

Dear Sirs,

Thank you for the “Request for Comments and Further information in your letter: TR020002-005170-200117 Manston Airport DCO Request for Further Information letter of 17<sup>th</sup> January, 2020.

The headings in that letter have been used for clarity.

### **Unilateral Undertakings**

**1. The Secretary of State seeks comments from Kent County Council and Thanet District Council in relation to their respective Unilateral Undertakings, that were submitted on 9 July 2019 (the final day of the examination), in relation to the appropriateness of RiverOak Fuels being the named party in those Undertakings.**

*No comment*

**2. The Secretary of State invites views from Thanet District Council regarding the level of the financial payments proposed in the Unilateral Undertaking representing the Applicant’s contribution for the Air Quality Station ZH3 and whether that commitment will ensure the air quality in Thanet Air Quality Management Area is not negatively impacted by the Development.**

*Response:*

Funding only one Air Quality Station will be completely inadequate for effective monitoring of the Thanet area, because the air pollution will not be restricted to the location of ZH3.

This Question refers to the Air Quality Management (AQM) Area, but areas outside the AQM Area may not have been monitored sufficiently and so could already exceed the levels requiring AQM designation.

This is especially true of what would happen if the proposals were to be approved because all areas would experience an increase in air pollution, both from the aircraft activity but also all the associated developments and the road traffic.

As shown in my representation (Mr Chris Lowe dated 6 January 2020, relating to air and noise emissions - see Question no. 27, below), Ultrafine particles are spread downwind of airports. As the wind varies in direction then it is essential to have sufficient monitors to catch the pollution as wind direction and speed varies, otherwise a single monitor could show a clean bill of health if was located so that wind direction rarely blew pollution over it.

It is also obvious that simply monitoring air quality will not: “**ensure the air quality in Thanet Air Quality Management Area is not negatively impacted by the Development**” as required by this Question.

In Gladman vs CPRE Kent, the High Court ruled that providing resources for 'mitigation' does not mean that mitigation will actually occur, and therefore proposals must provide more practical measures to ensure that mitigation does actually happen (see: [2017] EWHC 2768 (Admin) case No: CO/873/2017. [www.bailii.org/ew/cases/EWHC/Admin/2017/2768.html](http://www.bailii.org/ew/cases/EWHC/Admin/2017/2768.html) ).

In paragraph 32 of that Judgement, it says that the Inspector was entitled to consider the evidence and *not simply assume that the UK will soon become compliant with the Directive*.

So the Secretary of State for Transport cannot assume that existing measures in place will ensure that Thanet becomes compliant even without the airport, hence the current proposals must ensure that the current situation is not made any worse.

In addition an airport does not come within the remit under other regulatory systems such for nuclear power stations etc (paragraph 39), so that there is no potential for management by such a route.

This Judgement shows that the principle of providing funds such as for noise insulation or having flight procedures to reduce emissions, does not actually mean that improvement will be achieved unless there are rigorous procedures in place to both monitor implementation **and** clear rules, penalties and resources to correct

infringements.

Hence funding of other monitors is required, and they need to be in place for at least a year before development starts to provide the baseline data for all the expected pollutants, which is currently lacking.

Monitoring then needs to continue to ensure no area suffers increases in air pollution, together with action plans with funding commitments to reduce air pollution down to original levels if pollution does increase.

It should be noted that there is no safe level of air pollution because evidence presented to the Examination and subsequently shows that pollution can penetrate into brains and even into unborn foetus.

This means that even the WHO limits will not provide complete health protection, and hence no increase in air pollution is acceptable.

DEFRA's "Impact pathways approach, Guidance for air quality appraisal, January 2019" shows that air pollution has many impacts, which can be widespread, not just to human health, but also buildings and ecosystems, so that effective monitoring is needed to manage and control air pollution for far more than just local residents.

As to the monetary value, clearly a lot more money is required to provide an effective spread of monitors.

### **3. The Secretary of State invites views from Kent County Council on the acceptability and adequacy of the Applicant's contribution of £139,000 per year for affected schools for 20 years to mitigate and minimise the noise effects on schools.**

#### *Response:*

This proposal will only reduce noise within the buildings, and even then some buildings will still be adversely affected by the noise and so adversely affect the learning environment.

Education is much more than just classroom sessions: outdoor activities are an essential part of the curriculum, so no sum can "mitigate" for the intrusive aircraft noise.

One of the problems of trying to reduce noise inside buildings is that it is no good triple glazing windows if they are going to be opened to provide ventilation. So provision must be made to ensure that adequate ventilation can be provided with no windows open, and this means installing some sort of mechanical ventilation and for energy conservation it should be mechanical ventilation with heat recovery (MVHR), which both ensures adequate ventilation under all wind conditions, and recovers heat from the extract air.

MVHR is usually only installed in permeable but airtight buildings, so the airtightness also needs to be assessed and improved if it is too high.

Therefore it is highly unlikely that the proposed £139,000 funding per annum would resolve the noise issues for more than two schools, and more likely this sum would be needed for just one secondary school.

As the airport is the cause of this problem, they must fully fund the solution/

The 20 year timescale for the proposed payments implies that £2.78 m will cure the problem with no further funding needed, whereas in reality systems will need maintenance and replacement, so payments should be in perpetuity with an annual increase for inflation.

The funding proposed at £139,000 per annum is only going to help one, or possibly two, schools each year, but all the KCC schools will want to reduce noise levels as soon as possible – not in ten or twenty years time.

Hence there must be funding of at least £1 million per annum for four years, reducing to £500,000 per annum thereafter. This would allow more schools to be done from the first year, starting with worst affected, and moving on to the less affected schools.

Once all schools have been done, £139,000 per annum would allow for maintenance and upgrading of the earlier

systems.

Anything less would barely scrape the surface of what is needed.

In addition, these payments are proposed only for Kent County Council. Clearly other, non KCC, schools and education facilities, such as Nursery schools, will need similar funding, and this must also be provided on a similar scale, and likewise other noise sensitive buildings such as health and religious buildings.

### **Transport/Engagement with public transport operators**

**6. The Secretary of State invites the Applicant to comment and indicate agreement on a revised requirement 7, which is set out at Annex A to this letter. This will impose an obligation on the Applicant to agree a Bus Service Enhancement Scheme, including the enhancement of existing services and the provision of a shuttle bus service.**

*Response:*

At present the requirement is:

“ Scheme to 7.—(1) No part of the authorised development is to begin operation until an operation environmental management plan for that part has been submitted to, and approved in writing by, the relevant planning authority, following consultation with the relevant highway authority, the Environment Agency, Southern Water, Historic England, the Civil Aviation Authority and Natural England to the extent that it relates to matters relevant to their functions.”

So these plans could be confidential to the named bodies with no opportunity for any public knowledge of, nor involvement with agreement to the proposals.

As the operation environmental management plan would be likely to affect other bodies and the public, it is only logical to ensure that the draft documents are made publicly available so that anyone potentially affected can respond to the relevant body.

As the Examination has shown that many people would be potentially affected, not least those who might use the proposed bus services for their existing journeys, they need to know what is being proposed, especially as the details of the operation management plan have not been published nor assessed.

So this requirement must be amended as shown in orange to read:

“ Scheme to 7.—(1) No part of the authorised development is to begin operation until an operation environmental management plan for that part has been **published and widely publicised at least two months before being submitted to,** and approved in writing by, the relevant planning authority, following consultation with the relevant highway authority, the Environment Agency, Southern Water, Historic England, the Civil Aviation Authority and Natural England to the extent that it relates to matters relevant to their functions.”

### **Draft Development Consent Order**

**15. The Secretary of State seeks the views of the Applicant, Thanet District Council (who would have responsibility under any made DCO of discharging such a Requirement) and other Interested Parties in relation to the definition of “airport related” in article 2 for inclusion in any DCO that might be granted in due course. This would read:**

**““airport-related” development means development directly related to and required to support operations at Manston Airport including, but not limited to freight distribution centres, including freight forwarding and temporary storage facilities”.**

*Response:*

The inclusion of: “*but not limited to* ” means that the airport could define almost anything as being “Airport related”, so this requirement must delete “*but not limited to* ” otherwise the clause is meaningless.

It is essential that as little land as possible is built upon, for reasons such as drainage, nature, climate change and human well being, so the Applicant must not be given a licence to build anything that is not actually essential to the airport's function.

## Draft Development Consent Order

**17. The Secretary of State seeks confirmation from the Applicant that the documents listed in Annex B, which reflect technical notes and other documents submitted in the examination should be added to Schedule 10 (documents to be certified) in any DCO that might be granted in due course.**

*Response:*

Regarding: "Deadline 6 Appendix OP.2.11 Part B Wildlife Strike Risk Hazard management for aerodromes", a Freedom of Information request to Natural England (NE) revealed NE has given permission to unnamed airports to kill many Red and Amber "Birds of Conservation Concern 4".

SEE: **ATTACHMENTS: FoI data and Birds Conservation Status**

As these are birds which are in decline or at risk of extinction in the UK, then the general decline in birdlife overall in the UK means that if Manston Airport goes ahead they may need to kill or harm such bird activity to the detriment of biodiversity.

This is therefore a further reason to refuse permission for this proposal, especially as proposals are required to deliver a "Net Gain" in biodiversity under the Government's Environment Bill.

However if the proposals were to be permitted then Appendix OP.2.11 Part B, must be amended to: "Prohibit any detrimental activity against birds which are, or become, listed on the Birds of Conservation Concern database."

Regarding: *Deadline 11  
Additional Submissions*

- Updated versions of the Noise Mitigation Plan final version submitted as an additional submission on the 9 July 2019 [AS-579, AS-580]

*Response:*

The Applicant, in their *Overall Summary of Case (TR020002-004668-Applicant's Overall Summary of Case)* says: "57. The Applicant recognises that the project has engendered passionate responses from local people, both for and against the project, with substantial levels of representations and other submissions from all points of view. A number of the local people making representations both for and against have participated throughout the examination and have dedicated considerable time and effort in making their submissions. The Applicant thanks its supporters for their dedication and notes that those objecting to the project have caused significant concessions to be made to address their concerns. One group is called No Night Flights – there are now (nearly) going to be no night flights following the examination".

The last sentence: "there are now (nearly) going to be no night flights", is wrong and highly misleading because there could well be night flights, and these could be a large number.

For example, TR020002-004720-Noise Mitigation Plan D12 tracked.pdf says:

1.4 An aircraft cannot take-off or be scheduled to land at night between 2300 and 0600.

This means that landings *may* take place between 2300 and 0600, so there is no knowing how many arrivals scheduled for before 2300 could easily be delayed to after 2300. Such arrivals would usually be from the east and so badly affect Ramsgate.

The restriction of 1.5: An aircraft cannot take-off or land **during** between the hours of **0600** and 0700... was originally from 2300 to 0700 so now aircraft covered by 1.51 and 1.52 are only restricted for one hour of the Night Period.

So any number of new planes not listed in this version of the Noise Mitigation Plan could operate despite this clause restricting aircraft currently listed.

Although noisier aircraft of QC 4 or more have been restricted to 0600 to 0700 in 1.7, that restriction does not apply before 0600!!

Likewise 1.8 has been amended so that the Quota Count of 2000 only applies between 0600 and 0700 of the Night Period – so not relevant to those operating between 2300 and 0600.

The QC of 2000 means an average of over 5 flights in that one hour 0600 to 0700 every day: more than enough to wake people up before they would normally wake.

As a QC count this also means that some days they could be operating at less than 10 minute intervals, a cacophony of unacceptable noise

Paragraphs 1.10 and 1.11 provide maximum ATMs of 26,468 which means up 72 ATM's a day or more than 4 per hour in the 16 hour daytime, with maximum General Aviation movements of 38,000, which means over double the number of movements per day, or a flight every 7 minutes....or even more frequently at peak times.

General aviation can be just as disturbing a commercial flights because some are slow craft with noisy engines, and some private craft can 747's.

So the Applicant is wrong – the Noise Management Plan is a smokescreen and will not protect residents.

**18. The Secretary of State seeks the comments of the Applicant and other Interested Parties on the new requirement 21(4) for inclusion in any DCO that might be granted in due course. This would read: “(4) No passenger air transport departures will take place between the hours of 20.00 and 21.00. There shall only be one passenger air transport arrival between the hours of 16.00 and 17.00; only two passenger air transport departures between the hours of 18.00 and 19.00; and only one passenger air transport departure between the hours of 19.00 and 20.00.”**

#### *Response*

As these are 'day' flights it is very important that this requirement also includes a restriction so that these, or other, flights are not shifted so that they occur after 10 pm or before 8 am.

The reason for this additional requirement is to ensure that flights shifted to operate at or after 10 pm could be delayed and then operate after 11 pm, and thus unacceptably conflict with the Night Period of 2300 to 0700.

Similarly, as a flight shifted to 8 am could operate earlier, especially if it was an arrival from USA for example, and again be at risk of intruding in the Night Period.

The impact on associated road traffic etc., can be managed 'on the ground' with far less impact than any night flight.

**20. The Secretary of State seeks views from Network Rail and other Interested Parties on the new Protective Provisions at Annex C to this letter to be included in the draft DCO, if made.**

#### *No comment*

### **Climate Change**

**22. The Secretary of State invites further clarification from the Applicant on its assessment of the carbon emissions contribution from Manston Airport representing 1.9% from the total UK aviation emissions of 37.5 Mt CO2 for 2050. The Climate Change Act 2008, as amended through the Climate Change Act 2008 (2050 Target Amendment) Order 2019, established a net-zero greenhouse gas emissions target in law. The Committee on Climate Change is accordingly advising that the planning assumptions for international aviation should be to achieve net-zero emissions and its emerging advice to the UK Government is that this should be reflected in the UK emerging Aviation Strategy<sup>3</sup>, which means reducing actual emissions in the aviation sector. While the Secretary of State notes that the Aviation Strategy has not yet been published, he would welcome comments on what the implications of the Committee on Climate Change's recommendation on international aviation being adopted might be for the Development, and on that basis what further mitigation measures might be**

**3 <https://www.theccc.org.uk/wp-content/uploads/2019/09/Letter-from-Lord-Deben-to-Grant-Shapps-IAS.pdf>**

**considered in relation to the Development, so as to ensure the Government would be able to meet its 2050 net-zero emissions target.**

*Response:*

The Committee on Climate Change wrote to the Prime Minister on 18<sup>th</sup> December, 2019 (see Attachment), and said:

“UK efforts to address the climate crisis have so far fallen short. This story needn’t continue. With the commitment of the full Cabinet to tackling the causes and effects of climate change, the UK can lead in addressing the defining global challenge of our age.

Your Government’s actions in the coming year will define the UK response to the climate crisis. As host of next year’s UN Climate Summit in Glasgow, the steps we take in the next 12 months will also have a lasting global impact. **In this Parliament, the UK *must* get on track to delivering Net Zero emissions, and adapt to the climate-related changes we are experiencing. We have a unique opportunity to define the 2020s as the decade of delivery against legally-binding targets set by Parliament – meeting the ambitions of the Conservative election manifesto.**”

It concludes:

“We marked recently the 30th anniversary of Margaret Thatcher’s 1989 speech to the UN General Assembly. That speech described accurately the science of human-induced climate change and the scale of its economic impact. The Prime Minister advocated a strong global response then; but what followed was too little. **You have the opportunity to lead a better international effort. But first, we must get our own house in order.**”

Evidence already presented shows that existing airport plans would lead to the UK’s aviation emissions far exceeding the current Target total of UK aviation emissions of 37.5 Mt CO<sub>2</sub> for 2050.

Additional evidence from Carbon Brief ([www.carbonbrief.org/guest-post-planned-growth-of-uk-airports-not-consistent-with-net-zero-climate-goal?utm\\_campaign=RevueCBWeeklyBriefing&utm\\_medium=email&utm\\_source=Revue newsletter](http://www.carbonbrief.org/guest-post-planned-growth-of-uk-airports-not-consistent-with-net-zero-climate-goal?utm_campaign=RevueCBWeeklyBriefing&utm_medium=email&utm_source=Revue%20newsletter)) reinforces that evidence.

Although some of these are plans which may not happen, the table shows which airports have available capacity, are underway or have been approved, so without strong deterrents, such as carbon tax, it is highly unlikely on the information available at present that the 37.5Mt CO<sub>2</sub> limit will not be greatly exceeded.

Hence there is no scope at all for Manston to operate.

Furthermore this is merely the Carbon Dioxide part of the emissions, and does not include the effects of the other climate effects caused by aviation due to its unique operation in the air.

Five10Twelve have already referred to “Contrail cirrus Radiative Forcing (RF) for future air traffic, Lisa Bock and Ulrike Burkhardt, June 2019” (TR020002-004969 Five10Twelve 4WQ.pdf and see Attached), and it should be noted that although fuel efficiency improvements could reduce carbon dioxide emissions the problem of contrail cirrus will increase, and this increase would be greater over North America and Europe.

Also the impact of contrail cirrus is that the radiative forcing impact of air traffic is far greater than double the carbon dioxide impact, which was the multiplier previously used by DfT to estimate total climate change impact. So that even without Manston the Radiative Forcing impact of aviation will far exceed an acceptable level.

The traffic density over Europe is the second largest in the world (Paragraph 3.1) and Contrail cirrus radiative forcing per flight distance is significantly larger over Europe than USA/Mexico, and a large portion of the contrail cirrus coverage over Europe is due to aged contrail cirrus reinforced by contrail cirrus transported into Europe from Atlantic air traffic corridor.

What makes this increase in emissions even more damaging is that carbon offsetting deals only with the impact of carbon dioxide emissions, while leaving the impact of contrail cirrus on climate unchanged (Paragraph 5).

Since the increase in contrail radiative forcing can be stronger than carbon dioxide radiative forcing, this means that carbon offsetting is dealing with less half of the problem.

Hence even stronger action is needed to actually reduce emissions.

The Carbon Brief Report also says: “Transport experts have long shown that supply of transport infrastructures

induces demand, creating a sort of vicious circle. This is what happened, for example, with the road-building and road-widening programmes in the 20th century.

There, too, the initial intention was to solve congestion problems and to cope with predicted increases in car travel. We know now that those programmes actually contributed to encourage further car use and that quickly filled up the roads again.

Something similar is happening in the aviation sector right now. Expanded airports are likely to mean more and cheaper flight routes, which, in turn, will encourage more flying.”

The Question asks: “what further mitigation measures might be considered in relation to the Development, so as to ensure the Government would be able to meet its 2050 net-zero emissions target.”

The only effective measure is to forbid Manston to open.

Any other action would need to be more severe to reduce activity at existing airports as well as reducing Manston's proposed activity, thus damaging airports in the regions. The Government is starting a connectivity review for the regions ([www.gov.uk/government/news/regional-air-connectivity-review-aviation-minister-visits-liverpool-john-lennon-airport-to-launch-uk-tour-of-regional-airports](http://www.gov.uk/government/news/regional-air-connectivity-review-aviation-minister-visits-liverpool-john-lennon-airport-to-launch-uk-tour-of-regional-airports)) so it would make nonsense of the intention to help the regions and then say that have to reduce activity because of Manston, which is in the over-provided south-east.

In view of the overshoot of the target by existing airport's traffic increases, any “mitigation” by Manston would need to cover all the projected emissions from the proposals themselves and all the associated developments and the road traffic.

This would be very expensive and render the proposals uneconomic, and therefore unacceptable.

## **Late Representations**

**23. The Secretary of State invites the Applicant and other Interested Parties to submit any comments they have on two late representations from Five10Twelve Limited dated 17 October 2019 and 27 October 2019, which it states are an evidenced Rebuttal to the Applicant's Overall Need Case [REP11-013]. The representations are published alongside this letter.**

*Response:*

Strongly agree with this Rebuttal

**24. The Secretary of State seeks views from Historic England, Kent County Council, Thanet District Council and other Interested Parties on the late representation from Five10Twelve Limited dated 1 November 2019, which is also published alongside this letter.**

*Response:*

Strongly agree with this Rebuttal

**25. The Secretary of State invites the Applicant, York Aviation and the Civil Aviation Authority (“CAA”) to submit any comments they have on the late representation from Five10Twelve Limited dated 19 December 2019 relating to correspondence it has received from the CAA. The Secretary of State also invites their comments on the late representation from Five10Twelve Limited dated 20 December 2019 relating to inconsistencies in the application, The representations are published alongside this letter.**

*Response:*

Strongly agree with this Rebuttal

**26. The Secretary of State also invites comments from the Applicant and other Interested Parties on the late representation from Five10Twelve Limited dated 23 December 2019 relating to public cost and reputational risk, which is published alongside this letter.**



*Response:*

Strongly agree with this Rebuttal

**27. The Secretary of State invites comments from the Applicant and other Interested Parties on the late representation from Mr Chris Lowe dated 6 January 2020 relating to air and noise emissions. The representation is published alongside this letter.**

*Response:*

In addition to the evidence provided in that representation, CPRE have now published a report (available on: <http://www.cpresussex.org.uk/campaigns/gatwick/item/3069-flight-blight-the-environmental-and-social-costs-of-aviation-expansion> ) showing how human sensitivity to lower noise levels means that many more people are affected by aviation noise, and therefore much stronger action is needed to reduce this impact.

So this means that the proposals are unacceptable.

All the Representations and Rebuttal referred to in Questions 23 to 27 inclusive, show that the proposals are totally unacceptable, and that the Applicant has underestimated the many serious and significant impacts of the proposals.

In the time since the Applicant started public consultation, many new reports on noise, air pollution and climate change have been published.

Each successive report has shown that the adverse effects of noise, air pollution and climate change are all worse than previously accepted, and that climate change is happening more quickly.

The government's own publication on Air pollution, for example, has stated:

“Poor air quality is the largest environmental risk to public health in the UK, as long-term exposure to air pollution can cause chronic conditions such as cardiovascular and respiratory diseases as well as lung cancer, leading to reduced life expectancy.” ([www.gov.uk/government/publications/health-matters-air-pollution/health-matters-air-pollution](http://www.gov.uk/government/publications/health-matters-air-pollution/health-matters-air-pollution))

Back in 2010 this source said: “In 2010, the Environment Audit Committee considered that the cost of health impacts of air pollution was likely to exceed estimates of £8 to 20 billion.”

In particular it states: “The government recognises that protective health - and tackling air pollution - requires action, and is committed to improving the UK’s air quality and reducing harmful emissions. ”

In view of this commitment it would be unacceptable to allow the proposals to go ahead and make life worse for Thanet and East Kent.

Finally, it states: “Currently, there is no clear evidence of a safe level of exposure below which there is no risk of adverse health effects.”

So it is unsafe for the health of everyone, not to mention ecosystems, for air pollution to increase, so it would be unsafe for the proposals to go ahead.



23 January 2020

Our ref: RFI 4895



Sarah Clayton



Mail Hub  
Worcester County Hall  
Spetchley Road  
Worcester  
WR5 2NP

Dear Sarah

**Access to Information request – Response - Request No RFI 4895**

Thank you for your request for information, which we received on 02 January 2020. Your request has been considered under the Environmental Information Regulations 2004 ("EIR's").

You specifically asked for:-

**1. I would like to have the information about which airports/aerodromes have requested licences to "kill or take certain species of wild birds" in the past 10 years, as on your form at [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/852816/cl12-birds-take-kill-air-safety-licence.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/852816/cl12-birds-take-kill-air-safety-licence.pdf)**

**2. I would like information about which airports/aerodromes have been granted these licences in the past 10 years.**

**3. I would details of what information is held by Natural England as to the numbers, species and locations of birds killed under the terms of these licences, in the past 10 years.**

**4. I would like details of how the birds were killed, and what methods of killing were used.**

In response to your above questions please find attached a spreadsheet that contains details of the lethal control licences for Air Safety that Natural England has issued from 23 March 2014 which is when our current reporting system became live. We have considered lethal control to be covered in the following licensable activities:

- Birds to be shot (to reinforce scaring)
- Destruction, damage to and removal of nests
- Egg oiling and pricking
- Kill
- Kill or take
- Kill, injure or take
- Shooting to kill: close season
- Shooting to kill: otherwise protected species
- Take or destroy an egg of a wild bird
- Take, damage or destroy the nest of any wild bird
- Taking of eggs
- Trapping (please note that for trapping some do involve lethal control but not all).

**Please note that some licences may be displayed on more than one row//line so the amount of rows in the spreadsheet does not mean that we have issued that amount of licences.**

The reason for this is due to how our casework system generates reports. The system automatically separates any licence where there are multiple species, purposes and/or methods licensed and it places each additional species/purpose/method onto its own individual row. As such there may be more than one row per licence. It also does this for any amended licences and these can be identified as they have a -1, -2 etc. at the end of the licence number.

Please note any disclosure made under the Regulations is in effect a disclosure to the world at large, as any other applicant would be entitled to the same information on request. As such we take this into consideration when making any decisions as to whether it is in the public interest to disclose or withhold requested information.

Within the spreadsheet we have withheld location details at a level that could identify the specific sites these licences were issued for. This information in accordance with the following exceptions in the Environmental Information Regulations 2004:

- Regulation 12(5)(a) – Public Safety

I have set out below the reasons for relying on this exception.

**Regulation 12(5)(a) states:**

“...a public authority may refuse to disclose information to the extent that its disclosure would adversely affect...

(a) international relations, defence, national security or public safety;”

Any disclosure made under the Regulations is in effect a disclosure to the world at large., Natural England is therefore of the opinion that to release and subsequently place into the public domain details that could identify this location would adversely affect public safety. We believe that the release of these details would impact adversely upon the protection of the individuals, public buildings, and the health and safety of the individuals at the site.

Media coverage, as well as comments posted on websites and correspondence we have received, has clearly demonstrated that the management of problems caused by wild birds, even the use of non-lethal options, is an emotive and sensitive issue.

We therefore believe that the release of this information could impact adversely upon the people who have applied for the license.

In applying this exception, we have had to balance the public interest in withholding the information against the public interest in disclosure. The following issues were considered in deciding where the public interest lay.

Whilst Natural England believes in openness and transparency, as a public body, we also have a duty to safe-guard people who legitimately apply for licenses. Whilst we believe that the public do have the right to know that licenses have been applied for and issued or refused we feel that this should not extend to providing the location of the sites the licenses have been applied for, given the possible threat to those locations and those involved if that information is released.

We feel there is little additional public interest in knowing the locations aside from giving individuals/groups the opportunity to target the sites or the persons for the purposes of objection. While it is a public right to object that right has to be balanced against issues of security and safety of the personnel involved.

We believe that these are legitimate concerns sufficient to allow Natural England to engage this exception and withhold the information.

In addition we have only provided you with details of the how many birds were licenced to be controlled not the actual figures of the birds that were controlled under the licence (birds controlled can be less than those licenced for a variety of reasons) as this information (the returns) is not contained within specific data fields recorded on our licensing database. These returns cannot be searched other than by manual means and to accurately provide you with this information would require all cases to be checked manually. This would be an enormous task and require an unreasonable diversion of resources.

As such we consider this aspect of your request to be manifestly unreasonable in accordance with the exception in Regulation 12(4)(b) of the Environmental Information Regulations 2004. An explanation of how Natural England has applied this exception is set out below.

### **Natural England's assessment of 'manifestly unreasonable'**

It is Natural England's policy, in line with the ICO's Guidance, in respect of the EIR that we refuse requests for information where the cost of responding exceeds £450 (18 hours) and the request is manifestly unreasonable.

The information requested is not contained within a searchable system and these documents cannot be searched other than by manual means. To accurately provide you with all information that you requested that is not accessible by our current reporting system it would require the returns of all cases to be checked manually. This would be an enormous task and require an unreasonable diversion of resources.

### **Regulation 12(4)(b) - Request is manifestly unreasonable**

Regulation 12(4)(b) states:

"12(4) For the purposes of paragraph (1)(a), a public authority may refuse to disclose information to the extent that –

(b) the request for information is manifestly unreasonable"

As explained the information you requested is not data that can be captured by the licensing software we use. Therefore we cannot simply supply some of your requested information from an electronic search. In order to search for, and provide, the information you requested we need to manually check records for any cases where this may have been recorded.

We have estimated that if we undertake this task it would take a minimum of 10 minutes to locate and manually search through each one of the applications (6 per hour) in scope of your request to identify if the information you have requested Using the amount of rows within the spreadsheet it would take 211 hours ( $1270 \div 6 = 211$ hrs) to check our records just for the licences issued during 2018. We consider that this is an unreasonable diversion of resources.

The Freedom of Information and Data Protection (Appropriate Limit and Fees) Regulations 2004 allow us to set a nominal charge of £25 per hour and just too manually search through 5 years of licences would reach an equivalent cost of **£5291.66**. This has been calculated as follows: £25 x 211 hours = £5291.66. It does not include the time already taken to run the searches of our software or the time needed to undertake the manual searches required to locate the information prior to 23 March 2014.

We therefore consider data prior to our new system to be manifestly unreasonable in light of the time, resources and excessive costs needed to comply with it.

### **The 'public interest test':**

In applying this exception, we have to balance the public interest in withholding the information against the public interest in disclosure. Whilst Natural England believes in openness and transparency, as a public body, Natural England has a duty to be both accountable and transparent in the effective and wise spending of public money. It is clear from the estimates outlined above, that the cost equivalent of providing the information requested, is far in excess of the £450 "appropriate limit" as stated in the Freedom of Information and Data Protection (Appropriate Limit and Fees) Regulations 2004, and that the request (even if narrowed down to a specific time period) would place a substantial and unreasonable burden on the resources of Natural England. Moreover the work involved requires an unreasonable diversion of resources from the provisions of our public service and core functions.

Whilst there is a presumption in favour of disclosure of information, Natural England considers that the public interest will genuinely be served in this case, by withholding this information.

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If you have any queries about this letter, please contact me. As you may be aware, under the legislation should you have any concerns with the service you have received in relation to your requests and wish to make complaint or request a review of our decision, please contact me and I'll arrange for a colleague to conduct an internal review.

Under Regulation 11(2) this needs to be done no later than 40 working days after the date of this letter.

If you are not content with the outcome of that complaint or the internal review, you may apply directly to the Information Commissioner for a decision. Generally, the Commissioner cannot make a decision unless you have exhausted the internal review procedure provided by Natural England. The Information Commissioner can be contacted at: The Information Commissioner's Office, Wycliffe House, Water Lane, Wilmslow, Cheshire, SK9 5AF. Telephone: 0303 123 1113 (local rate), [www.ico.org.uk](http://www.ico.org.uk)

Yours sincerely

Kate Donovan  
Adviser – Access to Information  
Legal & Governance Team

Enc.

The Prime Minister  
Rt Hon Boris Johnson MP  
10 Downing Street  
SW1A 2AA  
London

Wednesday 18 December 2019

Dear Prime Minister,

Congratulations on your election victory. Your strong parliamentary majority will permit confident decisions on the climate challenges now before us. We urge you to seize that opportunity. We are writing to request an early meeting so we can brief you on our assessment of the priorities ahead.

UK efforts to address the climate crisis have so far fallen short. This story needn't continue. With the commitment of the full Cabinet to tackling the causes and effects of climate change, the UK can lead in addressing the defining global challenge of our age.

Your Government's actions in the coming year will define the UK response to the climate crisis. As host of next year's UN Climate Summit in Glasgow, the steps we take in the next 12 months will also have a lasting global impact. In this Parliament, the UK *must* get on track to delivering Net Zero emissions, and adapt to the climate-related changes we are experiencing. We have a unique opportunity to define the 2020s as the decade of delivery against legally-binding targets set by Parliament – meeting the ambitions of the Conservative election manifesto.

#### *Climate governance*

Were you to decide to make changes to the form and structure of Government, we trust that you recognise that climate change is not an issue that can be owned by any single Minister or Ministry. It requires strong leadership at the heart of Government, implementation of climate policies across Government, and a programme of change at a scale not previously attempted. 2019 established broad public, business, and political support for action; 2020 needs to be the year of renewed policy implementation in response. We therefore very much welcome your commitment to chair a cross-Cabinet Committee on climate change. It is this Cabinet Committee that can:

- **Lead the Government's strategy to reduce emissions**, demanding ambitious policy from *all* departments to ensure homes, businesses, industry, transport and land are helping to deliver Net Zero.
- **Ensure all departments are prioritising action to adapt to climate change**. The country is not prepared for even the minimum expected level of global warming, let alone the extreme changes predicted if international efforts to reduce emissions continue to stall.
- **Inject new urgency into the development and implementation of policy**. It has been nearly seven months since the Net Zero target became law. Every day of inaction makes the challenge of cutting emissions harder and costlier. Technological innovation is only

part of the answer. We must not wait for future technologies to solve the problems we can already tackle with known solutions.

- **Use all of the tools available.** Public spending will play a role, but our analysis also points to the importance of strong market-shaping mechanisms. These include carbon pricing fiscal policies, but also regulatory tools which can often drive the transition more rapidly than price mechanisms alone.
- **Ensure that the Treasury's Net Zero funding review identifies ways fully and fairly to pay for the transition,** putting Net Zero at the heart of the UK's economic strategy.
- **Oversee effective collaboration** between central, devolved and local/regional Government bodies. Addressing climate change demands a mix of national and local policies – and is a major coordination and governance challenge.

### *Priority actions*

There are five key priorities for cutting the UK's emissions:

1. **Buildings.** An ambitious and properly funded strategy for entirely removing fossil fuels from the UK's building stock, with action beginning immediately and standards that set a clear path for the longer-term.
2. **Transport.** Rapid progress in the implementation of your manifesto commitment to consult on an earlier phase-out of petrol and diesel cars, ideally by 2030.
3. **Electricity.** Delivering on your manifesto commitment for 40GW of offshore wind by 2030 – and ensuring that any market reforms are complementary to the Net Zero goal.
4. **Industry.** Developing an ongoing mechanism to pay for emissions reductions from industry and an approach to delivering hydrogen and CCS infrastructure, alongside your promised capital support.
5. **Land use and agriculture.** Introducing a world-leading package through the Agriculture and Environment Bills to cut emissions from agriculture and to pay for the 30,000 hectares (75,000 acres) of annual tree planting promised in your manifesto. We will offer specific policy recommendations on this in January.

Our recent assessment of UK action to adapt to climate change concluded that we are worryingly unprepared for the changes ahead. Many departmental plans do not even include a basic assessment of climate risk. Your Government can act to:

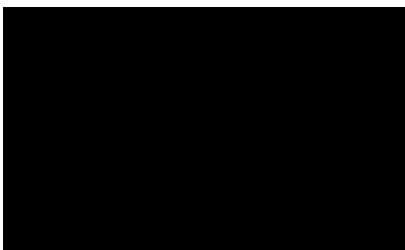
1. **Reduce flood risk.** This means delivering on your manifesto commitment to increase flood defence spending by £4 billion, but also enabling 200,000 properties that cannot be protected by defences to install property-level flood barriers. There has been a 20% increase in the paving-over of urban areas since 2001, increasing the risk of flash flooding. Planning policy needs to change to mandate natural features that absorb rainfall in new building developments.
2. **Manage the risks from extreme heat.** Over 2,000 people already die prematurely due to hot weather each year across the UK; this is likely to rise to over 7,000 in 30 years' time. The scorching summer of 2018 will be an average summer by 2050. There is no policy to ensure the risk of overheating is reduced in homes, hospitals, schools or care homes. Building Regulations need to be strengthened to make sure adequate natural cooling (not air-conditioning) is built into properties, alongside energy efficiency.
3. **Reduce the risk of drought.** Water company plans are heading in the right direction but need further signals from Government. Without further action, water deficits, which are currently negligible, could exceed 3 billion litres per day in the 2050s in England. Water consumption per person needs to fall by 30% to manage this, and supplies need to increase urgently.

4. **Protect the natural environment.** Climate change will exacerbate biodiversity loss in the UK and globally. Delivering on your manifesto commitments to create a Nature Climate Fund, increase tree planting and restore peatland will help to improve resilience and reduce emissions from land.

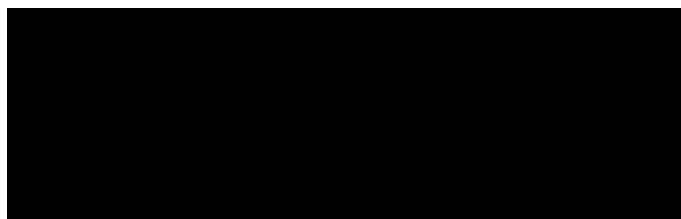
We marked recently the 30th anniversary of Margaret Thatcher's 1989 speech to the UN General Assembly. That speech described accurately the science of human-induced climate change and the scale of its economic impact. The Prime Minister advocated a strong global response then; but what followed was too little. You have the opportunity to lead a better international effort. But first, we must get our own house in order.

We look forward to working with you.

Yours sincerely,



**Lord Deben**  
Chairman  
Committee on Climate Change (CCC)



**Baroness Brown**  
Chair  
Adaptation Committee of the CCC





# Contrail cirrus radiative forcing for future air traffic

Lisa Bock and Ulrike Burkhardt

Deutsches Zentrum für Luft- und Raumfahrt (DLR), Institut für Physik der Atmosphäre, Oberpfaffenhofen, Germany

**Correspondence:** Lisa Bock (lisa.bock@dlr.de)

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**Abstract.** The climate impact of air traffic is to a large degree caused by changes in cirrus cloudiness resulting from the formation of contrails. Contrail cirrus radiative forcing is expected to increase significantly over time due to the large projected increases in air traffic. We use ECHAM5-CCMod, an atmospheric climate model with an online contrail cirrus parameterization including a microphysical two-moment scheme, to investigate the climate impact of contrail cirrus for the year 2050. We take into account the predicted increase in air traffic volume, changes in propulsion efficiency and emissions, in particular soot emissions, and the modification of the contrail cirrus climate impact due to anthropogenic climate change.

Global contrail cirrus radiative forcing increases by a factor of 3 from 2006 to 2050, reaching 160 or even 180 mW m<sup>-2</sup>, which is the result of the increase in air traffic volume and a slight shift in air traffic towards higher altitudes. Large increases in contrail cirrus radiative forcing are expected over all of the main air traffic areas, but relative increases are largest over main air traffic areas over eastern Asia. The projected upward shift in air traffic attenuates contrail cirrus radiative forcing increases in the midlatitudes but reinforces it in the tropical areas. Climate change has an insignificant impact on global contrail cirrus radiative forcing, while regional changes are significant. Of the emission reductions it is the soot number emission reductions by 50 % that lead to a significant decrease in contrail cirrus optical depth and coverage, leading to a decrease in radiative forcing by approximately 15 %. The strong increase in contrail cirrus radiative forcing due to the projected increase in air traffic volume cannot be compensated for by the decrease in initial ice crystal numbers due to reduced soot emissions and improvements in propulsion efficiency.

## 1 Introduction

Air traffic contributed approximately 5 % to the anthropogenic climate forcing in 2005 (Lee et al., 2009), and its contribution is rising due to the large yearly increases in air traffic (ICAO, 2007). Radiative forcing due to contrail cirrus, consisting of linear contrails and the cirrus clouds arising from them, is the largest known radiative forcing component associated with air traffic, and is larger than the contribution of CO<sub>2</sub> accumulated from aviation (Burkhardt and Kärcher, 2011). Contrail cirrus are central for mitigation efforts due to their short lifetimes by, for example, varying flight level, path or timing, using alternative fuels, new engine designs or other technological advances (e.g. Noppel and Singh, 2007; Lee et al., 2010; Newinger and Burkhardt, 2012; Deuber et al., 2013; Burkhardt et al., 2018). Both their large climate impact and their suitability for mitigation underline the importance of investigating contrail cirrus for future air traffic scenarios.

The climate impact of contrail cirrus in the future is determined by a number of factors: the strength and geographic distribution of the increase in air traffic volume, improved fuel efficiency, changes in aircraft emissions when using alternative fuels and the change in the background atmospheric state due to future climate change. Several projections for future air traffic volume and its emissions exist. According to ICAO (2007) and Airbus (2007), the distance flown by passengers is expected to double roughly every 15 years. The air traffic inventory Aviation Environmental Design Tool (AEDT) (Wilkerson et al., 2010) estimates that in 2050 the air traffic volume will have quadrupled relative to the year 2006. The distribution of air traffic, as well as its future increase, is globally very uneven. In 2006, 93 % of aviation fuel was burned in the Northern Hemisphere and 69 % between 30 and 60° N. More than half of global aviation CO<sub>2</sub> is

emitted over three regions: the United States (26 %), Europe (15 %) and East Asia (11 %) (Wilkerson et al., 2010). Due to historically low air traffic densities in the tropics, the relative increases are expected to be much larger in the tropical areas than in the extratropics.

Lee et al. (2009) estimate that fuel usage is expected to increase between 2000 and 2050 by factors of 2.7 to 3.9, depending on the Intergovernmental Panel on Climate Change's Special Report on Emissions Scenarios (IPCC SRES) while AEDT estimates an increase by factors of 2.7 to 5 between 2006 and 2050 (Chen and Gettleman, 2016). Aerodynamic changes, weight reductions, more fuel efficient engines and an increased operational efficiency lead to increased overall fuel efficiency (Lee et al., 2009). ICAO (2007) expects a fuel efficiency improvement of 2 % yr<sup>-1</sup> until 2050. Increasing fuel efficiency of engines leads to an increase in the contrail formation probability and contrail radiative forcing (Marquart et al., 2003).

Measurements behind aircraft (Beyersdorf et al., 2014; Moore et al., 2017) show that the combustion of an alternative fuel, a blend of Jet A and Fischer-Tropsch fuel, induces a decrease in the mass and number of soot particles. This results in a lower number of nucleated ice crystals (Kärcher and Yu, 2009; Kärcher et al., 2015) and in a higher survival rate of ice crystals during the contrails' vortex phase (Unterstrasser, 2016). The change in the ice crystal number after the vortex phase has an impact on the microphysical process rates and the evolution of contrail cirrus (Bier et al., 2017) with ice crystals growing to larger sizes and sedimentation initiated earlier in the life cycle. This leads eventually to a decrease in the mean optical depth and lifetime of contrail cirrus (Burkhardt et al., 2018). This is particularly important in large-scale and long-lived contrail cirrus clusters (Bier et al., 2017) which are responsible for a large part of the contrail cirrus radiative forcing (Burkhardt et al., 2018).

With climate change caused by increasing greenhouse gas concentrations, contrail cirrus formation and properties may change. The increase in temperature may lead to a lower contrail formation probability in particular in the tropics and in summer in the subtropics (Marquart et al., 2003). An increase in atmospheric water vapour concentration may lead to higher contrail cirrus ice water content and optical depths. A decrease in the ice supersaturation frequency (Irvine and Shine, 2015) may result in lower contrail cirrus coverage and associated radiative forcing.

The radiative forcing of line-shaped contrails (the contrails that have retained their initial line shape and are, therefore, easily distinguishable from natural clouds in satellite images) and contrail cirrus for the year 2050 have been studied in a number of publications. Minnis et al. (1999) estimate a radiative forcing due to line-shaped contrails for the year 2050 of 100 mW m<sup>-2</sup> when assuming a constant visible optical depth of 0.3. In Marquart et al. (2003), line-shaped contrail radiative forcing increases from 2015 to 2050 by a factor of approximately 1.6, amounting to 15 mW m<sup>-2</sup> in the year 2050,

or after a suitable correction for a low bias in optical depth, to about 45 mW m<sup>-2</sup> (Kärcher et al., 2010). For contrail cirrus comprising of line-shaped contrails and the clouds developing from them, Lee et al. (2009) scaled present-day radiative forcing estimates, from models and observations, to 2050 arriving at a range between 27 and 315 mW m<sup>-2</sup> with no best estimate given. Chen and Gettelman (2016) studied the change in cirrus cloudiness due to contrail formation using a model in which contrail formation is treated as a source term for cirrus ice crystals and the microphysics parameterization is applied to a mix of contrail and natural cirrus ice crystals. They estimated that contrail cirrus radiative forcing increased by a factor of 7 from 2006 to 2050, reaching 87 mW m<sup>-2</sup> in the year 2050, a factor that is approximately double the factor of increase in air traffic volume. They argued that this is caused by the non-uniform regional increase in air traffic and different sensitivities of contrail cirrus radiative forcing to an increased air traffic volume in different regions.

Our aim is to estimate contrail cirrus radiative forcing for the year 2050 globally and regionally, isolating changes due to the increase and upward shift in air traffic volume, due to climate change and due to changes caused by the use of alternative fuels and changes in the propulsion efficiency. We use the atmospheric general circulation model coupled with a contrail cirrus scheme, ECHAM5-CCMod (Bock and Burkhardt, 2016a; Sect. 2.1), which treats contrail cirrus as an independent cloud class. The model simulates the whole life cycle of contrail cirrus and resolves the competition of the two cloud classes, natural clouds and aircraft-induced clouds, for water vapour. We apply ECHAM5-CCMod to future aviation emission scenarios from the AEDT inventory (Sect. 2.2) and estimate contrail cirrus coverage, optical depth and radiative forcing for air traffic for the year 2050 (Sect. 3). Discussion and conclusions are given in Sects. 4 and 5.

## 2 Model and data

### 2.1 CCMod in ECHAM5

We use a contrail cirrus scheme developed for ECHAM5 (Bock et al., 2016a) which is based on the contrail scheme of Burkhardt and Kaercher (2009) and the two-moment microphysical scheme of Lohmann et al. (2008). The scheme introduces a new cloud class, contrail cirrus, in the ECHAM5-HAM model (Roeckner et al., 2003; Stier et al., 2005) with contrail cirrus modifying the atmospheric heat and water budget, thus feeding back on natural clouds (Burkhardt and Kärcher, 2011). The prognostic variables in the parameterization are contrail cirrus cover, volume and length, ice water content and ice crystal number concentration. Contrail cirrus properties change due to the following parameterized processes: contrail formation, contrail cirrus volume

growth due to turbulent diffusion and sedimentation, contrail spreading due to vertical wind shear, water vapour deposition and sublimation on contrail ice crystals, contrail ice crystal sedimentation and precipitation and indirectly due to contrail-induced changes in the diabatic heating rates. Contrail cirrus form according to the Schmidt–Appleman criterion (Schumann, 1996) and persist in ice supersaturated regions which are parameterized in the model (Burkhardt et al., 2008; Lamquin et al., 2012). Contrail cirrus are initialized with the air traffic density (distance per grid box) and water vapour emissions prescribed by an air traffic inventory, and with an ice crystal number concentration and a contrail cross-sectional area inferred from observations (Bock and Burkhardt, 2016a). If persistent, contrails spread and accumulate more ice from ambient water vapour as long as supersaturation prevails. Contrail cirrus gradually vanish through ice crystal sedimentation into subsaturated areas and through sublimation. Hence, the whole life cycle of contrail cirrus is simulated.

We calculate total contrail cirrus coverage assuming a maximum random overlap of contrail cirrus in the vertical for each column (Burkhardt and Kärcher, 2011). This implies that contrail cirrus coverage above or below other cirrus overlaps maximally, whereas contrail cirrus that are vertically separated from other cirrus by cloud-free air overlap randomly. We estimate the stratosphere-adjusted radiative forcing that is the change in the radiation flux at the top of the atmosphere after the stratosphere has reached a new radiative balance (Hansen et al., 1997).

## 2.2 Inventory

The gridded aviation emissions database, developed at the Volpe National Transportation Systems Center using the U.S. Federal Aviation Administration's Aviation Environmental Design Tool (AEDT) (Roof et al., 2007; Barrett et al., 2010), is composed of one base case for the year 2006 (2006), which has been compared against other aviation emissions data sets (Wilkerson et al., 2010), and two future 2050 scenarios. The latter include the projected increase in air traffic (2050 *Baseline*), which is based on the IPCC FESG (Forecasting and Economic Analysis Sub-group) consensus demand forecast (ICAO/FESG, 1998) and additionally an increase in fuel efficiency by  $2\% \text{ yr}^{-1}$  (2050 *Scenario 1*). As fuel burn increases by a factor of 4.8 between 2006 to 2050 *Baseline* and still by a factor of 2.7 between 2006 and 2050 *Scenario 1* (Unger et al., 2013), the specifications of the future projections do not meet the requirements of the international CORSIA agreement unless the remaining necessary  $\text{CO}_2$  emission reductions are introduced purely by carbon offsetting.

The AEDT flight inventory that we use in our model has originally a  $1^\circ \times 1^\circ$  horizontal resolution with 30 vertical levels, transformed with a recursive discretization method (Jöckel, 2006) to our model resolution. We use inventory data of air traffic density (distance per grid box) and water vapour

emissions to initialize contrails in the model. The flight path distance for 2050 *Baseline* and 2050 *Scenario 1* is only provided as monthly mean aggregated ground projected path distance per grid cell (track distance). Therefore, we could not use the 3-D flight path distance per grid cell (slant distance) as in Bock and Burkhardt (2016b), which results in an underestimation of the initial volume and ice crystal number of contrails, and therefore in an underestimation of the total contrail cirrus radiative forcing (Bock and Burkhardt, 2016b). But we scale the resulting radiative forcing estimates using a factor calculated from radiative forcing for contrail cirrus when using slant distance and using track distance for the year 2006 (Bock and Burkhardt, 2016b).

Flight distance is expected to increase between 2006 and 2050 by approximately a factor of 4 (Table 1). Due to changes in aviation technologies, flight altitudes are expected to shift upwards by between 0.3 and 1.5 km (Mohan Gupta, personal communication, FAA, 2015), resulting in the shift to maximum flight density as seen in Fig. 1a. In 2006 air traffic is heaviest at about 240 hPa, whereas in 2050 air traffic is predicted to be heaviest at about 200 hPa. The regional distribution of air traffic for 2050 is expected to remain close to the distribution for 2006 with main air traffic maxima over Europe and the US (Fig. 1c). In addition to those air traffic maxima, air traffic over eastern and southeastern Asia is strongly increased. Maxima in zonal mean aircraft density remain between 30 and  $50^\circ \text{ N}$  (Fig. 1b).

## 2.3 Simulation setup

We have performed the following simulations:

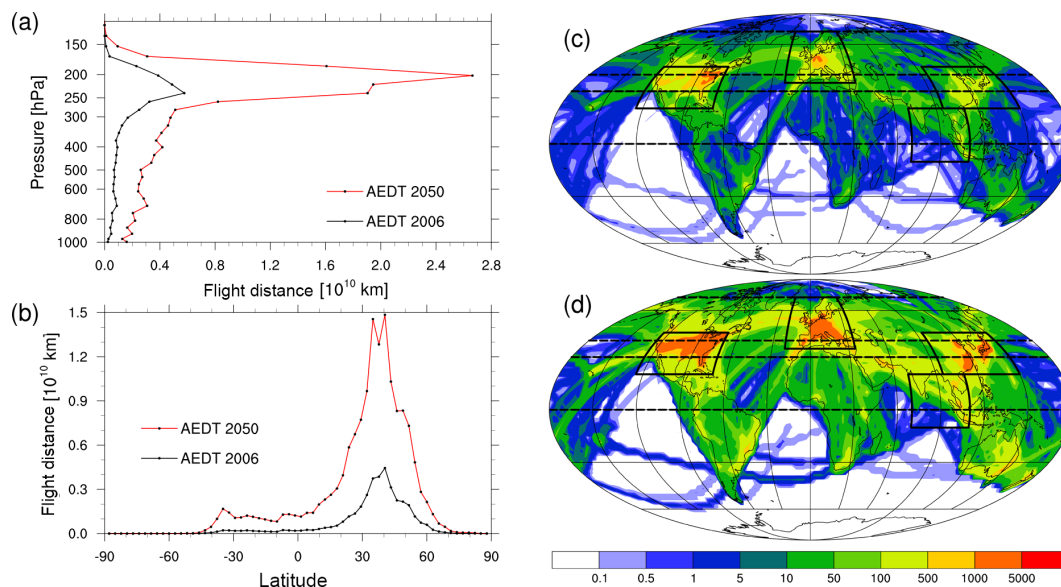
- a control simulation for the air traffic of 2006 (simulation *C2006-T06*)
- a simulation with increased air traffic according to the AEDT projection of air traffic for the year 2050 (simulation *C2006-T50*)
- a simulation that additionally accounts for a changed background climate in 2050 (simulation *C2050-T50*)
- a simulation that considers additionally an increase in fuel and propulsion efficiency as well as a change in emissions connected with the use of renewable alternative fuel, in particular a reduction in soot emissions by 50 % and a slight increase in the water emission coefficient connected with the use of alternative fuels (simulation *C2050-T50M*).

The specifications for the different simulations are summarized in Table 1.

All simulations were performed over 5 years with ECHAM5-CCMod at T42L41 resolution with a time step of 15 min. The  $\text{CO}_2$  mixing ratio is prescribed for the respective base year (381 ppm for the year 2006 and 478 ppm for the year 2050 following the Representative Concentration

**Table 1.** Overview over the model simulations. Air traffic distance is given as ground projected track distance. Coverage is given for all contrail cirrus and visible (visible optical depth > 0.05) contrail cirrus only is given in brackets (Bock and Burkhardt, 2016b). The radiative forcing is given for track distance and slant distance (see Sect. 2.2) in brackets. Asterisks mark extrapolated values calculated with the factor resulting from the radiative forcing in 2006 associated with air traffic volume using slant distance and track distance (Bock and Burkhardt, 2016b).

Simulation	Background climate	Inventory	Air traffic volume (km yr <sup>-1</sup> )	Propulsion efficiency	Initial ice number concentration (cm <sup>-3</sup> )	Coverage (%)	RF (mW m <sup>-2</sup> )
C2006-T06	2006	2006	$3.7 \times 10^{10}$	0.3	150	1.1 (0.7)	49 (56)
C2006-T50	2006	2050 Baseline	$15.4 \times 10^{10}$	0.3	150	2.9 (2.0)	159 (182*)
C2050-T50	2050 (RCP6.0)	2050 Baseline	$15.4 \times 10^{10}$	0.3	150	2.8 (2.0)	160 (183*)
C2050-T50M	2050 (RCP6.0)	2050 Scenario 1	$15.4 \times 10^{10}$	0.42	75	2.8 (1.7)	137 (157*)



**Figure 1.** Vertical (a) and zonal (b) distribution of total annual flight distance and (c) horizontal distribution of vertically integrated air traffic density (km m<sup>-2</sup> s<sup>-1</sup>) for the years (c) 2006 and (d) 2050.

Pathway 6.0; RCP6.0.) (Meinshausen et al., 2011). The annual cycle of sea surface temperature and sea ice concentration was taken from the Atmospheric Model Intercomparison Project (AMIP II) database for the year 2006 and from simulations with the Hadley Centre Global Environmental Model version 2 – Earth System (HadGEM2-ES) (Jones et al., 2011) following the Representative Concentration Pathway (RCP) 6.0 for the year 2050. Other than that, emissions and boundary data are not changed. In order to calculate the contrail formation criterion we prescribe the emission index of water vapour to be 1.21 kg H<sub>2</sub>O per kilogramme fuel and the combustion heat  $43 \times 10^6$  J kg<sup>-1</sup> (Chen et al., 2012). The radiation scheme is called every half hour calculating radiative transfer with and without contrail cirrus (see Bock and Burkhardt, 2016b, for details).

Using alternative aviation fuels reduces soot emissions in terms of mass as well as of particle number (Moore et

al., 2015, 2017). This in turn leads to a reduction in ice crystal nucleation within contrails (Kärcher et al., 2015) and to a reduction in the ice crystal loss in the vortex phase (Unterstrasser, 2016). Additionally, using alternative fuels causes a slight increase of the water emission coefficient by 15 % (Moore et al., 2017). In our study we initialize contrails at a contrail age of  $\sim 7$  min with a contrail cross-sectional area of  $200 \text{ m} \times 200 \text{ m}$  and an ice crystal number concentration of  $150 \text{ cm}^{-3}$ , a value derived from in situ measurements of young contrails after the vortex phase (Bock and Burkhardt, 2016a), neglecting the variability due to the influence of the atmospheric state on ice crystal nucleation and ice crystal loss within the contrail's vortex phase. In simulation 2050 Scenario 1 we assume that a 50 % reduction in soot emissions causes a 50 % reduction in the initial ice crystal number.

We analyse the change in contrail cirrus properties in different areas defining four equally sized regions of high air

traffic density, US–Mexico (20–45° N, 235–290° E), Europe (35–70° N, 20° W–35° E), South East Asia–India (10° S–20° N, 70–110° E) and eastern China–Japan (20–45° N, 95–150° E). Additionally two latitude bands (with different areal coverage) representing different background climate conditions, the tropics (0–30° N) and midlatitudes (40–70° N) (see Fig. 1c and d) are compared.

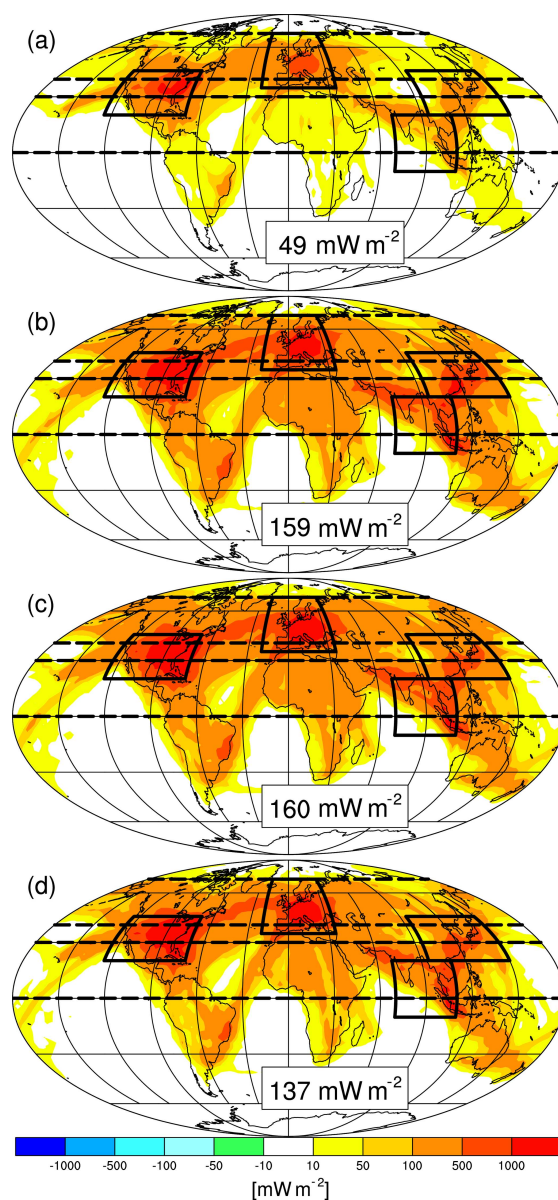
### 3 Results

In this section we describe the change in simulated contrail cirrus properties and radiative forcing prescribing air traffic for the years 2006 and 2050. We distinguish between changes resulting only from the increase in air traffic and its upward shift, and from increasing air traffic within a changed climate state. Finally we discuss an additional change in propulsion efficiency and aircraft emissions.

#### 3.1 Air traffic for the year 2006

Our simulation for the year 2006, which we use as a reference, has already been described in detail in Bock and Burkhardt (2016b). Differences between the simulation presented here and in Bock and Burkhardt (2016b) are due to the fact that we use here track distance as a measure for aircraft flight movements (Sect. 2.2). Using the 3-D flight path distance per grid cell (slant distance) instead of the ground-projected distance (track distance) leads to an increase in global air traffic volume by 1.8, with increases being largest at lower levels and over Europe and North America. The radiative forcing due to air traffic in the year 2006 using the ground projected estimate for air traffic distance amounts to approximately  $49 \text{ mW m}^{-2}$  (Fig. 2; see also Bock and Burkhardt, 2016b, Table 1), whereas the radiative forcing estimate using slant distance is larger by a factor of 1.14 (Bock and Burkhardt, 2016b).

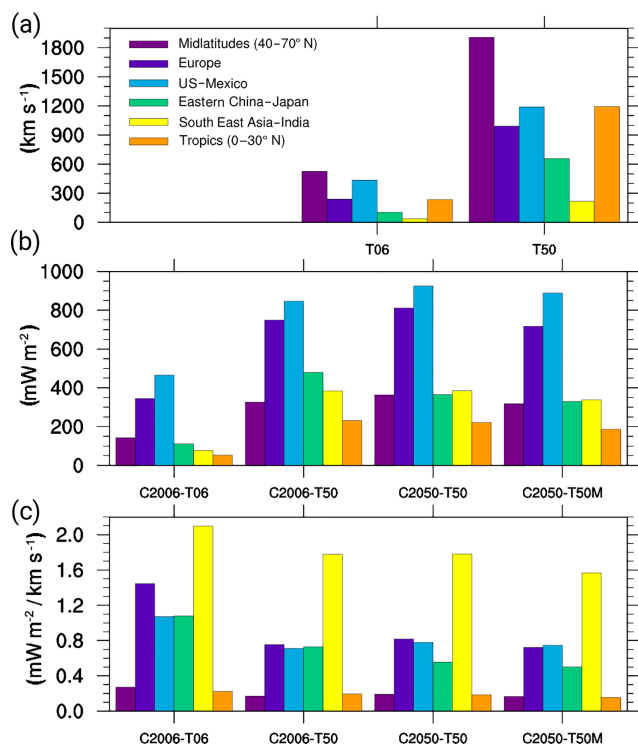
Of the four equally sized air traffic areas indicated in Figs. 1c and 2, flight density is largest over the US–Mexico area and second largest over Europe for the year 2006 (Fig. 3a). Consistently, the maxima of contrail cirrus coverage are over the US–Mexico area and Europe (Fig. 4d). The contribution to global contrail cirrus radiative forcing is largest from these two regions and amounts to 27 % and 18 %, respectively (Fig. 3b). Contrail cirrus radiative forcing per flight distance is significantly larger over Europe than over the US–Mexico area, and optical depth is larger over the US–Mexico area (Fig. 4e and f). This is in agreement with the fact that a large portion of the contrail cirrus coverage over Europe is due to aged contrail cirrus reinforced by contrail cirrus transported into Europe from the Atlantic air traffic corridor. The contribution of contrail cirrus radiative forcing from the South East Asia–India region to global mean radiative forcing is low (Fig. 3b), about 5 %, but relative to the air traffic distance flown in the area very high (Fig. 3c). In this



**Figure 2.** Radiative forcing in scenarios C2006-T06 (a), C2006-T50 (b), C2050-T50 (c) and C2050-T50M (d). Boxes (solid lines) and latitude bands (dashed lines) indicate regions (defined in Sect. 2.3) which we compare in Figs. 3 and 4.

area the ice supersaturation frequency is very high (Lamquin et al., 2012), leading to a high probability of contrail formation, and the amount of water vapour available for deposition is large, leading to a high optical depth (Fig. 4e and f; Bock and Burkhardt, 2016b). It needs to be pointed out that contrail optical depth is likely overestimated in the tropics, since in the tropics contrails form within a few degrees of the temperature threshold (Schmidt–Appleman criterion), limiting ice nucleation in the contrail (Bier and Burkhardt, 2019), a process that is not resolved in our simulations (Sect. 2.3). Therefore optical depth and lifetimes of contrails will be





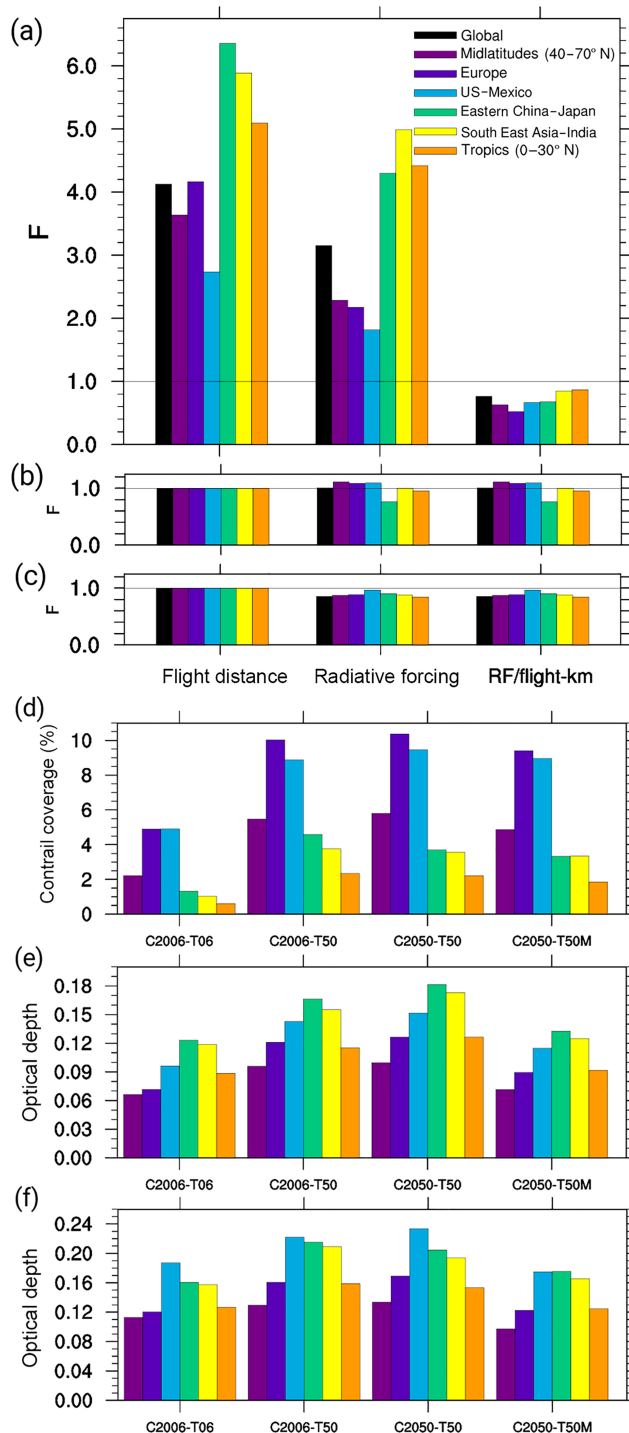
**Figure 3.** (a) Flight distance ( $\text{km s}^{-1}$ ) for 2006 and 2050, (b) contrail cirrus radiative forcing ( $\text{mW m}^{-2}$ ) and (c) contrail cirrus radiative forcing per flight distance for simulations summarized in Table 1 in different regions (same area size), in the midlatitudes and in the tropics.

overestimated (Burkhardt et al., 2018) and consequently radiative forcing will be overestimated. On average, ice supersaturation frequencies (not shown) and contrail cirrus radiative forcing are in the whole tropical belt smaller than over South East Asia–India region.

Contrail cirrus in the tropics are estimated to have a smaller radiative impact, absolute and per flight distance, than in the midlatitudes (Fig. 3b and c). The radiative impact per contrail cirrus coverage (not shown) is in the tropics larger than in the extratropics due to the larger specific humidity that leads to a larger optical depth than in the extratropics (Fig. 4e and f).

### 3.2 Increased air traffic

The increase in global air traffic volume, including the shift to higher altitudes (Sect. 2.2), leads to a large increase in contrail cirrus radiative forcing (Table 1, Fig. 2). While the global flight distance increases from 2006 to 2050 by a factor of about 4, the global radiative forcing increases from 49 to  $159 \text{ mW m}^{-2}$  by a factor of about 3. The global pattern of contrail cirrus radiative forcing changes only slightly, with maxima over eastern and south-eastern Asia gaining in importance (Fig. 2). Spatial differences in the increase of contrail cirrus radiative forcing are largely due to the unequal



**Figure 4.** Factor of change (F) for flight distance, radiative forcing (RF) and ratio RF over flight distance from scenario C2006-T06 to C2006-T50 (a), C2006-T50 to C2050-T50 (b) and C2050-T50 to C2050-T50M (c). Also shown is the mean contrail cirrus coverage (in %) due to contrail cirrus with a visible optical depth of  $> 0.05$  (d) and the mean visible optical depth at 200 hPa (e) and 240 hPa (f) for different areas.

global distribution of the increase in flight distance, due to differences in the response to shifting air traffic to higher altitudes and due to saturation effects.

The shift in air traffic to higher altitudes leads in the mid-latitudes to a shift in a large fraction (in the northern mid-latitudes the fraction increases on average from 16 % to 29 %) of air traffic into the stratosphere, where fewer persistent contrails can form due to the lower atmospheric humidity. Therefore, the increase in radiative forcing is substantially smaller than in flight distance, leading to a strong decrease ( $\sim 37$  %) in contrail cirrus radiative forcing per flight distance in the mid-latitudes (Fig. 3c). This decrease is most pronounced over Europe (amounting to  $\sim 48$  %), our most northern analysed area. Over the US–Mexico and eastern China–Japan areas, radiative forcing per flight distance decreases similarly by about 30 %.

In the tropics, the upwards shift in air traffic leads to a larger probability of contrail formation. Contrail formation at lower air traffic altitudes in the tropics is mostly limited by temperature which is too high for contrail formation (Burkhardt et al., 2008). The shifting of air traffic in the tropical troposphere upwards towards lower temperature conditions thus leads to a higher probability of contrail formation. This change in contrail formation probability together with the increase in flight distance leads to a large increase in contrail cirrus radiative forcing (Fig. 3b). The radiative forcing per flight distance decreases slightly but remains larger in the South East Asia–India area than in all other areas (Fig. 3c). The largest relative increase in flight distance and contrail cirrus radiative forcing is expected in the regions of eastern China–Japan and South East Asia–India (Fig. 4a), but their absolute contribution to global contrail cirrus radiative forcing still remains far smaller than those from the US–Mexico area and from Europe (Fig. 3b).

### 3.3 Climate change

We calculate contrail cirrus properties and radiative forcing for air traffic for the year 2050 within a warming climate in our C2050-T50 simulation. The background meteorology in 2050 is assumed to change according to the RCP6.0 scenario. The RCP scenario does not include the climate impact of contrail cirrus. In a changed climate we estimate contrail cirrus radiative forcing to amount to  $160 \text{ mW m}^{-2}$  (Table 1). The net impact of climate change on global contrail cirrus radiative forcing for the year 2050 is not significantly different from zero.

Figure 5a shows the zonal mean changes in probability of persistent contrail formation from 2006 to 2050 meteorology. North of about  $30$  to  $40^\circ \text{ N}$ , the probability of persistent contrail formation increases above 250 hPa, whereas it decreases in the tropical regions to between 100 and 300 hPa. This leads to a slight decrease in contrail cirrus coverage and radiative forcing in the tropical areas (by  $\sim 5$  %) and over the eastern China–Japan region (by  $\sim 20$  %) (Fig. 4b and d). The

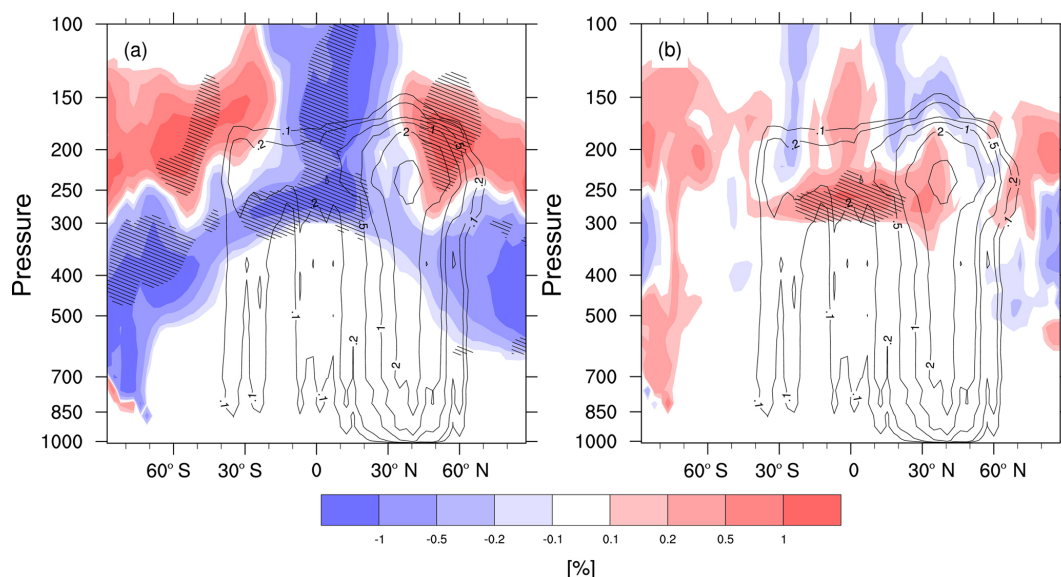
contrail cirrus cover decreases in the eastern China–Japan region (Fig. 4d) due to a lower ice supersaturation frequency and a lower contrail formation probability. This leads to a decrease in radiative forcing (Fig. 4b) and in radiative forcing per flight distance (Fig. 3c) over the eastern China–Japan area. Over Europe and the US–Mexico area, contrail cirrus coverage and optical depth is slightly increased (by  $\sim 5$  %) (Fig. 4d, e and f), which leads to a slight increase in contrail cirrus radiative forcing over Europe and the US–Mexico area (Fig. 4b). These two different effects, an increase of contrail cirrus radiative forcing over the US–Mexico area and over Europe, and a decrease over the eastern China–Japan area and the tropical areas, almost compensate each other (Fig. 4b).

### 3.4 Reduced soot emission and improvement in propulsion efficiency

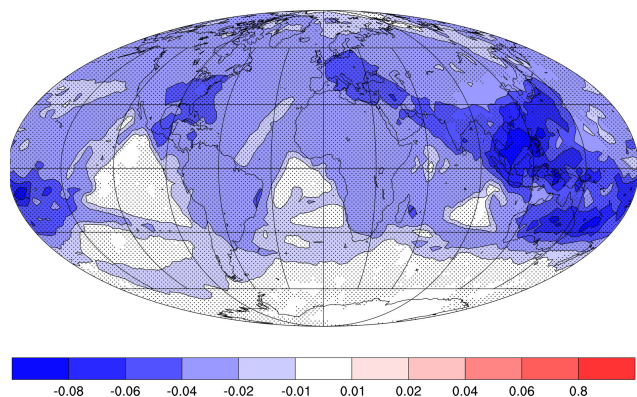
A reduction in the initial contrail ice particle number by 50 % leads to a strong decrease in the climate impact of contrail cirrus reducing global radiative forcing for the year 2050 by 14 % from 160 to  $138 \text{ mW m}^{-2}$  (Table 1). A smaller number of initial ice crystals can grow faster assuming a constant amount of ambient water vapour available for deposition, leading to an earlier and larger sedimentation loss of ice crystals (Bier et al., 2017), and therefore to a decrease in contrail cirrus optical depth, lifetimes and radiative forcing (Burkhardt et al., 2018). The decrease in contrail cirrus radiative forcing for the year 2050 is caused by a decrease in contrail cirrus optical depth of up to 30 % (Figs. 4e, f and 6) and by a decrease in contrail cirrus coverage (Fig. 4d). The changes in radiative forcing are largest over the South East Asia–India area where sedimentation plays a greater role due to the larger amount of water vapour available for deposition. Over Europe the effect is slightly larger than over the US–Mexico area. This is because of its location downwind of the North Atlantic flight corridor where contrail cirrus coverage is strongly influenced by the lifetime of the contrail cirrus originating over the Atlantic. The smallest impact of the reduction in initial ice crystal numbers on contrail cirrus radiative forcing among the four studied regions can be found over the US–Mexico area (Fig. 4c) where contrail cirrus coverage mainly consists of young contrails.

The impact of soot reductions is smaller than estimated in Burkhardt et al. (2018), who found that a 50 % reduction in soot emissions causes a 20 % reduction in contrail cirrus radiative forcing for air traffic in the year 2006. The difference in sensitivity may be caused by the change in air traffic volume and pattern. Contrail cirrus radiative forcing is nonlinearly dependent on the initial ice crystal number (Burkhardt et al., 2018). This means that reducing initial ice crystal numbers in an increased air traffic environment has a smaller impact on contrail cirrus radiative forcing than for current air traffic since an abundance of contrail cirrus ice crystals will still exist even if nucleation rates are reduced.





**Figure 5.** Changes in persistent contrail formation probability from 2006 to 2050 due to climate change (a) and due to improved propulsion efficiency (b). Contour lines indicate annual flight distance ( $10^8$  km) in 2050. Hatched areas indicate statistically significant changes.



**Figure 6.** Absolute difference in visible optical depth at 200 hPa between scenario C2050-T50 and C2050-T50M due to soot reductions. Dotted regions are significant.

The increase in propulsion efficiency and the change in water vapour emissions (Sect. 2.3) have no significant impact on contrail cirrus radiative forcing. Persistent contrail formation probability around 250 hPa is slightly increased only in the tropics (Fig. 5b), which has no significant impact on the global radiative forcing due to contrail cirrus.

#### 4 Discussion

Only one study exists that analyses the impact of contrail cirrus on the radiative balance in the future, and another study looks at the change in line-shaped contrails only. Chen and Gettelman (2016) use a very different approach to simulating contrail cirrus: calculating the number of newly formed con-

trail ice crystals from the available water vapour, setting the size of the ice crystals as constant and feeding this tendency in ice crystal number into the natural cloud scheme. Their resulting estimate of contrail cirrus radiative forcing for the year 2006,  $13 \text{ mW m}^{-2}$ , is significantly smaller than our estimate which is likely connected with an underestimation of ice crystals formed at contrail formation resulting from assumed ice crystals sizes larger than those observed in young contrails (Schumann and Heymsfield, 2017). Due to the 4-fold increase in air traffic they estimate an increase in contrail cirrus radiative forcing by a factor of 7, which they argue is caused by non-uniform increases in air traffic and regional differences in sensitivity to air traffic. We calculate a 3-fold increase in contrail cirrus radiative forcing connected with the 4-fold increase in air traffic, which is in line with the 3-fold increase in contrail cirrus coverage predicted by our model. Finally, Chen and Gettelman (2016) estimate a decrease in contrail cirrus radiative forcing by about 12 % and 8 % assuming RCP8.5 and RCP4.5, respectively, whereas we find that regionally significant changes in contrail cirrus radiative forcing due the changing climate (assuming RCP6.0) cancel out globally. This difference in the impact of climate change on contrail cirrus radiative forcing is caused by differences in the estimated change in the persistent contrail formation probability (Fig. 5a). The decrease in contrail formation probability in the tropics, caused mainly by temperature changes, is captured by both models. In the northern extratropics we find an increase in the persistent contrail formation probability at about 250 to 350 hPa which lies north of  $40^\circ \text{ N}$ , whereas in the simulations of Chen and Gettelman (2016, their Fig. 2) this increase is found further north starting at  $60^\circ \text{ N}$ . Thus in our simulation, the increase in contrail

formation probability still affects contrail formation over the US–Mexico region. This leads in our study to a cancellation of the decrease in contrail formation in the tropics and an increase in the extratropics due to climate change at main flight levels. The disagreement in the extratropics is not unexpected as future changes in contrail cirrus properties and radiative forcing due to a changing climate are much more uncertain in the midlatitudes than in the tropics since the trend in ice supersaturation frequency in the midlatitudes is strongly model dependent (Irvine and Shine, 2015).

Marquart et al. (2003), who study only line-shaped contrails, use an approach that relies on the scaling of the contrail formation probability over a specified area to observations. They show a strong decrease of line-shaped contrail coverage in the tropics due to climate change of up to 70 %. Their method is connected with a number of weaknesses, firstly there is an error in the parameterization of potential contrail coverage which is effective especially in the tropics (Burkhardt et al., 2008). They make assumptions about the scalability of contrail cirrus coverage (Burkhardt et al., 2010) that assume contrail cirrus life cycles to be equal in the extratropics and tropics, which is not justified (Burkhardt et al., 2018). Finally, they make the assumption that scaling coefficients can be transferred from our climate to a future climate.

However, all studies agree that increasing air traffic is the dominating effect that causes higher global mean contrail cirrus radiative forcing in the future. The Chen and Gettelman study and our study agree on the change in climate having only a small impact on global mean contrail cirrus radiative forcing.

Contrail cirrus radiative forcing per flight distance appears to be particularly high in the tropics. This result should still be viewed with some caution, since in the tropical areas contrails form close to the threshold conditions which lead to a lower contrail ice crystal nucleation rate (Bier and Burkhardt, 2019). This has implications not only for contrail optical depth but also for the ice crystal loss rates during the vortex phase, microphysical process rates and contrail cirrus lifetimes (Bier et al., 2017). When including a parameterization for contrail ice crystal nucleation this is likely to lead to a decrease in contrail cirrus radiative forcing in the tropics. The impact of the tropical areas on global contrail cirrus radiative forcing is still very limited so that the overestimation of contrail cirrus ice crystals has a limited impact on global contrail cirrus radiative forcing. As air traffic increases strongly in the tropical areas, future simulations should include the impact of lower nucleation rates and the associated changes in ice crystal loss rates, changes in optical depth, microphysical process rates and contrail cirrus lifetime in the tropics.

## 5 Conclusion

In this paper, we present contrail cirrus properties and radiative forcing for the year 2050 using AEDT emission scenarios. We isolate effects that can be expected from the change in air traffic volume and its geographic and vertical distribution, from climate change, from improvements in fuel and propulsion efficiency and decreases in soot and water vapour emissions caused by the use of alternative fuels. We study regional changes in the main air traffic areas and in areas where air traffic is projected to strongly increase.

We find that the future projected increase in air traffic and the slight shift to higher altitudes lead to a large increase in contrail cirrus coverage, optical depth and radiative forcing. With a 4-fold increase in air traffic contrail cirrus radiative forcing is increasing 3-fold, from 49 to 159  $\text{mW m}^{-2}$ . The results are based on an air traffic inventory of future air traffic measured as track (ground projected) distance rather than slant (3-D) distance. Assuming that the relation of contrail cirrus radiative forcing calculated from track or slant distance stays constant for future scenarios and therefore applying the factor 1.14 (Bock and Burkhardt, 2016b), this would correspond to a global mean contrail cirrus radiative forcing of 182  $\text{mW m}^{-2}$  that would result from an inventory of future air traffic measured in slant distance. The main air traffic areas over North America and Europe continue to contribute the largest fraction of the contrail cirrus radiative forcing, but the Asian main air traffic areas gain in importance. Our estimates of current and future contrail cirrus radiative forcing are different to those given by Chen and Gettelman (2016) which are likely connected to their methodology estimating contrail ice nucleation (see Sect. 4). Contrail cirrus radiative forcing appears to be hardly affected by climate change assuming RCP6.0, which leads to a slight decrease in contrail cirrus coverage and radiative forcing over Asia and a compensating small increase over North America and Europe. This is in contrast to results from Chen and Gettelman (2016) which found contrail cirrus radiative forcing to decrease due to climate change by about 12 % assuming RCP8.5. The reason for this discrepancy can be traced back to a difference in the pattern of change of contrail formation probability in the Northern Hemisphere. Nevertheless, the studies agree that changes in contrail cirrus radiative forcing due to the projected increase in air traffic by far outweigh any damping effect that a change in climate may have.

Of the fuel and propulsion efficiency improvements and soot reductions due to the use of alternative fuels, it is the soot reduction that has the largest impact on contrail cirrus. The larger propulsion efficiency leads to a slight increase in the contrail formation probability in the tropics with little impact on global radiative forcing. The soot emissions cause a reduction in contrail cirrus optical depth and lifetime (Burkhardt et al., 2018) which leads again to a decrease in contrail cirrus coverage. Consequently, contrail cirrus radiative forcing is decreased by 15 %, less than estimated by

Burkhardt et al. (2018), who infer a 20 % reduction for air traffic in the year 2006. This slight decrease in sensitivity connected with soot number emission reductions is likely caused by the fact that the strong increase in air traffic leads to an abundance of ice crystals which makes decreases in ice crystal numbers less effective.

Overall, the strong increase in radiative forcing from 2006 to 2050 due to larger air traffic volume and the shift in air traffic towards higher altitudes cannot be compensated by small reductions in radiative forcing due to changes expected from climate change, the projected reductions in reduced soot emissions and improvements in fuel efficiency. Even if soot number emissions could be reduced by 90 %, the associated reduction in the contrail cirrus radiative forcing (Burkhardt et al., 2018) in the year 2050 would likely not be enough to stabilize contrail cirrus radiative forcing at the level of the year 2006. Since larger reductions in soot number emissions are expected to lead to increases in ice nucleation (Kärcher and Yu, 2009) and in the contrail cirrus climate impact (Burkhardt et al., 2018) a further decrease of soot number emissions may not be expedient.

In order to understand the implications of our results for the overall air traffic climate impact, we calculated the aviation CO<sub>2</sub> radiative forcing according to Myhre et al. (1998). CO<sub>2</sub> emissions and contrail cirrus radiative forcing are the two largest aviation-related radiative forcing components besides the possibly large, but as yet unquantified, impact of indirect effects on clouds (Lee et al., 2009). Radiative forcing due to aviation CO<sub>2</sub> emissions amounts for 2006 to 24.0 mW m<sup>-2</sup>; for the year 2050, assuming the C2050-T50 scenario, to 84.8 mW m<sup>-2</sup>; and assuming the C2050-T50M scenario to 58.0 mW m<sup>-2</sup>. This means that the factor of increase in CO<sub>2</sub> radiative forcing from C2006-T06 to C2050-T50 is 3.5, slightly higher than 3.2 for the contrail cirrus radiative forcing. Considering the increase in fuel efficiency from C2006-T06 to C2050-T50M, the factor of change for the CO<sub>2</sub> radiative forcing is reduced to 2.4, whereas the factor of change for the global contrail cirrus radiative forcing in this scenario is reduced to 2.8. The decrease in contrail cirrus radiative forcing in this scenario is caused by the decrease in soot emissions. This means that radiative forcing due to contrail cirrus can be expected to increase faster in the future than that due to CO<sub>2</sub>.

The increase in fuel efficiency included in the AEDT inventory does not conform with the CORSIA agreement unless a large part of the CO<sub>2</sub> emission reduction is reached by carbon offsetting. It is important to point out that carbon offsetting deals only with the impact of CO<sub>2</sub> emissions while leaving the impact of contrail cirrus on climate unchanged. Since the increase in contrail cirrus radiative forcing can be stronger than in CO<sub>2</sub> radiative forcing, both radiative forcing components need to be considered in future agreements.

*Data availability.* The data obtained from this study are available upon request from the authors.

*Author contributions.* LB performed and analysed simulations. LB and UB jointly discussed scientific results and wrote the paper.

*Competing interests.* The authors declare that they have no conflict of interest.

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## BoCC4 Amber list

Mute swan <sup>a</sup>	Manx shearwater	Common sandpiper	Stock dove
Bewick's swan	European storm petrel	Green sandpiper	Tawny owl <sup>a</sup>
Whooper swan	Leach's petrel	Spotted redshank	Short-eared owl
Bean goose	Gannet	Greenshank <sup>a</sup>	Nightjar <sup>r</sup>
Pink-footed goose	Bittern <sup>r</sup>	Wood sandpiper	Swift
Greylag goose	Spoonbill	Redshank	Kingfisher
Barnacle goose	Black-necked grebe	Snipe	Kestrel
Brent goose	Honey buzzard	Great skua	Shorelark
Shelduck	Marsh harrier	Black guillemot	House martin
Wigeon	Montagu's harrier	Razorbill	Willow warbler
Gadwall	Osprey	Guillemot	Dartford warbler
Teal	Spotted crane	Little tern	Short-toed treecreeper
Mallard	Crane	Sandwich tern	Dipper <sup>a</sup>
Pintail	Stone-curlew	Common tern	Common redstart
Garganey	Avocet	Arctic tern	Dunnock
Shoveler	Oystercatcher	Black-headed gull	Meadow pipit
Eider	Grey plover	Mediterranean gull	Water pipit
Goldeneye	Bar-tailed godwit	Common gull	Bullfinch
Smew	Turnstone	Lesser black-backed gull	Mealy redpoll <sup>a</sup>
Quail	Knot	Yellow-legged gull	Scottish crossbill
Red grouse	Curlew sandpiper <sup>a</sup>	Caspian gull <sup>na</sup>	Parrot crossbill
Black-throated diver	Sanderling <sup>a</sup>	Iceland gull	Snow bunting
Great northern diver	Dunlin <sup>r</sup>	Glaucous gull	Lapland bunting
Fulmar	Purple sandpiper	Great black-backed gull	Reed bunting

r - species on the Red list previously, g - species on the Green list previously, na - not assessed previously

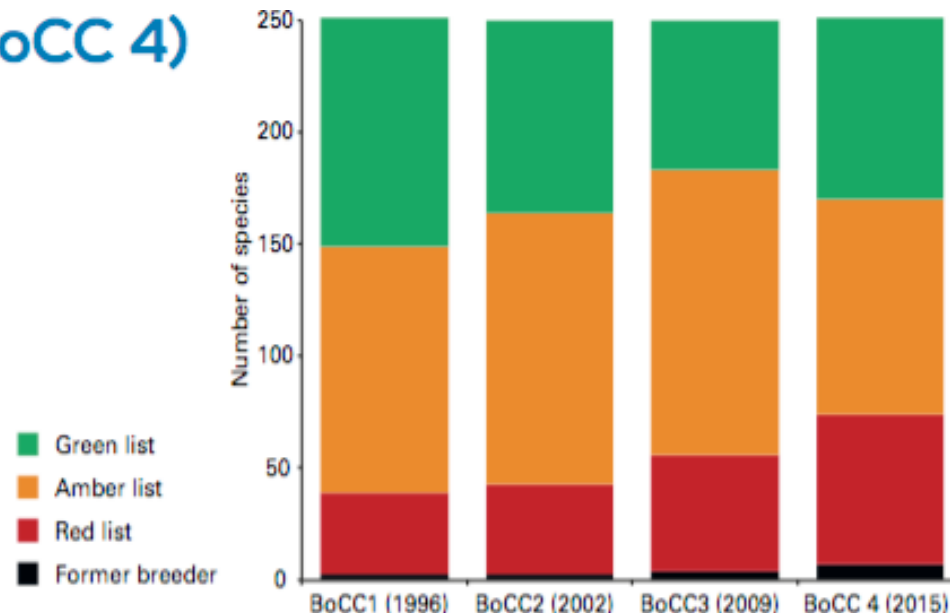
# Birds of Conservation Concern 4 (BoCC 4)

The UK's leading bird conservation organisations have worked together to review the status of birds in the UK, Channel Islands and Isle of Man.

The bird species that breed or overwinter were assessed against a set of objective

criteria to be placed on the Green, Amber or Red list – indicating an increasing level of conservation concern.

The review used up-to-date information on the status of birds in the UK and elsewhere in their ranges, drawing on data collated through the UK's bird monitoring schemes.



## BoCC4 Red list

White-fronted goose <sup>a</sup>	Ringed plover <sup>a</sup>	Golden oriole	Nightingale <sup>a</sup>
Pochard <sup>a</sup>	Dotterel <sup>a</sup>	Red-backed shrike	Pied flycatcher <sup>a</sup>
Scaup	Whimbrel	Willow tit	Black redstart <sup>a</sup>
Long-tailed duck <sup>a</sup>	Curlew <sup>a</sup>	Marsh tit	Whinchat <sup>a</sup>
Common scoter	Black-tailed godwit	Skylark	House sparrow
Velvet scoter <sup>a</sup>	Ruff	Wood warbler	Tree sparrow
Black grouse	Red-necked phalarope	Grasshopper warbler	Yellow wagtail
Capercaillie	Woodcock <sup>a</sup>	Savi's warbler	Grey wagtail <sup>a</sup>
Grey partridge	Arctic skua	Aquatic warbler	Tree pipit
Balearic shearwater	Puffin <sup>a</sup>	Marsh warbler	Hawfinch
Shag <sup>a</sup>	Roseate tern	Starling	Linnet
Red-necked grebe <sup>a</sup>	Kittiwake <sup>a</sup>	Ring ouzel	Twite
Slavonian grebe <sup>a</sup>	Herring gull	Fieldfare	Lesser redpoll
White-tailed eagle	Turtle dove	Song thrush	Yellowhammer
Hen harrier	Cuckoo	Redwing	Girl bunting
Corncrake	Lesser spotted woodpecker	Mistle thrush <sup>a</sup>	Corn bunting
Lapwing	Merlin <sup>a</sup>	Spotted flycatcher	

a - species on the Amber list previously, g - species on the Green list previously.



Birds being controlled at UK Airports

Barnacle goose
Black-headed gull
Canada goose
Common buzzard
Curlew
Great black-backed gull
Grey heron
Greylag goose
Herring gull
Kestrel
Mallard
Mute swan
Oystercatcher
Pied wagtail
Red kite
Ringed plover
Robin
Skylark
Stock dove
Swallow

See:  
[birds-of-conservation-concern-4—the-population-status-of-birds-in-the-united-kingdom-channel-islands-and-the-isle-of-man](#)

downloadable from:  
[www.bto.org/our-science/publications/psob](http://www.bto.org/our-science/publications/psob)

in Work/Garden/Nature



Application Reference	Case Type	Species	Activities	Method(s)	Purpose of Application	Capture County	Number Licensed	Application Receipt Date	Licence Start Date	Licence End Date	Date Licence Issued
2018-33259-SPM-WLM	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		6	08-Jan-18	20-Feb-18	31-Aug-18	20-Feb-18
2018-33259-SPM-WLM	SPM-WLM	Curlew	Take or destroy an egg of a wild bird	Egg oiling/pricking	Preserving air safety under section 16(1)(i)		15	08-Jan-18	20-Feb-18	31-Aug-18	20-Feb-18
2018-33259-SPM-WLM	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	Nest destruction	Preserving air safety under section 16(1)(i)		3	08-Jan-18	20-Feb-18	31-Aug-18	20-Feb-18
2018-33307-SPM-WLM	SPM-WLM	Grey heron	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		2	10-Jan-18	26-Feb-18	28-Feb-19	26-Feb-18
2018-33312-SPM-WLM	SPM-WLM	Red kite	Kill, injure or take	Shooting	Preserving air safety, under section 16(1)(i)		3	10-Jan-18	26-Feb-18	28-Feb-19	26-Feb-18
2018-33314-SPM-WLM	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		2	10-Jan-18	23-Feb-18	28-Feb-19	23-Feb-18
2018-33315-SPM-WLM	SPM-WLM	Mute swan	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		2	10-Jan-18	26-Feb-18	28-Feb-19	26-Feb-18
2018-33398-SPM-WLM	SPM-WLM	Kestrel	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)		5	19-Jan-18	23-Feb-18	28-Feb-19	23-Feb-18
2018-33398-SPM-WLM	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		17	19-Jan-18	23-Feb-18	28-Feb-19	23-Feb-18
2018-33399-SPM-WLM	SPM-WLM	Stock dove	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		10	19-Jan-18	23-Feb-18	28-Feb-19	23-Feb-18
2018-33597-SPM-WLM	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		10	01-Feb-18	19-Mar-18	30-Dec-18	17-Mar-18
2018-33597-SPM-WLM	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		10	01-Feb-18	19-Mar-18	30-Dec-18	17-Mar-18
2018-33597-SPM-WLM	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)		2	01-Feb-18	19-Mar-18	30-Dec-18	17-Mar-18
2018-33597-SPM-WLM	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		10	01-Feb-18	19-Mar-18	30-Dec-18	17-Mar-18
2018-33597-SPM-WLM	SPM-WLM	Oystercatcher	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)		6	01-Feb-18	19-Mar-18	30-Dec-18	17-Mar-18
2018-33597-SPM-WLM	SPM-WLM	Oystercatcher	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		10	01-Feb-18	19-Mar-18	30-Dec-18	17-Mar-18
2018-33597-SPM-WLM-10	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		10	25-Apr-18	25-Apr-18	30-Dec-18	25-Apr-18
2018-33597-SPM-WLM-10	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		10	25-Apr-18	25-Apr-18	30-Dec-18	25-Apr-18
2018-33597-SPM-WLM-10	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)		10	25-Apr-18	25-Apr-18	30-Dec-18	25-Apr-18
2018-33597-SPM-WLM-10	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		10	25-Apr-18	25-Apr-18	30-Dec-18	25-Apr-18
2018-33597-SPM-WLM-10	SPM-WLM	Oystercatcher	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)		6	25-Apr-18	25-Apr-18	30-Dec-18	25-Apr-18
2018-33597-SPM-WLM-10	SPM-WLM	Oystercatcher	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		10	25-Apr-18	25-Apr-18	30-Dec-18	25-Apr-18
2018-33597-SPM-WLM-11	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		10	12-Jun-18	12-Jun-18	30-Dec-18	12-Jun-18
2018-33597-SPM-WLM-11	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		10	12-Jun-18	12-Jun-18	30-Dec-18	12-Jun-18
2018-33597-SPM-WLM-11	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)		10	12-Jun-18	12-Jun-18	30-Dec-18	12-Jun-18
2018-33597-SPM-WLM-11	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		10	12-Jun-18	12-Jun-18	30-Dec-18	12-Jun-18
2018-33597-SPM-WLM-11	SPM-WLM	Oystercatcher	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)		6	12-Jun-18	12-Jun-18	30-Dec-18	12-Jun-18
2018-33597-SPM-WLM-11	SPM-WLM	Oystercatcher	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		10	12-Jun-18	12-Jun-18	30-Dec-18	12-Jun-18
2018-33598-SPM-WLM	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		4	01-Feb-18	17-Mar-18	30-Dec-18	16-Mar-18
2018-33598-SPM-WLM	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)		4	01-Feb-18	17-Mar-18	30-Dec-18	16-Mar-18
2018-33598-SPM-WLM-2	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		4	12-Jun-18	12-Jun-18	30-Dec-18	12-Jun-18
2018-33598-SPM-WLM-2	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)		4	12-Jun-18	12-Jun-18	30-Dec-18	12-Jun-18
2018-33599-SPM-WLM	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		2	01-Feb-18	19-Mar-18	30-Dec-18	17-Mar-18
2018-33599-SPM-WLM	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		2	01-Feb-18	19-Mar-18	30-Dec-18	17-Mar-18
2018-33599-SPM-WLM	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)		2	01-Feb-18	19-Mar-18	30-Dec-18	17-Mar-18
2018-33599-SPM-WLM-3	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		2	13-Jun-18	13-Jun-18	30-Dec-18	13-Jun-18
2018-33599-SPM-WLM-3	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		2	13-Jun-18	13-Jun-18	30-Dec-18	13-Jun-18
2018-33599-SPM-WLM-3	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)		2	13-Jun-18	13-Jun-18	30-Dec-18	13-Jun-18
2018-33600-SPM-WLM	SPM-WLM	Red kite	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		2	01-Feb-18	19-Mar-18	30-Dec-18	17-Mar-18
2018-33601-SPM-WLM	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		5	01-Feb-18	20-Mar-18	30-Dec-18	20-Mar-18
2018-33601-SPM-WLM	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)		5	01-Feb-18	20-Mar-18	30-Dec-18	20-Mar-18
2018-33601-SPM-WLM-1	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		5	13-Jun-18	13-Jun-18	30-Dec-18	13-Jun-18
2018-33601-SPM-WLM-1	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)		5	13-Jun-18	13-Jun-18	30-Dec-18	13-Jun-18
2018-33602-SPM-WLM	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)		5	01-Feb-18	20-Mar-18	30-Dec-18	20-Mar-18
2018-33602-SPM-WLM	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		5	01-Feb-18	20-Mar-18	30-Dec-18	20-Mar-18
2018-33602-SPM-WLM	SPM-WLM	Oystercatcher	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)		2	01-Feb-18	20-Mar-18	30-Dec-18	20-Mar-18
2018-33602-SPM-WLM-4	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)		5	13-Jun-18	13-Jun-18	30-Dec-18	13-Jun-18
2018-33602-SPM-WLM-4	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		5	13-Jun-18	13-Jun-18	30-Dec-18	13-Jun-18
2018-33602-SPM-WLM-4	SPM-WLM	Oystercatcher	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)		2	13-Jun-18	13-Jun-18	30-Dec-18	13-Jun-18
2018-33624-SPM-WLM	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		8	11-Jan-18	16-Feb-18	30-Dec-18	16-Feb-18
2018-33624-SPM-WLM	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		8	11-Jan-18	16-Feb-18	30-Dec-18	16-Feb-18
2018-33792-SPM-WLM	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety		4	07-Feb-18	04-Sep-18	03-Sep-19	04-Sep-18
2018-33902-SPM-WLM	SPM-WLM	Black-headed gull	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		100	01-Feb-18	02-Mar-18	01-Mar-19	02-Mar-18
2018-33902-SPM-WLM	SPM-WLM	Black-headed gull	Take or destroy an egg of a wild bird	Egg oiling/pricking	Preserving air safety under section 16(1)(i)		400	01-Feb-18	02-Mar-18	01-Mar-19	02-Mar-18
2018-33902-SPM-WLM	SPM-WLM	Black-headed gull	Take, damage or destroy the nest of any wild bird	Nest destruction	Preserving air safety under section 16(1)(i)		100	01-Feb-18	02-Mar-18	01-Mar-19	02-Mar-18
2018-34201-SPM-WLM	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		3	13-Mar-18	26-Mar-18	25-Mar-19	26-Mar-18
2018-34201-SPM-WLM	SPM-WLM	Common buzzard	Trapping	Trapping	Preserving air safety under section 16(1)(i)		3	13-Mar-18	26-Mar-18	25-Mar-19	26-Mar-18
2018-34353-SPM-WLM	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		10	26-Mar-18	09-Apr-18	31-Dec-18	09-Apr-18
2018-34353-SPM-WLM-1	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		10	09-Apr-18	09-Apr-18	30-Dec-18	09-Apr-18
2018-34355-SPM-WLM	SPM-WLM	Curlew	Take or destroy an egg of a wild bird	By hand	Preserving air safety under section 16(1)(i)		8	22-Mar-18	10-May-18	31-Dec-18	10-May-18
2018-34355-SPM-WLM	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		8	22-Mar-18	10-May-18	31-Dec-18	10-May-18
2018-34355-SPM-WLM	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	Nest destruction	Preserving air safety under section 16(1)(i)		2	22-Mar-18	10-May-18	31-Dec-18	10-May-18
2018-34687-SPM-WLM	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		2	16-Apr-18	24-Apr-18	23-Apr-19	25-Apr-18
2018-34687-SPM-WLM	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		2	16-Apr-18	24-Apr-18	23-Apr-19	25-Apr-18
2018-35230-SPM-WLM	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		4	03-May-18	07-Jun-18	06-Jun-19	07-Jun-18
2018-35230-SPM-WLM	SPM-WLM	Grey heron	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		3	03-May-18	07-Jun-18	06-Jun-19	07-Jun-18
2018-35230-SPM-WLM	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		6	03-May-18	07-Jun-18	06-Jun-19	07-Jun-18
2018-35230-SPM-WLM	SPM-WLM	Stock dove	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		20	03-May-18	07-Jun-18	06-Jun-19	07-Jun-18
2018-35316-SPM-WLM	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		4	18-May-18	01-Jun-18	31-May-19	01-Jun-18
2018-35316-SPM-WLM	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		2	18-May-18	01-Jun-18	31-May-19	01-Jun-18
2018-35392-SPM-WLM	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		5	23-May-18	31-May-18	18-May-19	31-May-18
2018-35392-SPM-WLM	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	Nest destruction	Preserving air safety under section 16(1)(i)		2	23-May-18	31-May-18	18-May-19	31-May-18
2018-35601-SPM-WLM	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		3	16-May-18	15-Jun-17	31-Dec-18	15-Jun-18
2018-35601-SPM-WLM	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	Nest destruction	Preserving air safety under section 16(1)(i)		2	16-May-18	15-Jun-17	31-Dec-18	15-Jun-18
2018-35601-SPM-WLM	SPM-WLM	Oystercatcher	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		3	16-May-18	15-Jun-17	31-Dec-18	15-Jun-18
2018-35601-SPM-WLM	SPM-WLM	Oystercatcher	Take, damage or destroy the nest of any wild bird	Nest destruction	Preserving air safety under section 16(1)(i)		3	16-May-18	15-Jun-17	31-Dec-18	15-Jun-18
2018-35980-SPM-WLM	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		2	21-Jun-18	06-Aug-18	06-Aug-19	06-Aug-18
2018-35980-SPM-WLM	SPM-WLM	Stock dove	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		5	21-Jun-18	06-Aug-18	06-Aug-19	06-Aug-18
2018-33314-SPM-WLM-2	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		4	03-Jul-18	04-Jul-18	28-Feb-19	04-Jul-18
2018-34201-SPM-WLM-1	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		3	12-Dec-18	13-Dec-18	25-Mar-19	13-Dec-18
2018-34201-SPM-WLM-1	SPM-WLM	Common buzzard	Trapping	Trapping	Preserving air safety under section 16(1)(i)		3	12-Dec-18	13-Dec-18	25-Mar-19	13-Dec-18
2018-34201-SPM-WLM-2	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		3	18-Dec-18	20-Dec-18	25-Mar-19	20-Dec-18
2018-34201-SPM-WLM-2	SPM-WLM	Common buzzard	Trapping	Trapping	Preserving air safety under section 16(1)(i)		3	18-Dec-18	20-Dec-18	25-Mar-19	20-Dec-18
2018-35230-SPM-WLM-6	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		6	17-Dec-18	19-Dec-18	06-Jun-19	19-Dec-18
2018-35230-SPM-WLM-6	SPM-WLM	Grey heron	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		4	17-Dec-18	19-Dec-18	06-Jun-19	19-Dec-18
2018-35230-SPM-WLM-6	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		6	17-Dec-18	19-Dec-18	06-Jun-19	19-Dec-18
2018-35230-SPM-WLM-6	SPM-WLM	Stock dove	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		20	17-Dec-18	19-Dec-18	06-Jun-19	19-Dec-18
2018-35392-SPM-WLM-1	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		5	12-Dec-18	13-Dec-18	18-May-19	13-Dec-18
2018-35392-SPM-WLM-1	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	Nest destruction	Preserving air safety under section 16(1)(i)		2	12-Dec-18	13-Dec-18	18-May-19	13-Dec-18
2018-35392-SPM-WLM-2	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		5	18-Dec-18	20-Dec-18	18-May-19	20-Dec-18
2018-35392-SPM-WLM-2	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	Nest destruction	Preserving air safety under section 16(1)(i)		2	18-Dec-18	20-Dec-18	18-May-19	20-Dec-18
2018-36175-SPM-WLM	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)		5	04-Jul-18	26-Jul-18	25-Jul-19	26-Jul-18
2018-36175-SPM-WLM	SPM-WLM	Kestrel	Kill, injure or take	Shooting</							



2017-32600-SPM-WLM	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)				3	20-Nov-17	01-May-18	31-Oct-18	05-Mar-18
2017-32881-SPM-WLM	SPM-WLM	Greylag goose	Kill, injure or take	Shooting	Preserving air safety			100	21-Nov-17	01-Feb-18	31-Aug-18	19-Dec-17	
2017-32881-SPM-WLM-2	SPM-WLM	Greylag goose	Kill, injure or take	Shooting	Preserving air safety			100	19-Dec-17	01-Feb-18	31-Aug-18	20-Dec-17	
2017-32912-SPM-WLM	SPM-WLM	Greylag goose	Take, damage or destroy the nest of any wild bird	Nest destruction	Preserving air safety under section 16(1)(i)			25	21-Nov-17	01-Feb-18	15-May-18	20-Dec-17	
2018-33058-SPM-WLM	SPM-WLM	Greylag goose	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			20	06-Dec-17	01-Feb-18	31-Aug-19	04-Jan-18	
2018-33073-SPM-WLM	SPM-WLM	Greylag goose	Take or destroy an egg of a wild bird	Egg oiling/pricking	Preserving air safety under section 16(1)(i)			60	24-Nov-17	01-Feb-18	15-May-19	05-Jan-18	
2016-22905-SPM-WLM-L4	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			2	20-Feb-17	22-Feb-17	31-Mar-17	22-Feb-17	
2016-22905-SPM-WLM-L4	SPM-WLM	Grey heron	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			1	20-Feb-17	22-Feb-17	31-Mar-17	22-Feb-17	
2016-22905-SPM-WLM-L4	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			2	20-Feb-17	22-Feb-17	31-Mar-17	22-Feb-17	
2016-22905-SPM-WLM-L4	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			4	20-Feb-17	22-Feb-17	31-Mar-17	22-Feb-17	
2016-22905-SPM-WLM-L4	SPM-WLM	Stock dove	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			30	20-Feb-17	22-Feb-17	31-Mar-17	22-Feb-17	
2016-22905-SPM-WLM-L5	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			4	20-Feb-17	22-Feb-17	31-Mar-17	22-Feb-17	
2016-22905-SPM-WLM-L5	SPM-WLM	Grey heron	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			4	20-Feb-17	22-Feb-17	31-Mar-17	22-Feb-17	
2016-22905-SPM-WLM-L5	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			6	20-Feb-17	22-Feb-17	31-Mar-17	22-Feb-17	
2016-22905-SPM-WLM-L5	SPM-WLM	Stock dove	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			30	20-Feb-17	22-Feb-17	31-Mar-17	22-Feb-17	
2016-25912-SPM-WLM-L2	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			5	24-Feb-17	01-Apr-17	31-Aug-17	27-Feb-17	
2016-25912-SPM-WLM-L2	SPM-WLM	Oystercatcher	Take, damage or destroy the nest of any wild bird	Nest destruction	Preserving air safety under section 16(1)(i)			2	24-Feb-17	01-Apr-17	31-Aug-17	27-Feb-17	
2016-25912-SPM-WLM-L2	SPM-WLM	Oystercatcher	Take, damage or destroy the nest of any wild bird	Nest destruction	Preserving air safety under section 16(1)(i)			5	02-May-17	19-May-17	31-Aug-17	19-May-17	
2016-25912-SPM-WLM-L3	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			5	02-May-17	19-May-17	31-Aug-17	19-May-17	
2016-25912-SPM-WLM-L3	SPM-WLM	Oystercatcher	Take, damage or destroy the nest of any wild bird	Nest destruction	Preserving air safety under section 16(1)(i)			2	02-May-17	19-May-17	31-Aug-17	19-May-17	
2017-27494-SPM-WLM	SPM-WLM	Black-headed gull	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			100	05-Jan-17	11-Jan-17	10-Jan-18	11-Jan-17	
2017-27494-SPM-WLM	SPM-WLM	Black-headed gull	Take or destroy an egg of a wild bird	Egg oiling/pricking	Preserving air safety under section 16(1)(i)			400	05-Jan-17	11-Jan-17	10-Jan-18	11-Jan-17	
2017-27494-SPM-WLM	SPM-WLM	Black-headed gull	Take, damage or destroy the nest of any wild bird	Nest destruction	Preserving air safety under section 16(1)(i)			100	05-Jan-17	11-Jan-17	10-Jan-18	11-Jan-17	
2017-27502-SPM-WLM	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			8	09-Jan-17	20-Jan-17	31-Jan-18	19-Jan-17	
2017-27502-SPM-WLM	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			8	09-Jan-17	20-Jan-17	31-Jan-18	19-Jan-17	
2017-27502-SPM-WLM-L2	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			8	26-Apr-17	26-Apr-17	31-Jan-18	26-Apr-17	
2017-27502-SPM-WLM-L2	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			8	26-Apr-17	26-Apr-17	31-Jan-18	26-Apr-17	
2017-27590-SPM-WLM	SPM-WLM	Kestrel	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)			5	13-Jan-17	30-Mar-17	31-Jul-17	30-Mar-17	
2017-27593-SPM-WLM	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			3	16-Jan-17	20-Jan-17	31-Mar-17	23-Jan-17	
2017-27716-SPM-WLM	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety			4	17-Jan-17	25-Jan-17	24-Jan-18	25-Jan-17	
2017-27969-SPM-WLM	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			4	06-Feb-17	17-Feb-17	31-Jan-18	16-Feb-17	
2017-27969-SPM-WLM	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)			6	06-Feb-17	17-Feb-17	31-Jan-18	16-Feb-17	
2017-27969-SPM-WLM	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			12	06-Feb-17	17-Feb-17	31-Jan-18	16-Feb-17	
2017-27969-SPM-WLM	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			10	06-Feb-17	17-Feb-17	31-Jan-18	16-Feb-17	
2017-27969-SPM-WLM	SPM-WLM	Oystercatcher	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)			6	06-Feb-17	17-Feb-17	31-Jan-18	16-Feb-17	
2017-27969-SPM-WLM	SPM-WLM	Oystercatcher	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			12	06-Feb-17	17-Feb-17	31-Jan-18	16-Feb-17	
2017-27969-SPM-WLM-L6	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			10	08-Mar-17	21-Mar-17	31-Jan-18	31-Mar-17	
2017-27969-SPM-WLM-L6	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			12	08-Mar-17	21-Mar-17	31-Jan-18	31-Mar-17	
2017-27969-SPM-WLM-L6	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)			10	08-Mar-17	21-Mar-17	31-Jan-18	31-Mar-17	
2017-27969-SPM-WLM-L6	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			10	08-Mar-17	21-Mar-17	31-Jan-18	31-Mar-17	
2017-27969-SPM-WLM-L6	SPM-WLM	Oystercatcher	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)			6	08-Mar-17	21-Mar-17	31-Jan-18	31-Mar-17	
2017-27969-SPM-WLM-L6	SPM-WLM	Oystercatcher	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			12	08-Mar-17	21-Mar-17	31-Jan-18	31-Mar-17	
2017-27969-SPM-WLM-L7	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			10	31-Mar-17	31-Mar-17	31-Jan-18	31-Mar-17	
2017-27969-SPM-WLM-L7	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			12	31-Mar-17	31-Mar-17	31-Jan-18	31-Mar-17	
2017-27969-SPM-WLM-L7	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)			10	31-Mar-17	31-Mar-17	31-Jan-18	31-Mar-17	
2017-27969-SPM-WLM-L7	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			10	31-Mar-17	31-Mar-17	31-Jan-18	31-Mar-17	
2017-27969-SPM-WLM-L7	SPM-WLM	Oystercatcher	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)			6	31-Mar-17	31-Mar-17	31-Jan-18	31-Mar-17	
2017-27969-SPM-WLM-L7	SPM-WLM	Oystercatcher	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			12	31-Mar-17	31-Mar-17	31-Jan-18	31-Mar-17	
2017-27969-SPM-WLM-L8	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			10	02-May-17	09-Jun-17	31-Jan-18	09-Jun-17	
2017-27969-SPM-WLM-L8	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			12	02-May-17	09-Jun-17	31-Jan-18	09-Jun-17	
2017-27969-SPM-WLM-L8	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)			10	02-May-17	09-Jun-17	31-Jan-18	09-Jun-17	
2017-27969-SPM-WLM-L8	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			10	02-May-17	09-Jun-17	31-Jan-18	09-Jun-17	
2017-27969-SPM-WLM-L8	SPM-WLM	Oystercatcher	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)			6	02-May-17	09-Jun-17	31-Jan-18	09-Jun-17	
2017-27969-SPM-WLM-L8	SPM-WLM	Oystercatcher	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			12	02-May-17	09-Jun-17	31-Jan-18	09-Jun-17	
2017-28453-SPM-WLM	SPM-WLM	Golden plover	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			10	07-Mar-17	15-Mar-17	30-Apr-17	15-Mar-17	
2017-28458-SPM-WLM	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			4	07-Mar-17	15-Mar-17	31-Jul-17	15-Mar-17	
2017-28501-SPM-WLM	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			3	10-Mar-17	13-Mar-17	12-Mar-18	13-Mar-17	
2017-28501-SPM-WLM	SPM-WLM	Common buzzard	Trapping	Trapping	Preserving air safety under section 16(1)(i)			3	10-Mar-17	13-Mar-17	12-Mar-18	13-Mar-17	
2017-28557-SPM-WLM	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			13	13-Mar-17	12-May-17	31-Aug-17	13-May-17	
2017-28557-SPM-WLM	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)			13	13-Mar-17	12-May-17	31-Aug-17	13-May-17	
2017-28557-SPM-WLM-L1	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			4	09-May-17	19-May-17	31-Aug-17	19-May-17	
2017-28557-SPM-WLM-L1	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)			4	09-May-17	19-May-17	31-Aug-17	19-May-17	
2017-28714-SPM-WLM	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			2	23-Mar-17	26-Apr-17	31-Dec-17	27-Apr-17	
2017-28714-SPM-WLM	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			2	23-Mar-17	26-Apr-17	31-Dec-17	27-Apr-17	
2017-28714-SPM-WLM	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	Nest destruction	Preserving air safety under section 16(1)(i)			2	23-Mar-17	26-Apr-17	31-Dec-17	27-Apr-17	
2017-28714-SPM-WLM-L2	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			2	02-May-17	24-May-17	31-Dec-17	24-May-17	
2017-28714-SPM-WLM-L2	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			2	02-May-17	24-May-17	31-Dec-17	24-May-17	
2017-28714-SPM-WLM-L2	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	Nest destruction	Preserving air safety under section 16(1)(i)			2	02-May-17	24-May-17	31-Dec-17	24-May-17	
2017-28715-SPM-WLM	SPM-WLM	Red kite	Kill, injure or take	Shooting	Preserving air safety, under section 16(1)(i)			2	23-Mar-17	26-Apr-17	31-Dec-17	27-Apr-17	
2017-28715-SPM-WLM-L2	SPM-WLM	Red kite	Kill, injure or take	Shooting	Preserving air safety, under section 16(1)(i)			2	02-May-17	24-May-17	31-Dec-17	24-May-17	
2017-28770-SPM-WLM	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)			10	22-Mar-17	14-Apr-17	31-Aug-17	13-Apr-17	
2017-28770-SPM-WLM	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			20	22-Mar-17	14-Apr-17	31-Aug-17	13-Apr-17	
2017-28788-SPM-WLM	SPM-WLM	Red kite	Kill, injure or take	Shooting	Preserving air safety, under section 16(1)(i)			3	24-Mar-17	30-Jan-18	30-Jan-19	01-Feb-18	
2017-28844-SPM-WLM	SPM-WLM	Stock dove	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			50	03-Apr-17	07-Apr-17	30-Nov-17	07-Apr-17	
2017-28889-SPM-WLM	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			4	28-Mar-17	17-May-17	30-Apr-18	17-May-17	
2017-28889-SPM-WLM	SPM-WLM	Grey heron	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			3	28-Mar-17	17-May-17	30-Apr-18	17-May-17	
2017-28889-SPM-WLM	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			6	28-Mar-17	17-May-17	30-Apr-18	17-May-17	
2017-28889-SPM-WLM	SPM-WLM	Stock dove	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			20	28-Mar-17	17-May-17	30-Apr-18	17-May-17	
2017-28898-SPM-WLM	SPM-WLM	Red kite	Take, damage or destroy an egg of a wild bird	Nest destruction	Preserving air safety, under section 16(1)(i)			4	06-Apr-17	07-Apr-17	01-May-17	10-Apr-17	
2017-28898-SPM-WLM	SPM-WLM	Red kite	Take, damage or destroy the nest of any wild bird	Nest destruction	Preserving air safety, under section 16(1)(i)			1	06-Apr-17	07-Apr-17	01-May-17	10-Apr-17	
2017-28958-SPM-WLM	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			5	07-Apr-17	19-May-17	18-May-18	19-May-17	
2017-28958-SPM-WLM	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	Nest destruction	Preserving air safety under section 16(1)(i)			2	07-Apr-17	19-May-17	18-May-18	19-May-17	
2017-28997-SPM-WLM	SPM-WLM	Mute swan	Trapping	Trapping	Preserving air safety under section 16(1)(i)			2	13-Apr-17	27-Apr-17	30-May-17	27-Apr-17	
2017-29212-SPM-WLM	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			5	26-Apr-17	15-May-17	31-Aug-17	15-May-17	
2017-29212-SPM-WLM	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	Nest destruction	Preserving air safety under section 16(1)(i)			5	26-Apr-17	15-May-17	31-Aug-17	15-May-17	
2017-29353-SPM-WLM	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			4	04-May-17	18-May-17	31-Aug-18	18-May-17	
2017-29353-SPM-WLM	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			2	04-May-17	18-May-17	17-May-18	18-May-17	
2017-29981-SPM-WLM	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			5	07-Jun-17	13-Jun-17			



2016-22995-SPM-WLM-M	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)				5	12-May-16	12-May-16	31-Aug-16	03-Aug-16
2016-22995-SPM-WLM-M	SPM-WLM	Curlew	Take or destroy an egg of a wild bird	Egg oiling/pricking	Preserving air safety under section 16(1)(i)				5	12-May-16	12-May-16	31-Aug-16	03-Aug-16
2016-22995-SPM-WLM-M	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	Nest destruction	Preserving air safety under section 16(1)(i)				5	12-May-16	12-May-16	31-Aug-16	03-Aug-16
2016-22995-SPM-WLM-M	SPM-WLM	Oystercatcher	Take or destroy an egg of a wild bird	Egg oiling/pricking	Preserving air safety under section 16(1)(i)			10	12-May-16	12-May-16	31-Aug-16	03-Aug-16	03-Aug-16
2016-22995-SPM-WLM-M	SPM-WLM	Oystercatcher	Take, damage or destroy the nest of any wild bird	Nest destruction	Preserving air safety under section 16(1)(i)			2	12-May-16	12-May-16	31-Aug-16	03-Aug-16	03-Aug-16
2016-23256-SPM-WLM	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			5	14-Apr-16	29-Apr-16	31-Aug-16	29-Apr-16	29-Apr-16
2016-23256-SPM-WLM	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	Nest destruction	Preserving air safety under section 16(1)(i)			5	14-Apr-16	29-Apr-16	31-Aug-16	29-Apr-16	29-Apr-16
2016-23548-SPM-WLM	SPM-WLM	Great black-backed gull	Kill, damage or destroy the nest of any wild bird	Nest destruction	Preserving air safety under section 16(1)(i)			5	26-Apr-16	11-May-16	31-Aug-16	11-May-16	11-May-16
2016-23548-SPM-WLM	SPM-WLM	Great black-backed gull	Take, injure or take	Shooting	Preserving air safety under section 16(1)(i)			5	26-Apr-16	11-May-16	31-Aug-16	11-May-16	11-May-16
2016-23548-SPM-WLM	SPM-WLM	Great black-backed gull	Take or destroy an egg of a wild bird	Egg oiling/pricking	Preserving air safety under section 16(1)(i)			10	26-Apr-16	11-May-16	31-Aug-16	11-May-16	11-May-16
2016-23548-SPM-WLM	SPM-WLM	Herring gull	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			50	26-Apr-16	11-May-16	31-Aug-16	11-May-16	11-May-16
2016-23548-SPM-WLM	SPM-WLM	Herring gull	Take or destroy an egg of a wild bird	Egg oiling/pricking	Preserving air safety under section 16(1)(i)			100	26-Apr-16	11-May-16	31-Aug-16	11-May-16	11-May-16
2016-23548-SPM-WLM	SPM-WLM	Herring gull	Take, damage or destroy the nest of any wild bird	Nest destruction	Preserving air safety under section 16(1)(i)			50	26-Apr-16	11-May-16	31-Aug-16	11-May-16	11-May-16
2016-23548-SPM-WLM-M	SPM-WLM	Great black-backed gull	Take, damage or destroy the nest of any wild bird	Nest destruction	Preserving air safety under section 16(1)(i)			5	11-May-16	11-May-16	31-Aug-16	11-May-16	11-May-16
2016-23548-SPM-WLM-M	SPM-WLM	Great black-backed gull	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			5	11-May-16	11-May-16	31-Aug-16	11-May-16	11-May-16
2016-23548-SPM-WLM-M	SPM-WLM	Great black-backed gull	Take or destroy an egg of a wild bird	Egg oiling/pricking	Preserving air safety under section 16(1)(i)			10	11-May-16	11-May-16	31-Aug-16	11-May-16	11-May-16
2016-23548-SPM-WLM-M	SPM-WLM	Herring gull	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			50	11-May-16	11-May-16	31-Aug-16	11-May-16	11-May-16
2016-23548-SPM-WLM-M	SPM-WLM	Herring gull	Take or destroy an egg of a wild bird	Egg oiling/pricking	Preserving air safety under section 16(1)(i)			100	11-May-16	11-May-16	31-Aug-16	11-May-16	11-May-16
2016-23548-SPM-WLM-M	SPM-WLM	Herring gull	Take, damage or destroy the nest of any wild bird	Nest destruction	Preserving air safety under section 16(1)(i)			50	11-May-16	11-May-16	31-Aug-16	11-May-16	11-May-16
2016-23706-SPM-WLM	SPM-WLM	Canada goose	Kill, injure or take	Round up and cull	Preserving air safety under section 16(1)(i)			400	06-May-16	13-Jun-16	22-Jul-16	08-Jun-16	08-Jun-16
2016-23717-SPM-WLM	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			5	27-Apr-16	09-May-16	08-May-17	09-May-16	09-May-16
2016-23717-SPM-WLM	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			5	27-Apr-16	09-May-16	08-May-17	09-May-16	09-May-16
2016-23717-SPM-WLM	SPM-WLM	Stock dove	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			20	27-Apr-16	09-May-16	08-May-17	09-May-16	09-May-16
2016-23927-SPM-WLM	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			5	13-May-16	13-Jun-16	12-Jun-17	15-Jun-16	15-Jun-16
2016-24707-SPM-WLM	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			5	27-Jun-16	07-Jul-16	06-Jul-17	07-Jul-16	07-Jul-16
2016-24707-SPM-WLM	SPM-WLM	Grey heron	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			1	27-Jun-16	07-Jul-16	06-Jul-17	07-Jul-16	07-Jul-16
2016-24707-SPM-WLM	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			1	27-Jun-16	07-Jul-16	06-Jul-17	07-Jul-16	07-Jul-16
2015-17187-SPM-WLM-M	SPM-WLM	Red kite	Kill, injure or take	Shooting	Preserving air safety, under section 16(1)(i)			3	25-Aug-16	26-Aug-16	01-Nov-16	26-Aug-16	26-Aug-16
2016-20688-SPM-WLM-M	SPM-WLM	Grey heron	Kill, injure or take	Shooting	Preserving air safety, under section 16(1)(i)			2	22-Oct-16	04-Feb-16	30-Nov-16	23-Dec-16	23-Dec-16
2016-22175-SPM-WLM-M	SPM-WLM	Mute swan	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			2	22-Oct-16	10-Jan-17	09-Jan-18	10-Jan-17	10-Jan-17
2016-22905-SPM-WLM-M	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			2	21-Nov-16	21-Nov-16	31-Mar-17	21-Nov-16	21-Nov-16
2016-22905-SPM-WLM-M	SPM-WLM	Grey heron	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			3	21-Nov-16	21-Nov-16	31-Mar-17	21-Nov-16	21-Nov-16
2016-22905-SPM-WLM-M	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			2	21-Nov-16	21-Nov-16	31-Mar-17	21-Nov-16	21-Nov-16
2016-22905-SPM-WLM-M	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			3	21-Nov-16	21-Nov-16	31-Mar-17	21-Nov-16	21-Nov-16
2016-22905-SPM-WLM-M	SPM-WLM	Stock dove	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			4	21-Nov-16	21-Nov-16	31-Mar-17	21-Nov-16	21-Nov-16
2016-22905-SPM-WLM-M	SPM-WLM	Stock dove	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			30	21-Nov-16	21-Nov-16	31-Mar-17	21-Nov-16	21-Nov-16
2016-22905-SPM-WLM-M	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			2	22-Nov-16	22-Nov-16	31-Mar-17	22-Nov-16	22-Nov-16
2016-22905-SPM-WLM-M	SPM-WLM	Grey heron	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			3	22-Nov-16	22-Nov-16	31-Mar-17	22-Nov-16	22-Nov-16
2016-22905-SPM-WLM-M	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			2	22-Nov-16	22-Nov-16	31-Mar-17	22-Nov-16	22-Nov-16
2016-22905-SPM-WLM-M	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			4	22-Nov-16	22-Nov-16	31-Mar-17	22-Nov-16	22-Nov-16
2016-22905-SPM-WLM-M	SPM-WLM	Stock dove	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			30	22-Nov-16	22-Nov-16	31-Mar-17	22-Nov-16	22-Nov-16
2016-23717-SPM-WLM-M	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			5	19-Dec-16	20-Dec-16	08-May-17	20-Dec-16	20-Dec-16
2016-23717-SPM-WLM-M	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			5	19-Dec-16	20-Dec-16	08-May-17	20-Dec-16	20-Dec-16
2016-23717-SPM-WLM-M	SPM-WLM	Stock dove	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			20	19-Dec-16	20-Dec-16	08-May-17	20-Dec-16	20-Dec-16
2016-25089-SPM-WLM	SPM-WLM	Stock dove	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			5	22-Jul-16	28-Sep-16	25-Sep-17	26-Sep-16	26-Sep-16
2016-25094-SPM-WLM	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety			2	22-Jul-16	28-Sep-16	25-Sep-17	26-Sep-16	26-Sep-16
2016-25676-SPM-WLM	SPM-WLM	Barnacle goose	Take or destroy an egg of a wild bird	Egg oiling/pricking	Damage/H&S/Air safety			300	24-Aug-16	01-Feb-17	31-Jul-18	16-Nov-16	16-Nov-16
2016-25676-SPM-WLM	SPM-WLM	Mallard	Take or destroy an egg of a wild bird	Egg oiling/pricking	Damage/H&S/Air safety			2000	24-Aug-16	01-Feb-17	31-Jul-18	16-Nov-16	16-Nov-16
2016-25912-SPM-WLM	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			5	05-Sep-16	01-Apr-17	31-Aug-17	11-Oct-16	11-Oct-16
2016-25912-SPM-WLM	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	Nest destruction	Preserving air safety under section 16(1)(i)			5	05-Sep-16	01-Apr-17	31-Aug-17	11-Oct-16	11-Oct-16
2016-25912-SPM-WLM	SPM-WLM	Oystercatcher	Take, damage or destroy the nest of any wild bird	Nest destruction	Preserving air safety under section 16(1)(i)			2	05-Sep-16	01-Apr-17	31-Aug-17	11-Oct-16	11-Oct-16
2016-26185-SPM-WLM	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			4	13-Sep-16	01-Apr-17	31-Aug-17	09-Mar-17	09-Mar-17
2016-26185-SPM-WLM	SPM-WLM	Curlew	Take or destroy an egg of a wild bird	By hand	Preserving air safety under section 16(1)(i)			16	13-Sep-16	01-Apr-17	31-Aug-17	09-Mar-17	09-Mar-17
2016-26185-SPM-WLM	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)			4	13-Sep-16	01-Apr-17	31-Aug-17	09-Mar-17	09-Mar-17
2016-26185-SPM-WLM	SPM-WLM	Oystercatcher	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			4	13-Sep-16	01-Apr-17	31-Aug-17	09-Mar-17	09-Mar-17
2016-26185-SPM-WLM	SPM-WLM	Oystercatcher	Take or destroy an egg of a wild bird	By hand	Preserving air safety under section 16(1)(i)			16	13-Sep-16	01-Apr-17	31-Aug-17	09-Mar-17	09-Mar-17
2016-26185-SPM-WLM	SPM-WLM	Oystercatcher	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)			2	13-Sep-16	01-Apr-17	31-Aug-17	09-Mar-17	09-Mar-17
2016-26186-SPM-WLM	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			4	13-Sep-16	01-Apr-17	31-Aug-17	09-Mar-17	09-Mar-17
2016-26186-SPM-WLM	SPM-WLM	Curlew	Take or destroy an egg of a wild bird	By hand	Preserving air safety under section 16(1)(i)			16	13-Sep-16	01-Apr-17	31-Aug-17	09-Mar-17	09-Mar-17
2016-26186-SPM-WLM	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)			4	13-Sep-16	01-Apr-17	31-Aug-17	09-Mar-17	09-Mar-17
2016-26186-SPM-WLM	SPM-WLM	Oystercatcher	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			4	13-Sep-16	01-Apr-17	31-Aug-17	09-Mar-17	09-Mar-17
2016-26186-SPM-WLM	SPM-WLM	Oystercatcher	Take or destroy an egg of a wild bird	By hand	Preserving air safety under section 16(1)(i)			16	13-Sep-16	01-Apr-17	31-Aug-17	09-Mar-17	09-Mar-17
2016-26186-SPM-WLM	SPM-WLM	Oystercatcher	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)			2	13-Sep-16	01-Apr-17	31-Aug-17	09-Mar-17	09-Mar-17
2016-26214-SPM-WLM	SPM-WLM	Great black-backed gull	Take or destroy an egg of a wild bird	Egg oiling/pricking	Preserving air safety under section 16(1)(i)			10	21-Sep-16	01-Apr-17	31-Aug-17	27-Sep-16	27-Sep-16
2016-26214-SPM-WLM	SPM-WLM	Great black-backed gull	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			5	21-Sep-16	01-Apr-17	31-Aug-17	27-Sep-16	27-Sep-16
2016-26214-SPM-WLM	SPM-WLM	Great black-backed gull	Take, damage or destroy the nest of any wild bird	Nest destruction	Preserving air safety under section 16(1)(i)			5	21-Sep-16	01-Apr-17	31-Aug-17	27-Sep-16	27-Sep-16
2016-26214-SPM-WLM	SPM-WLM	Herring gull	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			50	21-Sep-16	01-Apr-17	31-Aug-17	27-Sep-16	27-Sep-16
2016-26214-SPM-WLM	SPM-WLM	Herring gull	Take or destroy an egg of a wild bird	Egg oiling/pricking	Preserving air safety under section 16(1)(i)			100	21-Sep-16	01-Apr-17	31-Aug-17	27-Sep-16	27-Sep-16
2016-26214-SPM-WLM	SPM-WLM	Herring gull	Take, damage or destroy the nest of any wild bird	Nest destruction	Preserving air safety under section 16(1)(i)			50	21-Sep-16	01-Apr-17	31-Aug-17	27-Sep-16	27-Sep-16
2016-26446-SPM-WLM	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			6	06-Oct-16	08-Feb-17	31-Aug-17	08-Feb-17	08-Feb-17
2016-26447-SPM-WLM	SPM-WLM	Curlew	Take or destroy an egg of a wild bird	Egg oiling/pricking	Preserving air safety under section 16(1)(i)			15	06-Oct-16	08-Feb-17	31-Aug-17	08-Feb-17	08-Feb-17
2016-26447-SPM-WLM	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	Nest destruction	Preserving air safety under section 16(1)(i)			3	06-Oct-16	08-Feb-17	31-Aug-17	08-Feb-17	08-Feb-17
2016-26463-SPM-WLM	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			2	20-Sep-16	21-Oct-16	20-Oct-17	21-Oct-16	21-Oct-16
2016-26463-SPM-WLM-M	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			2	22-Oct-16	10-Jan-17	09-Jan-18	10-Jan-17	10-Jan-17
2016-26715-SPM-WLM	SPM-WLM	Red kite	Kill, injure or take	Shooting	Preserving air safety, under section 16(1)(i)			3	26-Oct-16	17-Nov-16	17-Nov-16	17-Nov-16	17-Nov-16
2016-27132-SPM-WLM	SPM-WLM	Robin	Trapping	Trapping	Preserving air safety under section 16(1)(i)			1	07-Dec-16	15-Dec-16	31-Jan-17	15-Dec-16	15-Dec-16
2016-27152-SPM-WLM	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			10	08-Dec-16	17-Mar-17	31-Jan-18	16-Mar-17	16-Mar-17
2016-27356-SPM-WLM	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			12	06-Dec-16	10-Jan-17	09-Jan-18	10-Jan-17	10-Jan-17
2016-27361-SPM-WLM	SPM-WLM	Red kite	Kill, injure or take	Shooting	Preserving air safety, under section 16(1)(i)			3	06-Dec-16	23-Dec-16	30-Nov-17	23-Dec-16	23-Dec-16
2016-27361-SPM-WLM-M	SPM-WLM	Red kite	Kill, injure or take	Shooting	Preserving air safety, under section 16(1)(i)			3	22-Dec-16	10-Jan-17	09-Jan-18	10-Jan-17	10-Jan-17
2016-27364-SPM-WLM	SPM-WLM	Stock dove	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			10	06-Dec-16	10-Jan-17	09-Jan-18	10-Jan-17	10-Jan-17
2016-27367-SPM-WLM	SPM-WLM	Grey heron	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			2	06-Dec-16	10-Jan-17	09-Jan-18	10-Jan-17	10-Jan-17
2017-28601-SPM-WLM	SPM-WLM	Red kite	Kill, injure or take	Shooting	Preserving air safety, under section 16(1)(i)			10	08-Dec-16	17-Mar-17	31-Jan-18	16-Mar-17	16-Mar-17
2015-14177-SPM-WLM	SPM-WLM	Stock dove	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			10	30-Jul-15				

2015-7321-SPM-WLM	SPM-WLM	Grey heron	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			2	15-Jan-15	29-Jan-15	28-Jan-16	02-Feb-15
2015-7323-SPM-WLM	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			10	14-Jan-15	29-Jan-15	29-Jan-15	
2015-8541-SPM-WLM	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			9	20-Feb-15	22-May-15	05-May-16	28-Aug-15
2015-9475-SPM-WLM	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			5	13-Mar-15	05-May-15	31-Aug-15	05-May-15
2015-9475-SPM-WLM	SPM-WLM	Curlew	Take or destroy an egg of a wild bird	Egg oiling/pricking	Preserving air safety under section 16(1)(i)			5	13-Mar-15	05-May-15	31-Aug-15	05-May-15
2015-9475-SPM-WLM	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	Nest destruction	Preserving air safety under section 16(1)(i)			5	13-Mar-15	05-May-15	31-Aug-15	05-May-15
2015-9881-SPM-WLM	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			2	19-Mar-15	04-Apr-15	03-Apr-16	31-Mar-15
2015-9881-SPM-WLM	SPM-WLM	Grey heron	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			9	19-Mar-15	04-Apr-15	03-Apr-16	31-Mar-15
2015-9881-SPM-WLM	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			4	19-Mar-15	04-Apr-15	03-Apr-16	31-Mar-15
2015-9881-SPM-WLM	SPM-WLM	Stock dove	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			30	19-Mar-15	04-Apr-15	03-Apr-16	31-Mar-15
2015-9920-SPM-WLM	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			5	25-Mar-15	06-May-15	30-Apr-16	06-May-15
2015-9920-SPM-WLM	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			5	25-Mar-15	06-May-15	30-Apr-16	06-May-15
2015-9920-SPM-WLM	SPM-WLM	Stock dove	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			20	25-Mar-15	06-May-15	30-Apr-16	06-May-15
2015-9920-SPM-WLM-1	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			5	14-May-15	19-May-15	30-Apr-16	19-May-15
2015-9920-SPM-WLM-1	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			5	14-May-15	19-May-15	30-Apr-16	19-May-15
2015-9920-SPM-WLM-1	SPM-WLM	Stock dove	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			20	14-May-15	19-May-15	30-Apr-16	19-May-15
2015-9922-SPM-WLM	SPM-WLM	Golden plover	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			50	25-Mar-15	06-May-15	31-Aug-15	06-May-15
2014-1243-SPM-WLM	SPM-WLM	Pied wagtail	Take or destroy an egg of a wild bird	By hand	Preserving air safety under section 16(1)(i)			6	29-May-14	29-May-14	30-Jun-14	18-Jul-14
2014-1243-SPM-WLM	SPM-WLM	Pied wagtail	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)			1	29-May-14	29-May-14	30-Jun-14	18-Jul-14
2014-1326-SPM-WLM	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			6	27-May-14	06-Jun-14	05-Jun-15	13-Jun-14
2014-1326-SPM-WLM	SPM-WLM	Common buzzard	Kill, injure or take	Trapping	Preserving air safety under section 16(1)(i)			6	27-May-14	06-Jun-14	05-Jun-15	13-Jun-14
2014-1410-SPM-WLM	SPM-WLM	Canada goose	Kill, injure or take	By hand	Preserving air safety under section 16(1)(i)			150	03-Jun-14	23-Jun-14	01-Jul-14	23-Jun-14
2014-1410-SPM-WLM	SPM-WLM	Canada goose	Kill, injure or take	By hand	Preserving air safety under section 16(1)(i)			150	03-Jun-14	23-Jun-14	01-Jul-14	23-Jun-14
2014-145-SPM-WLM	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			5	26-Mar-14	29-Apr-14	31-Aug-14	16-May-14
2014-145-SPM-WLM	SPM-WLM	Curlew	Take or destroy an egg of a wild bird	Egg oiling/pricking	Preserving air safety under section 16(1)(i)			5	26-Mar-14	29-Apr-14	31-Aug-14	16-May-14
2014-145-SPM-WLM	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	Nest destruction	Preserving air safety under section 16(1)(i)			5	26-Mar-14	29-Apr-14	31-Aug-14	16-May-14
2014-174-SPM-WLM	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			20	24-Mar-14	08-Apr-14	31-Aug-14	09-Apr-14
2014-174-SPM-WLM	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)			10	24-Mar-14	08-Apr-14	31-Aug-14	09-Apr-14
2014-187-SPM-WLM	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			4	27-Mar-14	04-May-14	30-Sep-14	30-May-14
2014-354-SPM-WLM	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			8	04-Apr-14	08-May-14	29-Jan-15	09-May-14
2014-354-SPM-WLM-1	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			10	15-May-14	08-May-14	29-Jan-15	15-May-14
2014-3843-SPM-WLM	SPM-WLM	Swallow	Take or destroy an egg of a wild bird	By hand	Preserving air safety under section 16(1)(i)			10	18-Feb-14	30-May-14	31-Aug-14	08-Sep-14
2014-3843-SPM-WLM	SPM-WLM	Swallow	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)			2	18-Feb-14	30-May-14	31-Aug-14	08-Sep-14
2014-415-SPM-WLM	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			2	02-Apr-14	04-Apr-14	03-Apr-15	09-Apr-14
2014-415-SPM-WLM	SPM-WLM	Grey heron	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			3	02-Apr-14	04-Apr-14	03-Apr-15	09-Apr-14
2014-415-SPM-WLM	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			4	02-Apr-14	04-Apr-14	03-Apr-15	09-Apr-14
2014-415-SPM-WLM	SPM-WLM	Stock dove	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			30	02-Apr-14	04-Apr-14	03-Apr-15	09-Apr-14
2014-427-SPM-WLM	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			20	09-Apr-14	09-Apr-14	31-Aug-14	09-Apr-14
2014-427-SPM-WLM	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)			10	09-Apr-14	09-Apr-14	31-Aug-14	09-Apr-14
2014-66-SPM-WLM	SPM-WLM	Golden plover	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			19	19-Mar-14	01-Feb-14	31-Aug-14	23-Dec-14
2015-8072-SPM-WLM	SPM-WLM	Greylag goose	Take or destroy an egg of a wild bird	Egg oiling/pricking	Preserving air safety under section 16(1)(i)			100	01-Mar-14	24-Mar-14	31-May-14	30-Jan-15
2015-8072-SPM-WLM	SPM-WLM	Greylag goose	Take or destroy an egg of a wild bird	Egg oiling/pricking	Preserving air safety under section 16(1)(i)			100	01-Mar-14	24-Mar-14	31-May-14	30-Jan-15
GSWLM/2014/0149	SPM-WLM	Greylag goose	Kill, injure or take	Shooting	Damage/H&S/Air safety				17-Apr-14			09-Nov-15
OBWLM/2013/1506	SPM-WLM	Oystercatcher	Take, damage or destroy the nest of any wild bird	By hand	Damage/H&S/Air safety			5	10-Apr-14	10-Apr-2014	31-Dec-2014	12-Nov-14
OBWLM/2014/0112	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			4	05-Feb-14			02-Jan-15
OBWLM/2014/0113	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)			2	05-Feb-14			02-Jan-15
OBWLM/2014/0116	SPM-WLM	Curlew	Kill, injure or take	Shooting	Damage/H&S/Air safety			4	08-Jan-14	01-Apr-2014	31-Aug-2014	03-Oct-14
OBWLM/2014/0119	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	By hand	Damage/H&S/Air safety			2	08-Jan-14	01-Apr-2014	31-Aug-2014	03-Oct-14
OBWLM/2014/0120	SPM-WLM	Oystercatcher	Take, damage or destroy the nest of any wild bird	Nest destruction	Damage/H&S/Air safety			2	08-Jan-14	01-Apr-2014	31-Aug-2014	03-Oct-14
2014-1326-SPM-WLM-1	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			6	01-Jul-14	14-Oct-14	05-Jun-15	14-Oct-14
2014-1326-SPM-WLM-1	SPM-WLM	Common buzzard	Kill, injure or take	Trapping	Preserving air safety under section 16(1)(i)			6	01-Jul-14	14-Oct-14	05-Jun-15	14-Oct-14
2014-1326-SPM-WLM-2	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			6	06-Oct-14	20-Oct-14	05-Jun-15	24-Oct-14
2014-1326-SPM-WLM-2	SPM-WLM	Common buzzard	Kill, injure or take	Trapping	Preserving air safety under section 16(1)(i)			6	06-Oct-14	20-Oct-14	05-Jun-15	24-Oct-14
2014-2188-SPM-WLM	SPM-WLM	Stock dove	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			30	15-Jul-14	01-Aug-14	31-Dec-14	04-Aug-15
2014-354-SPM-WLM-2	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			12	13-Nov-14	13-Nov-14	29-Jan-15	13-Nov-14
2014-3989-SPM-WLM	SPM-WLM	Swallow	Take or destroy an egg of a wild bird	By hand	Preserving air safety under section 16(1)(i)			10	02-Sep-14	03-Jun-14	31-Aug-14	17-Sep-14
2014-3989-SPM-WLM	SPM-WLM	Swallow	Take, damage or destroy the nest of any wild bird	Nest destruction	Preserving air safety under section 16(1)(i)			2	02-Sep-14	03-Jun-14	31-Aug-14	17-Sep-14
2014-4066-SPM-WLM	SPM-WLM	Red kite	Kill, injure or take	Shooting	Preserving air safety, under section 16(1)(i)			2	09-Sep-14	25-Sep-14	24-Sep-15	28-Oct-14
2014-4129-SPM-WLM	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety			3	10-Sep-14	25-Sep-14	24-Sep-15	25-Sep-14
2014-4133-SPM-WLM	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety			5	10-Sep-14	25-Sep-14	24-Sep-15	25-Sep-14
2014-415-SPM-WLM-1	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			2	01-Oct-14	04-Apr-14	03-Apr-15	01-Oct-14
2014-415-SPM-WLM-1	SPM-WLM	Grey heron	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			3	01-Oct-14	04-Apr-14	03-Apr-15	01-Oct-14
2014-415-SPM-WLM-1	SPM-WLM	Kestrel	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			4	01-Oct-14	04-Apr-14	03-Apr-15	01-Oct-14
2014-415-SPM-WLM-1	SPM-WLM	Stock dove	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			40	01-Oct-14	04-Apr-14	03-Apr-15	01-Oct-14
2014-4794-SPM-WLM	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			4	12-Sep-14	01-Apr-15	31-Aug-15	16-Mar-15
2014-4794-SPM-WLM	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)			2	12-Sep-14	01-Apr-15	31-Aug-15	16-Mar-15
2014-4794-SPM-WLM	SPM-WLM	Oystercatcher	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			4	12-Sep-14	01-Apr-15	31-Aug-15	16-Mar-15
2014-4794-SPM-WLM	SPM-WLM	Oystercatcher	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)			2	12-Sep-14	01-Apr-15	31-Aug-15	16-Mar-15
2014-4808-SPM-WLM	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety			4	10-Oct-14	20-Nov-14	19-Nov-15	20-Nov-14
2014-5046-SPM-WLM	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			20	13-Oct-14	04-Apr-15	31-Aug-15	02-Apr-15
2014-5046-SPM-WLM	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)			10	13-Oct-14	04-Apr-15	31-Aug-15	02-Apr-15
2014-5191-SPM-WLM	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			10	10-Sep-14	01-Apr-15	31-Aug-15	06-Aug-15
2014-5191-SPM-WLM	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	Egg oiling/pricking	Preserving air safety under section 16(1)(i)			5	10-Sep-14	01-Apr-15	31-Aug-15	06-Aug-15
2014-6459-SPM-WLM	SPM-WLM	Oystercatcher	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			6	13-Nov-14	01-Jan-15	31-Dec-15	15-Jan-15
2014-6459-SPM-WLM	SPM-WLM	Oystercatcher	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)			5	13-Nov-14	01-Jan-15	31-Dec-15	15-Jan-15
2014-6460-SPM-WLM	SPM-WLM	Greylag goose	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			6	13-Nov-14	01-Jan-15	31-Dec-15	15-Jan-15
2015-12615-SPM-WLM	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			6	23-Dec-14	22-Jun-15	31-Aug-15	22-Jun-15
2015-12617-SPM-WLM	SPM-WLM	Curlew	Take or destroy an egg of a wild bird	Egg oiling/pricking	Preserving air safety under section 16(1)(i)			15	23-Dec-14	22-Jun-15	31-Aug-15	22-Jun-15
2015-12617-SPM-WLM	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	Nest destruction	Preserving air safety under section 16(1)(i)			3	23-Dec-14	22-Jun-15	31-Aug-15	22-Jun-15
2015-6682-SPM-WLM	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)			2	12-Sep-14	01-Mar-15	31-Aug-15	16-Mar-15
2015-6682-SPM-WLM	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			4	12-Sep-14	01-Mar-15	31-Aug-15	16-Mar-15
2015-6704-SPM-WLM	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			4	12-Sep-14	01-Apr-15	31-Aug-15	16-Mar-15
2015-6704-SPM-WLM	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)			2	12-Sep-14	01-Apr-15	31-Aug-15	16-Mar-15
2015-6704-SPM-WLM	SPM-WLM	Oystercatcher	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			4	12-Sep-14	01-Apr-15	31-Aug-15	16-Mar-15
2015-6704-SPM-WLM	SPM-WLM	Oystercatcher	Take, damage or destroy the nest of any wild bird	By hand	Preserving air safety under section 16(1)(i)			2	12-Sep-14	01-Apr-15	31-Aug-15	16-Mar-15
2015-6843-SPM-WLM	SPM-WLM	Common buzzard	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			3	29-Dec-14	20-Feb-15	20-Feb-16	20-Feb-15
GSWLM/2014/0167	SPM-WLM	Barnacle goose	Take or destroy an egg of a wild bird	Egg oiling/pricking	Damage/H&S/Air safety			150	18-Aug-14	01-Feb-2014	31-Aug-2015	17-Oct-14
OBWLM/2013/0325	SPM-WLM	Curlew	Kill, injure or take	Shooting	Preserving air safety under section 16(1)(i)			10	23-Dec-14			24-Dec-14
OBWLM/2013/0326	SPM-WLM	Curlew	Take, damage or destroy the nest of any wild bird	Nest destruction	Preserving air safety under section 16(1)(i)			5	23-Dec-14			24-Dec-14
OBWLM/2014/0117	SPM-WLM	Oystercatcher	Kill, injure or take	Shooting	Damage/H&S/Air safety			4	12-Sep-14	01-Apr-2014	31-Aug-2014	18-Nov-14
OBWLM/2014/0124	SPM-WLM	Curlew	Kill, injure or take	Shooting	Damage/H&S/Air safety			4	12-Sep-14			22-Sep-14
OBWLM/2014/0124-0-0-0-1	SPM-WLM	Curlew	Kill, injure or take	Shooting	Damage/H&S/Air safety			4	12-Sep-14	01-Apr-14	31-Aug-14	22-Sep-14
OBWLM/2014/0125-0-0-0-1	SPM-WLM	Oystercatcher	Kill, injure or take	Shooting								