.
Will the earthworks required to win material involve land not owned by LLAL?	LLAL generally own or have an option on all the land envisaged at this stage to be required, with the exception of isolated pockets.			No - it will not be necessary to involve additional land to win earthworks material.
Do the proposed access routes and the earthworks needed to support them directly occupy land not owned by LLAL?	LLAL generally own or have an option on all the land envisaged at this stage to be required.			Yes a large area of additional land is required.
Appraisal level	10	10	10	-20
Summary	Given that options 1a, 1b and 1c would be located generally within LLAL's boundaries, they are considered as performing well against this criterion. However, as these options may require isolated pockets outside of LLAL ownership for their underpinning earthworks, they are appraised as Moderate Beneficial. Option 2 however is considered Large Adverse as it could require third-party land to be included to enable access.			

5.12 Strategic Objective O11: To enhance LTN's system efficiency and resilience

5.12.1 The current airfield layout is inefficient, giving rise to delays to arriving and departing aircraft and limiting the number of aircraft movements per hour using the runway. The current terminal layout is also inefficient, with long walking distances for some passengers, particularly those using the older part of the building. There are therefore clear opportunities to provide new airfield and terminal layout which improve overall efficiency, and to make the most of technological improvements which could drive efficiency. **Table 5.23** below sets out how each of the four options performs with regard to operational effectiveness.

5.12.2 As part of the finalisation of this report, the back-checking process covered in the Sift 3 report identified that the current passenger experience was an important consideration for airport users and airline operators, and should be afforded greater consideration in the appraisal. In the draft Sift 2 report, options 1b and 1c were appraised as Large Beneficial as the single terminal building would likely increase operational efficiency, flexibility and enhance the passenger experience. After the back-checking, the appraisal level of option 1b has been reduced to Moderate Beneficial, reflecting the perceived impact to passenger experience due to building from west to east, resulting in disruption to existing terminal operations before there is sufficient space to decant operations to the east. The updated appraisal levels and rationale are reflected in **Table 5.23** below and paragraph 4.4.6 of the Sift 3 Report provides further explanation of the changes.

Table 5.23: S23 Operational effectiveness

S23 Operational effectiveness				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
How efficient is the layout?	New terminal would enhance efficiency but could result in some inefficiency due to split operation over two buildings.	Single terminal would potentially increase operational efficiency.		Some inefficiencies due to split operation across the runway.
Delays to airlines	Delays are considered to be within acceptable levels.			Delays within acceptable levels but some reduction in performance due intermeshing movements north and south of the runway.

S23 Operational effectiveness				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
Passenger experience	Whilst the new terminal building would provide operational flexibility and enhance passenger experience, the existing terminal would be retained with a lower efficiency and passenger experience.	The passenger experience of this option is comparatively worse than option 1c due to building from west to east. This would result in disruption to existing terminal operations before there is sufficient space to decant operations to the east.	A completely new terminal building would be designed to provide operational flexibility and to enhance passenger experience.	Please see appraisal for option 1a.
Appraisal level	10	10	20	10
Summary	Options 1c is appraised as Large Beneficial due to increased efficiency due to the design of a completely new terminal building, which would also provide operational flexibility to airlines and enhance the passenger experience. Whilst option 1b also receives these benefits, passenger benefits within this option are comparatively lower given the disruption of building from west to east. Options 1a and 2 are both considered Moderate Beneficial due to the residual inefficiencies of the existing terminal.			

5.12.3 Shortage of taxiway infrastructure means that the current airfield layout has little resilience to any blockage of the runway or taxiways, and the single entrance to the central terminal areas means that there are no alternative road access routes to the terminal. The Project provides the opportunity to provide a full length parallel taxiway which could also provide for an Emergency runway to improve resilience in the event of a blockage to the main runway.

5.12.4 Building on the strategic objective 11, sift criterion S24 appraised the four option families for their resilience to operational disruption, both in absolute terms and compared to the existing scenario, as shown below in **Table 5.24**. It should be noted that this assessment is made on the basis of the final configuration as indicated by the options as phasing issues are considered separately under deliverability (see S19).

Table 5.24: S24 System resilience

S24 System resilience				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
Resilience to operational disruption	Two-terminal operations increase resilience to disruption. The inefficient loop taxiway configuration is retained, although additional taxiways will reduce delays.	Single terminal improves operational efficiency but lower resilience in the case of disruption to single terminal operation. These options replace the inefficient loop taxiway configuration which is prone to blockage. Additional taxiway infrastructure enhances resilience.		As for option 1a with the additional benefit that the southside location of one of the terminal buildings could provide enhanced resilience to any incidents north of the runway.
Resilience in the broader infrastructure (road and rail)	Two-terminal options provide alternative surface access routes and are therefore more resilient than the single terminal options.	These options are reliant on a single front door and surface access links and are therefore less resilient that the two-terminal options.		Please see appraisal for option 1a.
Extent of resilience improvement	Extent of resilience improvement is greater in two-terminal options in terms of operational disruption and broader infrastructure.	Resilience is improved to a lesser extent when compared with two-terminal buildings as in 1a and option 2.		Please see appraisal for option 1a.
Appraisal level	20	10	10	20
Summary	The single terminal options are considered to provide lower resilience in the case of disruption compared to two-terminal options. This is because options 1b and 1c are reliant on singular surface access links and therefore reduce the ability to close a section of the airport; whilst this would be possible if there was an incident, in either of the two-terminal options. As a result, options 1b and 1c are appraised as Moderate Beneficial, with options 1a and option 2 appraised as Large Beneficial.			

5.12.5 Low airport charges currently make LTN the airport of choice for low fare airlines serving north London and south east Midlands. However, at present, a shortage of aircraft stands limits the opportunities for based additional aircraft; high levels of remote parking and bussing add to operating costs and may contribute to delays; and terminal congestion and the use of older parts of the terminal may lead to shortcomings in the quality of service. Cost effective development of capacity at an early date could secure LTN's position in the London airport system and improved facilities could enhance LTN's attractiveness to a broader range of airlines.

5.12.6 **Table 5.25** covers the appraisal of the four option families on their attractiveness to airline operators, taking into account the attractiveness to passengers, airport charges and the cost of operation.

Table 5.25: S25 Attractiveness to airline operators

S25 Attractiveness to airline operators				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
Impact on airline delays	The additional taxiways will increase efficiency and could reduce delays.	The efficient apron layout in these options will reduce delays for arriving and departing aircraft.		Please see appraisal for option 1a.
Impact on airport charges and cost of operation	The ability of this option to phase should keep charges to acceptable levels and provide capacity in time to meet demand.	The high cost of delivery of these options, notably ahead of demand, could impact adversely on airport charges.		Please see appraisal for option 1a.
Resilience to operational disruption	Two terminals would enhance resilience to disruption.	A single terminal is potentially less resilient to disruption than the two-terminal options, 1a and 2.		Please see appraisal for option 1a.
Attractiveness to passengers	As charges would be kept to an acceptable level, these options would be more attractive to passengers than option 1b and 1c where the airlines are likely to incur higher costs.	The high costs incurred by the airlines could be passed down to passengers, making the airport less attractive.		Please see appraisal for option 1a.
Flexibility to adapt to airlines changing requirements	The proposed retention of T1 would reduce efficiency and make the airport less flexible to adapt to changing markets or service requirements.	New terminal is likely to be more flexible in layout and use than the existing terminal.		Please see appraisal for option 1a.
Flexibility to adapt to airline operational requirements (i.e. parking/offices)	The two terminal buildings proposed could require airline split operations.	The efficiency of single terminal operations is likely to be attractive to airlines.		Split terminals across the runway reduce efficiency of operation and may result in one or more airlines having split operations.
Ability to accommodate based carriers	Co-located maintenance activities on the northside of the runway are likely to be more attractive			Maintenance activity on the

S25 Attractiveness to airline operators				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
	to based airlines than split operations.			northside of the runway may be less attractive for based airlines in this option.
Appraisal level	10	10	10	5
Summary	Options 1b and 1c are considered to have Moderate Beneficial impacts as both would ultimately provide a modern efficient airport but the phasing required could increase costs and hence airport charges. Option 1a was also appraised as Moderate Beneficial as it would leave the relatively inefficient T1 still in use. Option 2 was rated as Slight Beneficial in comparison to the other options as it would leave T1 still in use but would also risk some airlines having to split operations either side of the runway.			

5.12.7 Current policy does not support expansion beyond the capacity of a single runway but preserving options for further capacity expansion would be desirable from LLAL's point of view. However, land for further expansion is limited by residential development to the north, Green Belt to the east and south, and Luton Hoo and Someries Castle to the southwest and south respectively. **Table 5.26** sets out how well the four option families performed in sift criterion S26 in relation to safeguarding for expansion.

Table 5.26: S26 Safeguarding for expansion

S26 Safeguarding for expansion				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
Flexibility in expansion	These three options will utilise all of the effective northside site when full phasing and MRO requirements are taken into account.			Land on the north could facilitate some further expansion, subject to alternative uses of the land in the meantime. This would provide the airport with some flexibility to accommodate additional airport related uses on the north.
Safeguarding for requirements past 2040	These options leave open any expansion options to the south in the longer term, unlike option 2.			Configuration could impact on ultimate expansion prospects to the south.
Appraisal level	10	10	10	5
Summary	Both options 1b and 1c involve the redevelopment of the existing T1 building which may result in some wastage of space, and option 1a also requires the redevelopment of T1 but in the longer term – all three options were considered to have a Moderate Beneficial rating. In comparison, option 2 was appraised as having a Slight Beneficial rating as it will occupy land to the south before the potential of this area has been fully explored whilst in the meantime, land to the north of the runway may have been developed for alternative uses.			

5.12.8 LTN currently has substantial MRO activity at the airport (with hangars in the west of the site), and retaining at least the current level of operations is important to ensuring the Airport continues to deliver skilled job opportunities. Cargo is located currently in a facility to the north of the terminal, with two dedicated aircraft stands, and there are two fixed base operators (FBOs), Signature and Harrods.

5.12.9 The concessionaire currently earns a sizeable income stream from business aviation activity and gains income from cargo and MRO aircraft parking. These will be important for the attractiveness of the future concession but may not deliver significant direct income to LLAL. Options which have land available for the expansion of these activities could increase employment opportunities in these activities, and a longer runway could facilitate services by aircraft with

greater freight capacity. **Table 5.27** sets out the appraisal of the options against sift criterion S27. It should be noted that the precise requirement for cargo, MRO and business aviation will be defined in a subsequent stage of design.

Table 5.27: S27 Safeguarding existing levels of MRO, business aviation and cargo activity

S27 Safeguarding existing levels of MRO, Business Aviation and cargo activity				
Sub Criteria	**Option Family**			
	Option 1a	**Option 1b**	**Option 1c**	**Option 2**
Maintain slots and land for MRO, Business Aviation and Cargo to minimise disruption and maintain existing operations	This option allows for the western maintenance zone, cargo and business aviation zones to remain in operation.	These options allow for the western maintenance zone to remain in operation but cargo, the EasyJet hangar and Harrods business aviation would need to be relocated.		Please see appraisal for option 1a.
Appraisal level	20	10	10	20
Summary	Options 1a and 2 are appraised as Large Beneficial as they retain existing levels of MRO, Business Aviation and Cargo Activity. Options 1b and 1c are appraised as Moderately Beneficial and the options will impact on existing businesses.			

5.13 Strategic Objective O12: To be affordable including any public expenditure that may be required and taking account of the needs of airport users and operators (Value for Money)

5.13.1 A preliminary comparative analysis on the direct benefit of the programme has been undertaken based on broad based likely investment and revenue assumptions. This analysis has sought to understand the benefit derived over a possible future concession arrangement.

Table 5.28: S28 Estimated cost benefit

Sub Criteria	Option Family			
	Option 1a	Option 1b	Option 1c	Option 2
Capex expenditure	Capex cost is estimated to be lower in this option than 1b and 1c.	Capex cost is estimated to be larger in these single terminal options compared to the two-terminal options 1a and 2.		Capex cost is estimated to be lower in this option than 1b and 1c.
Affordability of scheme	Affordability is greater than for alternative options with higher capital expenditure. There is insufficient difference at this stage between 1a and 2 to differentiate scoring.	Whilst the revenue profiles are broadly generated by the projected passenger numbers and common to each option, the investment profiles are thought to vary significantly with investment in these options and potentially twice that of 1a and 2. Therefore overall affordability is lower than for alternative options with lower capital expenditure affordability.		Affordability is greater than for alternative options with higher capital expenditure. There is insufficient difference at this stage between 1a and 2 to differentiate scoring.
Appraisal level	20	10	10	20
Summary	Given the assumptions stated above, Options 1a and 2 are appraised as 'Large Beneficial', with insufficient differences at this time between options to differentiate between them. Options 1b and 1c, with the comparatively much greater investment indicate lower benefit compared to the two-terminal options and are therefore appraised as 'Moderate Beneficial'. Beyond comparative levels of investment, any future differentiation between options will be greatest if there is any variation in the maximum number of passengers supported by an option (i.e. an option is constrained in comparison to others).			

5.14 Overall commentary

5.14.1 The overall performance of the options against the criteria is shown below in **Table 5.29** and, as noted above, includes updated appraisal levels for sift criteria S15, S22, S23 and paragraph 4.4.6 of the Sift 3 Report provides further explanation of the changes.

Table 5.29 Overall appraisal levels and numerical values for each option at Sift 2

Strategic Objective	Sift Criteria	Option Family			
		Option 1a	Option 1b	Option 1c	Option 2
O1: Compliance with Government Aviation Policy	S1: Consistent with making best use of the existing runway	Large Beneficial (20)	Large Beneficial (20)	Large Beneficial (20)	Large Beneficial (20)
O2: To identify a scheme that is likely to be capable of being consented and secured through a DCO	S2: In broad conformity with national and local town planning policies and capable of attracting the consents required	Moderate Beneficial (10)	Moderate Beneficial (10)	Moderate Beneficial (10)	Currently Unworkable (-20)
O3: To provide additional capacity and connectivity in line with the assessment of need	S3: Increase capacity both airside and landside to achieve target increase up to 36-38mppa	Large Beneficial (20)	Slight Adverse (-5)	Moderate Beneficial (10)	Large Beneficial (20)
O4: To maximise the potential economic benefits to the regional, sub-regional and local economies	S4: Deliver economic benefits nationally and regionally	Large Beneficial (20)	Slight Beneficial (5)	Moderate Beneficial (10)	Large Beneficial (20)
	S5: Increase job opportunities for the people of Luton and the surrounding areas	Large Beneficial (20)	Large Beneficial (20)	Large Beneficial (20)	Moderate Beneficial (10)
O5: To maintain and where possible improve the quality of life for Luton's residents and the wider population	S6: Promote positive benefits and minimise adverse impacts on local communities	Slight Beneficial (5)	Slight Beneficial (5)	Slight Beneficial (5)	Slight Beneficial (5)
O6: To minimise environmental impacts and, where practicable, to actively mitigate and manage any potential environmental effects	S7: Noise impact	Moderate Adverse (-10)	Moderate Adverse (-10)	Moderate Adverse (-10)	Large Adverse (-20)

Strategic Objective	Sift Criteria	Option Family			
		Option 1a	Option 1b	Option 1c	Option 2
	S8: Air quality	Moderate Adverse (-10)	Moderate Adverse (-10)	Moderate Adverse (-10)	Slight Adverse (-5)
	S9: Natural habitats and biodiversity	Moderate Adverse (-10)	Moderate Adverse (-10)	Moderate Adverse (-10)	Moderate Adverse (-10)
	S10: Carbon emissions	Large Adverse (-20)	Large Adverse (-20)	Large Adverse (-20)	Large Adverse (-20)
	S11: Water Resources	Slight Adverse (-5)	Slight Adverse (-5)	Slight Adverse (-5)	Neutral (0)
	S12: Flood risk	Neutral (0)	Neutral (0)	Neutral (0)	Neutral (0)
	S13: Cultural Heritage	Slight Adverse (-5)	Slight Adverse (-5)	Slight Adverse (-5)	Large Adverse (-20)
	S14: Landscape and visual impact and Environmental Land Use	Moderate Adverse (-10)	Moderate Adverse (-10)	Moderate Adverse (-10)	Large Adverse (-20)
	S15: Climate change	Slight Beneficial (5)	Slight Beneficial (5)	Slight Beneficial (5)	Slight Beneficial (5)
O7: To maximise the number of passengers and workforce arriving at the airport on public transport	S16: Public transport modal share	Slight Beneficial (5)	Moderate Beneficial (10)	Moderate Beneficial (10)	Slight Adverse (-5)

Strategic Objective	Sift Criteria	Option Family			
		Option 1a	Option 1b	Option 1c	Option 2
O8: To minimise new build highway requirements	S17: Requirement for additional highway infrastructure	Moderate Adverse (-10)	Large Adverse (-20)	Large Adverse (-20)	Large Adverse (-20)
O9: To minimise impact on the wider highway network	S18: Impact on wider highway network	Moderate Adverse (-10)	Large Adverse (-20)	Large Adverse (-20)	Large Adverse (-20)
O10: To be technically viable, taking account of the needs of airport users, operators and phasing	S19: Deliverable within the context of the current concession to 2031	Moderate Beneficial (10)	Moderate Adverse (-10)	Slight Adverse (-5)	Large Beneficial (20)
	S20: Attractive to future concessionaires	Large Beneficial (20)	Slight Adverse (-5)	Slight Beneficial (5)	Large Beneficial (20)
	S21: Feasibility of landfill, earthworks and ground conditions	Large Adverse (-20)	Large Adverse (-20)	Large Adverse (-20)	Slight Adverse (-5)
	S22: Additional land required beyond current LLAL holdings	Moderate Beneficial (10)	Moderate Beneficial (10)	Moderate Beneficial (10)	Large Adverse (-20)
O11: To enhance LTN's system efficiency and resilience	S23: Operational effectiveness	Moderate Beneficial (10)	Moderate Beneficial (10)	Large Beneficial (20)	Moderate Beneficial (10)
	S24: System resilience	Large Beneficial (20)	Moderate Beneficial (10)	Moderate Beneficial (10)	Large Beneficial (20)
	S25: Attractiveness to airline operators	Moderate Beneficial (10)	Moderate Beneficial (10)	Moderate Beneficial (10)	Slight Beneficial (5)

Strategic Objective	Sift Criteria	Option Family			
		Option 1a	Option 1b	Option 1c	Option 2
	S26: Safeguarding for expansion	Moderate Beneficial (10)	Moderate Beneficial (10)	Moderate Beneficial (10)	Slight Beneficial (5)
	S27: Safeguarding existing levels of MRO, Business, Aviation and Cargo activity	Large Beneficial (20)	Moderate Beneficial (10)	Moderate Beneficial (10)	Large Beneficial (20)
O12:To be affordable including any public expenditure that may be required and taking account of the needs of airport users and operators (Value for Money)	S28: Estimated cost benefit	Large Beneficial (20)	Moderate Beneficial (10)	Moderate Beneficial (10)	Large Beneficial (20)
	Total	125	-5	40	15

5.15 Summary of appraisal

5.15.1 Overall, the key findings by strategic objective heading were:

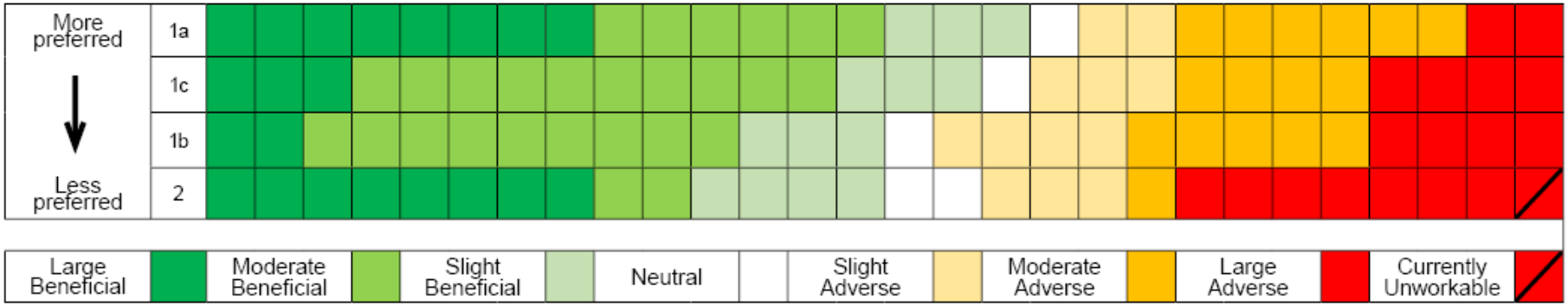
- **Strategic fit** – The appraisal of strategic fit has shown that all of the options are capable of providing beneficial impacts to a greater or lesser degree, with the obvious exception of option 2 which is considered Currently Unworkable as it is highly unlikely to be capable of securing the consents required at the present time due to the "very special circumstances" Green Belt test. Both single terminal options, options 1b and 1c, score less well in terms of delivering the additional capacity and connectivity than the two-terminal options, 1a and 2, due to the increased ability to phase development in line with demand.
- **Economic** – Broadly speaking, all the options are considered capable of delivering benefits nationally and regionally (to both users and airlines) and locally in terms of increased job opportunities. Economic benefits are considered to be proportional to the capacity and throughput of the airport. The single terminal options are likely to have less beneficial impacts than the two-terminal options, due to their comparative disruption to the existing terminal operations.
- **Social (people)** – All options are likely to maintain and improve the quality of life for residents of Luton and the wider area, with an overall appraisal of Slight Beneficial for all options. This takes into account for all options benefits of improved quality and choice of employment and training opportunities and reduced adverse effects of unemployment, low income and job insecurity, with the negative impacts from increased ATMs on amenity on residential areas and community facilities already affected under existing flight paths.
- **Sustainability and environment** – Overall for the majority of the sustainability and environment criteria, all four options score less well than for other strategic objectives, although all options are likely to have slight to moderate beneficial impacts in terms of their resilience to climate change. Option 2 scored less well than the other three in terms of the impact on noise levels, cultural heritage, and landscape and visual impact and land use. All options were considered to have a Large Adverse impact on carbon emissions.
- **Surface access** – The three options which propose development on the north side of the runway are expected to produce positive increases in public transport modal share, whilst option 2 will require a more difficult Luton DART design solution which is also less likely to be attractive to operators and users. Options 1b, 1c and 2 are expected to produce Large Adverse effects in terms of additional highways required compared to option 1a. In terms of

Surface Access, a single terminal option would require more significant infrastructure provision to the CPAR over and above what is currently proposed, compared to the two-terminal options. In Public Transport terms a single terminal is more attractive.

- **Deliverability** – The three options which focus development north of the runway all propose occupying part of the area underlain by landfill and will require earthworks to create a platform at an appropriate level, with cost implications for the Project, therefore scoring Large Adverse. Both the two-terminal options score positively compared to the single terminal options in terms of being considered more deliverable within the context of the current concession to 2031, as well as being more attractive to future concessionaires. However, option 2 requires a large area of additional land beyond current LLAL holdings, compared to the comparatively minor amount required for earthworks in the other options, which reduces its appraisal score.
- **Operational viability** – all options are considered likely to deliver benefits in terms of enhancing LTN's system efficiency and resilience. The single terminal options could deliver Large Beneficial impacts due to increased operational efficiency, ability to deliver an enhanced passenger experience and operational flexibility to airlines, but split operations either side of the runway are less desirable operationally. The two-terminal options could deliver similarly significant positive impacts in relation to enhanced system resilience due to having two terminal buildings, and ability to retain existing levels of MRO, business aviation and cargo activity which can remain operational during construction.
- **Cost/ Benefit** – this is based on a preliminary analysis on the benefit derived from the Project focusing on comparative magnitudes of investment and the information available at this stage in relation to passenger traffic and revenue assumptions. All options are likely to deliver positive beneficial impacts, with both two terminal options offering greater financial benefits than the single terminal options.

5.15.2 **Figure 5.1** below takes the numerical values above and ranks the options from more preferred to less preferred, to show the relative distribution of appraisal levels. It can be seen that option 2 has four times the number of Large Adverse appraisal levels as the more preferred option, option 1a, and a Currently Unworkable appraisal level as well.

Figure 5.1 Frequency of appraisal levels for each option family at Sift 2 (please note this has been updated from the draft version, reflecting the revised scores under criteria S15, S22 and S23, as described above)



6 OUTCOMES

6.1 Introduction

6.1.1 Following from the summary of the appraisals set out in **Table 5.29** and **Section 5.15**, **Chapter 6** identified the less favoured and most preferred option appraised as part of Sift 2.

6.2 Least preferred option

6.2.1 Based on the sift 2 findings, only one option is considered to be much less favourable than the other options, option 2, which represents a new terminal building and all associated infrastructure south of the existing runway. It is recommended that this option should be discontinued based on the appraisal of sift criterion S2: *In broad conformity with national and local town planning policies and capable of attracting the consents required*, subject to the outcome of the consultation process. This recommendation is because the appraisal concluded that it would be difficult to establish the necessary compelling case in the public interest for the very special circumstances required for development in the Green Belt where alterative options are available north of the runway. In addition, option 2 proposes development south of the runway which is outside of the LLP6 Strategic Allocation boundary and extending into the Luton and Central Bedfordshire Green Belts. As such, it is considered that option 2 is currently unworkable as an option given the existing planning policy context and other options available. However, option 2 is recommended to be included in the non-statutory consultation.

6.3 Most preferred option

6.3.1 Option 1a performed better against the majority of the sift criteria than the other options and is considered the most preferred at this stage, based on available information. This option performed the most strongly in relation to strategic fit, economic benefits, deliverability (within the context of the current concession, attractiveness to future concessionaires and not requiring significant additional land beyond current LLAL holdings), operational viability and cost benefit.

6.3.2 It is therefore recommended that this option is progressed for more consideration and promoted for initial stakeholder feedback. It is also recommended that whilst this option is put forward as the currently most preferred option, it should be accompanied by the other three option families for feedback in the non-statutory consultation process.

6.4 Other preferred options

6.4.1 Overall, both single terminal options 1b and 1c performed less well than option 1a. Whilst they were appraised as being capable of delivering some degree of beneficial impacts in relation to strategic fit, economic, social, deliverability, operational viability and cost benefits, the scoring of Large Adverse on four of the criteria meant that it performed less well than option 1a which had two less Large Adverse scores. Both single terminal options scored poorly in relation to option 1a particularly regarding the surface access criteria which looked at the requirement for additional highways infrastructure and the potential impact on the existing highways network. Major new build highways would be required to accommodate the generated traffic with a higher magnitude of upgrade to the CPAR for options 1b and 1c. Finally, the impact of these options on the existing highway network is likely to require greater off site highway works than for option 1a.

6.4.2 The outcome of Sift 2 suggests that options 1b and 1c are less preferred options compared to option 1a based on their appraisal scores, but should still be taken forward and progressed in the evaluation and optioneering process and considered as part of the forthcoming non-statutory consultation process.

APPENDIX A: Refinement between Sift 1 and Sift 2

Refinement to strategic objectives

Strategic objective in Sift 1	Reason for refinement	Used for Sift 2 appraisal
O1: To make best use of the existing runway	Need to appreciate wider aspects of aviation policy, such as environmental guidance and definitions of 'best use'	O1: Compliance with Government Aviation Policy
O2: To identify a scheme that is likely to be capable of being consented and secured through a DCO	N/A	O2: To identify a scheme that is likely to be capable of being consented and secured through a DCO
O3: To provide additional capacity and connectivity in line with the assessment of need	N/A	O3: To provide additional capacity and connectivity in line with the assessment of need
O4: To maximise the potential economic benefits to the regional and sub-regional economy	N/A	O4: To maximise the potential economic benefits to the regional, sub-regional and local economies
O5:To maintain and where possible improve the quality of life for Luton's residents and the wider population	N/A	O5: To maintain and where possible improve the quality of life for Luton's residents and the wider population
O6: To minimise environmental impacts and, where practicable, to actively mitigate and manage any potential environmental effects	N/A	O6: To minimise environmental impacts and, where practicable, to actively mitigate and manage any potential environmental effects
O7: To maximise the number of passengers and workforce arriving at the airport on public transport	N/A	O7: To maximise the number of passengers and workforce arriving at the airport on public transport
O8:To minimise new build highway requirements	N/A	O8: To minimise new build highway requirements
O9: To minimise impact on wider highway network	N/A	O9: To minimise impact on the wider highway network
O10: To be financially and technically viable, taking into account of the needs of airport users, operators and phasing	Removed the word financially to avoid overlap with Strategic Objective 12	O10: To be technically viable, taking account of the needs of airport users, operators and phasing
O11: To enhance LTN's system efficiency and resilience	N/A	O11: To enhance LTN's system efficiency and resilience
O12: To be affordable, including any public expenditure that may be required and taking account of the needs of airport users and operators (Value for Money).	N/A	O12:To be affordable including any public expenditure that may be required and taking account of the needs of airport users and operators (Value for Money)

Refinement to sift criteria

Strategic objective	Sift criteria in Sift 1	Reason for refinement	Used for Sift 2 appraisal
O1: Compliance with Government Aviation Policy	Consistent with, and supportive of, Government Aviation policy and wider objectives	Emphasis change in Strategic Objective 1	S1 Consistent with making best use of the existing runway
O2: To identify a scheme that is likely to be capable of being consented and secured through a DCO	Consistent with national town planning policies	Although previously considered, clarify local planning policy has been considered	S2 In broad conformity with national and local town planning policies and capable of attracting the consents required.
O3: To provide additional capacity and connectivity in line with the assessment of need	Increase capacity both airside and landside	Adjusted to make reference to Vision aspiration of up to 36-38 mppa	S3 Increase capacity both airside and landside to achieve target increase up to 36-38mppa
O4: To maximise the potential economic benefits to the regional and sub-regional economy	Increase economic opportunities for the regional and sub-regional economies	WebTAG guidance focuses on benefits, with employment opportunities considered under S5	S4 Deliver economic benefits nationally and regionally
	Increase job opportunities for the people of Luton and the surrounding areas	As above	S5 Increase job opportunities for the people of Luton and the surrounding areas
O5:To maintain and where possible improve the quality of life for Luton's residents and the wider population	To promote quality of life and minimise adverse impacts on communities	N/A	S6 To promote quality of life and minimise adverse impacts on communities
O6: To minimise environmental impacts and, where practicable, to actively mitigate and manage any potential environmental effects	Noise impact	N/A	S7 Noise impact
	Air Quality	N/A	S8 Air quality
	Natural habitats and biodiversity	N/A	S9Natural habitats and biodiversity
	Carbon emissions	N/A	S10 Carbon emissions
	Surface, ground water and landfill	Landfill covered under its own criterion	S11 Water Resources
	Flood risk	N/A	S12 Flood risk
	Cultural Heritage	N/A	S13 Cultural Heritage
	Landscape and visual impact	Clarify distinction between S14 and S21-22. This criterion considered land in an environmental sense.	S14 Landscape and visual impact and Environmental Land Use

Strategic objective	Sift criteria in Sift 1	Reason for refinement	Used for Sift 2 appraisal
	Climate change resilience	Detailed design stage- sub criteria as relevant to information available.	S15 Climate change
O7: To maximise the number of passengers and workforce arriving at the airport on public transport	Public transport modal share	N/A	S16 Public transport modal share
O8:To minimise new build highway requirements	Requirement for additional highway infrastructure	N/A	S17 Requirement for additional highway infrastructure
O9: To minimise impact on wider highway network	Impact on wider higher network	N/A	S18 Impact on wider higher network
O10: To be technically viable, taking into account of the needs of airport users, operators and phasing	Technically viable	Achievable separated into user groups	S19 Deliverable within the context of the current concession to 2031
			S20 Attractive to future concessionaires
	Land	Clarify distinction between S14 and S21-22. This criterion considered land in a planning sense	S21 Feasibility of landfill, earthworks and ground conditions
			S22 Additional land required beyond current LLAL holdings
O11: To enhance LTN's system efficiency and resilience	Provide appropriate levels of service (including during construction)	There are many different, and potentially competing, elements within the appraisal of the deliverability and operational merits of the options; these have therefore been highlighted in additional criteria.	S23 Operational effectiveness
			S24 System Resilience
			S25 Attractiveness to airline operators
			S26 Safeguarding for expansion
			S27 Safeguarding existing levels of MRO, Business, Aviation and Cargo activity
O12: To be affordable, including any public expenditure that may be required and taking account of the needs of airport users and operators (Value for Money).	Estimated cost of the programme including surface access, land purchase and associated infrastructure	Although implied during Sift 1, elaborated for clarity.	S28 Estimated cost/benefit

APPENDIX B: KEY POLICIES, STRATEGIES AND GUIDANCE

Key policies, strategies and guidance relevant for each sift criteria

Sift criteria number	Sift criteria	Key policies, strategies and guidance	Reference
S1	Consistent with making best use of the existing runway	– 2003 Future of Aviation White Paper. Executive Summary: "The first priority is to make best use of the existing runways, including the remaining capacity at Stansted and Luton." A second runway was not supported and it was stated that support for maximum use of a single runway was on the basis of it remaining broadly on the existing alignment. – 2013 Aviation Policy Framework. This remains policy until replaced by a new aviation strategy and the NPS in so far as relevant. Para 5: "The Government's primary objective is to achieve long term economic growth. The aviation sector is a major contributor to the economy and we support its growth within a framework which maintains a balance between the benefits of aviation and its costs, particularly noise and climate change." Airports Commission to consider requirement for airport capacity in the SE of England. – Draft Airports NPS (Oct 2017). Directly applicable only to NW Runway at Heathrow but relevant consideration. Environmental policies are relevant. Expected to be law by mid-2018.Para 1.37: "The Government stated that in light of the Airports Commission's findings on more intensive use of existing airports, it was minded to be supportive of all airports who wish to make best use of their existing runways, including those in the South East" – Aviation Strategy Call for Evidence. A new Aviation Strategy will replace the Aviation Policy Framework by the end of 2018. Objective: "To achieve a safe, secure and sustainable aviation sector that meets the needs of consumers and a global outward-looking Britain" Para 7.20 indicated provisional policy support for making best use of existing runways. Emphasis on the economic importance of connectivity and putting consumer interests at the heart of policy as well as environmental and safety/security issues. Capacity assessment based IATA Airport Development.	– Future of Aviation ‑ Consultation on air transport policy, accessed at: [redacted] – Aviation Policy Framework, 2013, accessed at: [redacted] – Revised Draft Airports National Policy Statement, 2017, Department for Transport, accessed at: [redacted]
S2	In broad conformity with national and local	– 2008 Planning Act (s105 / s122): Determination under Planning Act 2008 s105 (including regard to Local Impact Report and other relevant matters), any compulsory acquisition s122 (including is	– Planning Act 2008, accessed at: [redacted]

Sift criteria number	Sift criteria	Key policies, strategies and guidance	Reference
	town planning policies and capable of attracting the consents required.	required, and compelling case in the public interest) – National Planning Policy Framework: National Planning Policy Framework 2019, including "87. As with previous Green Belt policy, inappropriate development is, by definition, harmful to the Green Belt and should not be approved except in very special circumstances. – 'Draft Airports NPS 2017: Draft NPS 2017, not for determination in respect of non-Heathrow DCOs, but relevant consideration, including 'make best use of existing airport infrastructure', 'supportive of all airports who wish to make best use of their existing runways', and 'capacity expansion should take place in a way that satisfactorily mitigates these impacts wherever possible' Luton Local Plan 2017 (LLP6) – Luton Local Plan 2017, including 'Proposals for development will only be supported where…directly related to airport use …fully assess the impacts on surrounding occupiers and/or local environment and identify appropriate forms of mitigation in the event significant adverse effects are identified'. – North Hertfordshire and Central Bedfordshire Local Plans. Green Belt boundaries	– National Planning Policy Framework 2019, MHCLG, accessed at: [redacted] – Revised Draft Airports National Policy Statement, 2017, Department for Transport, accessed at: [redacted] – Luton Local Plan 2011-2031, Nov 2017, accessed at: [redacted] – North Herts Local Plan 2011-2031 Proposed Submission, Oct 2016, accessed at: [redacted] – Central Bedfordshire Local Plan 2015-2035, Jan 2018, accessed at: [redacted]
S3	Increase capacity both airside and landside to achieve target increase up to 36-38mppa	– 2003 Future of Aviation White Paper. Executive Summary: "The first priority is to make best use of the existing runways, including the remaining capacity at Stansted and Luton." A second runway was not supported and it was stated that support for maximum use of a single runway was on the basis of it remaining broadly on the existing alignment. – 2013 Aviation Policy Framework. This remains policy until replaced by a new aviation strategy and the NPS in so far as relevant. Para 5:	– Future of Aviation – Consultation on air transport policy, accessed at: [redacted] – Aviation Policy Framework, 2013, accessed at: [redacted]

Sift criteria number	Sift criteria	Key policies, strategies and guidance	Reference
		"The Government's primary objective is to achieve long term economic growth. The aviation sector is a major contributor to the economy and we support its growth within a framework which maintains a balance between the benefits of aviation and its costs, particularly noise and climate change." Airports Commission to consider requirement for airport capacity in the SE of England. – Draft Airports NPS (Oct 2017). Directly applicable only to NW Runway at Heathrow but relevant consideration. Environmental policies are relevant. Expected to be law by mid-2018.Para 1.37: "The Government stated that in light of the Airports Commission's findings on more intensive use of existing airports, it was minded to be supportive of all airports who wish to make best use of their existing runways, including those in the South East" – Aviation Strategy Call for Evidence. A new Aviation Strategy will replace the Aviation Policy Framework by the end of 2018. Objective: "To achieve a safe, secure and sustainable aviation sector that meets the needs of consumers and a global outward-looking Britain" Para 7.20 indicated provisional policy support for making best use of existing runways. Emphasis on the economic importance of connectivity and putting consumer interests at the heart of policy as well as environmental and safety/security issues. Capacity assessment based IATA Airport Development.	[redacted] – Revised Draft Airports National Policy Statement, 2017, Department for Transport, accessed at: [redacted]
S4	Deliver economic benefits nationally and regionally	– Airports Commission Appraisal – Economic Impact Assessment – NPS – Economic Assessment of Need – WebTAG – Aviation Module – SEMLEP Economic Strategy.	– Airport Commission: Appraisal Framework, accessed at: [redacted] – Revised Draft Airports National Policy Statement, 2017, Department for Transport, accessed at: [redacted] – Transport analysis guidance: WebTag, accessed at: [redacted]

Sift criteria number	Sift criteria	Key policies, strategies and guidance	Reference
			– SEMLEP Strategic Economic Plan, accessed at : [redacted]
S5	Increase job opportunities for the people of Luton and the surrounding areas	– Airports Commission Appraisal. – Economic Impact Assessment - to promote employment and economic growth in the local area and surrounding region; and to produce positive outcomes for local communities and the local economy from any surface access that may be required to support the proposal. – NPS. Employment and skills are part of the assessment criteria – Luton Skills and Employability Policy/Luton Investment Framework. "Luton is committed to the development of a skilled workforce, creating better opportunities for its residents and supporting a vibrant and thriving business economy." – SEMLEP Economic Strategy. Other economic strategies may also be relevant	– Airport Commission: Appraisal Frame work, accessed at: [redacted] – Revised Draft Airports National Policy Statement, 2017, Department for Transport, accessed at: [redacted] – Luton Skills and Employability Strategy 2016-2020, accessed at: [redacted] – SEMLEP Strategic Economic Plan, accessed at : [redacted]
S6	To promote quality of life and minimise adverse impacts on communities	– Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 - requirement for EIA to consider, among other things, the direct and indirect significant effects of projects on 'population and human health' – Draft Airports National Policy Statement(2017) and Aviation Policy Framework (2013) – Luton Health Inequalities Strategic Plan 2015-2020: STRATEGIC OBJECTIVE 3: Creating Fair Employment and Good Work for All – Luton Skills and Employability Strategy, 2016-2020 – Luton Green Spaces Strategy – Luton Local Transport Plan 3 2011-2026	– Infrastructure Planning (Environmental Impact Assessment) Regulations 2017, accessed at: [redacted] – Revised Draft Airports National Policy Statement, 2017, Department for Transport, accessed at: [redacted] – Luton Skills and Employability Strategy

Sift criteria number	Sift criteria	Key policies, strategies and guidance	Reference
		– Luton Local Plan 2011-2031 – Central Bedfordshire Draft Local Plan (2017) – North Hertfordshire Submission Local Plan – Equality Act 2010, including the Public Sector Equality Duty set out in Section 149 – Equalities assessment principles of the Revised Airports NPS (2017), set out in paragraphs 4.23-4.27 – National Planning Policy Framework (2012) – Revised Airports NPS (2017) Appraisal of Sustainability and Equalities Assessment – IEMA guidance note on EqIA – Luton Passport for Skills – Luton Investment Framework 2015 - 2035	2016-2020, accessed at: [redacted] – Luton Local Plan 2011-2031, Nov 2017, accessed at: [redacted] – Central Bedfordshire Local Plan 2015-2035, Jan 2018, accessed at: [redacted] – North Herts Local Plan 2011-2031 Proposed Submission, Oct 2016, accessed at: [redacted] – National Planning Policy Framework 2012, MHCLG, accessed at: [redacted] – Aviation Policy Framework, 2013, accessed at: [redacted]
S7	Noise impact	– National Planning Policy Framework – National Planning Practice Guidance – Noise Policy Statement for England – Revised Draft Airport National Policy Statement, October 2017	– National Planning Policy Framework 2013, MHCLG, accessed at: [redacted]

Sift criteria number	Sift criteria	Key policies, strategies and guidance	Reference
		– LTN Noise Action Plan 2013-2018 – TAG Unit 3, Environmental Impact Assessment, DfT	– Noise Policy Statement for England, Defra, accessed at: [redacted] – Revised Draft Airports National Policy Statement, 2017, Department for Transport, accessed at: [redacted] – London Luton Airport Noise Action Plan 2013-2018, accessed at: [redacted] – TAG UNIT A3 Environmental Impact Appraisal, 2014, accessed at: [redacted]
S8	Air quality	– Revised Draft Airport National Policy Statement, October 2017 – Airport Commission Appraisal Framework – National Planning Policy Framework (2012) – Luton Borough Council Local Plan for 2011-2031 – Defra (2016), Local Air Quality Management Policy Guidance, PG16 – Defra (2016), Local Air Quality Management Technical Guidance, TG16 – EPUK/IAQM (2017) Land-use Planning & Development Control: Planning for Air Quality – IAQM (2016) Guidance on the Assessment of Dust from Demolition and Construction. – Defra/Environment Agency, Air emissions risk assessment for your environmental permit (guidance on assessing ecology impacts)	– Revised Draft Airports National Policy Statement, 2017, Department for Transport, accessed at: [redacted] – Airport Commission: Appraisal Frame work, accessed at: [redacted] – National Planning Policy Framework 2012, MHCLG, accessed at: [redacted]

Sift criteria number	Sift criteria	Key policies, strategies and guidance	Reference
			– Luton Local Plan 2011-2031, Nov 2017, accessed at: [redacted] – LAQM Policy Guidance (PG16), accessed at: [redacted] – LAQM Technical Guidance (TG16), accessed at: [redacted] – EPUK/IAQM Guidance on land-use planning and development control, accessed at: [redacted] – IAQM guidance on the assessment of dust from demolition and construction, accessed at: [redacted]
S9	Natural habitats and biodiversity	– Revised Draft Airports National Policy Statement (2017) – National Planning Policy Framework (2012) – Luton Local Plan 2011-2031 – Bedfordshire and Luton Local Biodiversity Action Plan (2010) – North Herts District Council Proposed Local Plan 2011-2031 (2017) – A 50 Year Vision: A Biodiversity Action Plan for Hertfordshire (2008) – ODPM Circular 06/2005 – Biodiversity and Geological Conservation – CIEEM (2016) Guidelines for Ecological Impact Assessment in the UK and Ireland (2nd Edition)	– Revised Draft Airports National Policy Statement, 2017, Department for Transport, accessed at: [redacted] – National Planning Policy Framework 2012, MHCLG, accessed at: [redacted] – Luton Local Plan 2011-2031, Nov 2017,

Sift criteria number	Sift criteria	Key policies, strategies and guidance	Reference
			accessed at: [redacted] – Bedfordshire and Luton Biodiversity Action Plan, accessed at: [redacted] – North Herts Local Plan 2011-2031 Proposed Submission, Oct 2016, accessed at: [redacted] – Biodiversity Action Plan for Herts, accessed at: [redacted] – ODPM Circular 06/2005 – Biodiversity and Geological Conservation, accessed at: [redacted] – CIEEM Guidelines for Ecological Impact Assessment in the UK and Ireland (2nd Edition), accessed at: [redacted]
S10	Carbon emissions	– Climate Change Act 2008 – Climate Change Act fifth carbon budget for the UK (2028 to 2032) – Revised EIA 2017 requirements for climate change assessment – Revised Draft Airports National Policy Statement – IEMA; Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emission and Assessing their Significance, 2017	– Climate Change Act, accessed at: [redacted] – Revised Draft Airports National Policy Statement, 2017, Department for Transport, accessed at: [redacted]

Sift criteria number	Sift criteria	Key policies, strategies and guidance	Reference
		– Local Luton Plan 2011-2031, November 2017 – WebTAG: TAG unit A5-2 aviation appraisal, 2015	[redacted] – EIA Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance, accessed at: [redacted] – Luton Local Plan 2011-2031, Nov 2017, accessed at: [redacted] – TAG Unit A5.2 Aviation Appraisal, DfT, accessed at: [redacted]
S11	Water Resources	– Luton Borough Council Local Plan 2011-2031 – Policy LP36 – Luton Level 1 Strategic Flood Risk Assessment – Luton Preliminary Flood Risk Assessment – Luton Surface Water Management Plan – Preliminary Flood Risk Assessment for Bedford Borough Council, Central Bedfordshire Council and Milton Keynes Council – North Herts District Council Flood Risk Assessment – Revised Draft Airports National Policy Statement – Luton Water Cycle Strategy	– Luton Local Plan 2011-2031, Nov 2017, accessed at: [redacted] – Luton level 1 FRA, accessed at: [redacted] – Luton Preliminary FRA, accessed at: [redacted] – Luton Surface Water Management Plan, accessed at:

Sift criteria number	Sift criteria	Key policies, strategies and guidance	Reference
			– [redacted] – North Herts FRA, accessed at: [redacted] – Revised Draft Airports National Policy Statement, 2017, Department for Transport, accessed at: [redacted] – Luton Water Cycle Strategy, accessed at: [redacted]
S12	Flood risk	– Luton Borough Council Local Plan 2011-2031 – Policy LP36 – Luton Level 1 Strategic Flood Risk Assessment – Luton Preliminary Flood Risk Assessment – Luton Surface Water Management Plan – Preliminary Flood Risk Assessment for Bedford Borough Council, Central Bedfordshire Council and Milton Keynes Council – North Herts District Council Flood Risk Assessment – Revised Draft Airports National Policy Statement – Luton Water Cycle Strategy – National Planning Policy Framework	– Luton Local Plan 2011-2031, Nov 2017, accessed at: [redacted] – Luton level 1 FRA, accessed at: [redacted] – Luton Preliminary FRA, accessed at: [redacted] – Luton Surface Water Management Plan, accessed at:

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			– [redacted] – North Herts FRA, accessed at: [redacted] – Revised Draft Airports National Policy Statement, 2017, Department for Transport, accessed at: [redacted] – Luton Water Cycle Strategy, accessed at: [redacted] – National Planning Policy Framework 2012, MHCLG, accessed at: [redacted]
S13	Cultural Heritage	– Ancient Monuments and Archaeological Areas Act (1979) – Planning (Listed Buildings and Conservation Areas) Act (1990) – National Planning Policy Framework (NPPF) 4, Section 12: Conserving & Enhancing the Historic Environment (2012) – Good Practice Advice in Planning (GPA2) Managing Significance in Decision – Taking in the Historic Environment (Historic England 2015). – Good Practice Advice in Planning (GPA3) The Setting of Heritage Assets (Historic England 2017) – Conservation Principles: Policies and Guidance (Historic England 2008)	– Ancient Monuments and Archaeological Areas Act, accessed at: [redacted] – Planning (Listed Buildings and Conservation Areas) Act 1990, accessed at: [redacted] – National Planning Policy Framework 2012, MHCLG, accessed at: [redacted]

Sift criteria number	Sift criteria	Key policies, strategies and guidance	Reference
		– Planning Practice Guidance 18a: Conserving and enhancing the historic environment, scoping and Luton Local Plan 2011-2031 – Luton Local Plan – Saved policies from North Herts Local Plan (2007) – North Herts Proposed Submission Local Plan – Draft Airports National Policy Statement	[redacted] – Historic England Good Practice Advice in Planning – taking in the Environment, accessed at: [redacted] – Luton Local Plan 2011-2031, Nov 2017, accessed at: [redacted] – North Herts Saved Policies Local Plan, accessed at: [redacted] – Good Practice Advice in Planning – The Setting of Heritage Assets, accessed at: [redacted] – Conservation Principles, Policies and Guidance, accessed at: [redacted] – Revised Draft Airports National Policy Statement, 2017, Department for Transport, accessed at: [redacted]

Sift criteria number	Sift criteria	Key policies, strategies and guidance	Reference
			[redacted]
S14	Landscape and visual impact and Environmental Land Use	– The key policies are; The Revised Draft Airports National Policy Statement, Infrastructure Planning (Environmental Impact Assessment) Regulations 2017, National Policy Statement for National Networks (December 2014), National Planning Policy Framework (NPPF), Policy LP 25 of the Pre- Submission Luton Local Plan (2011-2031), Green Belt Policy and the Planning Act 2008. – Relevant guidance includes; Guidelines for Landscape & Visual Impact Assessment (GLVIA3) and subsequent guidance, Ministry of Agriculture, Fisheries and Food (1988) Agricultural Land Classification for England and Wales, Natural England Technical Information Note 049 (2012) Best and Most Versatile Agricultural Land, Wildlife Hazard Management at Aerodromes (CAP 722). – Relevant strategies include; 'Safeguarding our Soils – A Strategy for England' (2009), 'Code of Practice for the Sustainable Use of Soils on Construction Sites' and 'Soil Action Plan for England' (2004-2006).	– Revised Draft Airports National Policy Statement, 2017, Department for Transport, accessed at: [redacted] – National Planning Policy Framework 2012, MHCLG, accessed at: [redacted] – Luton Local Plan 2011-2031, Nov 2017, accessed at: [redacted] – Infrastructure Planning (Environmental Impact Assessment) Regulations 2017, accessed at: [redacted] – Planning Act 2008, accessed at: [redacted] – Natural England Information Notes, accessed at: [redacted] – Safeguarding our soils, accessed at: [redacted]
S15	Climate change	– Climate change act 2008 – Guidance on Integrating Climate Change and Biodiversity into	– Climate Change Act, accessed at: [redacted]

Sift criteria number	Sift criteria	Key policies, strategies and guidance	Reference
		Environmental Impact Assessment, 2013 – An EU Strategy for adaptation to climate change – Climate Change Act fifth carbon budget for the UK (2028 to 2032) – Revised EIA Directive 2017 requirements for climate change assessment – Revised draft Airports National Policy Statement – IEMA guide to climate change resilience and adaptation, 2015 – Local Luton Plan 2011-2031, November 2017 – LBC Climate Change Adaptation Action Plan – UK Climate Change Risk Assessment, 2017 – England Biodiversity Strategy, 2011 – Climate Change Adaptation Report 2011, London Luton Airport	[redacted] – Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment, 2013, accessed at: [redacted] – EU Strategy on adaptation to climate change, accessed at: [redacted] – Town and Country Planning (Environmental Impact Assessment) Regulations, accessed at: [redacted] – Luton Local Plan 2011-2031, Nov 2017, accessed at: [redacted] – LBC Climate Change Adaptation Action Plan, accessed at: [redacted] – England Biodiversity Strategy, 2011, accessed at: [redacted]
S16	Public transport modal share	– National Planning Policy Framework – Luton Local Plan – Luton LTP3	– National Planning Policy Framework 2012, MHCLG, accessed at: [redacted]

Sift criteria number	Sift criteria	Key policies, strategies and guidance	Reference
		– Herts LTP – North Herts Local Plan – DfT TA Guidance – Aviation Policy Guidance	[redacted] – Luton Local Plan 2011-2031, Nov 2017, accessed at: [redacted] – North Herts Local Plan 2011-2031 Proposed Submission, Oct 2016, accessed at: [redacted] – Luton LTP, accessed at: [redacted] – Herts LTP, accessed at: [redacted] ve/local-transport-plan-2011-2031.pdf – DfT TA Guidance, accessed at: [redacted]
S17	Requirement for additional highway infrastructure	– National Planning Policy Framework – Luton Local Plan – Luton LTP3 – Herts LTP – North Herts Local Plan – DfT TA Guidance – Manual for Streets – Aviation Policy Guidance	– National Planning Policy Framework 2012, MHCLG, accessed at: [redacted] – Luton Local Plan 2011-2031, Nov 2017, accessed at: [redacted]

Sift criteria number	Sift criteria	Key policies, strategies and guidance	Reference
			– [redacted] – North Herts Local Plan 2011-2031 Proposed Submission, Oct 2016, accessed at: [redacted] – Luton LTP, accessed at: [redacted] – Herts LTP, accessed at: [redacted] – DfT TA Guidance, accessed at: [redacted] – Manual for Streets, accessed at: [redacted]
S18	Impact on wider highway network	– National Planning Policy Framework – Luton Local Plan – Luton LTP3 – Herts LTP – North Herts Local Plan – DfT TA Guidance – Manual for Streets – Aviation Policy Guidance	– National Planning Policy Framework 2012, MHCLG, accessed at: [redacted] – Luton Local Plan 2011-2031, Nov 2017, accessed at: [redacted]

Sift criteria number	Sift criteria	Key policies, strategies and guidance	Reference
			– North Herts Local Plan 2011-2031 Proposed Submission, Oct 2016, accessed at: [redacted] – Luton LTP, accessed at: [redacted] – Herts LTP, accessed at: [redacted] – DfT TA Guidance, accessed at: [redacted] – Manual for Streets, accessed at: [redacted]
S19	Deliverable within the context of the current concession to 2031	– Concession Agreement and Supplementary Agreements: Defines length of concession and rights and liabilities in respect of the Concession site and other areas leased by LLAOL. – IATA ADRM: Concession Agreement requires IATA LoS Level C.	– IATA Level of Service Best Practice, accessed at: [redacted]
S20	Attractive to future concessionaires	– Concession Agreement and Supplementary Agreements: Defines length of concession and rights and liabilities in respect of the Concession site and other areas leased by LLAOL. – IATA ADRM: Concession Agreement requires IATA LoS Level C.	– IATA Level of Service Best Practice, accessed at: [redacted]

Sift criteria number	Sift criteria	Key policies, strategies and guidance	Reference
			o[redacted]
S21	Feasibility of landfill, earthworks and ground conditions	Standards and guidance with respect to earthworks design: – The Waste (England and Wales) Regulations 2011 – National Planning Policy Framework (2012) – Environment Agency (2017) The Environment Agency's approach to groundwater protection – Luton Local Plan 2011-2031 (Pre-Submission) October 2015 – Environment Agency, Guiding Principles for Land Contamination (GPLC1). – Luton's Sustainable Community Strategy (2008-2026) – British Standard, Investigation of Potentially Contaminated Sites – Code of Practice BS10175 – Minerals and Waste Local Plan: Strategic Site and Policies (January 2014) – Defra and Environment Agency (2004) Model Procedures for the management of land contamination. CLR 11 – Environmental Protection Act (EPA) 1990 as amended by the Environmental Act 1995 – Defra (2012) Environmental Protection Act 1990: Part 2A. Contaminated Land Statutory Guidance – Contaminated Land (England) (Amendment) Regulations 2012 – National Planning Policy for Waste – Waste Management Plan for England – Environmental Permitting Regulations – Luton Local Plan and SPGs – EU Landfill Directive – EU Waste Framework Directive & Waste (England and Wales) Regulations – Guidance from CL:AIRE, Environment Agency and WRAP	– National Planning Policy Framework 2012, MHCLG, accessed at: [redacted] – Luton Local Plan 2011-2031, Nov 2017, accessed at: [redacted] – The Waste (England and Wales) Regulations 2011, accessed at: [redacted] – Environment Agency's approach to groundwater protection, accessed at: [redacted] – Luton Sustainable Community Strategy, accessed at: [redacted] – BSI of Potentially Contaminated Sites, accessed at: [redacted] – Environmental Protection Act 1990: Contaminated Land Statutory Guidance,

Sift criteria number	Sift criteria	Key policies, strategies and guidance	Reference
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S22	Additional land required beyond current LLAL holdings	–	–
S23	Operational effectiveness	– Concession Agreement and Supplementary Agreements - Defines length of concession and rights and liabilities in respect of the Concession site and other areas leased by LLAOL. – IATA ADRM - Concession Agreement requires IATA LoS Level C.	– IATA Level of Service Best Practice, accessed at: [redacted]
S24	System efficiency	– Concession Agreement and Supplementary Agreements - Defines length of concession and rights and liabilities in respect of the Concession site and other areas leased by LLAOL.	– IATA Level of Service Best Practice, accessed at: [redacted]

Sift criteria number	Sift criteria	Key policies, strategies and guidance	Reference
		– IATA ADRM - Concession Agreement requires IATA LoS Level C.	[redacted]
S25	Attractiveness to airline operators	– Concession Agreement and Supplementary Agreements - Defines length of concession and rights and liabilities in respect of the Concession site and other areas leased by LLAOL. – IATA ADRM - Concession Agreement requires IATA LoS Level C.	– IATA Level of Service Best Practice, accessed at: [redacted]
S26	Safeguarding for expansion	– Draft Airports NPS (Oct 2017) - Covers the period to 2030. Capacity requirements beyond that period are not covered. – Aviation Strategy Call for Evidence (2017) envisages longer term growth to 2050 and beyond. Para 2.10: "The Aviation Strategy will consider how the need for further growth should be treated beyond the additional runway that is required by 2030."	– Revised Draft Airports National Policy Statement, 2017, Department for Transport, accessed at: [redacted]
S27	Safeguarding existing levels of MRO, Business, Aviation and Cargo activity Estimated cost/benefit	– UK Government initiative on a strategic network for General Aviation – Luton Investment Framework and skills agenda	– Luton Skills and Employability Strategy 2016-2020, accessed at: [redacted]
S28	Estimated cost benefit	Not applicable	Not applicable

ABBREVIATIONS USED

Abbreviation used	
ALC	Agricultural Land Classification
AGLV	Area of Great Landscape Value
ALLV	Area of Local Landscape Value
AONB	Area of Outstanding Natural Beauty
AQMA	Air Quality Management Areas
ATM	Air Traffic Movements
BMV	Best and Most Versatile Land
CIEEM	Chartered Institute of Ecology and Environmental Management
CSR	Corporate Social Responsibility
CWS	County Wildlife Site
CPAR	Century Park Access Road
DART	Direct Air-Rail Transit
DCO	Development Consent Order
DfT	Department for Transport
EIA	Environmental Impact Assessment
EA	Environment Agency
EU	European Union
FBO	Fixed-base Operator
GHG	Greenhouse Gas
GVA	Gross Value Added
HGV	Heavy Goods Vehicle
IATA	International Air Transport Association
ICCA	In-combination Climate Change Assessment
IAQM	Institute of Air Quality Management
LBC	Luton Borough Council
LLAL	London Luton Airport Ltd
LLAOL	London Luton Airport Operations Ltd
LTN	London Luton Airport
LTO	landing take-off
MPPA	Million passengers per annum
MSCP	Multi-storey car parks
MRO	Maintenance, Repair and Overhaul
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NERC	Natural Environment and Rural Communities
NSIP	Nationally Significant Infrastructure Project

PCM	Pollution Climate Mapping
PFRA	Preliminary Flood Risk Assessment
PT	Public Transport
RAG	Red Amber Green
SEMLEP	South East Midland Local Economic Partnership
SPZ	Source Protection Zones
T1	Terminal 1 (Existing Terminal)
T2	Terminal 2 (New terminal)
WFD	Water Framework Directive

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Ref 1.1 London Luton Airport ltd (December 2017) London Luton Airport Vision for Sustainable Growth 2020-2050

Ref 2.1 Department for Transport (December 2015) WebTAG: TAG unit A5-2 Aviation Appraisal

Ref 3.1 Department for Transport (March 2013) Aviation Policy Framework

Ref 3.2 HM Government (July 2017) Beyond the Horizon: the future of UK aviation. Next steps towards an Aviation Strategy

Ref 3.3 Department for Transport (July 2017) A new aviation strategy for the UK: call for evidence

Ref 3.4 Department for Transport (June 2018) Airports National Policy Statement

Ref 3.5 Department for Transport (April 2014) Airports Commission: Appraisal Framework

Ref 4.1 Luton Borough Council (November 2017) Luton Local Plan 2011-2031.

Ref 4.2 MHCLG (2019) National Planning Policy Framework.

Ref 5.1 Environment Agency Flood Map for Planning (June 2018). Available at: http://apps.environment-agency.gov.uk/wiyby/37837.aspx

Ref 5.2 Luton Borough Council (2011) Preliminary Flood Risk Assessment for Luton

Ref 5.3 Hertfordshire County Council (2011) Preliminary Flood Risk Assessment for Hertfordshire

UK Regions Imports and Exports of Goods by Country and World Region

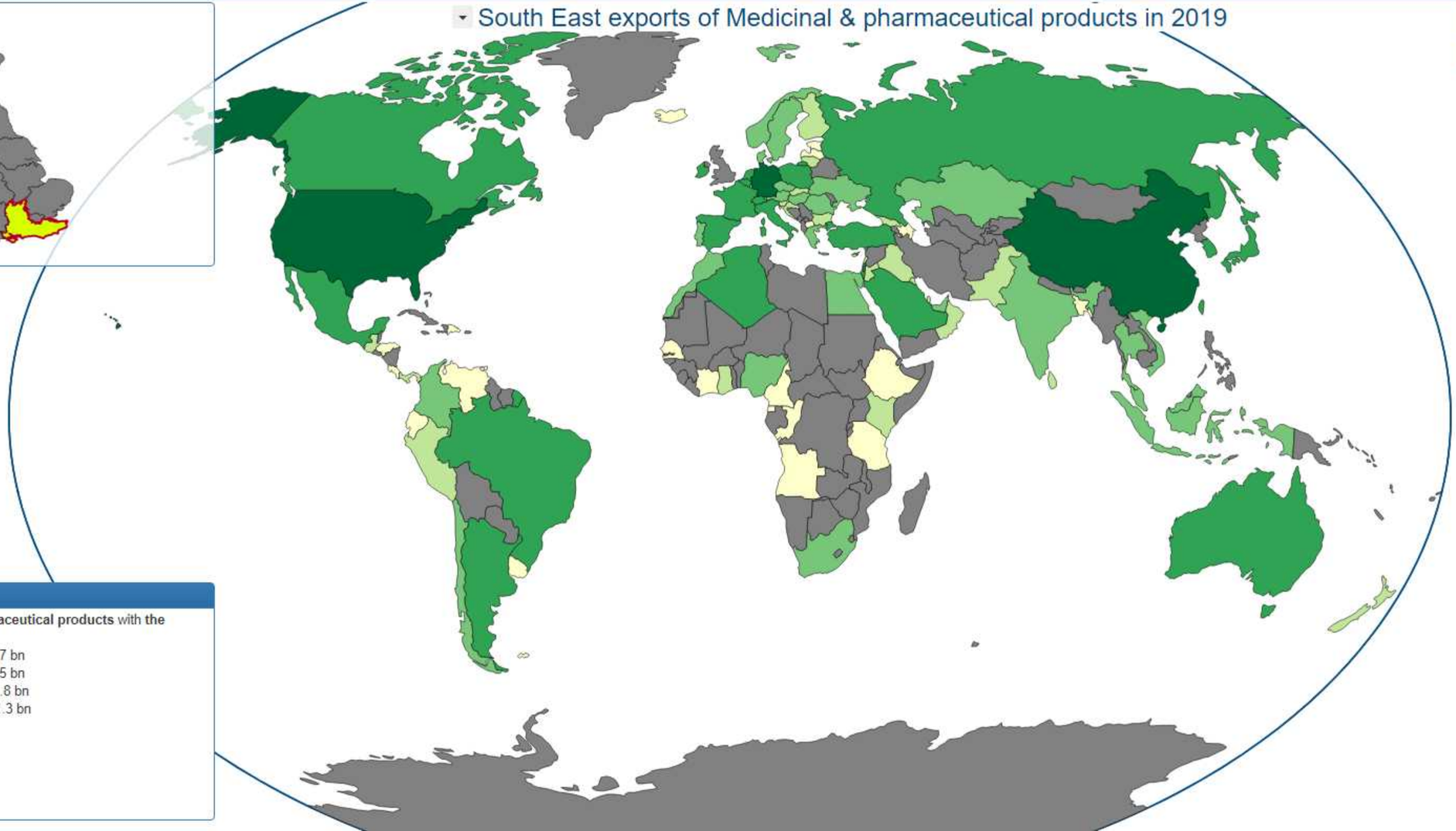
This prototype was developed by the Northern Ireland Statistics and Research Agency

About Share

Reporter: South East | **Partner:** Select a partner | **Commodity:** Medicinal & pharmaceutical products | 2019 | Clear all



South East exports of Medicinal & pharmaceutical products in 2019



Countries | Regions

Exports | Imports | Balance

Exports Legend

- No data available
- £178.0 m - £2.2 bn (3 partners)
- £24.1 m - £158.0 m (23 partners)
- £5.5 m - £23.4 m (26 partners)
- £634.0 th - £5.5 m (27 partners)
- 0 - £628.0 th (27 partners)

Key Facts

South East trade of **Medicinal & pharmaceutical products** with **the world** in **2019**

Exports: £4.7 bn
Imports: £6.5 bn
Trade balance: -£1.8 bn
Bilateral trade: £11.3 bn

At a glance

Location

South-East

Country/Region

United Kingdom

Client

Ministry of Housing, Communities and Local Government

Industries

Cities *Residential*

Services

Masterplanning and Urban Design *Economic planning*

The Thames Estuary is an area with great potential. It has sizeable economic power, a strong feeling of collaboration and a ‘can do attitude’ from London right out to the sea. The Estuary has an important brand and status, which makes a significant contribution to the UK economy and UK plc.

However, over the past few decades it has consistently been unable to deliver the same levels of economic growth as other parts of the UK. Whilst there are recent success stories, including Canary Wharf and the Thames Estuary’s ports, the benefits of these pockets of growth have not necessarily been felt across the area. This has resulted in a large disparity in wealth and opportunity.

The UK Government commissioned Arup to ensure that this is not an enduring problem. A multi-disciplinary team of city economists, town planners and urban designers developed a long-term vision based on the area’s key challenges and opportunities, alongside future trends.

Project Summary

1 million *homes*

1.3 million *new jobs*

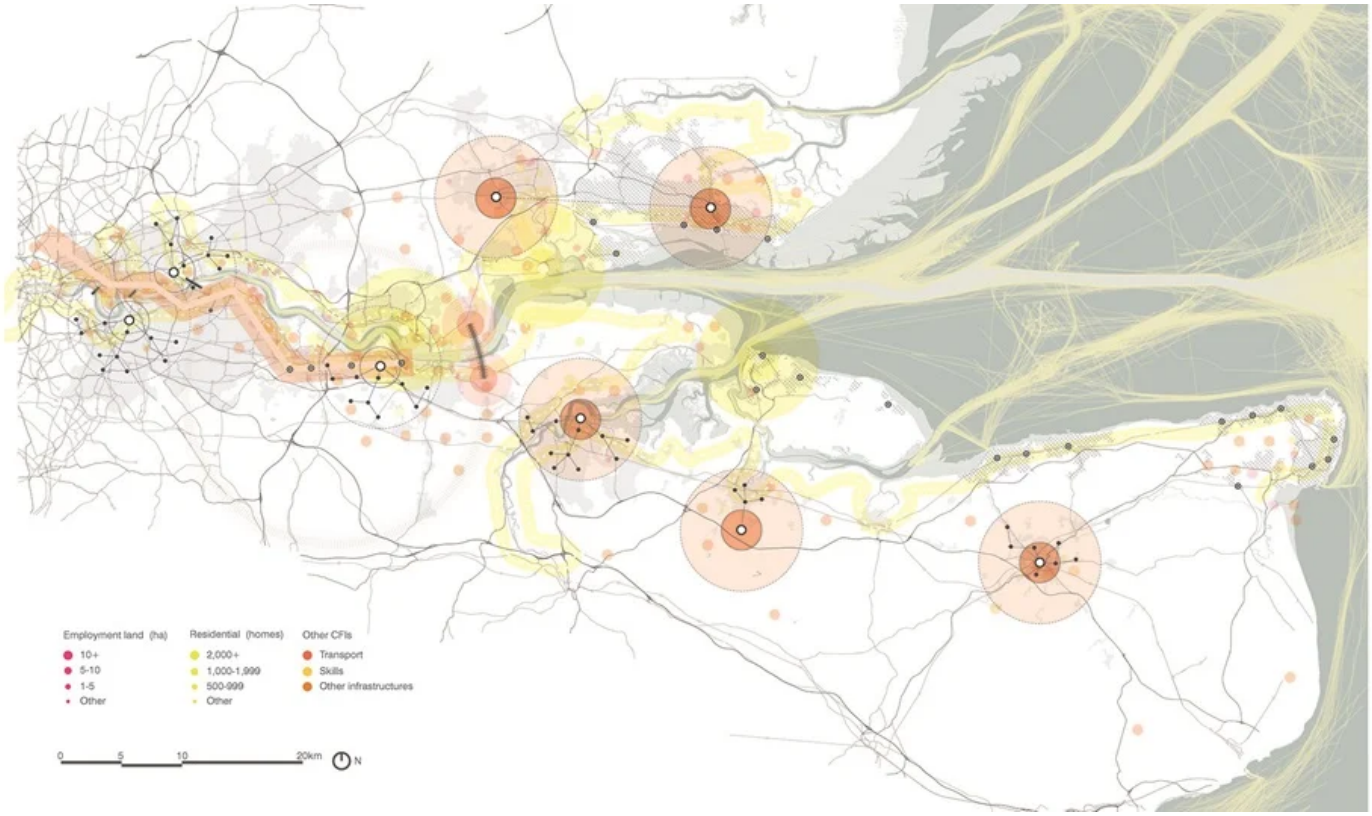
190 billion *additional GVA by 2050*

Understanding the Thames Estuary

The Thames Estuary presents a complex challenge given the size, scale and diversity of the place; it is urban, rural, coastal, suburban, a commuter belt and more. It has significant potential as an economic area, but there is not a clear economic or spatial framework to realise this potential. Recognising that the area includes a diversity of economic areas, places and people, we structured the vision into five interconnected but distinct ‘productive places’ based on existing areas and their assets with a clear vision for each area, a tight focus on priorities and stronger, streamlined governance.

The five areas are:

- City Ribbon
- Inner Estuary
- South Essex Foreshore
- North Kent Foreshore
- The River Thames

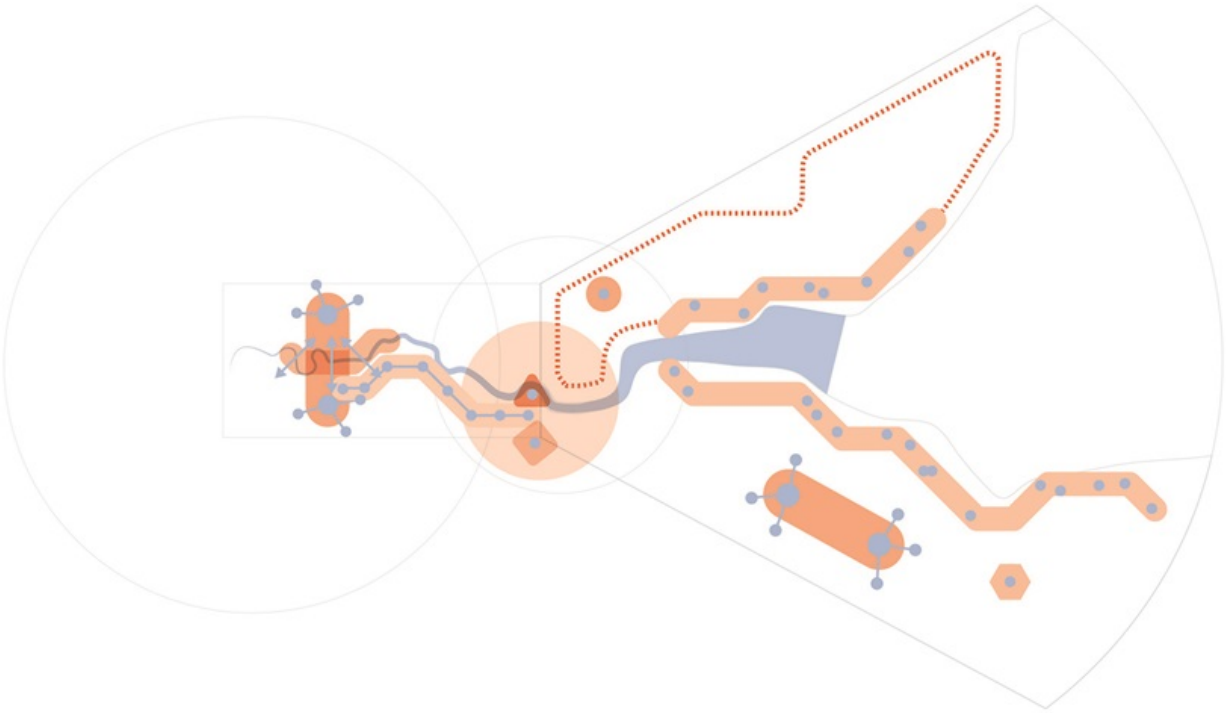


Priority projects by sector identified in the study area

Setting clear objectives to guide the vision

To provide further direction on how the Thames Estuary can boost productivity, make a greater contribution to the UK economy and deliver a series of positive outcomes by 2050 - we set six objectives for the visions success.

- **Productive places:** support the sustained growth of the Thames Estuary high value, healthy wage sectors, achieving up to 1.3 million new jobs by 2050.
- **Connected places**: improved connections between and within cities, towns, villages and industries be it for people or goods. This will support improved productivity through increased access to jobs and services. New and improved rail, bus, cycle and pedestrian links will reduce car dependency and increase the use of the area's integrated public transport systems.
- **Thriving places:** the growing communities which will be home to 4.3 million people by 2035, will pride themselves on their rich cultural and economic activity.
- **Affordable places:** a further 1 million high-quality homes, balanced to suit the affordable needs of the community, will be provided by 2050. They will offer a diversity of choice to all parts of the community, including ageing populations, and ensure that supply keeps pace with demand.
- **Adaptable places:** infrastructure investment will be integrated and multifunctional, maximising the benefits to people, places, and ecology. This will assist in the creation of nearly 900 hectares of new habitat by 2100 to replace the 1,200 hectares lost to tidal flooding.
- **Deliverable places:** the Thames Estuary will complete what it has started; delivering the homes and the balanced jobs it has planned, at the required scale and pace. This will be achieved through robust, locally-led governance structures, which build on existing partnerships and bring together, as needed, the area's local authorities.



Visual representation for the priorities that should be pursued simultaneously to provide ‘whole place’ solutions

Identifying priorities for the Growth Commission

With advice from Arup, the Thames Estuary 2050 Growth Commission identified fifteen priorities critical to achieving its vision and objectives for the Thames Estuary by 2050. The Commission argued that the priorities for each ‘productive place’ should be pursued simultaneously so that their impact is maximised, and they work together to provide ‘whole place’ solutions.

Government recognition

Following the publication of the Thames Estuary 2050 Vision, ***the government provided a positive response to it***, recognising the significant economic potential of the area and promising to support and deliver growth in the Estuary by working in partnership with local partners. Specifically, the government has committed to strengthen governance, deliver homes and improve mobility and infrastructure, amongst a long list of measures.

Find out more

Contact Joanna Rowelle to find out more about Integrated City Planning



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London, local time - 12:37pm

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London, United Kingdom, United Kingdom



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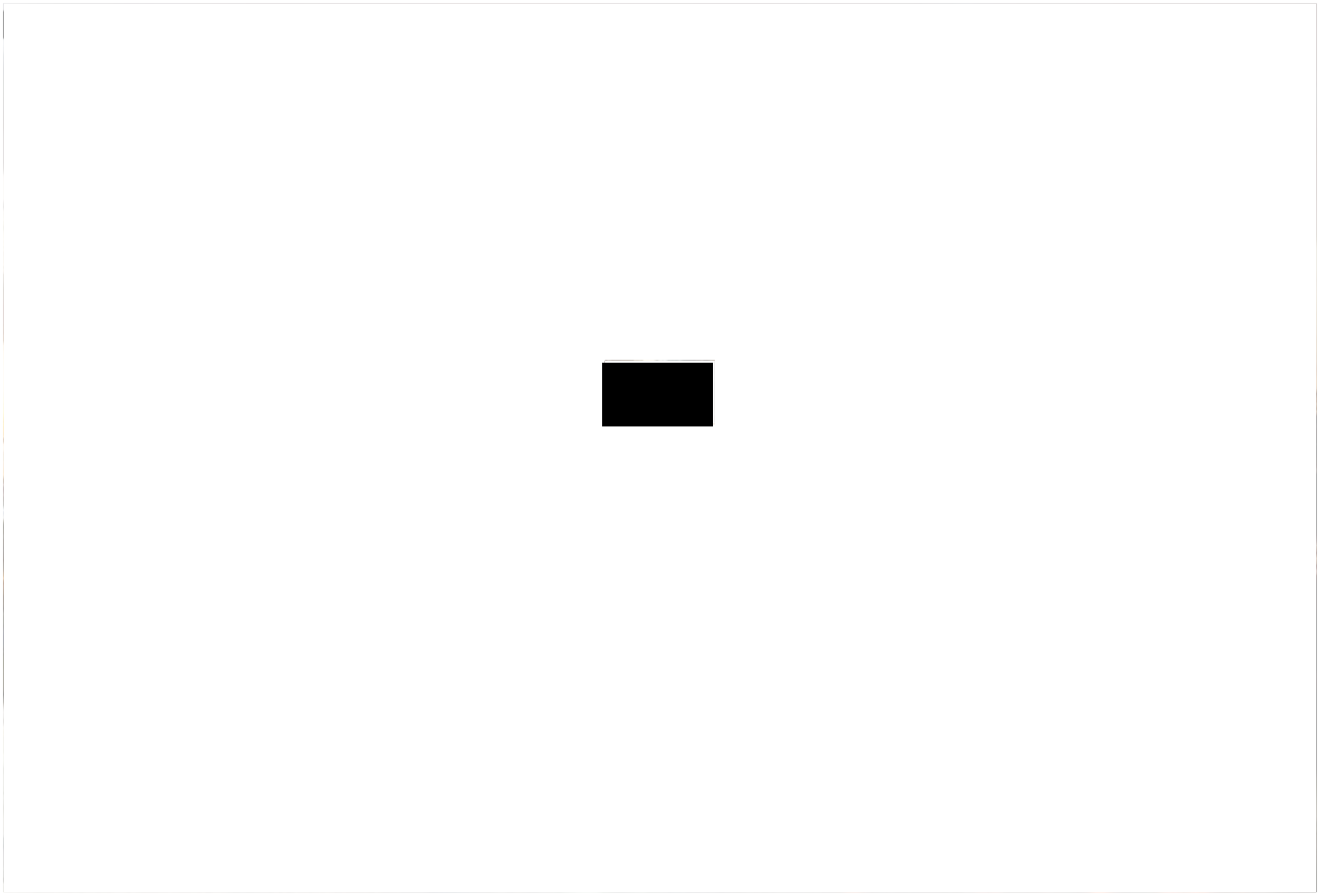


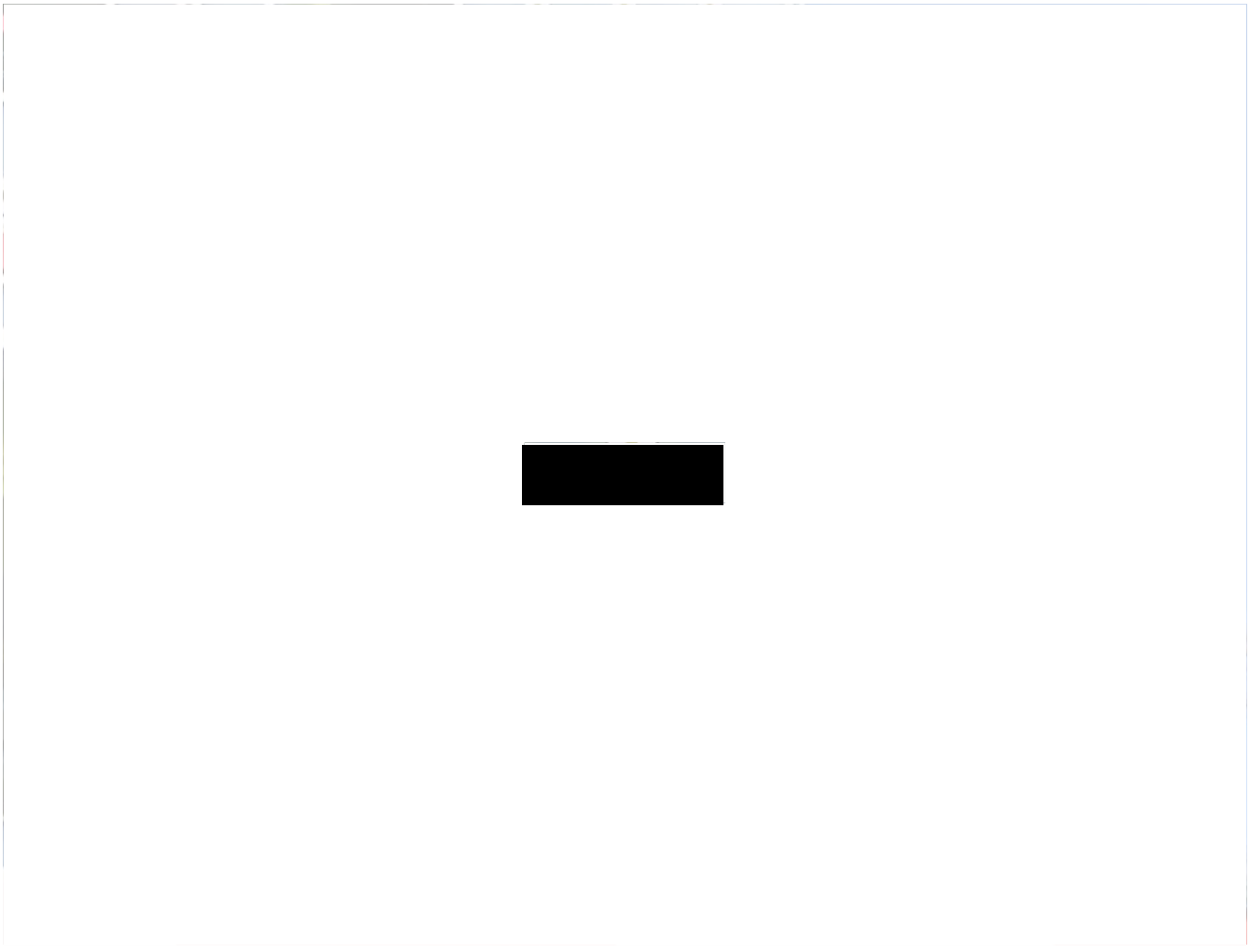
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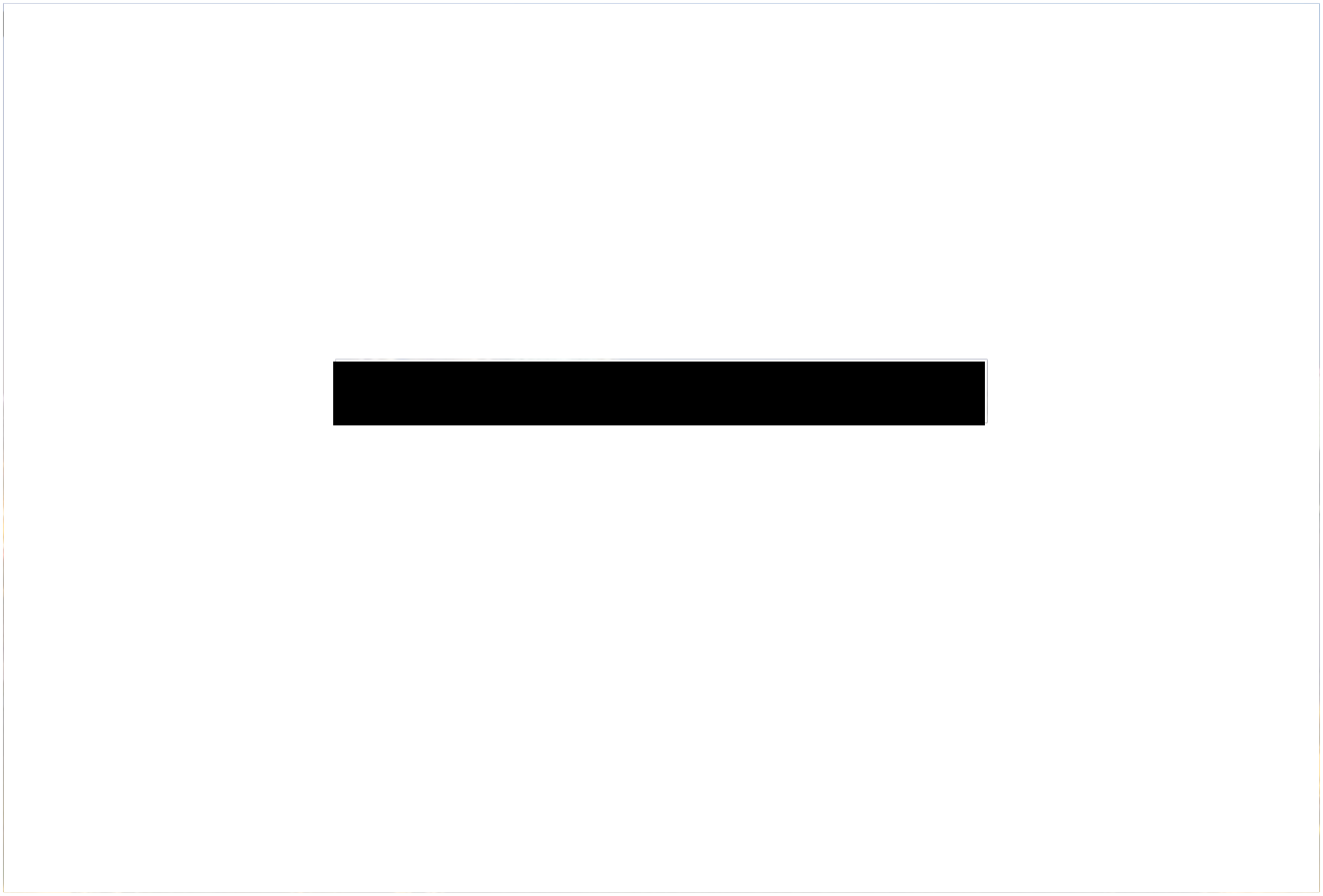
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THAMES ESTUARY HYDROGEN ROUTE MAP LAUNCHED

NEWS / ENVIRONMENT, HYDROGEN, LEVELLING UP

26TH OCTOBER 2021

The Thames Estuary Growth Board has launched the Thames Estuary Hydrogen Route Map. This significant step forward in hydrogen energy in the UK will keep the nation on track to net zero, support 9,000 jobs and deliver £3.8bn GVA to the UK economy by 2035.

Kate Willard OBE, Estuary Envoy and Chair of the Thames Estuary Growth Board said: "We are proud and excited to launch The Thames Estuary Hydrogen Route Map. Through our Green Blue vision, our objective is to unlock £190bn of national growth potential by capitalising upon the unique built and natural assets of the Thames Estuary. The Growth Board works tirelessly to identify and catalyse new opportunities to create the cleanest and greenest river-side region anywhere on the planet.

Over the past six months, we have looked across the Estuary to understand the needs and opportunities and articulate the scope for a hydrogen ecosystem which is compelling and capable of attracting multi-billion-pound investment. A hydrogen ecosystem in the Estuary will have far-reaching, positive implications not only for the region, but for the UK as a whole."

The Huge Hydrogen Opportunity in the Estuary

The Hydrogen Route Map identifies where demand, supply, distribution and storage opportunities exist; outlines requirements of the investment market and pinpoints investment clusters; establishes a broad set of relationships with key stakeholders; and highlights the competitive advantage of locating a hydrogen ecosystem in the Thames Estuary.

Nationally, this will keep the UK on target to net zero by reducing carbon emissions by **up to 5.9 million tons** annually. Ahead of COP26, the Thames Estuary is ready to play its part in international efforts to research, produce and use clean energy.

The Estuary's position next to the capital and stretching out to the North Sea means it is uniquely placed to deliver a hydrogen ecosystem. The region has a wide range of potential end users across a number of industries, such as high heat industrial, transport (road, rail, air and river), data, and heating, with each starting to develop plans for their journey towards zero carbon.

CATEGORIES

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THAMES ESTUARY IS READY TO PLAY ITS PART IN COP26 NET ZERO TARGETS

Additionally, major infrastructure projects such as the Lower Thames Crossing offer an opportunity to demonstrate fossil fuel-free alternatives for construction. Crucially, in terms of storage, local demand for carbon dioxide presents an opportunity for re-use. Lastly, the Thames is also the largest port cluster in the UK, supported by a significant fleet of back-to-base logistics operations situated in multiple port locations.

Across the Thames Estuary region, developments in hydrogen will unlock substantial benefits for people and local economies, attracting more than **£2.2billion of investment**, and supporting its levelling up through job creation. The transition away from fossil fuels will help address issues of poor air quality and improve health and wellbeing.

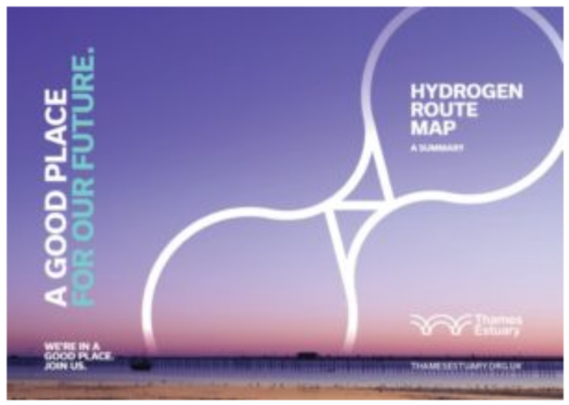
The benefits of hydrogen are abundant. Hydrogen is a clean, renewable energy source in bountiful supply, with numerous sources to produce locally and a sustainable production system. It's non-toxic and far more efficient than other sources of energy. Hydrogen can be a key enabler of decarbonisation across the heat and transport sectors, as well as energy-intensive industries such as chemicals, oil refineries and power.

The Thames Estuary Growth Board commissioned Ikigai and DNV to develop this Hydrogen Route Map following the Thames Estuary Hydrogen Summit in November 2020 attended by leaders and experts from industry, academia, transport and energy, which revealed a clear appetite and demand for hydrogen in the region. This week, the Thames Estuary will be calling on Government to back our Hydrogen Route Map in the Comprehensive Spending Review by providing source funding to kick off our 'Living Labs' concept.

The UK Government is committed to delivering hydrogen at scale and plans to work with industry to achieve 5GW of low carbon hydrogen production capacity in the UK by 2030. The Thames Estuary has the capability to power this ambition and support the Government in becoming a global player in hydrogen energy, owing to its natural and economic geography, and position as a strategic investment partner.

The Thames Estuary Growth Board is a strategic investment partner to Government and by commissioning bankable investment plans like the Hydrogen Route Map, this supports the levelling up agenda and national recovery from Covid. This is a compelling opportunity for investors to become part of the most amazing hydrogen project anywhere on the planet.

Find out more about the Hydrogen Route Map.

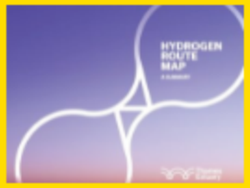


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