RiverOak Strategic Partners

Appendix to Comments on Written Representations

TR020002/D4/WRC/Appendix

Examination Document

Project Name:	Manston Airport Development Consent Order
Application Ref:	TR020002
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Date:	8 March 2019

NORTHPOINT

Aviation, Travel and Tourism Consultants

The Strategic Needs Case for RiverOak Strategic Partners' Manston Airport Proposals

By
Northpoint Aviation

March 2019

The Strategic Need Case Supporting RSP's Manston Airport Proposals

Introduction

1. In so doing, we are not setting to one side that PINS has accepted the DCO application for examination, and therefore have accepted that the scheme as proposed amounts to a nationally significant infrastructure project. However, we are recognising that:

(a) this is an issue which the ExA has shown significant interest,
(b) despite our responses to the first written 3 questions there is value in providing a consolidated overview of the 'big picture' case for an air freight led development at Manston, and
(c) the critique contained in Quod's Deadline 3 submission on behalf of SHP (and the supporting annexes from Altitude Advisory and York Aviation) contains a number of misleading assumptions and conclusions about the long-term development of the freight sector in the UK and Manston's potential positioning within it.

2. It is with this in mind that RSP has put together:

- A long run data set going back to 1983 of air freight activity at UK airports, distinguishing between bellyhold and freighter carried cargo, rather than the much shorter run data streams that SHP's consultants have relied on. The significance of examining this extended timescale will quickly become clear.

- A comparison of freight activity at benchmark airports in Europe, providing a far more relevant comparator than the UK and smaller airport analysis relied upon by Altitude in their reports.

- A high-level demand capacity model, using the same structure and principles as a similar, but more complex, model that is being used to underpin the project's commercial funding process and the wide variety of sensitivities and risks that are being examined as part of that. Summary outputs from the high-level demand capacity model are presented as an annex to this report and their significance explained.

- Evidence from a range of third-party sources that first demonstrate Azimuth Consultants forecasts are a sound platform for RSPs DCO proposals to be based and second help to articulate the wider need case for the project – namely a strategic demand-capacity gap in the UK air cargo which we anticipate will arise over the next 20 years in the South and East of England.

3. In so doing, we challenge the misconceptions and misleading assertions that lie at the heart of SHP's representations, and the consultancy reports that they, and Thanet DC before them, have commissioned, notably that:

(i) It is acceptable to rely on extrapolation of historical trends as the basis for projecting future outcomes, rather than attempt to develop a more in-depth understanding of

the dynamic changes that are taking place within the sector, and the implications that these may have for future growth projections.

(ii) The oft stated assumption that airport capacity in the UK, and especially in the South East of England, is unconstrained in so far as it relates to the future growth of air cargo.

(iii) The current division of freight carryings between bellyhold and freighter-based operations in the UK is fixed and will never change, even in the face of long run trends elsewhere.

(iv) The ‘new integrators’ that have emerged over the last 2-3 years in the US and China in response to the ongoing e-commerce boom, who are expected to establish a significance presence in Europe over the next 3-5 years, will not follow the same business and operational model as their predecessors and consequently will be significantly less dependent on night time flights.

Examining Air Cargo Growth Historic Trends in the UK

The Point at Issue

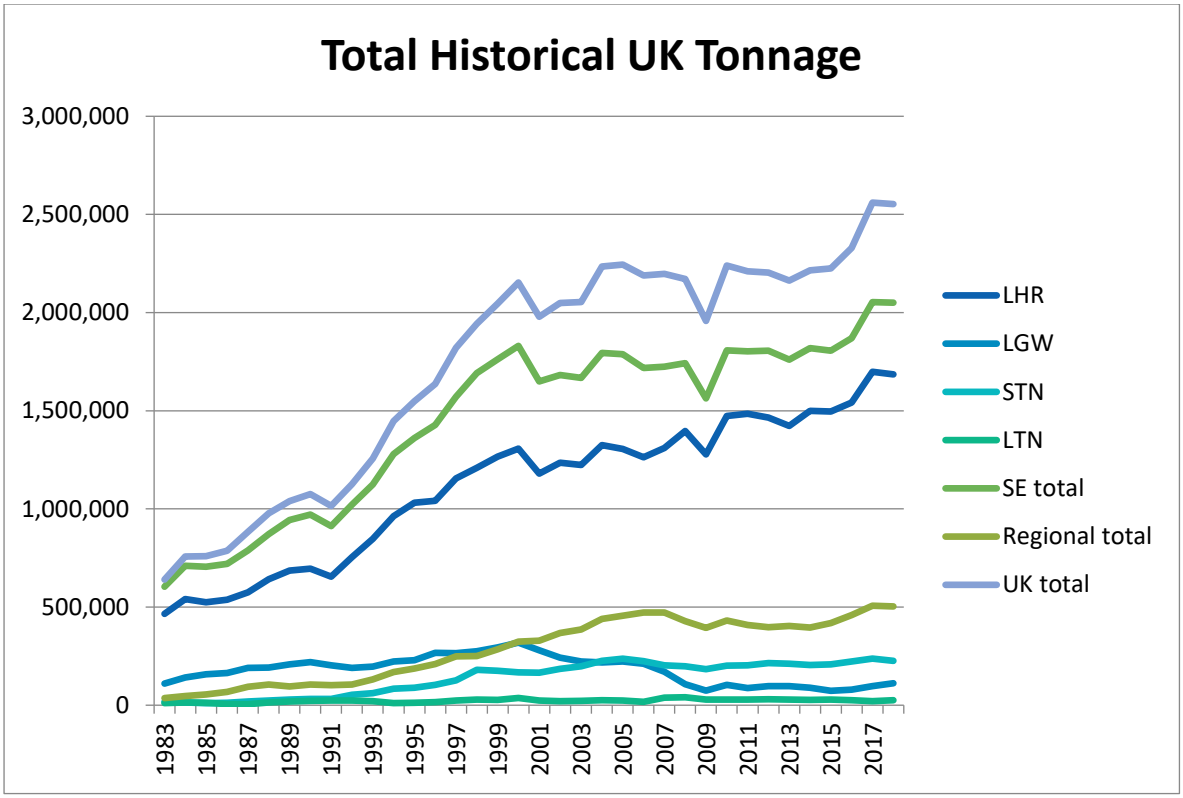
4. SHP's consultants have used data from 2003 to 2017 as the basis for much of their commentary on the prospects for Manston's development as an airport. This has been a common problem across all the reports that have been commissioned into the airport over the last 2-3 years. The effect of this has been to define a data set within limits that suits the purpose of someone seeking to demonstrate that there is a limited market for air freight to be attracted to use Manston; however, it also does not show the full long-term picture.

5. In response to the misleading analysis presented in Quod's overarching summary report for SHP, RSP have revisited some of the core data sources that have been used by the supporting aviation consultants and in so doing have gone back to the limits of the publicly available data published by CAA and have sought European comparisons with EU airports, to the similar data sets provided by Eurostat. The former provides cargo tonnage and movement data from 1983 for UK airports and the latter provides the same from 1990 and sometimes before for many EU airports.

6. We have then plotted this long-run data and examined the associated compound annual growth rates (CAGRs) over different periods, and in so doing have identified a substantially different picture than painted by SHP's consultancy team.

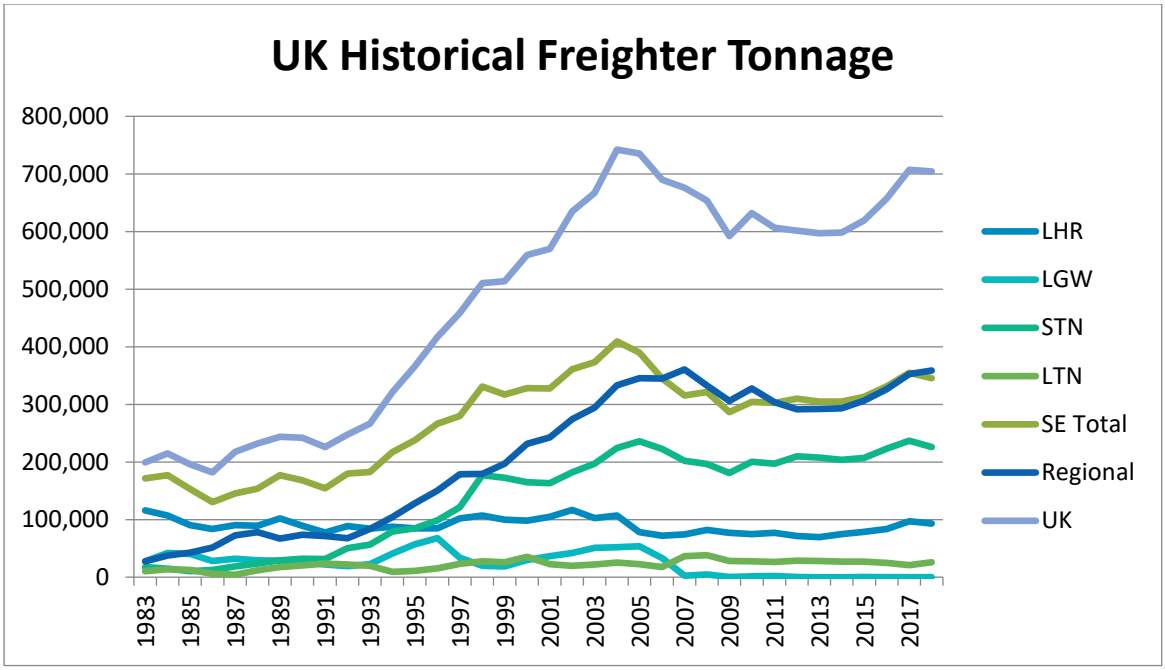
UK Airports

7. Looking first at the UK airport data we have plotted, it will quickly become apparent from the chart below that there is a significant change in the rate of growth in the UK and South East totals before and after the year 2000. This is emphasised in the subsequent table which has average annual growth in freight tonnes in the UK at 7.40% before 2000 and 0.95% after.



CAGR	LHR	EMA	STN	SE-UK	Rest-UK	Total-UK
All Freight						
Pre 2000	6.26%	20.20%	14.08%	6.74%	13.74%	7.40%
Post 2000	1.42%	3.54%	1.67%	0.63%	2.47%	0.95%
Whole Period	3.74%	11.32%	7.52%	3.55%	7.80%	4.03%
Freighter						
Pre 2000	-	20.72%	14.03%	3.89%	14.40%	6.46%
Post 2000	-	3.55%	1.77%	0.28%	2.49%	1.32%
Whole Period	-	11.56%	7.55%	2.02%	8.11%	3.79%
Belly						
Pre 2000	7.58%	-	18.47%	7.60%	12.16%	7.77%
Post 2000	1.54%	-	-	0.71%	2.42%	0.81%
Whole Period	4.43%	-	-	4.00%	7.04%	4.13%

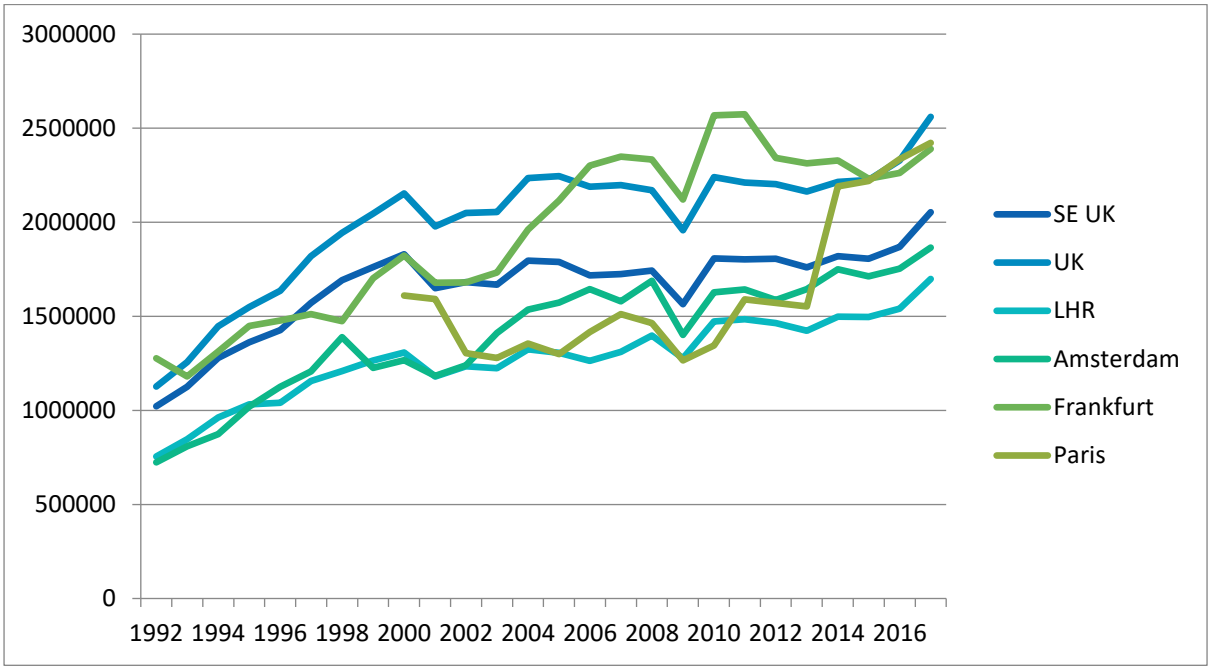
8. If one chooses 2003, the highpoint of freighter-based carryings as the start date for one's analysis and then plots subsequent freighter tonnages, it is not surprising that one can derive a negative growth curve; whereas when starting at virtually any year on or before 2001 will give you a completely different picture. Crucially, as the chart shows, from a low point in 2014, the trend in freight tonnage carried has again turned upwards, and although the data line is currently short, it would appear to be reverting to something close to its long-term historic trend line.



9. It is for this, amongst many other reasons that RSP do not accept the conclusions of SHP's consultants about the potential future market for air freight in the UK, and as we will demonstrate later hold strongly to our belief, at our significant commercial risk, that there is a strategic gap in the market for a specialist freighter-based airport in the UK.

Comparative Air Cargo Growth Trends Across Major EU Cities

10. Further evidence to support this conclusion is provided by comparing the long run growth trends in air freight carryings associated with London's principal competitor cities in Europe, having regard to both their hub and supporting satellite airports. The chart below provides a plot of total air freight tonnage throughput (encompassing bellyhold, express and freighter borne cargo) in Amsterdam, Frankfurt and Paris, alongside similar trend lines for Heathrow, the UK as a whole and the South East of England (comprising the six London airports). It is supported by a table derived from the same data, which also includes Milan and Madrid, summarising CAGR growth rates from 1990 and 2000.



Metric	SE UK	All UK	Amsterdam (AMS + Maastricht)	Milan (Malpensa + Bergamo)	Frankfurt (Main + Hahn)	Paris (CDG + Orly)	Madrid
CAGR from 1990+ (1st available data)	2.7%	3.1%	3.7%	5.6%	2.1%	2.5%	3.5%
CAGR from 2000+.	0.6%	0.9%	2.2%	4.8%	1.1%	2.5%	3.5%
Delta	-2.1%	-2.2%	-1.5%	-0.8%	-1.0%	0.0%	0.0%

11. This analysis offers a number of unique insights of relevance to the Manston need case:

i. The growth in freight traffic across airports in London and the South East was below that of the UK as a whole and also that of its principal competitor economic regions in Europe between 2000 and 2017. However, this is not the case if 1990 is used as the start date for the trend analysis, in which circumstances it falls more closely in line with Frankfurt and Paris, whilst remaining behind the performance of Amsterdam and the other smaller cities shown in the table.

ii. Since we know that over the long term the UK cargo sector has performed in line with its principal competitors (and remains one of the largest in Europe, and that they were all subject to the same fuel price entropy and external economic influences that the UK was), this points to the explanatory factors behind the variance being local to airports serving London and the South East of England and relatively recent in nature rather than there being a structural issue affecting the performance of the UK air cargo industry as a whole.

iii. The fact that Frankfurt also experienced a period of materially lower growth in this same period, during which it underwent a period of significant capacity constraint prior to the opening of a new runway in 2013 and has been unable to attract a significant integrator presence because of night noise restrictions, points towards a clear explanation at both airports.

iv. Between 2000-2017, South East of England (i.e. London) Airports have also experienced a period of gradually rising capacity constraint associated with:

- Heathrow operating at 99% slot utilisation resulting in limited scope for volume growth;
- Gatwick being subject to Traffic Distribution Rules on freighters and the aversion of its dominant low cost carrier sector to accepting bellyhold freight; and
- Stansted having limitations imposed on its ability to grow its presence in the integrator market because of night noise restrictions and the availability of a much more liberal night noise regime at East Midlands airport.

12. This in turn means that the latter has performed relatively well during the last 15 or so years and in so doing has ensured the UK air freight sector as a whole has out-performed the London and south east airport group, despite Heathrow being a dominant presence in both the regional and overall national markets.

Airport Capacity Constraints

13. Having dealt with long term historic trends and provided an analysis which point a very different and much more optimistic picture than that provided by SHP's consultants, we turn next to the issue of capacity, and specifically to the emerging constraints impacting upon this which were touched upon in the previous section of this report. The context for this is important, because one of the principal arguments upon which SHP's 'anti-need' case rests, as articulated by its supporting consultants' reports, is that now and over the next 20 years there are effectively no capacity constraints to the growth of freight traffic in the South East of England.
14. It is important to state at the outset that we are setting to one side the issue of capacity in the rest of the UK, this is because:

- we accept there is significant future growth potential at East Midlands (up to 1 million metric tonnes according to its 2015 Sustainable Development Plan) and have allowed for this in our demand capacity modelling;
- similarly there is scope for growth in bellyhold capacity at Manchester and Birmingham, and we see potential for expansion of freight activity at Scottish airports, and for Doncaster-Sheffield to grow materially as a freighter centre, each dealing with freight from within their own catchment areas.

15. But this is the essential point: regional airports have been growing, slowly but steadily, as freight operations over the last 15 years while South East airports have been stagnating in terms of volumes handled based on attracting traffic which they are geographically well located to capture. But even the success story that is East Midlands Airport, with access to the M1 motorway, is not as well placed as Manston to deal with the 35-40% of the UK freight market that has an origin or destination in London or the South East and East of England, as we illustrated in our Deadline 3 responses by reference to travel time analysis to strategic destinations in and around London and the M25 and detailed trucking time contour plots. And the fact remains that the airports which are most conveniently situated to serve those markets are, to a greater or lesser extent, already capacity constrained for freight operations, or will become so in the near future.

Heathrow

16. Capacity issues at Heathrow are well known; with slot utilisation at 99% there is little scope for new route development and pressure on existing freighter operations there. What growth there has been in total tonnage recently has been a function solely of up-sizing of passenger aircraft bringing more bellyhold capacity and initiatives within the air cargo industry based at the airport to try to make better use of the capacity available – although utilisation rates at Heathrow are known to be amongst the highest of its European peers already.
17. Clearly, a new runway will bring scope for material bellyhold capacity growth as the number of slots available will increase by approximately 35-40%. Based on current throughput, this would suggest a proportionate growth in available tonnage capacity to around 3MT compared to current constrained volumes at 1.75MT. This is in line with the freight capacity assumptions for the new runway supported in the National Planning Statement and with Davies Commission estimates. 3MT is also the figure quoted in all Heathrow's documentation about the Third Runway project; interestingly, they note that achieving even this level of capacity is dependent re-development of Terminal 4 and expansion of the cargo area close-by, and so the runway itself is not the sole determinant of future freight capacity.
18. The other factors relating to Heathrow that are relevant to the balance of demand and capacity for air freight within the South East region, is that the new runway is unlikely to become operational before 2027 at the very earliest and that leaves an

important 5 year window of opportunity for Manston to rapidly grow its market share when Heathrow will be at its most constrained. Offering a modern, unconstrained, efficient and highly digitalised alternative at the exact time when established freighter operators are looking for less congested and expensive alternatives while new model integrators are entering the UK market, affords Manston a significant opportunity to grow rapidly during that period.

Gatwick

19. In its recent draft Masterplan consultation document[1], Gatwick airport claimed its own 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. They went on to argue that it is the resurgence in long-haul services currently being experienced at Gatwick that is causing cargo volumes responding proportionately (2017-18 saw a 24% increase in cargo on the previous year). They conclude that if 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, although because of Traffic Distribution Rules restrictions it is entirely dependent on this long haul bellyhold traffic to do so.
20. This rosy assessment needs to be qualified on a number of grounds, however. First, Gatwick's recent success in attracting additional long-haul services, is at least in part accepted to be a consequence of capacity constraints at Heathrow and carriers who are unable to get slots there turning to Gatwick as the next best alternative. This means that when the third runway opens at Heathrow, they are likely to seek to move those services there.
21. Second, Gatwick is already operating at over 90% capacity and this is unlikely to change in the short term as it is already the busiest single runway airport in the world. Moreover, since the 2018 NPS on South East capacity supported a new runway being built at Heathrow not Gatwick, at this stage the scope for any major capacity increase at Gatwick is speculative.
22. Finally, although the airport's owners are known to be evaluating options for using existing infrastructure (in this case the main taxiway) to generate more peak period slots, these proposals are a long way from developed and would in any eventuality only generate at 30-40% capacity increment. Since it is most unlikely Gatwick would want to use this capacity for freighters, even if they were allowed to, the scope for increasing long haul bellyhold cargoes must be proportionally limited.
23. It is for these reasons that we believe, even in the most propitious of circumstances, Gatwick's freight handling capacity will not rise to more than 200-250,000 tonnes, even in the long term, and that any major increments are unlikely in the short term.

Stansted

24. Stansted is already slot co-ordinated and can be described as congested during its AM and PM peak periods, in that there are few if any slots readily available – and those that are, are quickly taken up by Ryanair and other passenger airlines that are well-established there. Having now reached 28.5mppa in 2017, MAG recently sought permission for expansion to 43.5mppa, on the basis of making 'full use' of the existing runway. They project that at current rates of growth the airport will be full

[1] https://www.gatwickairport.com/globalassets/business--community/growing-gatwick/gatwick-draft-master-plan-final.pdf

between 2030-35, and peak periods and shoulder periods will be congested well before then as low cost passenger operations expand quickly.

25. The potential for scheduling freighter movements during the day at Stansted therefore look as though they will become problematic during the second half of the next decade, just at the time when it is planned Manston will be available and entirely congestion free. The freight industry is also sanguine that MAG will always give priority to passenger aircraft because they are more profitable to handle than freight aircraft are. This is why, despite the capacity constraints elsewhere in the South East, Stansted has not seen a more rapid growth in its general freighter operations than it has.

26. Moreover, the real success story at Stansted, and the source of much of its growth has been the 'traditional' Integrator operations led by Fedex, and these largely operate at night. However they too will prospectively face capacity issues associated with night time movement constraints and noise QC caps in the short to medium term. These will certainly prevent Stansted growing its integrator operation to the scale of that at East Midlands because the scale of passenger operations, and therefore the demand for late night and early morning arrivals and departures from incumbents like Ryanair, will be much greater than at East Midlands where the passenger operation is 5 times smaller, and unlikely ever to create the same scale of competition for night time slots as at Stansted.

Luton

27. Luton is currently consulting on plans to double the size of its passenger operation to between 32-36 mppa. Passengers are the focus of its existing operation and its forward plans. While the consultation document reports that:

"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[2]"

28. On paragraph 5.12.8 it indicates that:

"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."

29. The new proposals do not appear to include any proposals for the expansion of that existing capacity and we have therefore assumed it will remain at or slightly below its current level of 20,000 tonnes, unless increased night time constraints (its principal attraction to DHL its primary freight customer, remove it altogether.

Conclusions

[2] This is an extract from page 87 Luton Airport Expansion Project London Luton Airport Limited (LLAL) Final Report February 2019 (https://futureluton.llal.org.uk/wp-content/uploads/ltn_sift2_report.pdf):

30. The foregoing analysis demonstrates that none of the other major alternative airports in the South East (London City and Southend are discounted for freight operations because their runways are too short) are entirely 'unconstrained' in terms of capacity now, or in the longer term, and we believe this will be an important consideration when the general freight community begin to review the pattern of freighter aircraft operations post Brexit, as there is evidence they have already begun to do with the announcement of an alliance between Liverpool and Leipzig airports to maintain supplies of automotive parts[3].

31. However, if further external verification of this analysis is warranted, then the recent IATA slots review (see below) officially classifies Gatwick, Heathrow, Luton and Stansted as Level 3 congested.

IATA World Slots Review

IATA

Worldwide Slot Guidelines (WSG) - Annex 11.6 - Contact List for Level 2/3 Airports

This document lists e-mail addresses of coordinators requiring SCRs (Level 3 airports), and of schedules facilitators requiring SMAs (Level 2 airports), for the airports specified. It is based on information provided to IATA.
Please note that the airports concerned are listed in alphabetical order by region, country and then by airport code.
The list is not guaranteed to be comprehensive, as its validity depends upon input from the addressees.
An airport will be shown as requiring SCRs (Level 3) only if the Coordinator provides information specifying applicable scheduling constraints for each forthcoming season plus data depicting the extent to which the airport is full or close to full, thus demonstrating the need for
If possible, details of the latest capacity and utilization information should be displayed on the coordinator's website.
Upon request from any airline acting as schedules facilitator to the Head of Scheduling, any airport may be shown as requiring SMAs.

Last Updated: 11-Jan-19

Region	Country	City	Airport Code	W18 Level	S19 Level	W19 Level	SCR/SMA Email	Online Potal	Website
Europe	United Kingdom	Aberdeen	ABZ	2	2	2	lonacxh@acl-uk.org	www.online-coordination.com	www.acl-uk.org
Europe	United Kingdom	Belfast- Belfast City	BHD	2	2	2	lonacxh@acl-uk.org	www.online-coordination.com	www.acl-uk.org
Europe	United Kingdom	Belfast- Belfast Internation	BFS	2	2	2	lonacxh@acl-uk.org	www.online-coordination.com	www.acl-uk.org
Europe	United Kingdom	Birmingham	BHX	3	3	3	lonacxh@acl-uk.org		www.acl-uk.org
Europe	United Kingdom	Bristol	BRS	3	3	3	lonacxh@acl-uk.org	www.online-coordination.com	www.acl-uk.org
Europe	United Kingdom	East Midlands	EMA	2	2	2	lonacxh@acl-uk.org	www.online-coordination.com	www.acl-uk.org
Europe	United Kingdom	Edinburgh	EDI	2	2	2	lonacxh@acl-uk.org	www.online-coordination.com	www.acl-uk.org
Europe	United Kingdom	Glasgow	GLA	2	2	2	lonacxh@acl-uk.org	www.online-coordination.com	www.acl-uk.org
Europe	United Kingdom	Leeds Bradford	LBA	2	2	2	lonacxh@acl-uk.org	www.online-coordination.com	www.acl-uk.org
Europe	United Kingdom	Liverpool	LPL	2	2	2	lonacxh@acl-uk.org	www.online-coordination.com	www.acl-uk.org
Europe	United Kingdom	London-City	LCY	3	3	3	lonacxh@acl-uk.org	www.online-coordination.com	www.acl-uk.org
Europe	United Kingdom	London-Gatwick	LGW	3	3	3	lonacxh@acl-uk.org	www.online-coordination.com	www.acl-uk.org
Europe	United Kingdom	London-Heathrow	LHR	3	3	3	lonacxh@acl-uk.org	www.online-coordination.com	www.acl-uk.org
Europe	United Kingdom	London-Luton	LTN	3	3	3	lonacxh@acl-uk.org	www.online-coordination.com	www.acl-uk.org
Europe	United Kingdom	Manchester	MAN	3	3	3	lonacxh@acl-uk.org	www.online-coordination.com	www.acl-uk.org
Europe	United Kingdom	Newcastle	NCL	2	2	2	lonacxh@acl-uk.org	www.online-coordination.com	www.acl-uk.org
Europe	United Kingdom	Southampton	SOU	2	2	2	lonacxh@acl-uk.org	www.online-coordination.com	www.acl-uk.org
Europe	United Kingdom	Stansted	STN	3	3	3	lonacxh@acl-uk.org	www.online-coordination.com	www.acl-uk.org
Europe Level 2 Total				75	79	73			
Europe Level 3 Total				78	104	79			

32. And DfT's own assessment of UK airport capacity, as an input to their 2017 national aviation forecasts is provided overleaf and accords with the analysis we have provided.

UK Airport Capacity Utilisation Assumptions in NAPAM[4]

[3] https://www.caasint.com/wynne-aviation-at-liverpool-john-lennon-and/

[4] DfT: UK Aviation Forecasts - Table 33, page 102; 2017

	2016	2030	2040	2050
Heathrow	100%	100%	100%	100%
Gatwick	100%	100%	100%	100%
Stansted	70%	88%	100%	100%
Luton	81%	100%	100%	100%
London City	80%	100%	100%	100%
London	93%	98%	100%	100%
Manchester	89%	81%	70%	91%
Birmingham	50%	66%	95%	100%
Bristol	76%	95%	100%	100%
East Midlands	79%	63%	87%	100%
Southampton	82%	99%	100%	100%

Cross Channel Traffic and the Potential for Clawback

33. The other component of the overall capacity analysis we have sought to capture in our demand - capacity modelling reported later in this document, is the likely extent of future cross-channel leakage of freight bound for, or departing from the UK, and the potential for 'clawing-back' some or all of this traffic to fly from UK based airports. This phenomenon, which effectively provides flexibility to an otherwise constrained south east airport freight market, is well known and widely acknowledged in the industry. It is, however, economically and environmentally inefficient (additional transport costs, travel time for consignments and emissions from the trucks that make the journeys via Dover Port and the Channel Tunnel to airports in near Europe – most notably, Liege, Paris, Frankfurt and Leipzig), and therefore a classic example of an imperfect market requiring Government intervention. The problem has been identified in the current Aviation 2050 Green Paper consultation.
34. From a commercial perspective, the UK freight forwarding industry would argue the current cross-channel trucking operations make sense as it allows loads to be consolidated and customs and security clearances to be made at less congested and cheaper airports. However, with the prospect of increased congestion at the Channel ports because of Brexit, and IATA's targets to move general freight operations from delivery times of a week to 5 days, the scope for the current level of cross-channel trade in air freight to continue must become increasingly undesirable and Manston, of course is geographically ideally located to intercept it – in part at least.
35. So what is the scale of the problem? In an early study of its kind for DfT in 1999[5], MDS Transmodal reported that:

"*Road transport is used as a means of local collection and delivery of air cargo, principally by air freight forwarders who funnel the traffic through regional distribution centres or hubs. Some of these are in turn connected to trunk haulage links through regional airports, from which points the goods are either flown or transferred by road to major cargo consolidation points within or round the periphery of key hub airports such as London-Heathrow, Amsterdam, Frankfurt and Paris*."

36. In terms of cross channel freight volumes, MDS Transmodal reported, then as now:

" *… very little data was available from the air cargo hauliers and therefore it was necessary to rely on regional estimates available for the amounts of cargo hauled with regions and hub airports provided generally by airports and transit shed operators. This data is largely collected through the goodwill of transit shed operators who supply the information to airport management for collation*".

37. Using these techniques and comparing volumes in 1996 with CAA data, it appears that: " … *there is approximately 90,000 -120,000 tonnes of freight coming into UK airports from non EC countries, not consumed in the UK, and 130,000-150,000 tonnes moving in the other direction*". Extrapolating based on the change in volumes of UK freight since then and now would suggest these estimates may have risen c40%, but since it is during that period where the UK freight industry has experienced the greatest constraints, it would not seem unreasonable – even on a conservative basis - to double that increase. This would imply current outbound tonnages travelling to EU airports of up to 225,000, and in-bound trucking from EU airports of c

[5] MDS Transmodal: UK Air Freight Study – for DfT (1999)

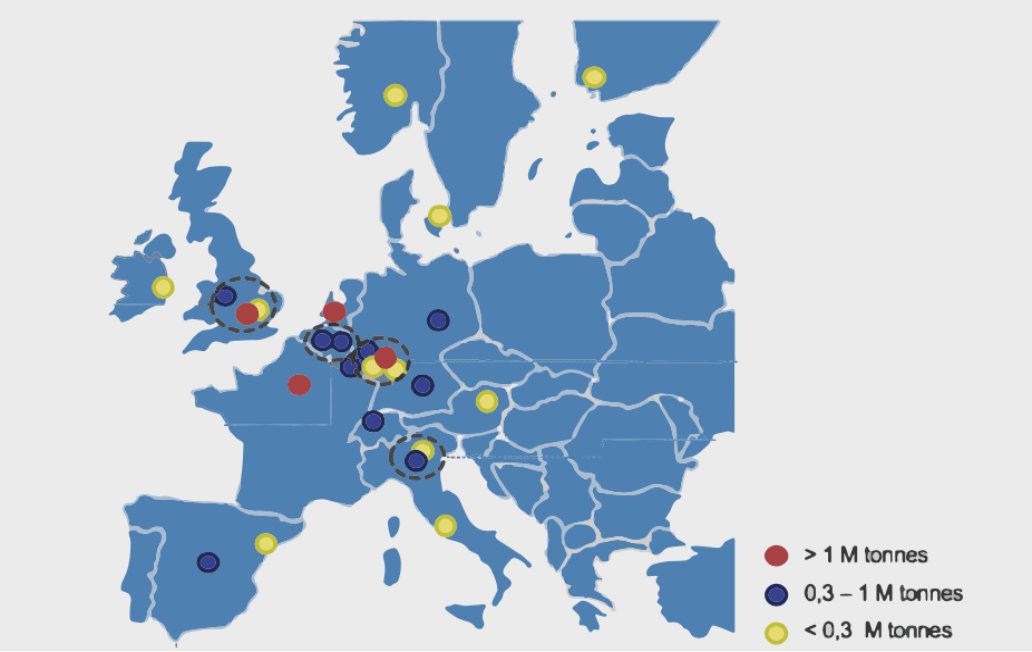
275,000 tonnes (i.e. nearly 500,000 tonnes in total)[6]. Extrapolating to 2050 these figures would double again if the remained proportionate to total volumes.

38. By way of confirmation of the scale of this cross-channel traffic, in evidence to the Transport Select Committee in 2018 about the Airports National Policy Statement, the Freight Transport Association stated that:

"*In the event of constrained capacity, significant volumes of high value cargo would have to be trucked elsewhere. In the event of no expansion [of Heathrow], our research[7] indicates this could be 2.1 million tonnes of freight, or around half of total freight demand, in 2050.*

39. Even if, as York Aviation now claim, the word 'elsewhere' includes other parts of the UK, conservatively (based on the existing South East to regional freight volume split), this suggests c 1.5MT is likely to be using EU airports – Brexit permitting – although Nick Platts, Head of Cargo at Heathrow has spoken about 250 trucks a day arriving at Heathrow from EU airports, which could imply as much as 2.5MT of UK originating or destined freight making the cross channel journey annually.

ARC Air Cargo in Airport regions - Top 25 European Cargo Airports



Steer Study

40. Further evidence attesting to the scale and importance of cross-channel leakage of air freight was provided in a recent study undertaken by the transport consultancy, Steer, for Airlines UK and the FTA[8]. Its report was published in October last year and used as a main source of reference on the sector in the Aviation 2050 Green Paper

[6] For air freight, the UK is a net importing country with a ratio of imports to exports in 1998 of 57%:43% when total trade is considered North America is the principal market for UK air freight followed by Asia, then Europe. MDS Transmodal, Ibid (p39).

[7] York Aviation, *"Implications for the Air Freight Sector of Different Airport Capacity Options"*, Prepared for the Freight Transport Association and Transport for London, January 2015

[8] Steer: Assessment of the value of air freight services to the UK economy (October 2018).

41. Paragraph 2.34 of the Steer report states that:

"*Several stakeholders have noted that capacity constraints are a significant hindrance to the operation of UK air freight – one stated that it has caused volume growth to fall behind other European countries and another stated it is one of the main reasons why so much freight is flown to mainland Europe and trucked to the UK – in turn causing more road and port congestion*."

42. It then continues:

"*While many of the UK's airports are not currently particularly congested, the concentration of air freight activity at Heathrow, which is severely slot constrained and which operates at 98% capacity, means that the congestion there has a disproportionate impact on UK air freight. Slot constraints at Heathrow mean that no additional freighter operations are possible, while the larger passenger aircraft such as the A380 actually have lower freight capacity than the aircraft they are replacing, particularly 747s*".

43. If this was not in itself independent validation of the arguments we have been making in this section of this document, and the one which preceded it, then a case study which Steer provides – and truncated version of which is set out in the box below, illustrates the points we have been making in a very practical way.

Case Study – Consumer electronics imports

In 2017, the UK imported £10.6 billion's worth of consumer electronics accessories, equivalent to just under 90,000 tonnes of goods. These imports, which are comprised of items such as iPhone cables, car hand-free kits and other similar accessories, are imported primarily from China and other East Asian countries. In 2017, 64% of the total import value was transported by air.

A consumer electronics importer consulted as part of this study, which imports its goods from 20 different locations in China, stated that it imports approximately two thirds of its goods (in value terms) by air, with the remaining third transported by sea. More bulky goods, such as laptop bags and wireless routers tend to be transported by sea, with smaller, lighter items, such as cables, transported by air. Although using air freight is approximately four times more expensive then transporting goods by sea, air freight is often more cost effective as goods can be transported much faster.

However, despite the need to import goods by air, the importer stated that it only flies around 20% of its total imports directly to the UK, with the remaining 80% being flown to mainland Europe (usually to Frankfurt or Amsterdam) and trucked in bond to the UK via a ferry or the Channel Tunnel. Imports are usually customs cleared at facilities near Heathrow, before being trucked to its Midlands distribution centre.

The importer stated the reason such a high proportion of its goods are flown to the UK via Europe, is because the UK's air freight capacity is not sufficient to service the required import volumes.

44. Finally, it is also worth noting that In a January edition of freight industry magazine Loadstar, Conan Busby, Head of Cargo at Manchester Airports Group (MAG), which owns East Midlands, Manchester and Stansted, Conan Busby, set out his view that there was

" *… a very real potential the UK could cede ground to international gateways if it did not act swiftly, and he appealed to forwarders to consider other UK airports*." He continued:

"*The country cannot sit still and wait for Heathrow to get its third runway, the airport is already becoming constrained*".

"*If it does that it will lose ground and its dominant position – and the UK is dominant in this sector…* "

45. He went on to point out that while domestic competition remained, the biggest developments come from European airports like Liege, which last year reported a 21.5% increase in volumes (up to 870,644 tonnes).

46. "*The pace of growth at Liege highlights his concerns over the reliance on Heathrow",* said Mr Busby (see our separate section on benchmarking near European freight airports).
47. This commentary from leading industry figures merely serves to reinforce the assessment that RSP has long held, that there is an urgent need for a specialist dedicated freight airport in the South East of England to address existing capacity constraints and tackle the cross-channel leakage problem highlighted above – and that the scale of infrastructure required amounts to a nationally significant infrastructure project.
48. The demand capacity modelling which RSP has undertaken, and we now go on to describe, addresses all of these issues in a robust and pragmatic way, as would be expected given the level of financial risk that they have knowingly committed themselves. It incorporates a clawback figure to reflect Manston's optimal geographical position to intercept part of this traffic en-route to the golden triangle airports shown in the map below. Our assumptions about the scale of this clawback are conservative as the modelling section of this paper explains.

Demand Capacity Modelling

Freight Forecasting

49. The process of forecasting future demand for air freight capacity in the UK is complicated. It is for this reason that it is notable that DfT, which has spent a lot of resource developing a national aviation passenger model, does not have a separate air cargo model. Indeed, the last time when this was attempted was back in 2000 to inform the 2003 Air Transport White Paper. But that is not to say that it is impossible, and the absence of such a DfT model is probably more symptomatic of the air freight sector being regarded as the Cinderella part of the air transport industry, a point made repeatedly at an FTA organised consultation event in the context of a 200 page Green Paper having no more than 2 pages on the sector, something DfT have acknowledged is not ideal.
50. In the absence of such a ready-made and widely accepted model, RSP adopted the traditional approach to forecasting future demand for Manston, notably Azimuth's detailed and carefully researched bottom-up analysis, supported by confidential and commercially sensitive demand capacity modelling, a summary from which is discussed later in this part of the document. The third approach which is typically used to generate such forecasts is the extrapolation of historic trend data and supporting qualitative analysis, of which the work by Altitude and York Aviation are examples.
51. RSP have shied away from relying on this methodology, in part because of the issues of statistical manipulation and reliability, we have highlighted earlier, but mostly because we do not believe that historic trends can be relied on as the basis of future forecasts. Simply extrapolating projections 30 years ahead, based on 10-15 years of data, is not a sensible basis for future planning. A much more dynamic and sophisticated scenario-based approach is required and this is what RSP have undertaken to support Azimuth's core commercially driven bottom-up forecasts and now present in order to address the Examining Authority's interest in the need case.

Demand Forecasts

52. Given that we have already established the extent of airport capacity constraints affecting the air freight sector in the South East, and have made estimates of the potential scale of the current cross-channel leakage of UK bound or originating air freight, the other key component of our demand-capacity modelling was to establish some realistic assumptions about future growth in the sector in the UK moving forward.

Airbus and Boeing Forecasts

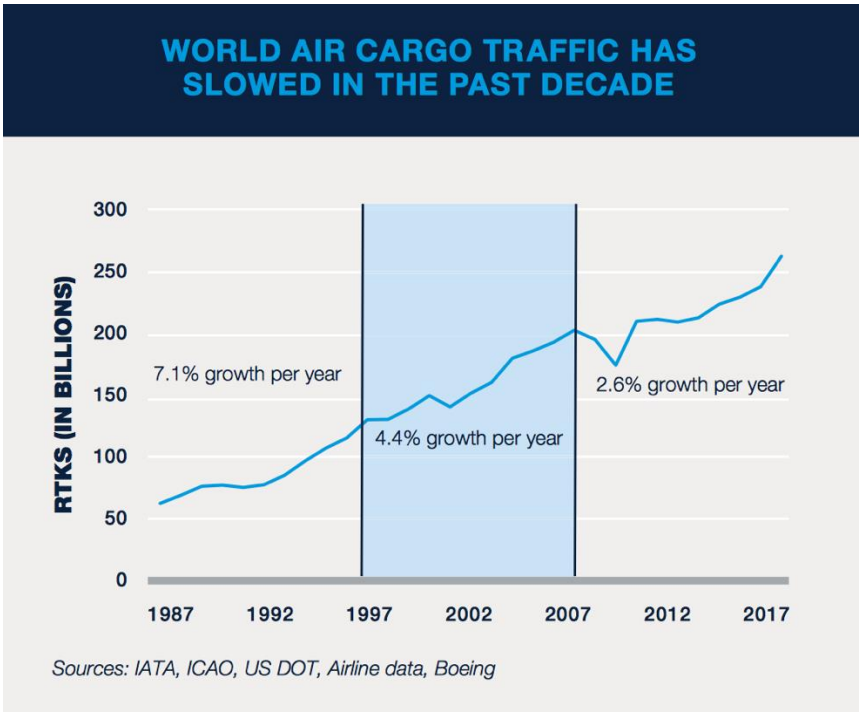
53. The starting point for this, as Azimuth Associates reports recognise, are the world freight forecast produced by Airbus and Boeing, the two dominant aircraft manufacturers. The resources that go into generating these forecasts are substantial and reflect the crucial role they play in the two companies' business planning for aircraft manufacture, conversion and MRO (maintenance, repair and overhaul). Essentially, they need to get them right and consequently are regarded by the industry as a whole as credible.

Boeing

54. Boeing's forecasts[9] acknowledge that the freight sector has been through a period of slower growth since the mid 2000's, but consistent with our earlier critique, they do not consider that this trend will continue into the future. Instead the project a restoration of faster rates of growth, as shown in the chart below, which is taken from their report.

55. Azimuth associates adopted the lowest end of the range of forecast growth rates (i.e. 3.7%), to underpin its bottom up analysis, but our demand capacity modelling was even more conservative, using growth rates of between 2.0% – 3.0% in our sensitivity testing, with a core rate of 2.35% used in our base case.

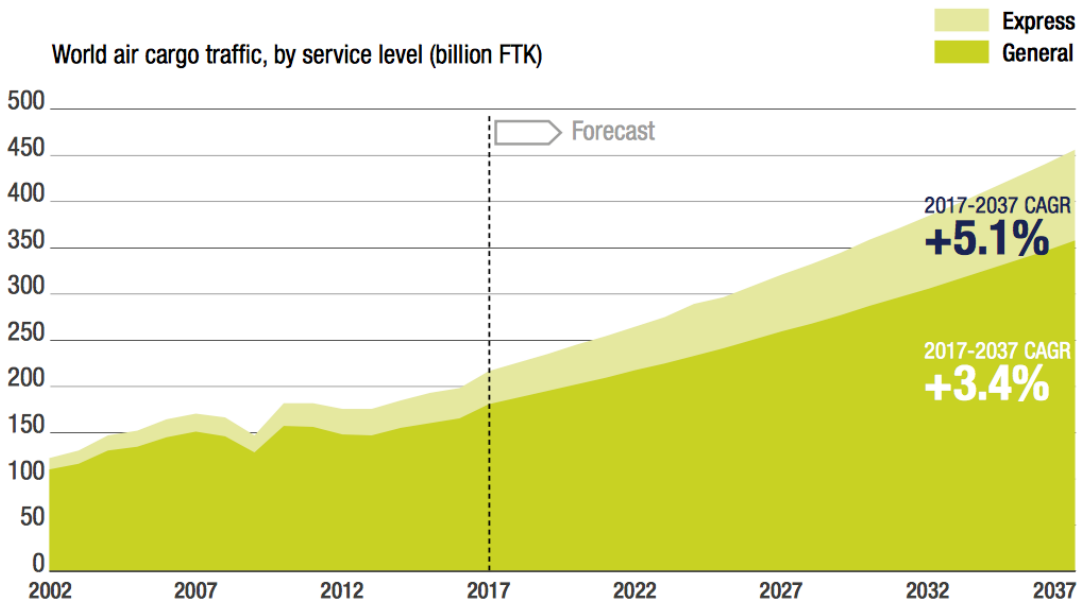
[9] Boeing: World Cargo Forecast 2017-37 (2018)



Airbus

56. Although projecting a slower growth rate for general cargo (i.e. freighter and bellyhold combined of of 3.4% vs Boeing's central forecast of 4.3%), Airbus also see the market for express freight growing more rapidly at 5.1% (see the chart below), reflecting the anticipated surge in demand from the rapidly expanding e-commerce sector. They measure freight traffic in Freight Tonne Kilometres (FTKs), and that metric is expected to double globally over the next 20 years, with the fastest growth out to 2037 coming from an express market, dominated by both the traditional large integrators and the e-commerce lead 'new' disruptor integrators such as Amazon Prime, Cainiao (part of Alibaba Group) and JD.Com (see Appendix A).

Airbus Global Market Forecast for Freight



57. In Airbus' forecast they assume that bellyhold load factors will remain constant, which with a more rapidly expanding passenger fleet (CAGR 4.4%) should result in some shift from dedicated freighters to passenger aircraft. Hence Airbus suggests belly cargo traffic expected to grow faster (at 4.4%) than dedicated freighters (2.9%). It acknowledges, however, that there will be limits to this movement, because for example oversized or dangerous goods cannot be carried in aircraft holds. Also, express traffic (with a need for speed/reliability) should be less impacted by increased belly capacity. The issue of bellyhold vs freighter operations and its implications for projected throughput at Manston is discussed a greater length in Appendix B.

Trade Route Forecasts

58. Underneath these headline growth figures, both Boeing and Airbus provide a more detailed 'regional' or inter-continental 'trade route' projections. Boeing's figures are set out below, and with the majority of UK trade heading to Europe, North America and Asia, the use of a CAGR of 2.35% in our demand-capacity modelling would appear to be well founded.

AIR CARGO GROWTH RATES

REGION	HISTORY 2007–2017 by percentage	FORECAST 2018–2037 by percentage
World	2.6	4.2
East Asia–North America	1.2	4.7
Europe–East Asia	4.2	4.7
Intra–East Asia	3.8	5.8
Europe–North America	0.0	2.5
Intra–North America	2.3	2.3
Domestic China	5.0	6.3
Latin America–Europe	3.0	4.0
Latin America–North America	-0.3	4.1
Africa–Europe	-1.0	3.7
South Asia–Europe	2.4	4.2
Middle East–Europe	3.3	3.2
Intra-Europe	3.1	2.3

Source: IATA, ICAO, ACI, AAPA, US DOT, US Trade, US DOC, TRADE, Eurostat, IHS Markit, CAAC, AAI, India DGCA, FAVT, Airline data, Airport data, Boeing

59. For Airbus's figures, we have provided a traffic light system summary on a route by route level in the table overleaf, using 2.35% as the core figure and 2.7% for green lighting and 2.0% for red. The results offer further reassurance about our consistency with the main industry focused forecasts.

Export Trade by Air CAGR

Traffic flow	2017-2027 CAGR	2027-2037 CAGR	2017-2037 CAGR
Europe - Advanced Asia	3.2%	2.1%	2.6%
Europe - Africa	4.4%	3.4%	3.9%
Europe - Central America	2.4%	0.4%	1.4%
Europe - CIS	3.1%	1.8%	2.5%
Europe - Emerging Asia	4.8%	4.2%	4.5%
Europe - Europe	2.5%	2.1%	2.3%
Europe - Indian Subcontinent	6.1%	4.4%	5.3%
Europe - Japan	1.1%	0.7%	0.9%
Europe - Middle East	4.0%	2.3%	3.2%
Europe - North America	2.7%	3.2%	3.0%
Europe - Pacific	1.9%	1.8%	1.9%
Europe - PRC	4.4%	3.0%	3.7%
Europe - South America	2.5%	2.5%	2.5%

Import Trade by Air CAGR

Traffic flow	2017-2027 CAGR	2027-2037 CAGR	2017-2037 CAGR
Advanced Asia - Europe	2.6%	1.6%	2.1%
Africa - Europe	4.8%	3.4%	4.1%
Central America - Europe	3.2%	1.3%	2.2%
CIS - Europe	2.1%	2.0%	2.0%
Emerging Asia - Europe	5.0%	4.9%	4.9%
Europe - Europe	2.5%	2.1%	2.3%
Indian Subcontinent - Europe	5.7%	5.2%	5.4%
Japan - Europe	1.5%	1.1%	1.3%
Middle East - Europe	3.3%	2.6%	3.0%
North America - Europe	3.7%	4.2%	3.9%
Pacific - Europe	1.6%	1.8%	1.7%
PRC - Europe	4.3%	2.8%	3.5%
South America - Europe	2.8%	2.9%	2.8%

Other Approaches to Growth Forecasting

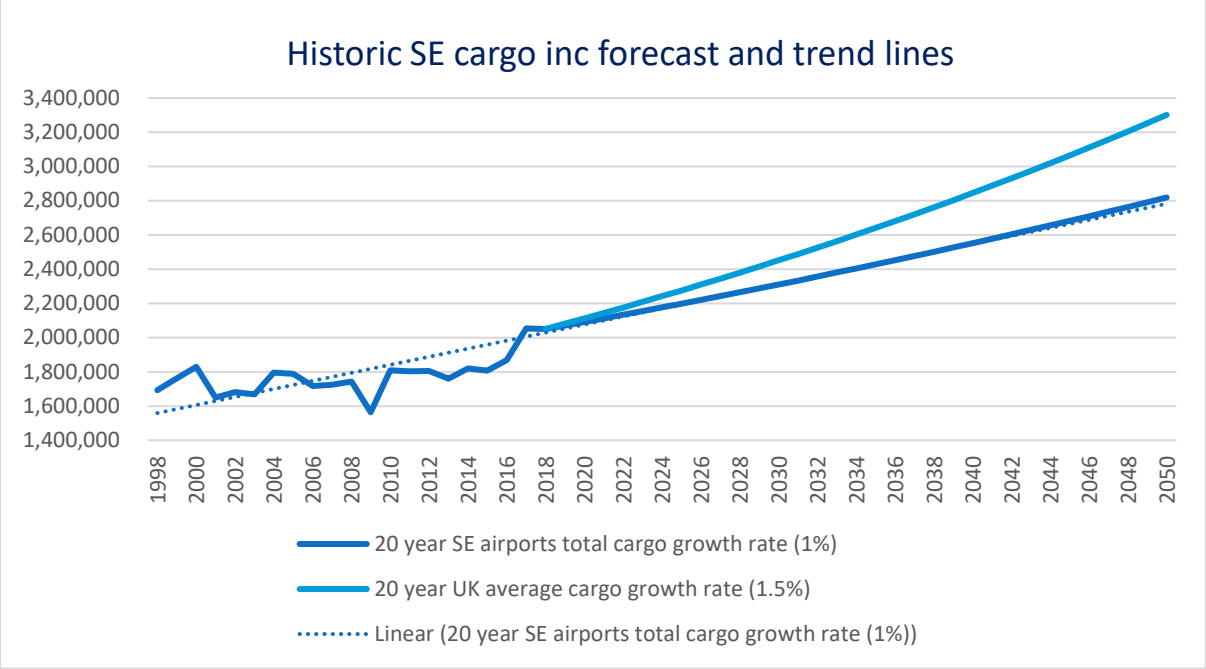
60. However, such is the sensitivity of our demand-capacity modelling to the core underlying growth rate used, we sought verification of our assumptions not just based on Airbus and Boeing projections, but also using our own and third party regression analysis.

Northpoint Analysis

61. Northpoint examined the issues in two ways using the same long run data sets we had developed to support our earlier historic trend analysis. The first used 1990 – 2017 as the representative period for the regression and generated the total tonnage results for the UK as follows. These are well within the bounds or our modelling parameters. In broad terms a market of 6 million tonnes at 2050 leaves a capacity gap of over 500,000 tonnes in the UK according to our demand capacity model.

Year	Post 2000	1990-2017	Difference
CAGR	0.95%	3.14%	
2020	2,601,437	2,715,359	113,921
2030	2,859,169	3,697,623	838,454
2040	3,142,434	5,035,215	1,892,781
2050	3,453,763	6,856,673	3,402,910

62. We then also sought to analyse South East only market trends and develop a range of projections based on these. The results are shown in the charts and accompanying table below.


Historic SE cargo inc forecast and trend lines
3,400,000
3,200,000
3,000,000
2,800,000
2,600,000
2,400,000
2,200,000
2,000,000
1,800,000
1,600,000
1,400,000
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
2036
2038
2040
2042
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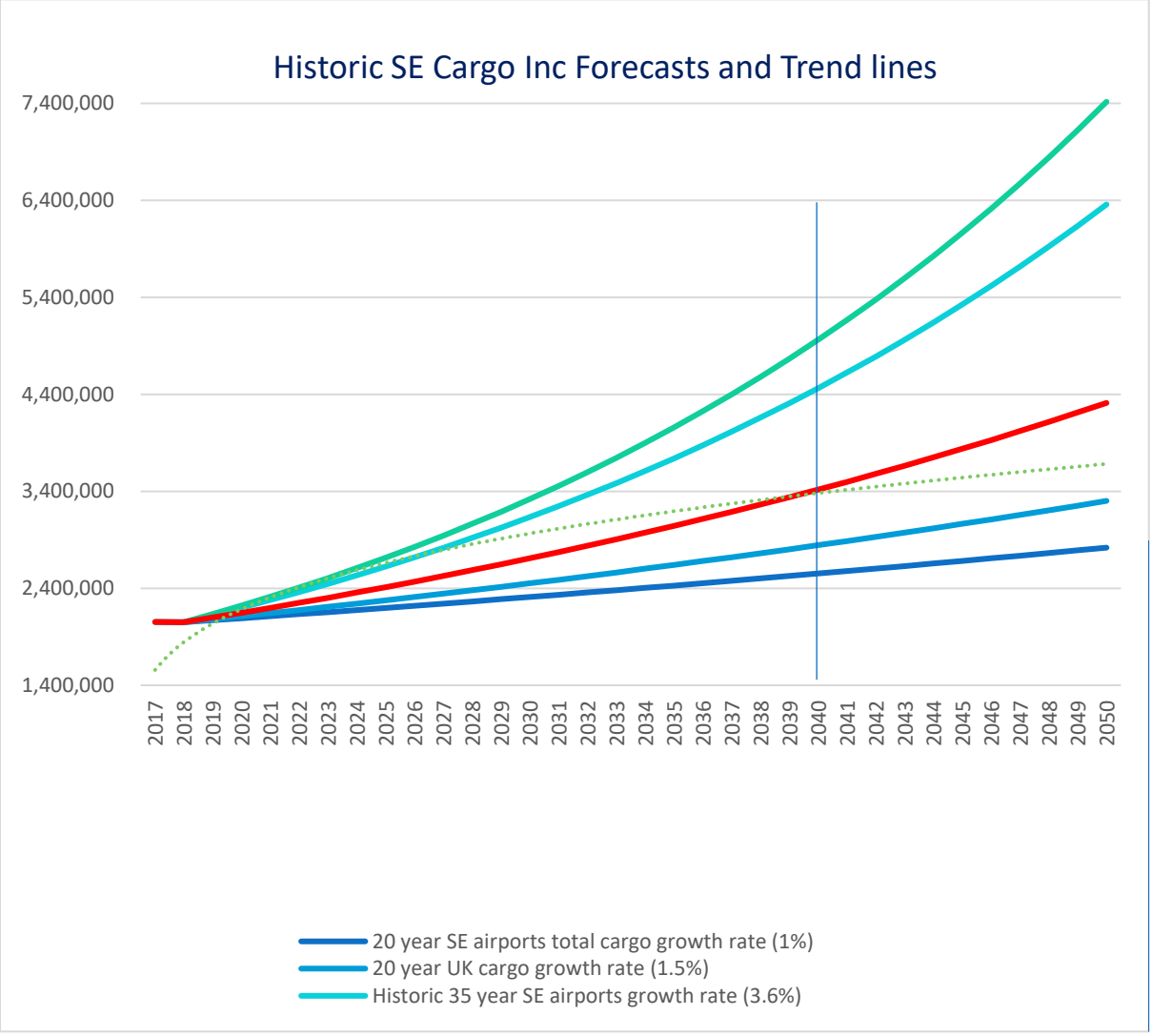
2048
2050
20 year SE airports total cargo growth rate (1%)
20 year UK average cargo growth rate (1.5%)
Linear (20 year SE airports total cargo growth rate (1%))


Historic SE Cargo Inc Forecasts and Trend lines
7,400,000
6,400,000
5,400,000
4,400,000
3,400,000
2,400,000
1,400,000
2017
2018
2019
2020
2021
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2050
20 year SE airports total cargo growth rate (1%)
20 year UK cargo growth rate (1.5%)
Historic 35 year SE airports growth rate (3.6%)

Additional Cargo Compared to 2018 SE Current Total Cargo								
Forecast Assumption	Est cargo at 2020	Additional cargo to 2018	Est cargo at 2030	Additional cargo to 2018	Est cargo at 2040	Additional cargo to 2018	Est cargo at 2050	Additional cargo to 2018
20 year SE airports total cargo growth rate (1%)	2,091,264	**41,206**	2,310,057	**259,999**	2,551,740	**501,682**	2,818,708	**768,650**
20 year UK cargo growth rate (1.5%)	2,112,021	**61,963**	2,451,087	**401,029**	2,844,586	**794,528**	3,301,258	**1,251,200**
Historic 35 year SE airports growth rate (3.6%)	2,200,319	**150,261**	3,133,886	**1,083,828**	4,463,554	**2,413,496**	6,357,382	**4,307,324**
Historic 35 year UK growth rate (4.1%)	2,221,609	**171,551**	3,320,281	**1,270,223**	4,962,291	**2,912,233**	7,416,338	**5,366,280**
Combined average growth (2.35%)	2,147,543	**97,485**	2,709,071	**659,013**	3,417,423	**1,367,365**	4,310,992	**2,260,934**

Romboll/Oxford Economics for TfL[10]

63. Finally, we turned to an external third party source who had attempted the same exercise. Their analysis of the issue for TFL is set out below.

An assessment of growth rates of air cargo volumes from 1990 to 2012 is summarised in Table below. Two periods are separately listed, 1990-2012 and 2000-2012. These two periods are shown because there was a marked shift in the growth of the air cargo market from 2000. Indeed, the growth rate for the 2000-2012 is much smaller. These two states of the world are used to predict a range of trend forecasts, with the 2000-2012 trend used to develop an Oxford Economics lower bound forecast and the 1990-2012 trend used to develop and Oxford Economics upper bound forecast.

A previous study has demonstrated that the night time aircraft movement limit is reached at Stansted in two to five years, depending on the timing and strength of the UK's economic recovery.

It is also essential that there is enough capacity for the UK to maintain its position as a hub. A key feature of the express industry is the use of the 'hub-and-spoke' distribution model. International packages are consolidated with packages from other countries for transportation on to their final destination (Transhipments). The UK offers a good geographical location to act as a hub between The USA and the rest of Europe. The market is competitive and the UK competes directly with other EU airports in e.g. France and Holland. The hub status also helps to sustain the range of destinations currently serviced in the UK and are needed to ensure that guaranteed next-day delivery is not limited to large 'point-to-point' routes.

Average Air Cargo Growth 1990-2012

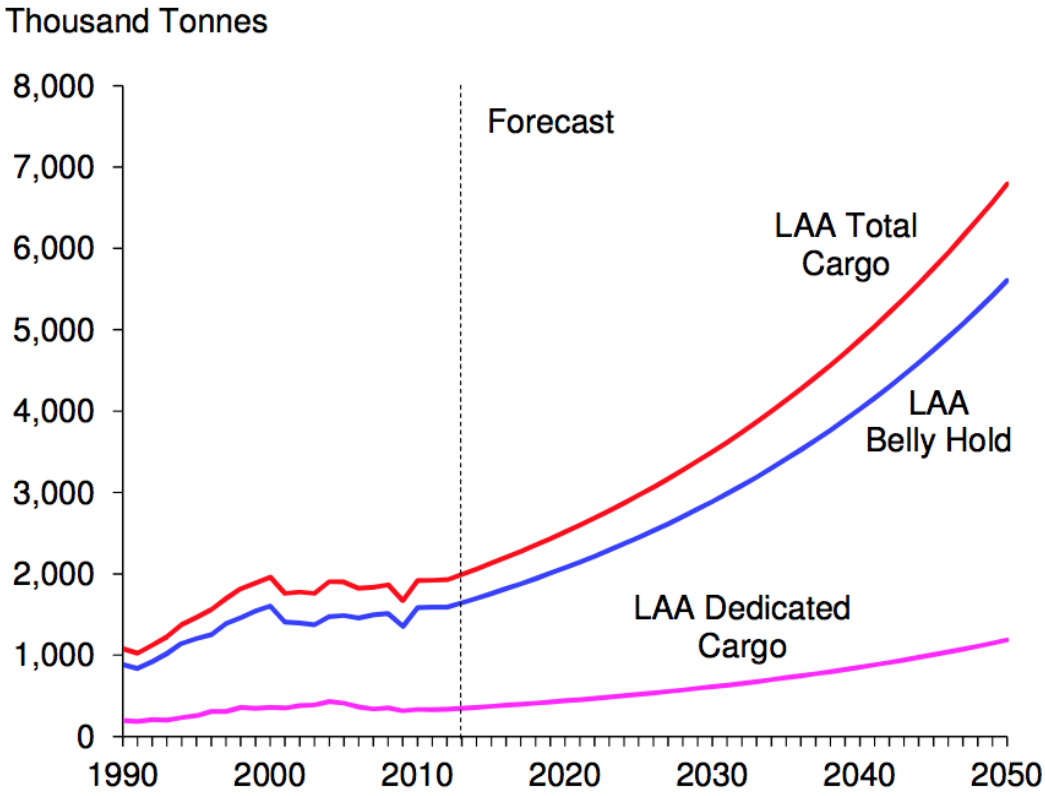
Geography	London Area Airports	UK
Average Belly Hold Cargo Growth 1990-2012	2.95%	2.87%
Average Belly Hold Cargo Growth 2000-2012	0.49%	0.48%
Average Dedicated Cargo Growth 1990-2012	2.76%	3.52%
Average Dedicated Cargo Growth 2000-2012	0.02%	0.40%

Source: CAA, Oxford Economics.

64. A graphical illustration of their work, including separate bellyhold and freighter forecasts follow overleaf.

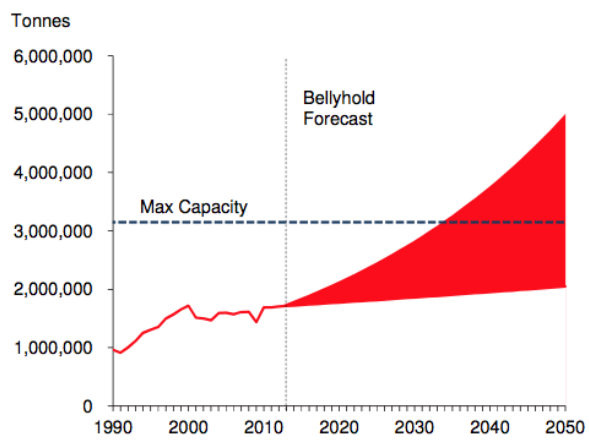
[10] Ramboll and Oxford Economics – Freight Report for TfL (2014)

Actual and Forecast London Area Airport Air Cargo Growth 1990-2050 Ramboll

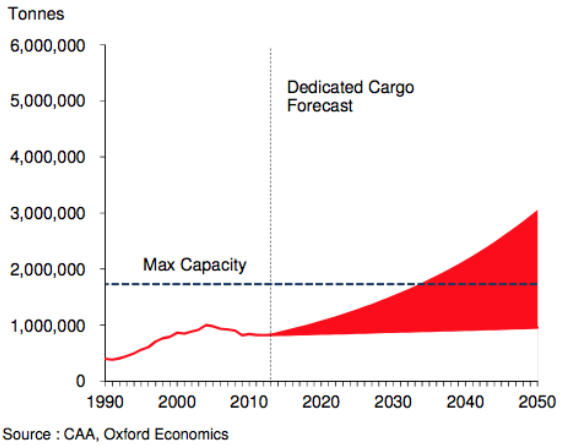


Source : Boeing, CAA, Oxford Economics

Actual and Forecast UK Trend Bellyhold and Dedicated Cargo Freight Growth 1990-2050



Source : CAA, Oxford Economics



Source : CAA, Oxford Economics

Demand Capacity Modelling Results

Key Features of the Demand Capacity Model

65. The aim of the model is to analyse a range of scenarios combining alternative future demand projections, with variable assumptions about the scale of clawback that is achievable, matching that with underlying capacity assumptions over a 50-year period to identify whether the South East system as a whole is likely to have a surplus of demand. The resulting surplus is then regarded as potentially capturable by Manston and is measured on a quinquennial basis against Azimuth's core project forecasts to assess the extent of fit (i.e. whether they are above (blue) or below (red) the core Azimuth tonnage forecasts). The input assumptions used in each of 30 scenarios are detailed in the model spreadsheet in Appendix C. They range from:

- Underlying growth applied to 2017 tonnages at each UK airport (or groups of airports) at either 2.35% (the base case), 2.0% the low case, 2.7% the high case and 3.0% the stretch case. Alternative asymptotic patterns of growth are also examined.

- Clawback, increasing over time, based on an assumed level of capture of the total market by Manston, at a lower, higher or step-change rate.

- Capacity is largely held constant, but a number of later scenarios examine what would happen if additional capacity, beyond what has been assumed for Heathrow R3, were to be added at:

  - Heathrow 3.5MT vs 3.0MT in 2050
  - East Midlands 1.2MT vs 1.0MT in 2050
  - Stansted 0.5MT at STN vs 150,000 MT in 2050

66. This simple functionality allows a large number of different demand capacity scenarios to be examined quickly and evaluated in terms of the tonnage forecasts the project has been calibrated against). The results are given a simple visual assessment using a traffic lights system with:

- Green: Performs better than the Azimuth projections
- Amber: Performs broadly similarly to the Azimuth projections
- Red: Perform worse than the Azimuth projections.

67. The results are provided in the output sheet in Appendix D. Although we acknowledge the functional limitations of this model:

- it does not use differential rates for bellyhold, express and ordinary freight – although the analysis is a level of aggregation where this is not a fundamental determining issue;

- it does not examine aircraft movements – we regard this primarily a function of tonnage volumes and airport location and runway length

- it does not look at the scope for migrating between type of carrier (e.g. bellyhold to freighter) and therefore between airports pairs; and

- it does not examine the impact of price because it is primarily interested in the issue of capacity.

68. RSP is building a more complex model capable of examining the impact of these factors as part of its ongoing business and financial modelling, but it incorporates a range of commercially sensitive assumptions which it is not appropriate to publish during this stage of the project's development.

Summary of the Model Results

69. Without going through each of the scenarios in detail, they are clustered to indicated the specific areas individual sensitivities are evaluating, the following summary conclusions can be drawn:

a. At a growth rate of 2.3% or greater, with relatively modest levels of cross-channel clawback, the project compares favourable against the Azimuth forecasts.

b. It is only when asymptotic curves or greater capacity at other large freight airports are introduced, that tonnage forecasts associated with these scenarios under-perform Azimuth's expectations

c. However, these under-performing scenarios typically perform satisfactorily at higher starting interest rates, or with high levels of cross-channel clawback.

70. Our overall conclusions, therefore, are that these Demand Capacity Model results confirm our confidence in the core Azimuth forecasts as the basis for taking forward the project and the environmental and economic assessments that have been undertaken to support the DCO application.

Conclusions

71. The analysis and forecasting presented in this paper challenges the fundamental basis upon which SHP have developed their own market projections for Manston and their associated claims about the project's viability. Their methodologies and assumptions are flawed and do not understand the positioning RSP is seeking in a dynamic and changing global freight market and an increasingly capacity constrained South East airport system.

72. The value of basing the project's development on the Azimuth bottom-up forecasting approach is that it required extensive contact with key market players, offering dynamic insights rather than relying on an inflexible methodology and data that relies on the notion that the key to the understanding the future is in the past when the future of this fast moving industry is going to look very different in 10-20 years' time when Manston is reaching maturity, than it does now.

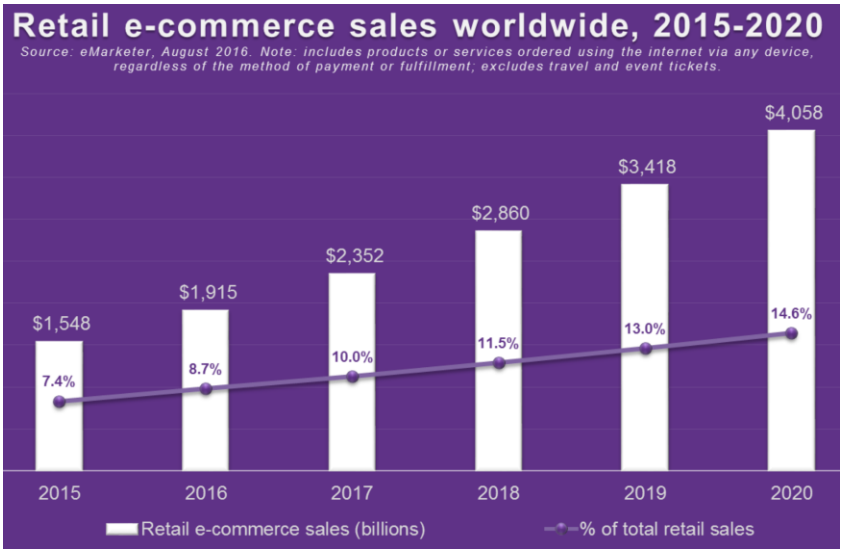
73. We believe a multi-component and scenario based analysis provides a much better informed basis upon which to make an assessment of the need case for Manston, and we believe it verifies the course that RSP has been set on during the last three years of project development.

74. With that in mind, it is perhaps apposite to conclude with a recent quote from a leading industry figure, looking ahead to the future of the industry, not back to its past:

"*In the medium to long term I think there will be some changing trade lane flows. The UK is currently an underserved airfreight market because it can rely upon logistics flows to and from the mainland of Europe, and I think that the offering could change in terms of timing, the speed to market*."

Appendix A: The "New' Integrators

75. The e-commerce industry is growing extremely rapidly (see chart below), and with a business model based on rapid (often 24hr) delivery, the sector has been looking toward the traditional express air-freight sector to meet its growing demands.



Source: IATA - Everything About Cargo

76. However, it has become clear that such is the importance of aviation on their logistical supply lines, that the leaders in the e-commerce sector such as Amazon, Alibaba and JD.Com are gravitating towards establishing their own airlines, even if the aircraft are owned and operated on their behalf by an established freighter airline.

Amazon Air

77. The first into this market was Amazon, with an airline called Amazon Prime Air, now shortened to Amazon Air. It has developed a fleet of 40 own-branded B767-300F aircraft operated on an ACMI basis by ATSG and Atlas Air.

78. Air Cargo News recently reported that ATSG is now turning to B777F operations to expand its ACMI business[11]. The significance of this is that ATSG as one of the largest owners of B767-300Fs and one of two principal suppliers of aircraft to Amazon, it would appear they are already anticipating that their major customer may need to upscale some of their fleet in the future. This is exactly the pattern of fleet development at Manston underpinning Azimuth's bottom-up air transport movement forecasts.
79. Its core hub is at Cincinnati/Northern Kentucky Airport and as it has rolled out it fleet is has established bases across a network of other destinations in the USA, some medium sized passenger airports, other like Rockford Chicago, Ontario Airport in LA, Wilmington in Ohio and Allentown in Pennsylvania being freight dominated like Manston is proposed to be.

[11] Air Cargo News: With a healthy pipeline of incoming 767Fs, ATSG now looking to 777F platform; 28 Feb 2019

80. RSP is aware that Amazon Air has already undertaken trial flights to airports in Europe and the UK and is in conversation with them about their future plans to find and airport to serve the South East of England.

Cainiao[12]

81. Alibaba's logistics arm Cainiao Network and Liege Airport also just signed a contract to lease a total area of 220,000 sq m to build a hub at Liege Airport. The initial investment will be €75m with the first phase of the facility planned to commence operations in early 2021.
82. In May last year the Alibaba group announced plans to establish five main logistics hubs around the world, with Liege being one of these. As well as Liege, Hangzhou, Dubai, Kuala Lumpur and Moscow are the chosen locations.

JD.Com[13]

83. E-commerce company JD.com has added a dedicated air cargo operation through Tianjin Air Cargo freighter as it continues to expand its logistics business.
84. JD.com said it had decided to use a dedicated all-cargo aircraft because it would be more reliable than the common alternative of bellyhold capacity on passenger aircraft because flight times can be adjusted according to industry demand, as opposed to having to comply with commercial airline schedules.
85. JD.com follows in the footsteps of Amazon which also has a dedicated air cargo operation running in the US.
86. Tianjin Air Cargo is a subsidiary of the HNA Group [recent purchasers of Frankfurt Hahn airport which the carrier now flies to] and was launched earlier this year with an initial fleet of three B737 freighters.

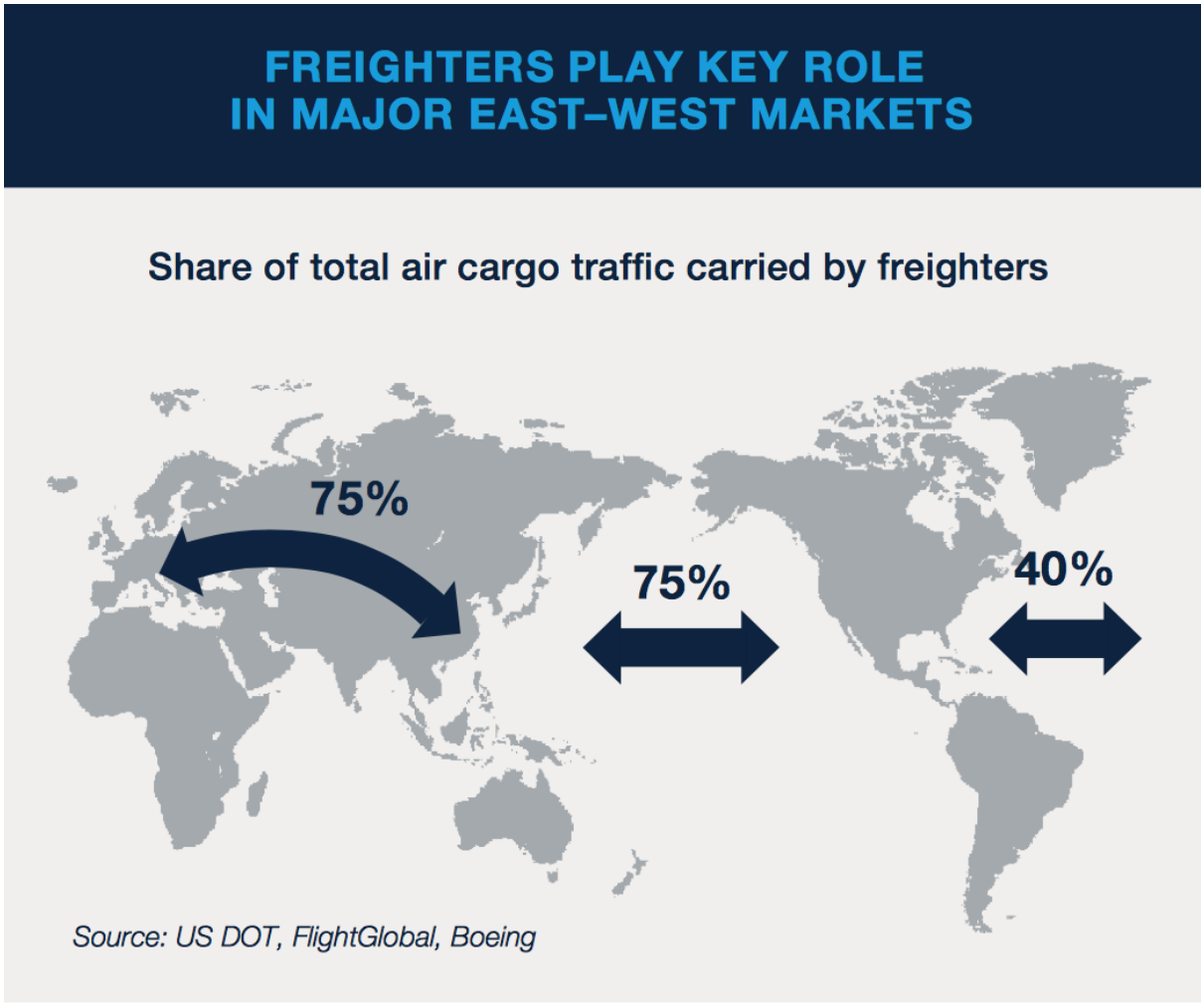
[12] Air Cargo News: Liege targets e-commerce as Belgium and Alibaba sign development agreement; 07 Dec 2018
[13] Air Cargo News: JD.com launches dedicated air cargo operation to increase delivery speed; 06 Nov 2018

Appendix B: Bellyhold vs Freighters

87. In 2017 Loadstar[14] reported Airbus' views that the plight of freighter carriers is likely going to get worse:

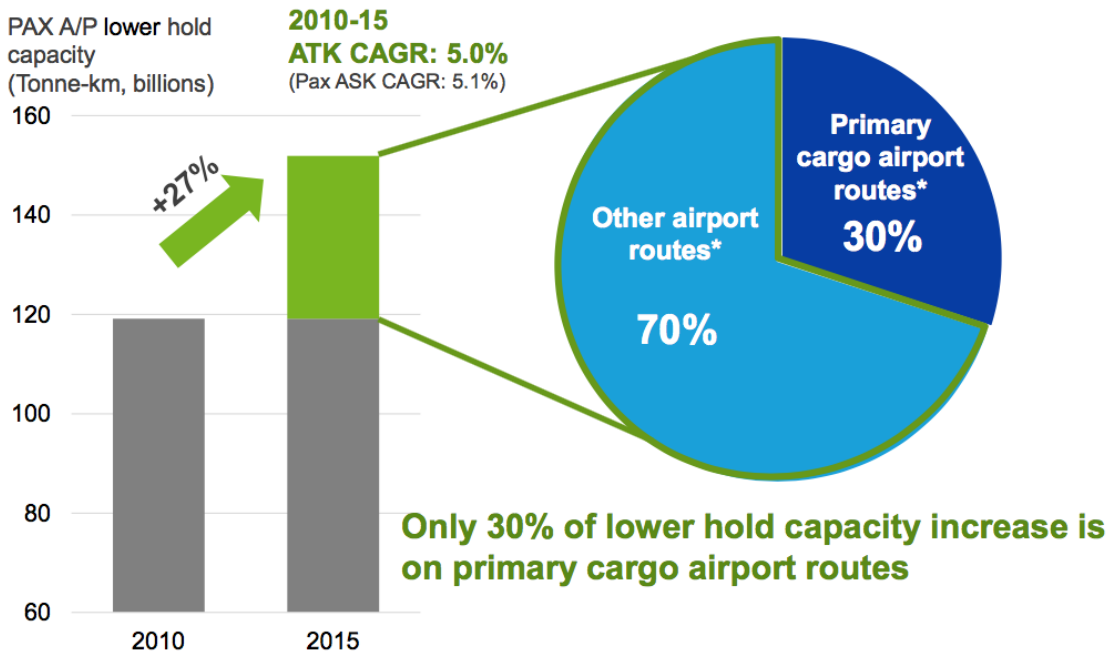
"*The plane maker projects that the share of freighters of global air cargo traffic (in FTKs) will slide from 2015's 48% to 38% in 2035, as more new-generation widebody passenger planes with cavernous bellies come onstream*."

88. However, it reports that Boeing takes a rather different view. According to the US plane manufacturer: " *… 66-70% of air cargo moves along the main trade corridors by dedicated freighter*" (see below).



89. Moreover, *"… only 30% of the belly capacity on new widebody aircraft introduced in the past five years has served the primary air cargo routes. Most flies to markets where forwarders, who determine gateway selection, are not active …."*.

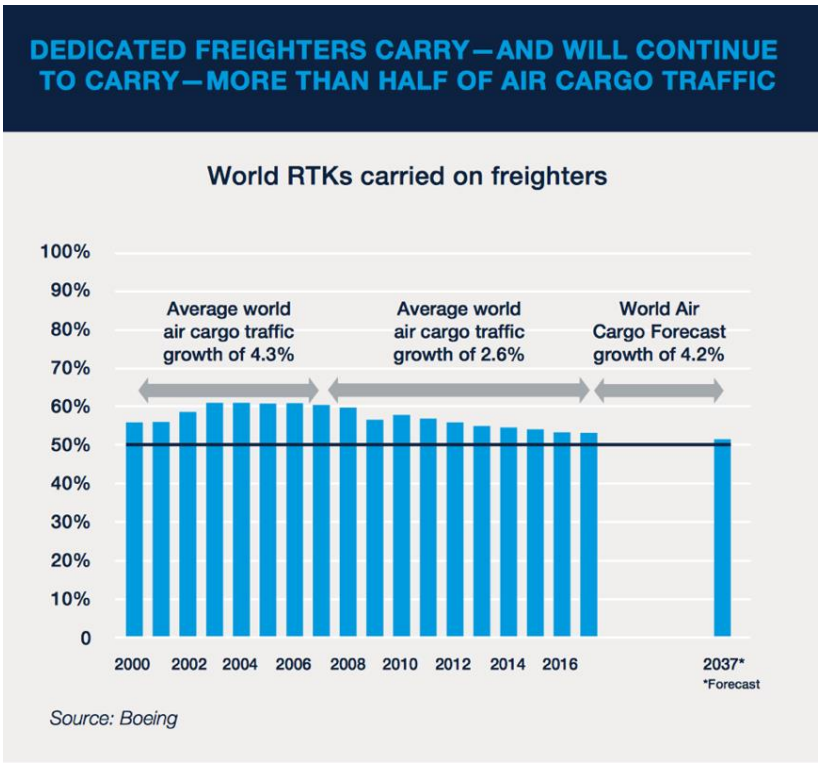
[14] Loadstar: Long Read Volume 7 - Belly and Freighter Networks (May 2017)



* Primary cargo airports are the top 50 cargo airports which account for 80% of total air cargo traffic.

SOURCE: Diio/Innovata schedule 2010-15 (all widebodies > 5,000 KM), ACI, Boeing Analysis

90. "Freighters continue to carry more than half of the global airfreight volume, although they make up only 8% of global air transports, and their share of the market has not declined through the downturn of recent years", he says. "Airlines that operate freighters generate 90% of the air cargo industry's revenues," he adds.
91. This is reflected in Boeing's projection for an unchanged share of the freight market for dedicated freight carriers in the graphic from their 2018 World Cargo Forecast below.



92. This debate bears upon not only upon the future market for new freighter aircraft (the interest of Boeing and Airbus), but also on the argument that York have continuously made that freight forwarders will favour the use of bellyhold capacity at Heathrow (if such exists) over the use of a dedicated freighter flying from another South East airport.
93. At Heathrow in 2017, 6% of total freight volumes were carried by freighter aircraft compared to between 40% and 60% at Amsterdam, Frankfurt and Paris. Although Heathrow and Amsterdam carried very similar levels of freight in 2017, there were around 3,000[4] freighter air traffic movements at Heathrow compared to just under 17,800 at Amsterdam. This is clearly because of slot constraints enshrined in Traffic Distribution Rules.
94. If we widen our scope first to the South East of England (i.e. including Gatwick, Stansted and Luton) as a whole the proportion of freight carried by freighter rises to 24.3%, still way less than in Europe because TDRs (and commercial imperatives) also drive their exclusion from Gatwick, which nevertheless handles 100,000 tonnes of bellyhold freight. If we then look at the UK as a whole, the proportion of freight carried on dedicated freight aircraft (freighter or integrators) rises to 42.6%, much more in line with what is seen in Europe.

As Lufthansa chief commercial officer, Alexis von Hoensbroech recently observed[15]:

"*We are also able to use our freighter fleet to respond to any sudden seasonal increases in demand where our passenger capacity may be insufficient to cater to capacity needs of the market*"

"*Freighters further allow us to well serve markets where the cargo market exceeds the capacity we have available on our passenger aircraft. We do not always observe a complete overlap between the kind of cargo that gets transported in the main deck of freighters and in the belly hold of a passenger aircraft and our freighter capacity supplements the cargo capacity we offer*"

"In contrast to the passenger demand, air cargo flows are pretty concentrated on relatively few trade-lanes. While the belly capacities provide a very broad network, many belly flights go to destinations, that have only little cargo demand. On the key cargo trade-lanes, there is and remains a heavy undersupply of belly capacities. Therefore, we need freighters to cover the remaining demand"

He gives the example of Frankfurt, where 60 per cent of all freight is being flown on freighters and this number has been growing over the last 10 years, he says, adding there are no indications, that this will change.

The highly volatile nature of the air cargo business with high-demand years quickly followed by much weaker periods also means that the flexibility of operating a freighter network allows for quick adjustment of capacities if the demand drops.

"*Therefore we expect to continue flying freighters in the future – while the fleet size might vary over time*."

95. Hence the issue in the UK is not that there is an inherent aversion to the use of freight aircraft, or that there is some structural or cost issue that drives the market to favour bellyhold as York Aviation suggest in their report. Rather it is the absence of availability that is leading to the low levels of freighter us in the South East market, and in any event, we anticipate per Kg charges in the busiest Heathrow bellyhold markets (i.e. North America and Asia – that are mostly at full capacity), will be at

[15] Air Cargo Week: The belly-main deck divide continues to widen: 26 Nov 2017

least as much if not higher than those achievable at Manston, and airport charges will be substantially lower than Heathrow.

Appendix C: Modelling Scenarios and Input Assumptions

Calendar Year		2022	2026	2030	2035	2040	2045	2050
Forecast Year		Yr 2	Yr 6	Yr 10	Yr 15	Yr 20		
Forecast Tonnage		96,553	181,436	212,351	270,579	340,758	-	-

Scenario		2022	2026	2030	2035	2040	2045	2050
1	Base Flat Rate @ 2.35%	96,195	186,499	214,888	252,245	343,399	532,351	789,166
2	Faster Flat Rate @ 2.7%	146,852	287,247	375,846	504,720	708,878	########	########
2a	Faster Flat Rate @ 3%	190,825	375,817	519,147	733,082	########	########	########
3	Slower Flat Rate @2%	46,227	88,469	60,402	14,029	4,405	72,735	185,862
4	Assontating Curve from 2.35%	96,195	144,157	82,084	(51,522)	(222,540)	(514,185)	(903,782)
4a	Assonating Curve from 3%	190,825	331,273	375,846	394,720	393,944	396,667	351,539
5	Assonating Curve from 2.7%	146,852	229,340	214,888	148,452	4,405	72,735	185,862
6	Base Case w/ Slower Clawback	96,195	161,499	139,888	164,745	243,399	419,851	664,166
7	Slower Rate w/ Faster Clawback	71,227	113,469	110,402	89,029	104,405	197,735	335,862
7a	Base Case w/ Faster Clawback	121,195	211,499	264,888	327,245	443,399	657,351	939,166
8	Assontating Curve from 2.35% w/ Faster Clawback	121,195	169,157	132,084	23,478	(122,540)	(389,185)	(753,782)
9	Assontating Curve from 2.70% w/ Slower Clawback	146,852	204,340	139,888	60,952	(95,595)	(39,765)	60,862
10	Base Case w/ Increased LHR Capacity	96,195	186,499	164,888	202,245	43,399	132,351	289,166
10a	Base Case w/ Increased LHR Capacity + step up Claw	121,195	211,499	214,888	327,245	243,399	407,351	639,166
11	Base Case w/ Increased LHR Capacity + slower Clawl	96,195	161,499	89,888	114,745	(56,601)	19,851	164,166
12	Base Case w/ Increased LHR Capacity + Higher Clawl	121,195	211,499	214,888	277,245	143,399	257,351	439,166
13	Base Case w/ Increased EMA Capacity	96,195	186,499	214,888	227,245	293,399	407,351	589,166
13a	Base Case w/ Increased EMA Capacity + step up claw	121,195	211,499	264,888	352,245	493,399	682,351	939,166
14	Base Case w/ Increased LHR AND EMA Capacity	96,195	186,499	164,888	177,245	(6,601)	7,351	89,166
14a	Base Case w/ Increased LHR AND EMA Capacity + ste	121,195	211,499	214,888	302,245	193,399	282,351	439,166
15	Base Case w/ Increased LHR AND EMA Capacity + Fa	121,195	211,499	214,888	252,245	93,399	132,351	239,166
16	Faster Flate Rate w/ Increased LHR AND EMA Capaci	146,852	287,247	325,846	429,720	358,878	511,423	762,234
17	Assontating Curve from 2.70% w/ Increased LHR AN	146,852	229,340	164,888	73,452	(345,595)	(452,265)	(514,138)
18	Base Case w/ Increased STN capacity	96,195	186,499	214,888	202,245	243,399	307,351	439,166
18a	Base Case w/ extra capacity @ STN, EMA, LHR	96,195	186,499	164,888	127,245	(106,601)	(217,649)	(260,834)
18b	As 18a w/ higher flat rate @ 2.7	146,852	287,247	325,846	379,720	258,878	286,423	412,234
18c	As 18a w/ even higher flat rate @3.0	190,825	375,817	469,147	608,082	594,716	756,986	########
19	Base Case w/ Increased LHR, EMA & STN capacity	146,852	287,247	325,846	379,720	258,878	286,423	412,234
19a	Base Case w/ more capacity STN, EMA, LHR & step u	121,195	211,499	214,888	252,245	93,399	57,351	89,166
20	S12 + STN more capacity	121,195	211,499	214,888	227,245	43,399	32,351	89,166

Scenario		2022	2026	2030	2035	2040	2045	2050
1	Base Flat Rate @ 2.35%	2.35%	2.35%	2.35%	2.35%	2.35%	2.35%	2.35%
2	Faster Flat Rate @ 2.7%	2.70%	2.70%	2.70%	2.70%	2.70%	2.70%	2.70%
2a	Faster Flat Rate @ 3%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
3	Slower Flat Rate @2%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
4	Assontating Curve from 2.35%	2.35%	2.20%	2.05%	1.90%	1.75%	1.50%	1.25%
4a	Assonating Curve from 3%	3.00%	2.85%	2.70%	2.55%	2.40%	2.25%	2.10%
5	Assonating Curve from 2.7%	2.70%	2.50%	2.35%	2.20%	2.00%	2.00%	2.00%
6	Base Case w/ Slower Clawback	2.35%	2.35%	2.35%	2.35%	2.35%	2.35%	2.35%
7	Slower Rate w/ Faster Clawback	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
7a	Base Case w/ Faster Clawback	2.35%	2.35%	2.35%	2.35%	2.35%	2.35%	2.35%
8	Assontating Curve from 2.35% w/ Faster Clawback	2.35%	2.20%	2.05%	1.90%	1.75%	1.50%	1.25%
9	Assontating Curve from 2.70% w/ Slower Clawback	2.70%	2.50%	2.35%	2.20%	2.00%	2.00%	2.00%
10	Base Case w/ Increased LHR Capacity	2.35%	2.35%	2.35%	2.35%	2.35%	2.35%	2.35%
10a	Base Case w/ Increased LHR Capacity + step up Claw	2.35%	2.35%	2.35%	2.35%	2.35%	2.35%	2.35%
11	Base Case w/ Increased LHR Capacity + slower Clawl	2.35%	2.35%	2.35%	2.35%	2.35%	2.35%	2.35%
12	Base Case w/ Increased LHR Capacity + Higher Clawl	2.35%	2.35%	2.35%	2.35%	2.35%	2.35%	2.35%
13	Base Case w/ Increased EMA Capacity	2.35%	2.35%	2.35%	2.35%	2.35%	2.35%	2.35%
13a	Base Case w/ Increased EMA Capacity + step up claw	2.35%	2.35%	2.35%	2.35%	2.35%	2.35%	2.35%
14	Base Case w/ Increased LHR AND EMA Capacity	2.35%	2.35%	2.35%	2.35%	2.35%	2.35%	2.35%
14a	Base Case w/ Increased LHR AND EMA Capacity + ste	2.35%	2.35%	2.35%	2.35%	2.35%	2.35%	2.35%
15	Base Case w/ Increased LHR AND EMA Capacity + Fa	2.35%	2.35%	2.35%	2.35%	2.35%	2.35%	2.35%
16	Faster Flate Rate w/ Increased LHR AND EMA Capaci	2.70%	2.70%	2.70%	2.70%	2.70%	2.70%	2.70%
17	Assontating Curve from 2.70% w/ Increased LHR AN	2.70%	2.50%	2.35%	2.20%	2.00%	2.00%	2.00%
18	Base Case w/ Increased STN capacity	2.35%	2.35%	2.35%	2.35%	2.35%	2.35%	2.35%
18a	Base Case w/ extra capacity @ STN, EMA, LHR	2.35%	2.35%	2.35%	2.35%	2.35%	2.35%	2.35%
18b	As 18a w/ higher flat rate @ 2.7	2.70%	2.70%	2.70%	2.70%	2.70%	2.70%	2.70%
18c	As 18a w/ even higher flat rate @3.0	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
19	Base Case w/ Increased LHR, EMA & STN capacity	2.70%	2.70%	2.70%	2.70%	2.70%	2.70%	2.70%
19a	Base Case w/ more capacity STN, EMA, LHR & step u	2.35%	2.35%	2.35%	2.35%	2.35%	2.35%	2.35%
20	S12 + STN more capacity	2.35%	2.35%	2.35%	2.35%	2.35%	2.35%	2.35%

Scenario		2022	2026	2030	2035	2040	2045	2050
1	Base Flat Rate @ 2.35%	25,000	75,000	150,000	175,000	200,000	225,000	250,000
2	Faster Flat Rate @ 2.7%	25,000	75,000	150,000	175,000	200,000	225,000	250,000
2a	Faster Flat Rate @ 3%	25,000	75,000	150,000	175,000	200,000	225,000	250,000
3	Slower Flat Rate @2%	25,000	75,000	150,000	175,000	200,000	225,000	250,000
4	Assontating Curve from 2.35%	25,000	75,000	150,000	175,000	200,000	225,000	250,000
4a	Assonating Curve from 3%	25,000	75,000	150,000	175,000	200,000	225,000	250,000
5	Assonating Curve from 2.7%	25,000	75,000	150,000	175,000	200,000	225,000	250,000
6	Base Case w/ Slower Clawback	25,000	50,000	75,000	87,500	100,000	112,500	125,000
7	Slower Rate w/ Faster Clawback	50,000	100,000	200,000	250,000	300,000	350,000	400,000
7a	Base Case w/ Faster Clawback	50,000	100,000	200,000	250,000	300,000	350,000	400,000
8	Assontating Curve from 2.35% w/ Faster Clawback	50,000	100,000	200,000	250,000	300,000	350,000	400,000
9	Assontating Curve from 2.70% w/ Slower Clawback	25,000	50,000	75,000	87,500	100,000	112,500	125,000
10	Base Case w/ Increased LHR Capacity	25,000	75,000	150,000	175,000	200,000	225,000	250,000
10a	Base Case w/ Increased LHR Capacity + step up Claw	50,000	100,000	200,000	300,000	400,000	500,000	600,000
11	Base Case w/ Increased LHR Capacity + slower Clawl	25,000	50,000	75,000	87,500	100,000	112,500	125,000
12	Base Case w/ Increased LHR Capacity + Higher Clawl	50,000	100,000	200,000	250,000	300,000	350,000	400,000
13	Base Case w/ Increased EMA Capacity	25,000	75,000	150,000	175,000	200,000	225,000	250,000
13a	Base Case w/ Increased EMA Capacity + step up claw	50,000	100,000	200,000	300,000	400,000	500,000	600,000
14	Base Case w/ Increased LHR AND EMA Capacity	25,000	75,000	150,000	175,000	200,000	225,000	250,000
14a	Base Case w/ Increased LHR AND EMA Capacity + ste	50,000	100,000	200,000	300,000	400,000	500,000	600,000
15	Base Case w/ Increased LHR AND EMA Capacity + Fa	50,000	100,000	200,000	250,000	300,000	350,000	400,000
16	Faster Flate Rate w/ Increased LHR AND EMA Capaci	25,000	75,000	150,000	175,000	200,000	225,000	250,000
17	Assontating Curve from 2.70% w/ Increased LHR AN	25,000	75,000	150,000	175,000	200,000	225,000	250,000
18	Base Case w/ Increased STN capacity	25,000	75,000	150,000	175,000	200,000	225,000	250,000
18a	Base Case w/ extra capacity @ STN, EMA, LHR	25,000	75,000	150,000	175,000	200,000	225,000	250,000
18b	As 18a w/ higher flat rate @ 2.7	25,000	75,000	150,000	175,000	200,000	225,000	250,000
18c	As 18a w/ even higher flat rate @3.0	25,000	75,000	150,000	175,000	200,000	225,000	250,000
19	Base Case w/ Increased LHR, EMA & STN capacity	25,000	75,000	150,000	175,000	200,000	225,000	250,000
19a	Base Case w/ more capacity STN, EMA, LHR & step u	50,000	100,000	200,000	300,000	400,000	500,000	600,000
20	S12 + STN more capacity	50,000	100,000	200,000	250,000	300,000	350,000	400,000

Appendix D: Demand Capacity Modelling – Results

Scenario	Growth Rate Sensitivities	2022	2026	2030	2035	2040	2045	2050
1	Base Flat Rate @ 2.35%	96,195	186,499	214,888	252,245	343,399	532,351	789,166
2	Faster Flat Rate @ 2.7%	146,852	287,247	375,846	504,720	708,878	1,036,423	1,462,234
2a	Faster Flat Rate @ 3%	190,825	375,817	519,147	733,082	1,044,716	1,506,986	2,100,556
3	Slower Flat Rate @2%	46,227	88,469	60,402	14,029	4,405	72,735	185,862
4	Assontating Curve from 2.35%	96,195	144,157	82,084	(51,522)	(222,540)	(514,185)	(903,782)
4a	Assonating Curve from 3%	190,825	331,273	375,846	394,720	393,944	396,667	351,539
5	Assontating Curve from 2.7%	146,852	229,340	214,888	148,452	4,405	72,735	185,862
	Clawback Sensitivities	**2022**	**2026**	**2030**	**2035**	**2040**	**2045**	**2050**
6	Base Case w/ Slower Clawback	96,195	161,499	139,888	164,745	243,399	419,851	664,166
7	Slower Rate w/ Faster Clawback	71,227	113,469	110,402	89,029	104,405	197,735	335,862
7a	Base Case w/ Faster Clawback	121,195	211,499	264,888	327,245	443,399	657,351	939,166
8	Assontating Curve from 2.35% w/ Faster Clawback	121,195	169,157	132,084	23,478	(122,540)	(389,185)	(753,782)
9	Assontating Curve from 2.70% w/ Slower Clawback	146,852	204,340	139,888	60,952	(95,595)	(39,765)	60,862
	Capacity Sensitivities	**2022**	**2026**	**2030**	**2035**	**2040**	**2045**	**2050**
10	Base Case w/ Increased LHR Capacity	96,195	186,499	164,888	202,245	43,399	132,351	289,166
13	Base Case w/ Increased EMA Capacity	96,195	186,499	214,888	227,245	293,399	407,351	589,166
14	Base Case w/ Increased LHR AND EMA Capacity	96,195	186,499	164,888	177,245	(6,601)	7,351	89,166
18	Base Case w/ Increased STN capacity	96,195	186,499	214,888	202,245	243,399	307,351	439,166
19	Faster Flat Rate w/ Increased LHR, EMA & STN capacity	146,852	287,247	325,846	379,720	258,878	286,423	412,234
	Combined Sensitivities	**2022**	**2026**	**2030**	**2035**	**2040**	**2045**	**2050**
12	Base Case w/ Increased LHR Capacity + Higher Clawback	121,195	211,499	214,888	277,245	143,399	257,351	439,166
11	Base Case w/ Increased LHR Capacity + Slower Clawback	96,195	161,499	89,888	114,745	(56,601)	19,851	164,166
10a	Base Case w/ Increased LHR Capacity + Step Change Clawback	121,195	211,499	214,888	327,245	243,399	407,351	639,166
13a	Base Case w/ Increased EMA Capacity + Step Change Clawback	121,195	211,499	264,888	352,245	493,399	682,351	939,166
15	Base Case w/ Increased LHR AND EMA Capacity + Faster Clawback Rate	121,195	211,499	214,888	252,245	93,399	132,351	239,166
14a	Base Case w/ Increased LHR AND EMA Capacity + Step Up Clawback	121,195	211,499	214,888	302,245	193,399	282,351	439,166
16	Faster Flate Rate 2.7% w/ Increased LHR AND EMA Capacity	146,852	287,247	325,846	429,720	358,878	511,423	762,234
17	Assontating Curve from 2.70% w/ Increased LHR AND EMA Capacity	146,852	229,340	164,888	73,452	(345,595)	(452,265)	(514,138)
18a	Base Case w/ extra capacity @ STN, EMA, LHR	96,195	186,499	164,888	127,245	(106,601)	(217,649)	(260,834)
18b	As 18a w/ higher flat rate @ 2.7	146,852	287,247	325,846	379,720	258,878	286,423	412,234
18c	As 18a w/ even higher flat rate @3.0	190,825	375,817	469,147	608,082	594,716	756,986	1,050,556
19a	Base Case w/ more capacity STN, EMA, LHR & step up	121,195	211,499	214,888	252,245	93,399	57,351	89,166
20	Base Cast / higher clawback & EMA, LHR & STN increased capacity	121,195	211,499	214,888	227,245	43,399	32,351	89,166

Scenario	Growth Rate Sensitivities	2022	2026	2030	2035	2040	2045	2050
1	Base Flat Rate @ 2.35%	(358)	5,063	2,537	(18,334)	2,641	532,351	789,166
2	Faster Flat Rate @ 2.7%	50,299	105,811	163,495	234,141	368,120	1,036,423	1,462,234
2a	Faster Flat Rate @ 3%	94,272	194,381	306,796	462,503	703,958	1,506,986	2,100,556
3	Slower Flat Rate @2%	(50,326)	(92,967)	(151,949)	(256,550)	(336,353)	72,735	185,862
4	Assontating Curve from 2.35%	(358)	(37,279)	(130,267)	(322,101)	(563,298)	(514,185)	(903,782)
4a	Assonating Curve from 3%	94,272	149,837	163,495	124,141	53,186	396,667	351,539
5	Assontating Curve from 2.7%	50,299	47,904	2,537	(122,127)	(336,353)	72,735	185,862
	Clawback Sensitivities	**2022**	**2026**	**2030**	**2035**	**2040**	**2045**	**2050**
6	Base Case w/ Slower Clawback	(358)	(19,937)	(72,463)	(105,834)	(97,359)	419,851	664,166
7	Slower Rate w/ Faster Clawback	(25,326)	(67,967)	(101,949)	(181,550)	(236,353)	197,735	335,862
7a	Base Case w/ Faster Clawback	24,642	30,063	52,537	56,666	102,641	657,351	939,166
8	Assontating Curve from 2.35% w/ Faster Clawback	24,642	(12,279)	(80,267)	(247,101)	(463,298)	(389,185)	(753,782)
9	Assontating Curve from 2.70% w/ Slower Clawback	50,299	22,904	(72,463)	(209,627)	(436,353)	(39,765)	60,862
	Capacity Sensitivities	**2022**	**2026**	**2030**	**2035**	**2040**	**2045**	**2050**
10	Base Case w/ Increased LHR Capacity	(358)	5,063	(47,463)	(68,334)	(297,359)	132,351	289,166
13	Base Case w/ Increased EMA Capacity	(358)	5,063	2,537	(43,334)	(47,359)	407,351	589,166
14	Base Case w/ Increased LHR AND EMA Capacity	(358)	5,063	(47,463)	(93,334)	(347,359)	7,351	89,166
18	Base Case w/ Increased STN capacity	(358)	5,063	2,537	(68,334)	(97,359)	307,351	439,166
19	Faster Flat Rate w/ Increased LHR, EMA & STN capacity	50,299	105,811	113,495	109,141	(81,880)	286,423	412,234
	Combined Sensitivities	**2022**	**2026**	**2030**	**2035**	**2040**	**2045**	**2050**
12	Base Case w/ Increased LHR Capacity + Higher Clawback	24,642	30,063	2,537	6,666	(197,359)	257,351	439,166
11	Base Case w/ Increased LHR Capacity + Slower Clawback	(358)	(19,937)	(122,463)	(155,834)	(397,359)	19,851	164,166
10a	Base Case w/ Increased LHR Capacity + Step Change Clawback	24,642	30,063	2,537	56,666	(97,359)	407,351	639,166
13a	Base Case w/ Increased EMA Capacity + Step Change Clawback	24,642	30,063	52,537	81,666	152,641	682,351	939,166
15	Base Case w/ Increased LHR AND EMA Capacity + Faster Clawback Rate	24,642	30,063	2,537	(18,334)	(247,359)	132,351	239,166
14a	Base Case w/ Increased LHR AND EMA Capacity + Step Up Clawback	24,642	30,063	2,537	31,666	(147,359)	282,351	439,166
16	Faster Flate Rate 2.7% w/ Increased LHR AND EMA Capacity	50,299	105,811	113,495	159,141	18,120	511,423	762,234
17	Assontating Curve from 2.70% w/ Increased LHR AND EMA Capacity	50,299	47,904	(47,463)	(197,127)	(686,353)	(452,265)	(514,138)
18a	Base Case w/ extra capacity @ STN, EMA, LHR	(358)	5,063	(47,463)	(143,334)	(447,359)	(217,649)	(260,834)
18b	As 18a w/ higher flat rate @ 2.7	50,299	105,811	113,495	109,141	(81,880)	286,423	412,234
18c	As 18a w/ even higher flat rate @3.0	94,272	194,381	256,796	337,503	253,958	756,986	1,050,556
19a	Base Case w/ more capacity STN, EMA, LHR & step up	24,642	30,063	2,537	(18,334)	(247,359)	57,351	89,166
20	Base Cast / higher clawback & EMA, LHR & STN increased capacity	24,642	30,063	2,537	(43,334)	(297,359)	32,351	89,166