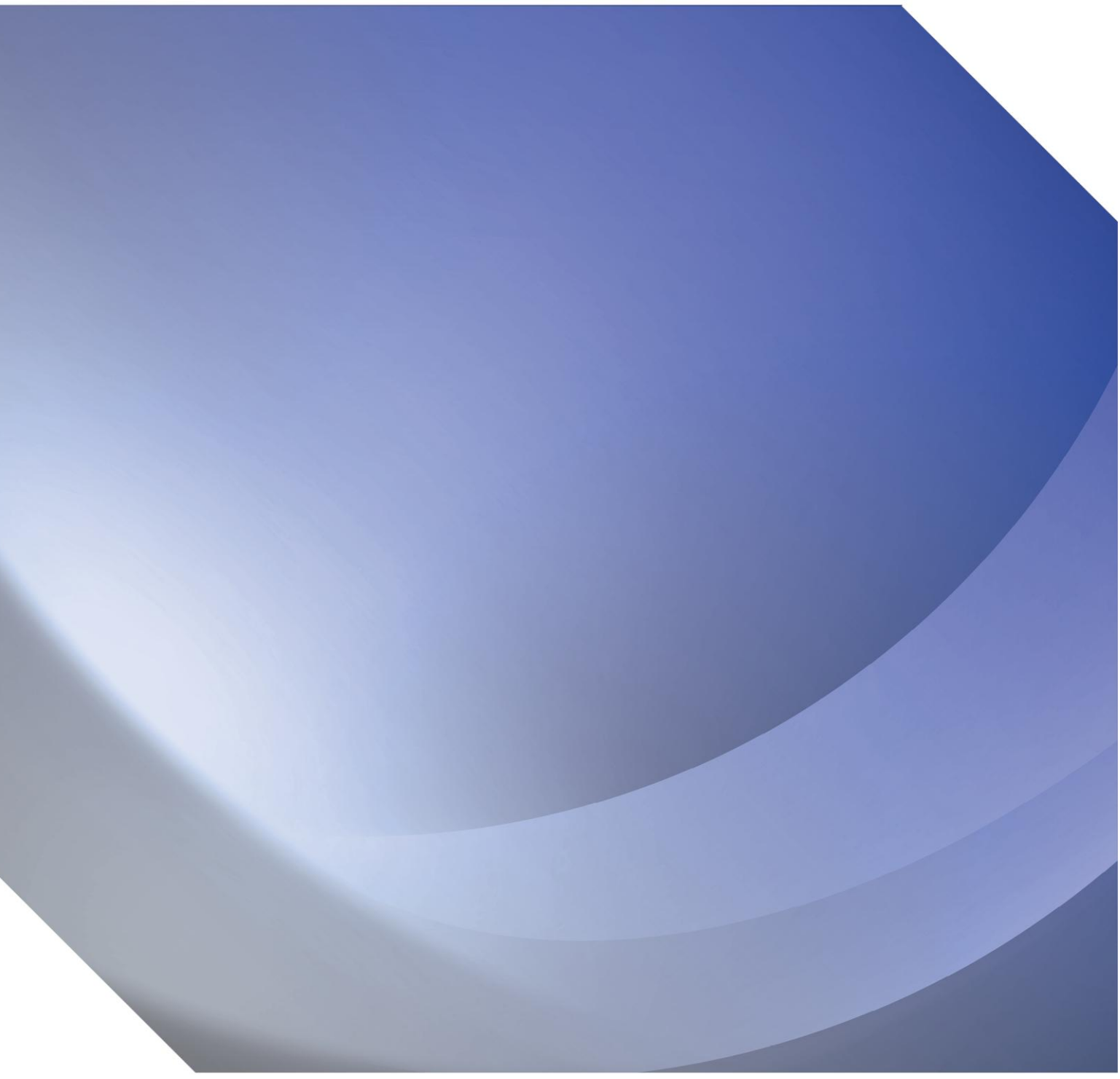
Report of the CAA's Post Implementation Review of the implementation of RNAV-1 Standard Instrument Departures at Gatwick Airport

CAP 1346



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Contents

Contents **3**

Chapter 1 **7**

Executive summary 7

Chapter 2 **12**

Scope and Objectives of the Post Implementation Review 12

What is a Post Implementation Review? 12

Particular features of this PIR 14

Chapter 3 **16**

Relevant background information and chronology 16

What is a SID 16

Nominal SID tracks over the ground 16

Actual aircraft tracks over the ground 18

What is a Route? 20

What is an NPR and what is tactical vectoring? 20

What are dispersion, concentration and respite? 22

What is FAS? 23

Background and Chronology to the airspace change decision that is the subject of this PIR 25

Other events taking place in the same time frame 30

Chapter 4 **32**

Regulatory Background to the CAA's Decision dated 14 August 2013 that is the subject of this Post Implementation Review 32

The CAA's approach under section 70 of the Transport Act to airspace change proposals 33

The efficient use of airspace 33

Environmental objectives 33

General Government Guidance 39

The Secretary of State's Directions to the CAA 42

International Requirements 43

Chapter 5 **45**
CAA Policy background to decision and review 45
Future Airspace Strategy 45
The CAA's policy as to changes in airspace 48
Chapter 6 **51**
Summary of decision and therefore of the airspace change approved 51
Gatwick's proposal and its objectives 51
The CAA's decision on the proposal 52
The impacts that we anticipated 53
Chapter 7 **59**
Post implementation conditions and actions 59
Post implementation conditions contained in the decision letter 59
Gatwick's consultation 23 May – 14 August 2014 following the CAA's decision 62
Chapter 8 **63**
CAA work undertaken during the review 63
Sources of information 63
Gatwick – the airspace change sponsor 63
Operators and Airlines 63
NATS 63
Groups and residents local to Gatwick Airport 63
Other information 65
Actions carried out by the CAA during this PIR 65
PIR Route Analysis report 65
PIR Environmental Analysis report 65
PIR Operational and Technical report 66
PIR Correspondence Assessment 66
CAA IFP Recommendations report 67

Chapter 9 **68**

CAA observations and conclusions on the information analysed 68

CAA findings common to all routes 69

Post change coincidence of aircraft mean track with the nominal track RNAV-1 SID above 4000ft AMSL 69

Environmental impact of the change 70

Route 1 72

Route 2 75

Route 3 79

Route 4 83

Route 5 87

Route 6 90

Route 7 93

Route 8 97

Route 9 100

Chapter 10 **102**

Options for Requirements and Recommendations and Final Conclusions, Requirements and Recommendation 102

General decisions 103

No interim suspension of RNAV-1 SIDs 104

No modifications required to the RNAV-1 SIDs to plan in, or design, respite for local communities near to where aircraft fly at lower levels below 4000ft AMSL 104

The conventional SIDs 105

Route specific decisions 106

Route 1 106

Route 2 106

Route 3 107

Route 4 108

Route 5 109

Route 6 110

Route 7 110

Route 8 111

Route 9 112

Decisions in respect of Gatwick's fulfilment of the conditions of the original decisions 112

Communications with Gatwick regarding the conclusions, requirements and recommendations of this PIR 113

Chapter 11 **114**

Feedback and Challenge to the CAA. Learning by the CAA. Improvements put in place by the CAA 114

Why has this process taken so long and will the next PIR take such a long time? 114

What practical lessons have we learned from this exercise? 115

We have received feedback that the delay in publishing this report has lead to concerns that the conclusions of the report will not be fair and reasoned 116

Consumer Panel 116

Plain language 117

Chapter 12 **119**

Information gathered by the CAA from the correspondence and from carrying out this review not directly related to the functions of a PIR 119

How to provide feedback on the form and content of this Post Implementation Review 121

List of Figures **122**

List of Annexes **123**

List of Attachments **123**

Glossary **124**

Chapter 1

Executive summary

1.1 The CAA's airspace change process is a seven-stage mechanism that is set out in detail in CAP 725.[1] Under this process Gatwick submitted proposals to the CAA to replicate the existing conventional Standard Instrument Departure (SID) procedures with revised procedures that utilise the improved navigational capabilities associated with Area Navigation (RNAV-1) technology. Stage 7 of this process is a Post Implementation Review (PIR) that normally begins one year after introduction of the revised procedures. The CAA commenced the PIR of the impact of its decision to approve RNAV-1 SIDs at Gatwick Airport on 7 November 2014. The content and outcome of that review process by the CAA is discussed in detail in this report including its annexes.

1.2 During the review process, the CAA considered all the material produced by Gatwick, NATS and aircraft operators in compliance with the CAA's guidance on carrying out a PIR as well as material provided by groups and residents. The CAA has considered this material in the context of the legal framework including the 2001 Air Navigation Directions from the Secretary of State to the CAA. The CAA has also had regard to the Secretary of State's Guidance to the CAA on Environmental Objectives relating to the Exercise of its Air Navigation Functions which was published in January 2014, after the CAA made its decision to approve the RNAV-1 SIDs at Gatwick Airport in August 2013. The CAA has considered whether the anticipated impacts and benefits of the proposal have materialised; where they have not, the CAA has sought to determine why, and the CAA has considered what the most appropriate course of action should be in respect of the SIDs of the nine routes that are the subject of this PIR. Although we received comments on a wide range of issues not related to RNAV-1 departures at Gatwick Airport, our review has been strictly confined to the scope of the RNAV-1 PIR.

1.3 As a result the CAA has reached the following conclusions, in respect of the nine routes which are set out diagrammatically in Figure 1 on page 17.

Route 1

No modification of the RNAV-1 SID design or accompanying procedures is required by Gatwick. Therefore, the CAA's airspace change process in respect of Gatwick's airspace change request dated 30 November 2012 (as amended 9 January 2013) in respect of the SIDs on this route has now concluded.

[1] http://www.caa.co.uk/docs/33/CAP725.PDF.

Route 2

The stated aim of introducing an RNAV-1 SID design the effect of which was to result in actual aircraft tracks that replicate the nominal track of the existing conventional SIDs was achieved to an acceptable standard.

However, it is considered that a better replication may be achieved. Therefore, Gatwick is required to investigate a modified design to achieve that replication more accurately.

If the modification does not achieve more accurate replication than was achieved by the original RNAV-1 design, Gatwick will be required to revert to the RNAV-1 design implemented in November 2013. If the modification does, in the view of the CAA, achieve more accurate replication, the modified RNAV-1 SID design will be notified and replace the RNAV-1 SID design originally approved. That will be the conclusion of Gatwick's airspace change request dated 30 November 2012 (as amended 9 January 2013) in respect of the Route 2 SIDs.

In the interim period the published RNAV-1 SIDs for this route will remain notified in the Aeronautical Information Publication (AIP).

Route 3

No modification of the RNAV-1 SID design or accompanying procedures is required by Gatwick. Therefore, the CAA's airspace change process in respect of Gatwick's airspace change request dated 30 November 2012 (as amended 9 January 2013) in respect of the SIDs on this route has now concluded.

Route 4

The stated aim of introducing an RNAV-1 SID design the effect of which was to result in actual aircraft tracks that replicate the nominal track of the existing conventional SIDs has not been achieved to an acceptable standard. It is considered that replication to an acceptable standard may be capable of being achieved. Therefore, Gatwick is required to modify its design to achieve the original stated aim.

The CAA requires Gatwick's modified design to be submitted to it as soon as possible but no later than 20 November 2015.

If an acceptable modified design is submitted and once it has been implemented and operated for six months the CAA will conduct a further assessment as part of this PIR. At its conclusion, if the CAA is of the view that the modified RNAV-1 design has not achieved, to an acceptable standard, its original stated aim, then that RNAV-1 SID route will not be confirmed and will be de-notified by the CAA, i.e. removed from the AIP. That will be the end of the airspace change process commenced by Gatwick's airspace change request dated 30 November 2012 (as amended 9 January 2013) in respect of the Route 4 SIDs.

If that occurs, unless and until a revised RNAV-1 SID design (put forward by Gatwick under a new airspace change proposal process) is approved by the CAA, the only SIDs on Route 4 will be the extant conventional SIDs.

In the period from now until the implementation of any modified design the published RNAV-1 SIDs for this route will remain notified in the AIP.

Route 5

The stated aim of introducing an RNAV-1 SID design the effect of which was to result in actual aircraft tracks that replicate the nominal track of the existing conventional SIDs was achieved to an acceptable standard.

However, it is considered that a better replication may be achieved. Therefore, Gatwick is required to investigate a modified design to achieve that replication more accurately.

If the modification does not achieve more accurate replication than was achieved by the original RNAV-1 design, Gatwick will be required to revert to the RNAV-1 design implemented in November 2013. If the modification does, in the view of the CAA, achieve more accurate replication, the modified RNAV-1 SID route will be notified and replace the RNAV-1 SID design originally approved. That will be the conclusion of Gatwick's airspace change request dated 30 November 2012 (as amended 9 January 2013) in respect of the Route 5 SIDs.

In the interim period the published RNAV-1 SIDs for this route will remain notified in the AIP.

Route 6

No modification of the RNAV-1 SID design or accompanying procedures is required by Gatwick. Therefore, the CAA's airspace change process in respect of Gatwick's airspace change request dated 30 November 2012 (as amended 9 January 2013) in respect of the SIDs on this route has now concluded.

Route 7

No modification of the RNAV-1 SID design or accompanying procedures is required by Gatwick. Therefore, the CAA's airspace change process in respect of Gatwick's airspace change request dated 30 November 2012 (as amended 9 January 2013) in respect of the SIDs on this route has now concluded.

Route 8

No modification of the RNAV-1 SID design or accompanying procedures is required by Gatwick. Therefore, the CAA's airspace change process in respect of Gatwick's airspace change request dated 30 November 2012 (as amended 9 January 2013) in respect of the SIDs on this route has now concluded.

Route 9

No modification of the RNAV-1 SID design or accompanying procedures is required by Gatwick. Therefore, the CAA's airspace change process in respect of Gatwick's airspace change request dated 30 November 2012 (as amended 9 January 2013) in respect of the SIDs on this route has now concluded.

1.4 In addition, the CAA has concluded that action is required of Gatwick in respect of the conventional SIDs at Gatwick Airport if they are to be retained. This includes a routine review consistent with all extant information flight procedures throughout the UK.

1.5 Chapter 10 contains more information on all the conclusions the CAA has reached.

1.6 This report, and its annexes and attachments, provide a summary of the information the CAA has reviewed and taken into account before reaching these conclusions. That information is either part of this report or will be published on the CAA's website at http://www.caa.co.uk/default.aspx?catid=2111&pagetype=90&pageid=16983.

1.7 Chapter 2 provides information on the scope of a post implementation review and the particular features of this one.

1.8 Chapter 6 recaps the CAA's decision to approve RNAV-1 SIDs at Gatwick Airport in August 2013 and Chapter 7 summarises the conditions that attached to the CAA's approval and actions that have been taken by Gatwick, since August 2013, with respect to them.

1.9 Chapter 8 summarises the types of information taken into account, and the work done, by the CAA during this review.

1.10 Chapter 9 summarises the CAA's observations and conclusions on the material analysed. Chapter 10 summarises the options the CAA considered and our final conclusions on our requirements on, and recommendations to, Gatwick.

1.11 By way of further relevant information, Chapter 3 provides explanations to help with understanding the material and analysis described in this report. It also provides a summary of the events leading up to the CAA's decision to approve the RNAV-1 SIDs in 2013. Finally this chapter contains information on other events affecting Gatwick Airport that have taken place in the same time frame as the implementation of the RNAV-1 SIDs and the CAA's post implementation review of them.

1.12 Chapters 4 and 5 contain information on the regulatory background to this work, as well as Government and CAA policy that have informed the CAA's actions throughout this entire airspace change process (including this stage, the post implementation review).

1.13 Chapters 11 and 12 seek to address some of the feedback that we have received throughout the year that we have been carrying out this review. It also discusses some of the lessons we have learned for the future.

1.14 Chapter 12 also acknowledges that people may wish to provide feedback to the CAA on the content of this report. In order that the CAA can properly consider such feedback it should be marked for the attention of James Walker and sent via the access point set up specifically by the CAA for the purpose of receiving comments on the use of UK airspace available at https://www.caa.co.uk/application.aspx?catid=33&pagetype=65&appid=11&mode=form&id=6596.

5 November 2015

Chapter 2

Scope and Objectives of the Post Implementation Review

What is a Post Implementation Review?

2.1 The CAA's approach to decision-making in relation to proposals to approve changes to airspace is explained in its Guidance on the Application of the Airspace Change Process, CAP 725. This detailed Guidance provides that the seventh and last stage of the process is a review of the implementation of the decision, particularly from an operational perspective, known as a Post Implementation Review (PIR). The decision-making process in relation to any airspace change is not complete until the PIR is concluded.

2.2 The Guidance states that a PIR will "*assess … the success of an airspace arrangement and its progress … to identify any operational issues that may have arisen*". The objective of a PIR is "*to identify any subsequent requirements to bring about further changes to ATC [air traffic control] patterns and procedures, and indeed further changes to airspace structures*".

2.3 The CAA's policy as to PIRs states that they are intended to determine whether *"the anticipated impacts and benefits, set out in the Airspace Change Proposal, have actually been delivered"*. The policy states that if those impacts and benefits have not been delivered then the review should *"ascertain why and … determine the most appropriate course of action"*. There are therefore a wide range of possibilities for the conclusions of a PIR; they include a rejection of the proposal, the imposition of further requirements on the proposal, and the making of wider recommendations, albeit that the success of the proposal is not dependent upon recommendations.

2.4 A PIR is therefore focused on a particular airspace change proposal, and does not engage, unless it becomes necessary to do so in order to carry out and/or conclude the review, with wider concerns about the relevant airspace or its surroundings. See Chapter 11 and Chapter 12.

2.5 A PIR's purpose is to review the impact of an airspace change decision that has been made, it is not to approve a completely new airspace change decision.

2.6 A PIR normally begins one year after implementation. After one year there will have been a complete cycle of traffic patterns, which vary throughout the year, and there is also likely to have been a range of differing operational and atmospheric conditions. These factors affect where aircraft will actually fly in airspace. Gathering one year's data will usually allow the necessary

investigations as to the operation and impact of an airspace change decision to take place.

2.7 A summary of the CAA's PIR process is available at http://www.caa.co.uk/default.aspx?pageid=9137 and is also shown here.

Box 1: Summary of the CAA's Post Implementation Review process

1. Post implementation review initiated

1. We determine the scope and objectives of the review after discussion with the organisation that requested the change.
   This may include:
   • A review of what was to be achieved by the change
   • Air traffic control/management requirements (safety, delay, capacity efficiencies)
   • Military air traffic control/management requirements (if applicable)
   • Environmental conclusions
   • Effectiveness of the change
   • Other benefits or impacts
   • Operational impact (feedback gathered from all affected aviation stakeholders)
   • A post implementation safety analysis.
2. We identify and confirm the data required from the organisation that requested the change.
3. We may, during our assessment phase, revise the scope and objectives of the review.
4. We may request further information from the organisation that requested the change at any time prior to publication of the report.

2. Data collection and analysis by the organisation that requested the change

1. Organisation gathers data and operational feedback and information from stakeholders.
2. Organisation submits data to us.

3. Our assessment

1. We assess the completeness and adequacy of the data submitted.
2. Where applicable we independently gather aviation stakeholder feedback.
3. Where applicable we log and analyse written feedback from people and organisations other than airlines, other aircraft operators, airport operators and air navigation service providers.
4. We assess the operational and environmental impact of the change against the expected impact.
5. We consider and determine any appropriate consequential action.

4. Report

1. The organisation that requested the change can provide comments.
2. The report is published on our website.

Particular features of this PIR

2.8 The subject of this PIR is Gatwick's airspace change proposal to replicate the extant conventional Standard Instrument Departures (SIDs) from Gatwick Airport with RNAV-1 SIDs.[2] The proposal's objective was the introduction of RNAV-1 SIDs in order to make the most efficient use of airspace by securing the wide range of benefits associated with using the latest RNAV-1 SIDs. Chapter 6 below sets out more information on the change made and the reasons for it.

2.9 The decision that was made by the CAA in respect of Gatwick's proposal specified that a number of steps should be carried out after implementation. In summary, they included the following.

- Gatwick should determine whether there was an impact on Dormansland, and, if so, consider repositioning one of the waypoints, and arrange for a design revision to be submitted to the CAA.
- Gatwick should advise the CAA of its track keeping assessment methodology, and inform the CAA of what it considers to be a detrimental effect of the change.
- The PIR should take into account the then forthcoming Guidance to the CAA on Environmental Objectives Relating to the Exercise of Its Air Navigation Functions (the 2014 Guidance), such Guidance being published in 2014 after the decision was taken.
- There should be an appropriate match between the SID and the NPR on Route 4,[3] and, if the SID does not meet the parameters of the NPR within the terms of the new 2014 Guidance, then Gatwick should consult on any changes necessary to ensure that it does meet the new parameters.

2.10 Consultation in relation to Gatwick's proposals therefore took place at two stages – at the time of developing the airspace change proposal before its submission to the CAA in accordance with the usual process, and after its implementation in accordance with the condition set out above in relation to the potential change to the NPR (rather than the SID which is the subject of the PIR). The PIR itself does not involve consultation, since this requirement is fulfilled at an earlier stage in the airspace change process. However, in this case, the CAA has, in addition to receiving copies of all the consultation responses received by Gatwick in the

[2] Conventional being where the design of a procedure is predicated on the navigational infrastructure of ground-based radio beacons, as opposed to performance-based, of which RNAV-1 is a subset, which makes use of many navigational references, including satellites, for far greater accuracy.

[3] The proposal expressly acknowledged its potential impact on members of the public i.e. that fewer people would be overflown but some would be overflown more intensely. It was also expressly acknowledged that one of the conventional SIDs (known collectively as Route 4) already led to some aircraft flying outside the Noise Preferential Route (NPR) compliance monitoring swathe, and that replication of the nominal track of that SID was also anticipated to continue to lead to some aircraft flying outside the NPR compliance monitoring swathe.

first consultation referred to above, also received material from groups and residents in relation to the implementation of the decision, which it has collated, analysed and taken into account in carrying out this review.

2.11 During the review process, the CAA considered the 2014 Guidance to the CAA. In addition, the CAA had regard to all the usual materials produced in compliance with the CAP 725 Guidance as well as material provided by groups and residents as set out above in paragraph 2.10. The CAA has considered whether the anticipated impacts and benefits of the proposal have materialised; where they have not, the CAA has sought to determine why, and the CAA has considered what the most appropriate course of action should be in respect of the SIDs of the nine routes that are the subject of this PIR.

Chapter 3

Relevant background information and chronology

What is a SID

3.1 One of the CAA's functions is to approve and publish Standard Instrument Departures or SIDs for Gatwick Airport in a publication called the Aeronautical Information Publication (AIP).[4]

3.2 SIDs are part of the airspace structure. SIDs are industry-designed but CAA-approved instrument flight procedures. The procedures are designed to govern the first phase of an aircraft's climb from take-off. The procedures are given effect by entering a list of co-ordinates, bearings, speeds and heights into an aircraft's flight management system. In advance of start-up and take-off, the operator of an aircraft departing an airport will file (and have accepted) a flight-plan to use a specific SID. After take-off the aircraft will fly the co-ordinates and bearings of that SID unless and until told to change its direction, bearing, speed or height by the air traffic controller responsible for that aircraft. Such instructions by air traffic controllers are often referred to as air traffic controllers vectoring aircraft.

3.3 Prior to November 2013 (when the change was implemented) all the SIDs departing Gatwick Airport were designed around conventional navigation. For this reason the pre-existing i.e. pre-November 2013 SIDs are referred to as the conventional SIDs.

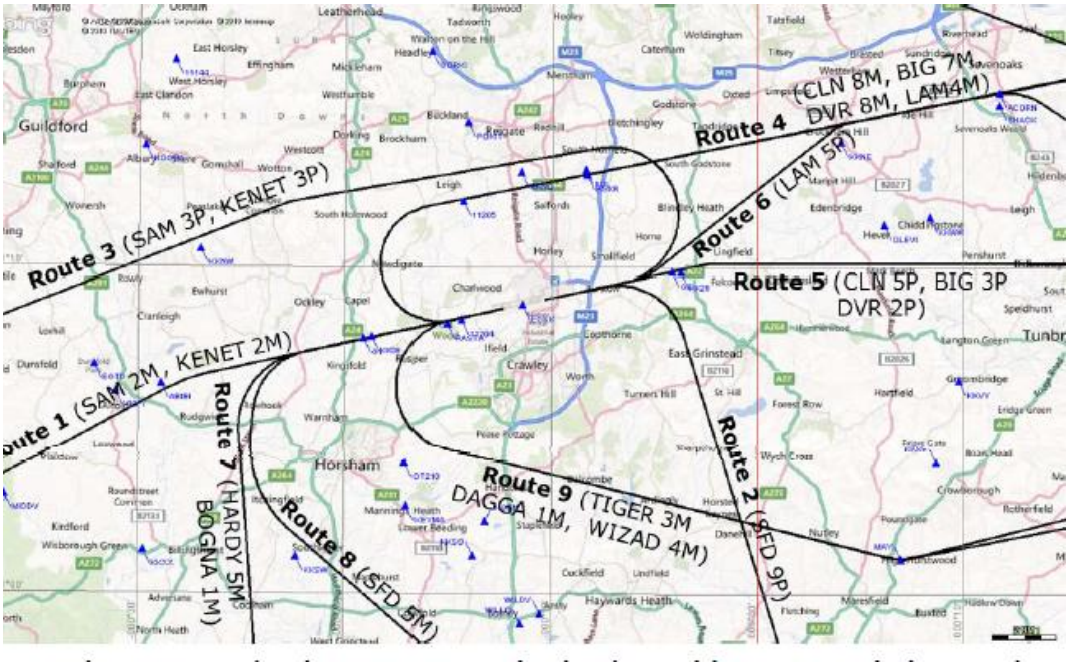
3.4 Aircraft have been departing Gatwick Airport using largely un-altered conventional SIDs for over 40 years.

Nominal SID tracks over the ground

3.5 Each conventional SID has a nominal track over the ground based on its co-ordinates and bearings assuming a specific air-speed of the aircraft flying the SID. The nominal tracks of Gatwick Airport's conventional SIDs are shown on the map below in Figure 1.

[4] The CAA performs this function at all airports where the SIDs are published. Under the terms of its licence NATS (En Route) plc (NATS) is required by the CAA to publish the AIP on behalf of the CAA. The Department for Transport also publishes Noise Abatement procedures (including NPRs) in the AIP.

Figure 1 Extract from airspace change proposal showing the nominal track of the Routes and the conventional SIDs



3.6 There are a number of reasons why aircraft do not as a rule, and did not in these cases, all fly the nominal track of the conventional SID over the ground and why representations of a SID on a map can only be described as nominal. These include the following.

a. After reaching the published height restriction aircraft can be vectored off the SID by air traffic control. This may happen, for example, if there is a more orderly or expeditious routing for an aircraft or there is a conflict with other aircraft in the airspace that must be addressed.

b. Airports and Air Navigation Service Providers (ANSPs) produce SID designs. The CAA checks the design and confirms the fly-ability of the procedure as part of the airspace change approval process. A SID will be designed for the range and capability of the aircraft types intending to use the procedure. Once published in the UK Aeronautical Information Publication (AIP) SIDs are entered into the flight management systems of aircraft. (An airline will have a contractual relationship with an aeronautical database provider, which will carry out this data entry task.) For Performance-Based Navigation (PBN) procedures such as RNAV-1 (of which the new procedures published in November 2013 at Gatwick Airport are an example), the AIP provides the base line coding tables to be used. For legacy, non-PBN procedures (such as those conventional SIDs in operation at Gatwick Airport up to November 2013), the aeronautical database providers can still generate a flight management system coding, although this activity is outside of the regulatory oversight provided in the airspace change process. Consequently, in endeavouring to replicate the conventional procedure design, the coding tables can be subtly different according to the airline's

operational procedures and aircraft types. This could result in a varied track dispersion for aircraft departing from airports using non-PBN procedures.

c. Different aircraft types (of differing powers and weights) have different performance capabilities which affect the actual track over the ground the aircraft fly notwithstanding that they may be flying the same SID.

d. Different airlines' operational procedures (and individual pilots' actions) can produce different aircraft tracks over the ground even when flying the same SIDs.

e. Weather, including wind strength and direction (wind veers and increases with altitude), can cause an aircraft flying the same SID to fly different tracks over the ground from one day to the next.

f. Conventional SIDs are partly based on reading bearings derived from magnetic north. Magnetic north shifts slowly over time and if SIDs are not amended to reflect this in a timely manner the same SID coding can begin to contribute to a drift of aircraft tracks over the ground over time.

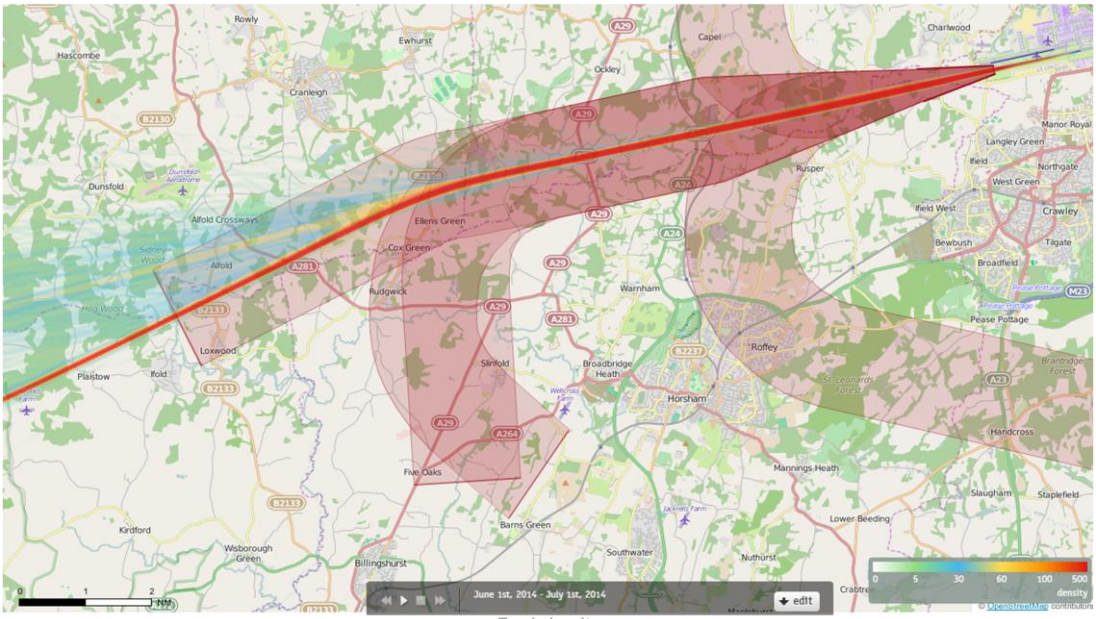
3.7 The nominal tracks of the conventional SIDs at Gatwick Airport are shown in the diagram above at Figure 1.

Actual aircraft tracks over the ground

3.8 When portraying actual aircraft tracks on a map, there are two general approaches that have been used throughout this airspace change. Firstly there is a track density chart (or a "heat map") which portrays the density of overlaid radar tracks to illustrate how traffic patterns may be concentrated. The diagram below at Figure 2 is an example. On this diagram, the NPR compliance monitoring swathes are shown in shaded red. The coloured lines illustrate the number of aircraft passing that point. In broad terms it helps to show which areas are overflown more often than others.

Figure 2 Example Heat Map Route 1 provided by Gatwick during the PIR

26SOUTHAMPTON Density June 2014
1577 Aircraft – Showing P-RNAV Departures Only



Track density

Each track is drawn as a line which has a width of just a few pixels and each pixel on the screen counts how often a 'track line' comes across this pixel when drawing all the tracks.

When all the tracks have been drawn, each pixel decides upon its colour based on the number of times a 'track line' has come across that pixel. The conversion from "count" to "colour" is guided by the numbers and colours given in the current Palette.

Counts in between are mapped to colours in between. If 100 were orange and 200 where red, then 150 would be coloured some orangy red.

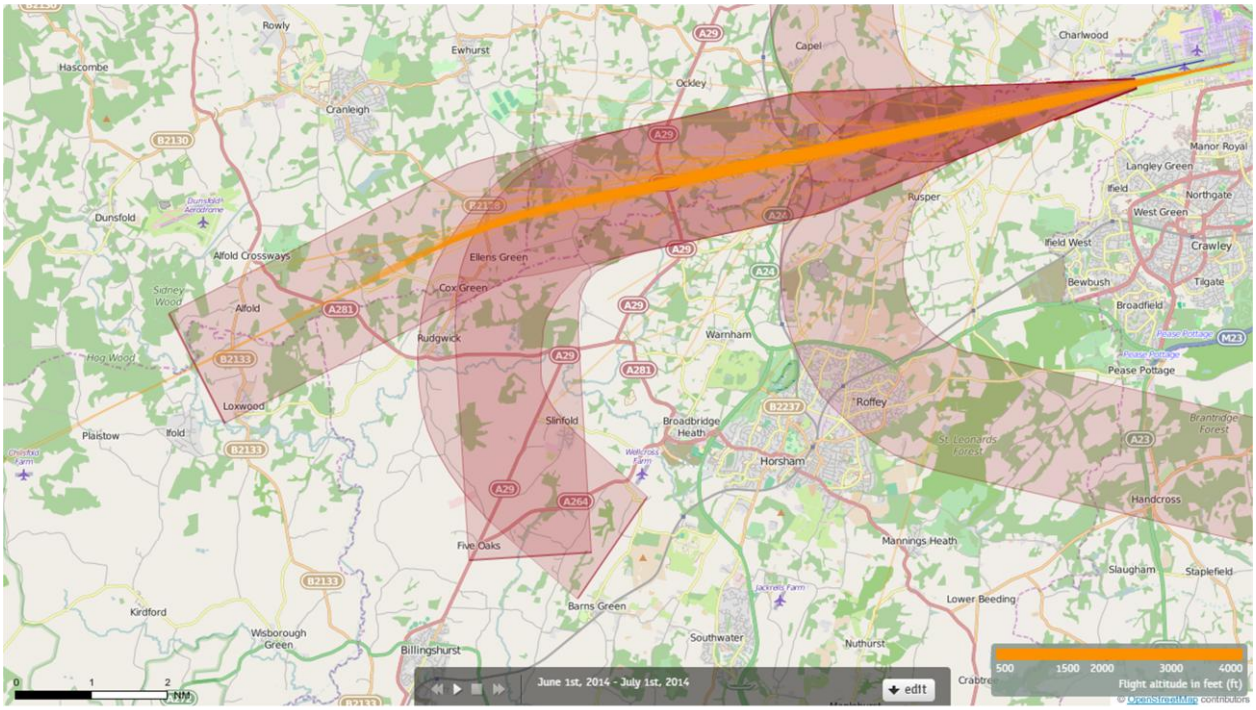
3.9 These diagrams can be further refined by using an altitude limit – for example a diagram may only portray the radar tracks of aircraft until they reach 4000ft AMSL.[5]

3.10 Secondly, we have analysed charts portraying actual radar tracks on which the tracks of all aircraft that flew during the period shown in the diagram are simply overlaid onto a map, with no changing colours to reflect concentration. This format helps to illustrate the entire spread or dispersion of aircraft tracks but is not good for portraying concentration. These can also be refined using an altitude limit. The diagram below at Figure 3 is an example.

[5] The charts published in Gatwick's 2012 consultation, reproduced in the PIR Route Analysis report, are examples. In these heat maps the altitude cut-off was 4000ft AMSL. Aircraft above 4000ft AMSL were not represented on these charts. See charts 101A and 101B for example in the CAA's PIR Route Analysis report.

Figure 3 Radar Track Chart of Route 1 provided by Gatwick during the PIR

26SOUTHAMPTON June 2014 Aircraft Tracks Cut Off at 4000ft Altitude
1577 Aircraft – Showing P-RNAV Departures Only



Orange plots show the tracks of aircraft until at an altitude of 4000ft

What is a Route?

3.11 In the context of this PIR and this airspace change we refer to nine routes, numbers 1-9. There are more than nine SIDs that depart Gatwick Airport. However a number of SIDs will have the same nominal departure profile as other SIDs, and only diverge from each other at later stages of the departure profile. Therefore despite there being 19 conventional SIDs departing Gatwick there are only nine different early stages of SIDs. Hence the reference to nine routes throughout this process and document. This is represented on the diagram above at Figure 1.

What is an NPR and what is tactical vectoring?

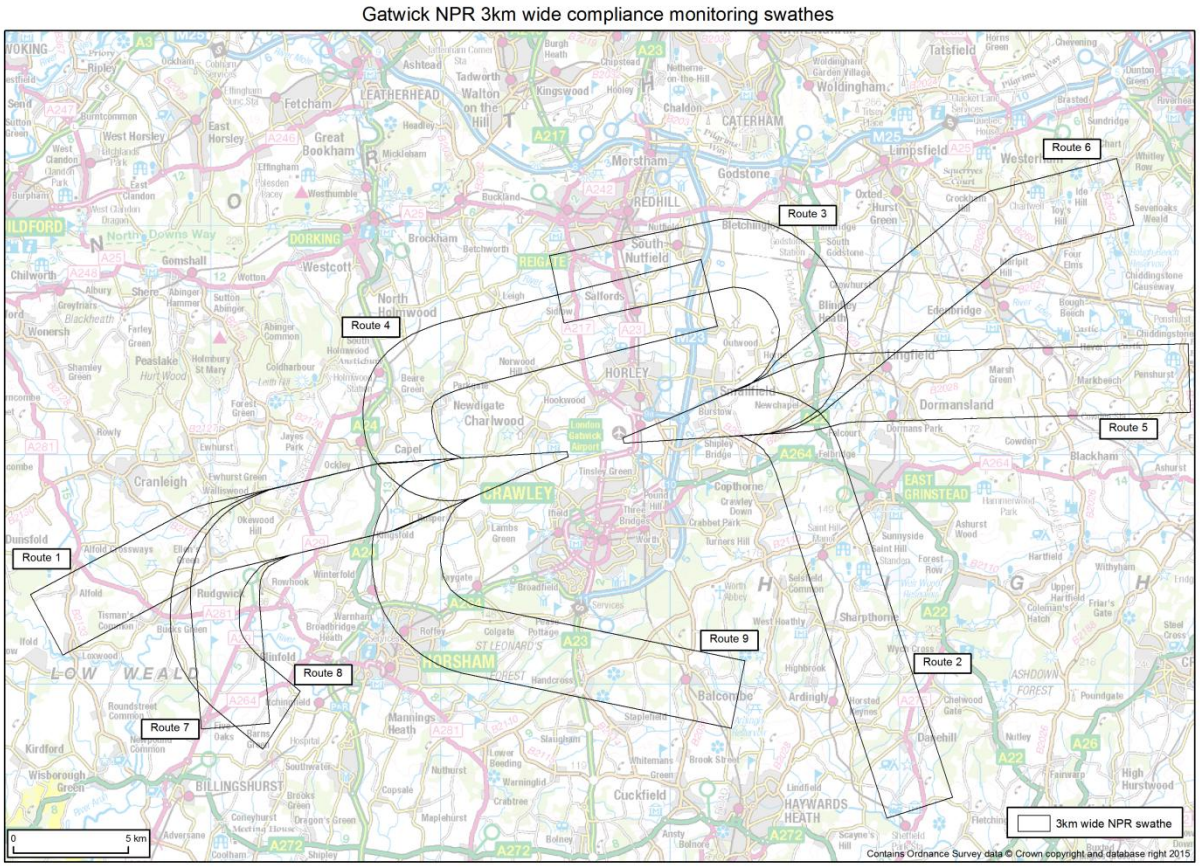
3.12 Some airports[6], including Gatwick Airport, also have published Noise Preferential Routes (NPRs). An NPR consists of a "centreline" and an associate compliance monitoring swathe (3km across, i.e. 1.5 km either side of the NPR centreline). NPRs are not part of the airspace structure although they are also published in

[6] Those that have been designated by the Secretary of State for Transport under s78 Civil Aviation Act 1982, currently Heathrow, Gatwick and Stansted.

the AIP, the same document in which SIDs are published. NPRs at Gatwick Airport are established by the Secretary of State for Transport and enforcement of them is also ultimately a matter for the Secretary of State. An aircraft operator (i.e. the airline) is required under the rules that govern NPRs to comply with them which requires the operator to ensure that its aircraft remain within the compliance monitoring swathe, often referred to as the NPR swathe.

3.13 NPRs only exist in relation to departures from the airport and not arrivals. The NPRs and associated compliance monitoring swathes for each of those NPRs from Gatwick Airport are shown in Figure 4.

Figure 4 Gatwick Airport's NPRs and associated compliance monitoring swathes



3.14 An NPR has a lateral profile in that it is a line on a map (with an associated lateral compliance monitoring swathe) and a vertical profile that extends from the ground to an agreed height, mostly 4000ft AMSL at Gatwick Airport. Those NPRs where 3000ft AMSL is the upper limit during the daytime period of 0600-2300 local time, are for Rwy 26 Route 1, and for Rwy 08 Routes 3, 5 and 6. As soon as an aircraft has reached 3000ft or 4000ft AMSL as applicable, the requirement to remain within the compliance monitoring swathe no longer applies. A controller needs to take into account the NPR height restriction when deciding whether or not to vector an aircraft away from the SID. Air traffic

controllers will not vector an aircraft away from a SID before it has reached 3000ft/4000ft AMSL as applicable unless there are overriding safety reasons.

3.15 Although SIDs and NPRs serve different purposes, as described above, SIDs are usually designed so as to take into account an NPR.

3.16 It is not the case that aircraft should follow the SID design flight path right up to the end of the SID. Aircraft may be vectored by air traffic controllers as soon as departing aircraft reach a certain altitude after departure. This means aircraft can be directed by air traffic controllers onto a different heading. At Gatwick Airport this altitude is determined by the Secretary of State and is either 3000ft or 4000ft AMSL.[7] In certain circumstances, aircraft may be instructed by air traffic control to turn before that altitude in the interests of flight safety, or for other air traffic control operational reasons which may result in an overriding requirement for controllers to issue vectors to aircraft to maintain safe separation from other traffic. Additionally, in the event of severe weather conditions, pilots may request deviations to avoid certain weather conditions.

3.17 Once able to, air traffic controllers will consider vectoring aircraft in order to achieve an expeditious climb or a more advantageous routing for an aircraft or to ensure aircraft are safely separated from other aircraft.

What are dispersion, concentration and respite?

3.18 In this report, when we refer to:

- **Dispersion**, or dispersed aircraft tracks, we are referring to aircraft that are instructed to follow the same routing yet fly a variety of tracks when measured over the ground. Dispersion is the consequence of a combination of, often variable, factors such as the procedure's design criteria, weather, aircraft performance, pilot or air traffic control reaction and time of the day.
- **Concentration** of aircraft is the opposite of dispersion. It takes place when aircraft instructed to follow the same routing consistently end up on very similar tracks. Concentration, as explained in this report, is a consequence of the accuracy of RNAV-1 design criteria. The accuracy and predictability associated with RNAV-1 related concentration is that it is possible to make a more efficient use of airspace by allowing more aircraft through a block of airspace with less air traffic controller intervention.

[7] These details are published on Department for Transport NPR maps, and are also notified in the UK AIP. At Gatwick Airport, there are a number of variables; during the day, some routes have an NPR altitude set at 3000ft or 4000ft AMSL during the day, and for all routes at night, the altitude is set at 4000ft AMSL.

- **Respite**, by contrast, must be planned. For example it may be planned or designed that different runways are used at different times of day, this gives residents near to the runways predictable respite. Another example could be alternating or changing between different SIDs taking different routes to the same UK exit point. Respite can be designed into airspace structures more easily once aircraft tracks are predictably concentrated on to safely separated routings, enabling the use of them to be alternated or varied. There is currently no agreed minimum distance between routes such that alternating their use would result in acceptable respite. This is discussed in more detail in Chapter 10.

What is FAS?

3.19 The airspace above London's airports is amongst the busiest and most complex in the world. The routes to and from London airports overlap, demonstrating the complexity of the system whereby air traffic control is required to maintain safe separation between aircraft, with aircraft passing above and below each other to reach their destination. There are very few parts of London and the South East which are not overflown by aircraft at one altitude or another. The high level of demand relative to the capacity of the airspace and major airports is a growing challenge, causing passenger delays and poor resilience to disruption such as can occur from the weather or technical difficulties.

3.20 The Future Airspace Strategy (FAS) is an initiative started by the CAA to create a joined-up UK airspace and air traffic management (ATM) modernisation programme across the many different stakeholder groups involved.

3.21 The goal of FAS is to modernise the UK airspace and ATM infrastructure through significant technological improvements by 2030, to make a more efficient use of airspace (thereby providing airspace capacity benefits), as well as environmental (noise and emissions) and safety benefits.

3.22 In particular, the introduction of satellite guidance, also known as performance-based navigation of which RNAV-1 is a type, instead of ground-based navigation aids (such as those used by conventional SIDs) will allow aircraft to fly more accurate flight paths, not constrained by the location of ground-based conventional navigational aids. Satellite guidance will also allow the UK's complicated and busy airspace to be redesigned, increasing capacity and efficiency while maintaining or enhancing safety performance. A route structure optimised for satellite guidance with aircraft flying a pre-programmed trajectory will also reduce the need for tactical intervention by air traffic controllers to instruct pilots to change direction, bringing down the cost of air traffic control, and optimise the climb and departure profiles of aircraft.[8]

[8] Which is the most expeditious routing of aircraft so far as airlines are concerned, and which also burns the

3.23 Several important projects are being progressed as part of the FAS programme. The projects can be grouped into three broad areas:

- those focused on aircraft at a cruise[9] altitude being able to fly more direct routes and at altitudes and speeds which are more efficient;
- those focused on increasing flight efficiency and reducing airborne holding in the busy terminal airspace, for example, around the major London airports; and
- those focused on maximising the efficiency of inbound, turnaround and outbound traffic flows in order to shorten taxi times, reduce in-airfield delays and improve the efficient use of airspace.

3.24 The introduction of routes based on satellite guidance, instead of ground navigation, is the cornerstone of the FAS changes in busy terminal airspace. Satellite guidance, also known as PBN, allows aircraft to follow much more accurate flight paths not constrained by the location of ground-based conventional navigational aids creating the opportunity to redesign the current route network to enable a more efficient use of airspace thereby facilitating greater capacity, while maintaining, and in some areas enhancing, safety. A route network optimised for satellite guidance will improve aircraft climb and descent profiles in line with the performance characteristics of modern engines that are more powerful and quieter. Satellite-based routes guide aircraft along a set of pre-programmed waypoints that will cut the workload required of air traffic controllers to manage route interactions – increasing airspace capacity in the areas where it is needed the most.

3.25 All of the initiatives described above have costs and returns for the investment made. The consumer benefits are expected to be in terms of reduced delay and lower cost of travel. The environmental benefit comes from the ability over time to design airspace to deliver respite and continuous climb and descent procedures thereby reducing emissions.

least fuel and overall causes the least noise.

[9] Cruise is the level portion of aircraft travel where flight is most fuel efficient. It occurs between ascent and descent phases and is usually the majority of a journey.

Background and Chronology to the airspace change decision that is the subject of this PIR

3.26 The aim of the airspace change which is the subject of this PIR was to design RNAV-1 SIDs that replicated so far as possible the nominal track over the ground of the existing conventional SIDs (see Figure 1 above).

3.27 RNAV-1 instrument flight procedures employ satellite-based navigation technology rather than rely solely on ground-based, radio beacon, technology. An aircraft will use multiple navigation services to fly in accordance with a pre-programmed set of co-ordinates and bearings.

3.28 Preliminary discussions between Gatwick and CAA regarding this airspace change commenced during March 2011.

3.29 Any airspace change that a proposer asks the CAA to approve follows a seven stage process known as the CAA's airspace change process.[10] A summary of that process is available on the CAA's website[11] and is also shown here.

[10] Published in CAP 724 https://www.caa.co.uk/CAP724 and CAP 725 https://www.caa.co.uk/CAP725

[11] http://www.caa.co.uk/default.aspx?catid=2111&pageid=12069.

Box 2: The seven-stage process of an airspace change

Stage 1 – framework briefing

We meet with the organisation that is considering proposing an airspace change to discuss their plans, the operational, environmental and consultation requirements for proposing a change and set out the how the CAA process will run.

Stage 2 – proposal development

The organisation that is considering proposing the airspace change begins to develop design options and researches who needs to be consulted. They will also conduct an initial environmental assessment of the proposals which will need to be more detailed if, and by the time, the organisation proceeds and with its proposal and prepares for consultation. It is recommended that the organisation invites a cross section of parties who may be affected by the change to form a Focus Group to help with the development of the design options.

Stage 3 – preparing for consultation

The organisation that is considering proposing the airspace change decides on the most appropriate consultation method needed to reach all consultees. This could include a written consultation, questionnaires or surveys, using representative groups and open/public meetings. We will provide advice to the organisation on the scope and conduct of the consultation but it remains their responsibility to ensure that the appropriate level of consultation is undertaken. Consultations should normally last for at least 12 weeks with consideration given to longer timescales where feasible and sensible. Consultation documents should be clear about the objectives of the proposal, what is being proposed, how the change would affect various stakeholders, the expected advantages and disadvantages of the proposals to all stakeholders, the consultation process and the scope to influence. If a single design option is being consulted upon, the document should state what other options were considered and why these were discarded.

Stage 4 – consultation and formal proposal submission

When the consultation is launched the organisation that is considering proposing the airspace change should make every effort to bring it to the attention of all interested parties. The organisation must ensure that accurate and complete records of all responses are kept. Following the consultation, the organisation collates and analyses all responses to identify the key issues and themes. There may be airspace design modifications in light of the consultation responses which results in the need for further consultation. The organisation is required to publish feedback consultees. If the organisation decides it will submit a formal airspace change proposal to us to then its feedback document must include information on how the final decision on the option selected was reached. In addition to publishing the feedback report the organisation sends all the consultation responses to the CAA within its formal proposal submission.

Stage 5 – our decision

We undertake a detailed assessment of the proposal and may ask for clarification or supplementary information from the organisation requesting the change. Our assessment covers

1. the operational need for, objectives and feasibility of the changes proposed
2. our analysis of the anticipated environmental benefits and impacts if the change were made; and
3. an assessment of the consultation carried out by the organisation proposing the change and of the responses received to that consultation.

Our conclusions in these three areas inform our decision whether to approve or reject the proposal. When making our decision the law requires us to give priority to safety but then to balance the need for the most efficient use of airspace with the needs of operators of aircraft and the environmental effect of aviation (including noise and CO_2 emissions). The means by which we assess and balance the environmental impact within our decision making process is set out in government policy which we implement. We aim to make our decision within 16 weeks of having all the information we need.

Stage 6 – implementation

If a change is approved then changes to airspace procedures and structures are timed to start on internationally specified dates which occur every 28 days. This ensures that the aviation community, as a whole, is aware of the changes and can prepare. The organisation that proposed the change should publicise the airspace change to members of the local community and other stakeholder groups who were consulted earlier in the process.

Stage 7 – operational review

Around 12 months after a change is implemented we will start a review of the change to assess whether the anticipated impacts and benefits, set out in the original airspace change proposal and decision, have been delivered and if not to ascertain why and to determine the most appropriate course of action. Once complete we will publish the review on our website.

3.30 A summary of the process followed for the airspace change that is the subject of this PIR is available on the CAA's website[12] and is also shown here.

Table 1: The 7-stage process of the airspace change that is the subject of this PIR

Stage of process	**Salient facts and decisions:**	
	Dates	**Facts/Decisions**
Stage 1 Framework Briefing	8 November 2011 and 23 April 2012	Meetings held. List of stakeholders who would actively be consulted during the consultation phase agreed. Gatwick and CAA's assessment at this stage concluded it was not anticipated that the change, if implemented, would have a significant environmental impact. [13]
	30 May 2012	Accordingly the CAA decided it was not necessary for Gatwick to produce new noise contours or noise footprints[14] for Gatwick's consultation with GATCOM.[15]

[12] http://www.caa.co.uk/default.aspx?catid=2111&pagetype=90&pageid=16983.

[13] See paragraph 4.37 of this report for more information on how the CAA makes this assessment.

[14] CAP 725 gives detailed guidance on the environmental assessments required in an airspace change process, and in particular as to how noise should be considered.

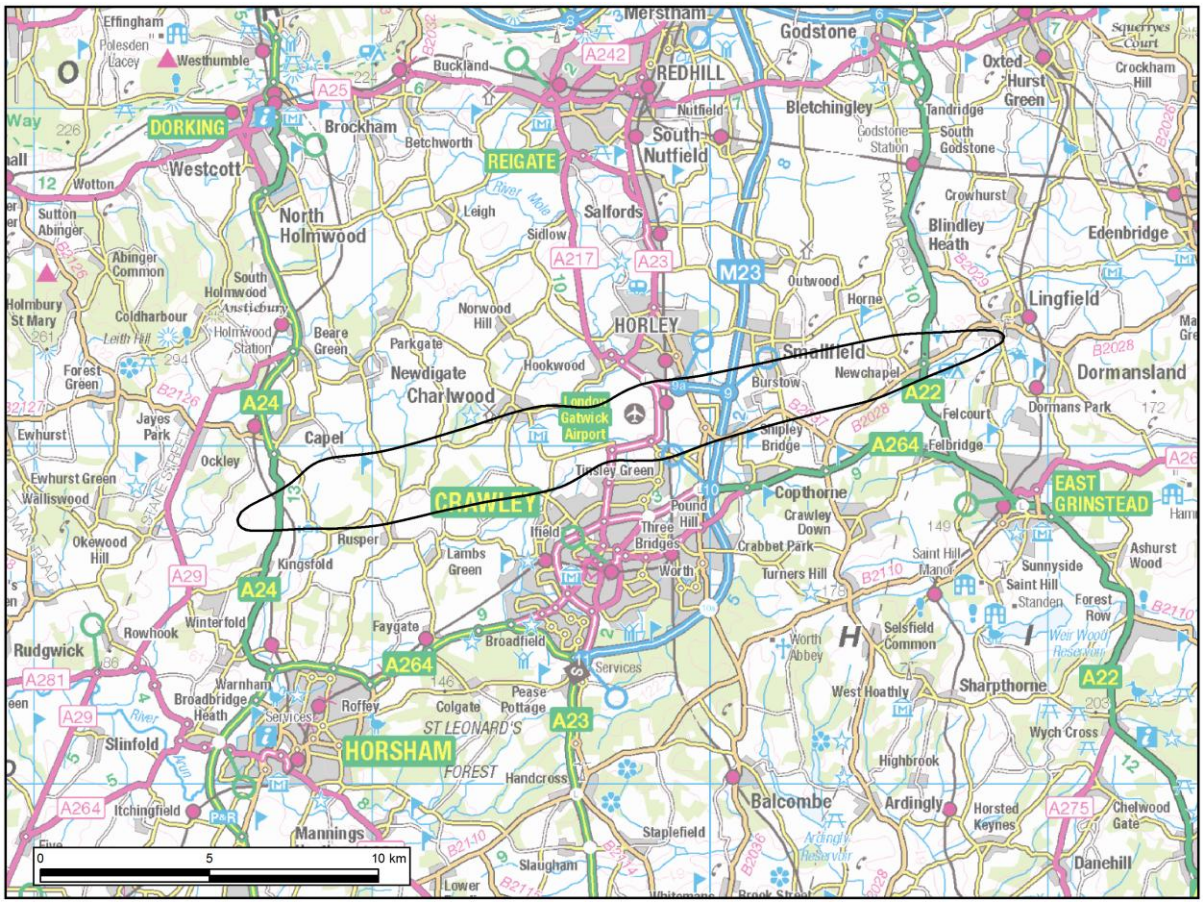
It explains that "the most commonly used method of portraying aircraft noise in the UK is the Leq noise exposure contour. Noise exposure contours show a set of closed curves on a map. Each contour shows places where people get the same amounts of noise energy – Leq – from aircraft." It also explains that "Research has indicated that Leq is a good predictor of a community's disturbance from aircraft noise." Further, it explains the concept of Leq thus: "Equivalent continuous sound level or Leq is defined as the level of hypothetical steady sound which, over the measurement period, would contain the same (frequency-weighted) sound energy as the actual variable sound." Leq thus takes into account the impact of many noise events over a long period on people living near an airport.

As regards SEL footprints CAP 725 explains "SEL footprints show the extent of noise energy generated from a single aircraft event, for example, an aircraft either taking off or landing (in contrast to the summing of events in noise exposure). This footprint shows a contour of equal SEL values. Thus, a 90dBA SEL footprint shows the area in which SEL values are greater than (or equal to) 90dBA. These footprints are useful in evaluating options by identifying the relative contribution of different aircraft types, routes and operating procedures on the total noise impact.

Footprints are particularly useful in portraying the impact of aircraft movements at night on sleep disturbance. Research has shown that residents tend to be awoken by the noise levels in a single noise event, as measured by SEL, rather than by an aggregation of noise events, as measured by Leq (DoT, 1992). One of the key findings of this research is that for outdoor aircraft noise events below 90dBA SEL, the average person's sleep is unlikely to be disturbed. At higher levels, between 90 and 100dBA SEL, the chance of an average person being awoken by that aircraft noise event was found to be about 1 in 75. Thus, it is possible to calculate the approximate number of awakenings by combining knowledge of the population count within 90dBA SEL footprints, the number of movements of different aircraft types and the probability of being awoken.

The 57dBA Leq 16 footprint around Gatwick Airport, summer day 2014 is shown on the map below

Stage 2 proposal development	October 2007 - May 2008	NATS ran a trial of RNAV-1 SIDs along the SIDs of Routes: 1, 2, 3 and 4. Approximately 10 operators participated. All other operators on those routes, and all aircraft on all other routes, continued to fly the conventional SIDs.
	Commenced May 2008	The airspace design of the trial on three of the routes was altered. The Approved Procedure Designer appointed by Gatwick used the design parameters and flight data collected from the trialled SIDs as the basis for the subsequent designs.
Stage 3 preparing for consultation	November 2011 to July 2012	Gatwick prepared its consultation.



[15] GATCOM is the Gatwick Airport Consultative Committee. It was established by Gatwick in accordance with the Civil Aviation Act 1982. Its role includes advising Gatwick on the views and concerns of local communities.

Stage 4 consultation and formal proposal submission	19 July 2012 – 19 October 2012	Consultation held.
	1 October 2012	At the request of the CAA, updated consultation diagrams were published on Gatwick's website to improve the clarity of the diagrams in the initial consultation document.
	12 November 2012	Gatwick closed receipt of consultation responses.
	30 November 2012	Gatwick submitted its airspace change proposal.
	6 December 2012	Gatwick's analysis of the consultation responses was provided to the CAA in Gatwick's Consultation Feedback Report (and published on Gatwick's website).
	10 January 2013	Following requests for further information Gatwick submitted a revised version of the airspace change proposal (version 1.1).[16]
Stage 5 our decision	14 August 2013	The airspace change proposed by Gatwick was approved.[17]
	15 August 2013	A CAA Information Notice of the decision was published.
	5 September 2013	NATS published the Aeronautical Information Publication amendment.
Stage 6 Implementation	14 November 2014	The change to the RNAV-1 SIDs was implemented (meaning the changes to the notified or SIDs published in the AIP came into effect).
	May 2014	Gatwick requested as conditions of use of Gatwick Airport that all operators, i.e. airlines, technically capable of using the RNAV-1 SIDs do so.

[16] The airspace change proposal is published on the CAA's website here http://www.caa.co.uk/default.aspx?catid=2111&pagetype=90&pageid=16983.

[17] The decision and three internal reports, on the three key areas are published on the CAA's website here http://www.caa.co.uk/default.aspx?catid=2111&pagetype=90&pageid=16983.

Other events taking place in the same time frame

3.31 Table 2 below summarises the events affecting Gatwick Airport that have taken place in the same time frame as the implementation of the RNAV-1 SIDs and the CAA's post implementation review of them.

Table 2: Other events taking place at the same time

Date	Activity	Relevance to issues being considered in the PIR	Current status
17 February 2014 - 8 August 2014	ADNID trial of revised departure procedures for Route 7	None Gatwick, NATS, the CAA and the Department for Transport/Secretary of State received a significant volume of correspondence from groups and residents regarding the impact on them of the airspace structure being trialled	On completion of the trial all flights reverted back to existing RNAV-1 SIDs on Route 7.
15 October 2013 - 21 January 2014	Gatwick, in conjunction with NATS, carried out a consultation on a number of issues including an NPR compliance monitoring swathe consultation, seeking feedback on factors which could influence positioning of any revised routes and NPRs in the local	None	This was subsequently followed by a further, more detailed consultation in the summer of 2014 - see below.

	airspace below 4000ft AMSL		
23 May 2014 - 14 August 2014	Gatwick carried out further consultation on low level proposals up to 4000ft AMSL in support of the NATS proposals for the LAMP Phase 1A proposals	The consultation included consideration of "fundamental PBN redesign – and therefore repositioning – of all Runway 26 departure routes". (Runway 26 equates to Routes 1, 4, 7 and 9 in this PIR.) This consultation was carried out in accordance with a condition of the CAA's decision to approve the airspace change that is the subject of this PIR, which was included by the CAA at the direction of the Secretary of State for Transport	The proposals relating to Gatwick Airport for LAMP Phase 1A were suspended and no proposals to re-align the NPRs or their compliance monitoring swathe delineation have been progressed.
4 April 2014 to 16 May 2014	Gatwick consulted publicly on second runway options	None	Decision to be made by Government

Chapter 4

Regulatory Background to the CAA's Decision dated 14 August 2013 that is the subject of this Post Implementation Review

4.1 By section 70 of the Transport Act 2000 (the Transport Act), the CAA is under a general duty in relation to air navigation to exercise its functions so as to maintain a high standard of safety in the provision of air traffic services. That duty is to have priority over the CAA's other duties in this area of work.

4.2 Noting that priority, the CAA's duties in relation to air navigation is to exercise its functions in the manner it thinks best so that:

- It secures the most efficient use of airspace consistent with the safe operation of aircraft and the expeditious flow of air traffic.
- It satisfies the requirements of operators and owners of all classes of aircraft.
- It takes account of the interests of any person (other than an owner or operator) in relation to the use of any particular airspace or airspace generally.
- It takes account of any guidance on environmental objectives given to the CAA by the Secretary of State.
- It facilitates the integrated operation of air traffic services provided by or on behalf of the armed forces and other air traffic services.
- It takes account of the interests of national security.
- It takes account of any international obligations of the UK notified to the CAA by the Secretary of State.

4.3 Where there is a conflict of these factors (other than safety, which must always take priority), the CAA must apply them as it thinks reasonable having regard to them as a whole.

4.4 The CAA must exercise its functions in this area so as to impose on providers of air traffic services the minimum restrictions consistent with the exercise of those functions.

The CAA's approach under section 70 of the Transport Act to airspace change proposals

4.5 The CAA will approve an airspace change proposal that best satisfies all of the factors (where safety is not in issue), or all the factors that are engaged. Where a change would satisfy some of the factors, but would be contrary to the fulfilment of others, then there is a conflict within the meaning of section 70 of the Transport Act. In reaching a decision in such circumstances, the CAA will apply its expertise to all the relevant information before it and use its judgement to strike a fair balance between the factors.

4.6 In striking that balance the CAA relies on the wording of section 70 which indicates the relative importance of any given factor.

4.7 In the instance of conflict, the CAA will usually offer suggestions to the sponsor of a proposal as to how the conflict might be mitigated or resolved, including encouraging the proposer to engage with affected stakeholders in determining how the desired outcome might be achieved.

The efficient use of airspace

4.8 The CAA considers the most efficient use of airspace to be that use of airspace that secures the greatest number of movements of aircraft through a specific volume of airspace over a period of time so that the best use is made of the limited resource of UK airspace. It is therefore concerned with the operation of the airspace system as a whole.

4.9 The CAA considers the expeditious flow of air traffic to involve each aircraft taking the shortest amount of time for its flight. It is concerned with individual flights.

4.10 The CAA considers the words "any person (other than an operator or owner of an aircraft)" to include airport operators, air navigation service providers, members of the public on the ground, owners of cargo being transported by air, and anyone else potentially affected by an airspace proposal.

Environmental objectives

4.11 The Secretary of State has given the CAA specific guidance on environmental objectives within the meaning of section 70 of the Transport Act. The first guidance, Guidance to the CAA on Environmental Objectives Relating to the Exercise of its Air Navigation Functions, was published in 2002 and was in force at the time of the decision (the 2002 Guidance). The second version, Guidance to the CAA on Environmental Objectives Relating to the Exercise of its Air Navigation Functions, was published in 2014, after the decision (the 2014 Guidance).

4.12 The 2002 Guidance included the following:

The challenge facing civil aviation is to deliver economic, social and environmental objectives while ensuring that the industry continues to operate safely, efficiently and effectively. In particular, negative effects on the environment should be minimised, taking account of land-use planning and conservation policies, whilst the contribution of air transport to the economy should be maximised. Additional capacity should be provided only where this is economically and environmentally justified. This necessarily involves striking a balance between the needs of an efficient air transport industry, providing jobs and serving the local, regional and national economy, and minimising the impacts on the environment and on the communities around aerodromes and under their flight paths. It is necessary to act proportionately, for example, by recognising that environmental dis-benefits may be justified when all sustainable development objectives are taken into account.

4.13 It also included this statement of long-standing Government policy:

The balance of social and environmental advantage lies in concentrating aircraft taking off from the airports along the least possible number of specified routes, consistent with airspace management considerations and the overriding need for safety.

4.14 It explained that the policy was effected by the Secretary of State's requirement that most departing aircraft follow the NPRs. NPRs at designated airports such as Gatwick Airport are introduced (or amended) by the Secretary of State pursuant to his powers under section 78 of the Civil Aviation Act 1982 (Civil Aviation Act) in order to limit or mitigate the effect of noise and vibration from aircraft landing or taking off from an airport (and some are imposed by local authorities under section of the Town and Country Planning Act 1990).

4.15 As to changes in airspace arrangements, the 2002 Guidance stated that they should be made only where it is clear that an overall environmental benefit will accrue or where airspace management considerations and the overriding need for safety allow for no practical alternative.

4.16 As to the impact of new technology, the 2002 Guidance stated as follows:

It is the Government's aim in connection with the development of "Area Navigation" (RNAV) procedures for use in terminal areas, to preserve the established route structures as far as possible in the vicinity of airports. Where it is not possible to do so, because the new technologies cannot be configured to support accurate navigation along an existing route to the required, standard, the aim should be to introduce modified routes that over-fly as few people as possible. It will be necessary in all cases to tailor the new procedures to suit local circumstances; a one-size-fits-all solution is unlikely to be a viable environmental option.

4.17 The 2014 Guidance came into force after the decision but it was a condition of the CAA's decision (albeit imposed at the direction of the Secretary of State) that this PIR should be carried out applying that Guidance. The 2014 Guidance includes the following:

> *The CAA's primary objective is to develop a "safe, efficient airspace that has the capacity to meet reasonable demand, balances the needs of all users and mitigates the impact of aviation on the environment".*
>
> *…*
>
> *In December 2012, the industry-led FAS Industry Implementation Group launched its plan for delivering Phase 1 of the FAS up to c2025. A considerable component of the plan is the need to redesign UK's terminal airspace to make it more efficient by using new procedures such as Performance-Based Navigation (PBN)[18] and better queue management techniques.*
>
> *…*
>
> *It is therefore now appropriate that the Government revisits and refreshes the 2002 Air Navigation Guidance to the CAA to take into account these policy and technical developments whilst remaining consistent with the overall legislative framework.*

4.18 The 2014 Guidance reiterates the need to balance environmental factors against other factors:

> *The purpose of the Guidance is to provide the CAA and the aviation community with additional clarity on the Government's environmental objectives relating to air navigation in the UK. However, when considering airspace changes, there may be other legitimate operational objectives, such as the overriding need to maintain an acceptable level of air safety, the desire for sustainable development, or to enhance the overall efficiency of the UK airspace network, which need to be considered alongside these environmental objectives. We look to the CAA to determine the most appropriate balance between these competing characteristics.*

4.19 The need to strike a balance specifically in relation to noise is reiterated:

> *The Government has made it clear therefore that it wants to strike a fair balance between the negative impacts of noise and the economic benefits derived from the aviation industry.*

4.20 The 2014 Guidance also reiterates the Government's overall policy to limit the number of people significantly affected by aircraft noise.

4.21 The 2014 Guidance states that the CAA should keep in mind the following altitude-based priorities.

[18] Of which RNAV-1 is a type.

- In the airspace from the ground to 4000ft AMSL the Government's environmental priority is to minimise the noise impact of aircraft and the number of people on the ground significantly affected by it;
- where options for route design below 4000ft AMSL are similar in terms of impact on densely populated areas the value of maintaining legacy arrangements should be taken into consideration;
- in the airspace from 4000ft AMSL to 7000ft AMSL, the focus should continue to be minimising the impact of aviation noise on densely populated areas, but the CAA may also balance this requirement by taking into account the need for an efficient and expeditious flow of traffic that minimises emissions;
- in the airspace above 7000ft AMSL, the CAA should promote the most efficient use of airspace with a view to minimising aircraft emissions and mitigating the impact of noise is no longer a priority;
- where practicable, and without a significant detrimental impact on efficient aircraft operations or noise impact on populated areas, airspace routes below 7000ft AMSL should, where possible, be avoided over Areas of Outstanding Natural Beauty (AONB) and National Parks as per Chapter 8.1 of the 2014 Guidance; and
- all changes below 7000ft AMSL should take into account local circumstances in the development of airspace structures.

The concept of altitude-based priorities reflects the Government's desire that only significant environmental impacts should be taken into account when considering the overall environmental impact of airspace changes. Any environmental impacts that are not priorities based on the above altitude-based criteria do not need to be assessed since the assumption is that they would not be significant.

4.22 The 2014 Guidance directly addresses the impact of new technology thus:

With PBN, the overall level of aircraft track-keeping is greatly improved for both approach and departure tracks, meaning aircraft will be more concentrated around the published route. This will mean noise impacts are concentrated on a smaller area, thereby exposing fewer people to noise than occurs with equivalent conventional procedures.

…Concentration as a result of PBN is likely to minimise the number of people overflown, but is also likely to increase the noise impact for those directly beneath the track as they will be overflown with greater frequency than if the aircraft were more dispersed.

…The move to PBN will require the updating of existing route structures such as Standard Instrument Departures (SIDs), Standard Terminal Arrival Routes

(STARS) and Initial Approach Procedures (IAPs). Updating individual routes in terminal areas can fall into one of two categories: "replication" where the existing route alignment is preserved as much as possible whilst catering for the greater navigational accuracy of PBN, or "redesign" where seeking to optimise the introduction of PBN will require consideration of a different alignment.

…For replication, the requirement is to preserve the existing route alignments as far as possible in the vicinity of airports …

4.23 The 2014 Guidance states that, once established, an NPR should be considered fixed unless it is removed or amended by a new airspace change request. (This implies that the CAA has the power to move an NPR. The CAA has not been given this function by the Secretary of State and requests to move NPRs at designated airports must be made to Secretary of State.) The 2014 Guidance acknowledges that there may be movement of a promulgated route caused by magnetic drift, but states that this needs to be corrected since if uncorrected it could result in the location of the SID's nominal track becoming disassociated from the NPR, so altering who might be affected on the ground and thus not providing sufficient clarity for those living under or near the flight paths concerned.

4.24 It states that any proposal to change an existing NPR will be considered an airspace change (see paragraph 4.23 above) and require appropriate consultation. Further, it states that when an airspace change involving an NPR is made, the change to the SID's nominal track is likely to require the NPR also to be moved to ensure that it is at least consistent and preferably coincident with the revised SID, providing that it is practicable and safe to achieve this.

4.25 The 2014 Guidance states that where an airspace change is being planned which would involve alterations to an NPR, the possibility of introducing respite should also be considered where operationally feasible and the view of local communities taken into account.

4.26 As to the interaction between NPRs, SIDs and the changes consequent upon PBN, the 2014 Guidance states as follows:

"The designated airports have a large number of NPRs which have been established over many years. It is recognised that: most of the SIDs associated with these NPRs use conventional navigation techniques; a number of SID nominal tracks are no longer centred on the NPR; and the introduction of PBN is likely to require a significant number of the existing routes to be updated to reflect the use of the new PBN procedures. As many of the required amendments to the SIDs to make them PBN compliant will reflect the flight paths flown by aircraft already and to ensure a smooth process for handing the necessary airspace change applications, the CAA can approve both the

replication and redesign of existing conventional SIDs using PBN at the designated airports providing that:

- The new PBN-based SID is considered by the CAA to be an acceptable replication or redesign of the existing conventional SID and it does not create a significant detrimental noise impact;
- The opportunity afforded by the airspace change involving a replicated or redesigned SID should be used to evaluate the extent to which the NPR needs to be realigned to the new PBN-based SID to comply with Chapter 5.10 of this Guidance;
- The Department [for Transport] is informed of the application and the decision reached by the CAA;
- The airspace change sponsor should carry out appropriate consultation and assessment of the airspace change involving the PBN-based SID and NPR to the satisfaction of the CAA; and

…The Secretary of State will be required to decide upon completely new NPRs or amendments to existing NPRs which are considered to have a significant detrimental impact on the environment at the designated airports."

4.27 The CAA understands this Guidance to confirm the position that it may approve the replication or redesign of an existing SID providing that it is an acceptable replication or redesign and does not create a significant detrimental noise impact. However, where such a replication or redesign leaves the SID out of alignment with the NPR, the CAA does not have the power to approve a change in the NPR in order to bring it into alignment with the proposed new SID, since such a power resides with the Secretary of State. The CAA therefore understands the 2014 Guidance in such circumstances as allowing it to inform the Secretary of State of the proposal and that the CAA is minded to approve it, of its view that it does not have significant detrimental noise impact, of its view that there has been appropriate consultation, and inviting the Secretary of State to consider the change to the NPR which would bring it and the new SID into alignment.

4.28 The 2014 Guidance in relation to the obligation on the CAA to ensure that there has been consultation in a particular case includes the following:

"The CAA shall ensure that an adequate level of consultation is undertaken for any given airspace change. The level of consultation required should take account of the scale and impact of the change, and the range of potential stakeholders involved as well as their ability to contribute either directly or through a representative body … The method, form and extent of the consultation will vary depending on the circumstances and expected impacts of

each case taking account of the altitude-based priorities presented in Chapter 4.1 of this Guidance.

…Consultation with environmental stakeholders will usually only be necessary where the proposed changes concern controlled airspace at or below an altitude of 7,000 feet (amsl) or could have significant knock-on effects on how traffic uses adjoining uncontrolled airspace at or below the same altitude."

4.29 The 2014 Guidance makes it clear that such consultation will be on a specific change and not on wider policy issues, for example, on the introduction of RNAV-1 technology generally.

General Government Guidance

4.30 The CAA acts in accordance with its legal duties and any specific directions or guidance given to it in carrying out those duties. However, in the absence of any specific direction or guidance on a particular point the CAA takes into account general guidance that seems to the CAA to be relevant. As to general guidance from central sources, the Government has laid down the following Guiding Principles of Sustainable Development:

Ensuring a Strong, Health and Just Society – Meeting the diverse needs of all people in existing and future communities, promoting personal wellbeing, social cohesion and inclusion, and creating equal opportunity for all.

Using Sound Science Responsibly – Ensuring policy is developed and implemented on the basis of strong scientific evidence, whilst taking into account scientific uncertainty (through the precautionary principle) as well as public attitudes and values.

Living Within Environmental Limits – Respecting the limits of the planet's environment, resources and biodiversity – to improve our environment and ensure that the natural resources needed for life are unimpaired and remain so for future generations.

Achieving a Sustainable Economy – Building a strong, stable and sustainable economy with provides prosperity and opportunities for all, and in which environmental and social costs fall on those who impose them (polluter pays), and efficient resource use is incentivised.

Promoting Good Governance – Actively promoting effective, participative systems of governance in all levels of society – engaging people's creativity, energy and diversity.

4.31 More specifically, the Noise Policy Statement for England 2010 includes the following:

1.1 The Government is committed to sustainable development and Defra plays an important role in this by working to secure a healthy environment in which we and future generations can prosper. One aspect of meeting these objectives is the need to manage noise for which Defra has the overall responsibility in England.

1.2 The Government recognises that the effective management of noise requires a co-ordinated and long term approach that encompasses many aspects of modern society.

…

Noise Policy Aims

Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- Avoid significant adverse impacts on health and quality of life;
- Mitigate and minimise adverse impacts on health and quality of life; and
- Where possible, contribute to the improvement of health and quality of life.

4.32 Central Government issued its general Aviation Policy Framework (APF) in March 2013. It contained the following in relation to the environmental impact of aviation, albeit that it expressly stated that it would give specific guidance to the CAA on environmental objectives the following year (the 2014 Guidance set out above at paragraph 4.17 et seq):

"The Government's primary objective is to achieve long-term economic growth. The aviation sector is a major contributor to the economy and we support its growth within a framework that which maintains a balance between the benefits of aviation and its costs particularly its contribution to climate change and noise.

…The Government recognises that noise is the primary concern of local communities near airports and we take its impact seriously.

…Our overall objective on noise is to limit and where possible reduce the number of people in the UK significantly affected by aircraft noise.

…The Government remains a strong supporter of the Single European Sky (SES) initiative, which has the potential to deliver real benefits by minimising air traffic delays, reducing aircraft fuel consumption and lowering the amount of emissions produced by the aviation sector. We also support the implementation of the CAA's Future Airspace Strategy (FAS), which sets out the long-term vision on how we should change our airspace within the overall aim of modernising the UK's airspace system in the context of the SES objectives. The implementation of the FAS can also play a significant role in delivering our

economic and environmental objectives in relation to aviation. For example, by improving the overall efficiency of our airspace we can also at the same time provide significant opportunities to minimise aircraft emissions and air traffic delays.

4.33 Specifically in relation to noise, the APF provides:

We want to strike a fair balance between the negative impacts of noise (on health, amenity (quality of life) and productivity) and the positive economic impacts of flights.

…the Government has powers under the Civil Aviation Act 1982 to set noise controls at specific airports which it designates for noise management purposes

…For many years, Heathrow, Gatwick and Stansted Airports have been designated for these purposes, and we will continue to maintain their status. These airports remain strategically important to the UK economy and we therefore consider that it is appropriate for the Government to take decisions on the right balance between noise controls and economic benefits, reconciling the local and national strategic interests.

…we will continue to treat the 57dB LAeq 16 hour contour as the average level of daytime aircraft noise marking the approximate onset of significant community annoyance.

…the Government recognises that people do not experience noise in an averaged manner and the that value of the LAeq indicator does not necessarily reflect all aspects of the perception of aircraft noise. For this reason we recommend that average noise contours should not be the only measure used when airports seek to explain how locations under flight paths are affected by aircraft noise. Instead the Government encourages airport operators to use alternative measures which better reflect how aircraft noise is experienced in different localities, developing those measures in consultation with their consultative committee and local communities. The objective should be to ensure a better understanding of noise impacts and to inform the development of targeted noise mitigation measures.

Consistent with its overall policy to limit and where possible reduce the number of people adversely affected by aircraft noise, the Government believes that, in most circumstances, it is desirable to concentrate aircraft along the fewest possible number of specified routes in the vicinity of airports and that these routes should avoid densely populated areas as far as possible.

The Secretary of State's Directions to the CAA

4.34 The Secretary of State has given directions to the CAA (pursuant to section 66 of the Transport Act 2000) by the Civil Aviation Authority (Air Navigation) Directions 2001 (the 2001 Directions).

4.35 Subject to section 70 of the Transport Act, the CAA is directed by the Secretary of State to perform its air navigation functions in the manner that it thinks best calculated to take into account the following:

- The Secretary of State's guidance on the Government's policies on sustainable development and on reducing, controlling and mitigating the impacts of civil aviation on the environment and the planning policy guidance it has given to local planning authorities.
- The need to reduce, control and mitigate as far as possible the environmental impacts of civil aircraft operations, and in particular the annoyance and disturbance caused to the general public arising from aircraft noise and vibration, and emissions from aircraft engines.
- At the local, national and international levels, the need for environmental impacts to be considered from the earliest possible stages of planning and designing, and revising, airspace procedures and arrangements.

4.36 The CAA is also specifically directed, where changes are proposed to the design or the provision of airspace arrangements, or to the use made of them to:

- Where the changes might have a significantly detrimental effect on the environment, advise the Secretary of State of the likely impact and of plans to keep it to a minimum.
- Where such changes might have a significant effect on the level or distribution of noise and emissions in the vicinity of an airport, ensure that the manager of the airport, users of it, any local authority and any organisation representing the interests of person in the locality have been consulted.
- Where such changes might have a significant effect on the level or distribution of noise and emissions under the arrival tracks and departure routes followed by aircraft using an airport but not in its immediate vicinity, or under a holding area set aside for aircraft waiting to land at an airport, ensure the manager of the airport and each local authority in the areas likely to be significantly affected by the changes have been consulted.

4.37 Further, the CAA is specifically directed where such changes might have one or more of these effects the CAA shall refrain from promulgating a change without first securing the approval of the Secretary of State. The Secretary of State has given no further direction nor guidance on the interpretation of these directions. Therefore the CAA proceeds on the basis that (a) the overall exposure to noise

must increase to a level that exceeds 57dB LAeq as a result of the changes proposed; and (b) the increase in the level of exposure to noise must in itself exceed 3dB. The 57dB figure is drawn from the Government's own Aviation Policy Framework (paragraphs 3.12 to 3.19 of the APF), in which it is stated that the Secretary of State would continue to treat the 57dB LAeq 16 hour contour as the average level of daytime aircraft noise marking the approximate onset of significant community annoyance. The 3dB figure is one that has been used in the Government's APF in relation noise policy (i.e. as a trigger for acoustic insulation).

4.38 Finally, the CAA is directed to provide a focal point for receiving and responding to aircraft related environmental complaints from the general public.

4.39 By section 69 of the Transport Act, if a requirement of the 2001 Directions conflicts with the requirements of another enactment or instrument (other than section 93 of the Transport Act or a direction under section 94) then the 2001 Directions should be disregarded. For example, the 2001 Directions are subservient to the requirement to make safety a priority under section 70 of the Transport Act and therefore the guidance should be disregarded where it seems to conflict with section 70.

International Requirements

4.40 In 2010, the International Civil Aviation Organisation (ICAO) Assembly agreed Resolution A37-11 on PBN Global Goals. The Resolution requires States to complete a PBN implementation plan to achieve:

- the implementation of RNAV-1 and RNP operations (where required) for en route and terminal areas according to established timelines and intermediate milestones; and
- the implementation of approach procedures with vertical guidance (APV) for all instrument runway ends, either as the primary approach or as a back-up for precision approaches by 2016.

4.41 The Assembly Resolution is not a mandate and the UK has agreed with the ICAO that whilst making every effort to meet the 2016 date, the implementation of approach procedures at all instrument runway ends may take longer.

4.42 The European Commission Implementing Regulation (EU) No 716/2014 on the Establishment of the Pilot Common Project supporting the implementation of the European Air Traffic Management Master Plan sets out six air traffic management functionalities to be deployed in pursuance of the Single European Air Traffic Management Research (SESAR) programme. In the UK, the RNP 1 PBN specification is mandated for terminal airspace and the RNP APCH PBN specification for approaches at Heathrow, Gatwick, Stansted and Manchester

Airports from 1 January 2024. This implementation must be co-ordinated and synchronised to ensure that the international performance objectives are met.

4.43 The European Commission, through the European Aviation Safety Agency (EASA), is also proposing PBN-related legislation for much earlier implementation. EASA Notice of Proposed Amendment 2015-01 (consulted on from January to February 2015) proposes implementation of PBN across the European Air Traffic Management Network with application in terminal airspace and en-route airspace from December 2018 and in approach operations by January 2024. The specification of PBN to be applied is RNP 1 in terminal airspace and Advanced RNP in the en-route. Any application is conditional on there being a performance objective. The instrument approach requirement is effectively a mandate for implementing the RNP APCH on all Instrument Flight Rules (IFR) runways. Publication of the Opinion from EASA is anticipated by the end of 2015.

4.44 In order to encourage PBN equipage and use, the CAA published Aeronautical Information Circular (AIC) (Y) 092/2014 in December 2014 requiring mandatory equipage to an RNAV-1 1 PBN specification by November 2017 for all aircraft operating in to and out of the five major London airports plus Southend, Farnborough and Biggin Hill.

4.45 In summary, the UK is under an obligation to ICAO, the European Commission and EASA to transition to PBN-based procedures in all flight phases. With regard to operations at Gatwick Airport, the obligation to the European Commission is in the form of a mandate affecting terminal airspace (RNP 1) and approach (RNP APCH) operations with a completion date of 1 January 2024. Whilst the European mandate is some years away, RNAV-1 is seen as a transitory step to achieve this objective.

Chapter 5

CAA Policy background to decision and review

Future Airspace Strategy

5.1 In June 2011, pursuant to its functions under the 2001 Directions, the CAA adopted the FAS. Broadly, the aim of FAS is to generate commercial, environmental and safety benefits by modernising, simplifying and harmonising the way airspace and air traffic control services function. One of the premises of FAS is that performance-based navigation technology, of which RNAV-1 is a method, provides an important opportunity for improvements in safety and the efficient use of airspace consistent with the aims set out in FAS.

5.2 Performance-based navigation allows routes to be flown more accurately and consistently. This brings with it safety benefits, for example reducing potential conflicts with other aircraft. The improvement in accuracy also allows for greater airspace capacity should it be required. The negotiation of preferred trajectories relying upon performance-based navigation will allow for more direct routes to be flown and the avoidance of stack holding, which will in turn minimise fuel burn, reducing the environmental impact of aircraft in terms of fuel consumption and emissions. The flying of more direct routes will also reduce the overall impact of aircraft noise, although FAS acknowledges that some individuals will be impacted more as improved accuracy causes the concentration of tracks. Finally, flying more direct routes will reduce costs associated with fuel consumption and aircraft maintenance, and it will improve efficiency since operations will be more resilient. The costs of maintaining and replacing ground-based navigation aids are also saved by the use of new technology.

5.3 FAS explains that for PBN to work as efficiently as possible there must be international co-operation and integration with new technologies. This will reduce the workload on controllers and thereby reduce the potential for error and associated risks. The international harmonisation of airspace structures based on the new technology will reduce the potential for conflicts which will in turn improve safety.

5.4 It is one of FAS's aims that the London Airspace Management Programme (LAMP) take full advantage of the potential improvements in navigational performance afforded by this technology.

5.5 The FAS Deployment Plan provides for replication or redesign of airport SIDs to PBN standards to optimise their environmental (noise) and operational performance and connect them to the PBN network between 2013 and 2017. It notes that:

The introduction of PBN is being promoted throughout the ICAO Global ATM Plan and the European Commission has proposed a PBN Implementing Rule (PBN IR) planned for the 2018 to 2020 timeframe to introduce the capability in a consistent manner across Europe. FAS aims to ensure the use of PBN as early as possible as a key enabler for many of the improvements described in the deployment plan.

5.6 Under the heading Airspace Re-design for PBN it states:

The advanced navigational capability of many aircraft is significantly under used in today's system, especially in the terminal airspace and at low altitudes around key airports, where much of the fleet is already equipped and there is the greatest potential to realise benefits. FAS aims to assure the costs incurred by operators to equip their fleets to a particular navigation standard are met by performance improvements derived through changes to the airspace design in a corresponding timeframe.

Changes to terminal and airport space will be designed to PBN standards – in the near-term RNAV1. PBN enables the implementation of closer spaced, more precise routes that facilitate the systematisation of today's tactical arrangements. PBN is also the navigational standard required for more advanced air traffic management concepts such as required time of over flight that will be used to support the evolution of arrival management.

Around airports PBN enables standard arrival and departure procedures to be optimised to better manage noise impacts on the ground, increase runway throughput and strengthen resilience for precision landing aids (e.g. ILS).

5.7 It makes the CAA responsible for a centralised programme to co-ordinate the implementation of PBN. It is asked to expedite implementation of simpler PBN replications at low altitudes around airports.

5.8 The programme of modernisation centred on London's airports and the surrounding airspace, drawn up by NERL in response to FAS, is known as the London Airspace Management Programme.

5.9 The initial aim of LAMP was to redesign the airspace network over the whole of London and the South East and consult on a complete package of changes. However, initial design work highlighted a significant constraint in achieving an optimised airspace structure. Therefore, LAMP is now progressing on a phased basis. It should be noted that there may be further opportunities to refine the design of airspace and realise greater improvement later in the process of LAMP. The CAA considers it is essential that the SIDs designed by Gatwick Airport that are the subject of this PIR complement the network of routes being designed under LAMP in order to realise the full benefit of moving to PBN.

5.10 The aim of LAMP is to produce a net effect of less noise – aircraft will climb higher, more quickly on departure, and stay higher for longer on arrival. It will, however, mean that some flight paths will change, and some areas may be overflown more although others will be overflown less. The possibility of respite routes is being considered. The changes should improve efficiency which will in turn reduce emissions.

5.11 It is important to note that RNAV-1 procedures and the wider deployment of Performance-Based Navigation (PBN) is just one enabler in an airspace modernisation project which is designed to bring benefits to airports, local communities, ATS providers, airspace users and the consumer.

5.12 In Europe, this is encapsulated in the Single European Sky Air Traffic Management Research programme with our own Future Airspace Strategy reflecting deployment at a State level. FAS contains a number of initiatives apart from PBN, including changes to Transition Altitude, new ATM tools e.g. Arrival Manager, greater airport co-ordination e.g. Airport-Collaborative Decision Making and Network efficiencies such as Flexible Use of Airspace and Departure Information.[19] All of these initiatives have costs and returns for the investment made. The consumer benefits are expected to be in terms of reduced delay and lower cost of travel. The environmental benefit comes from the ability over time to design airspace to deliver respite and continuous climb and descent procedures thereby reducing emissions.

5.13 A major stimulus for the technological developments such as PBN is how to manage the growth in air traffic demand. So PBN is an enabler for maintaining safety, making more efficient use of airspace thereby increasing its capacity, and the most expeditious and therefore environmentally efficient (in fuel terms) routings for individual aircraft.

5.14 However, it is a combination of airspace initiatives that will help us to prevent deterioration in or improve on levels of delay and cope with the traffic demand. The “do nothing” scenario will lead to increased delays as traffic restrictions are put in place on an antiquated airspace design and system.

5.15 But in many cases until all of the pieces of the airspace modernisation jigsaw are in place we will not realise the benefits that new airspace structures will bring as traffic continues to increase.

5.16 NATS has expressed its position in relation to RNAV-1 technology thus (taken from the NATS 2013 consultation in relation to Phase 1 of LAMP):

Modernisation of the airspace system is essential for the UK and continental Europe to remain competitive in the global market. For this reason processes

[19] See FAS at http://www.caa.co.uk/FAS for more information on these initiatives.

are underway at a European level to make modernisation a legal requirement for the UK and other European states by 2020. Doing nothing is therefore not an option.

The UK's airspace infrastructure is currently predicated on 'conventional' navigation, using ground-based beacons. This system has been in place for many decades and does not exploit the modern navigational capabilities with which most commercial aircraft are already equipped (e.g. satellite technology). It is therefore relatively inefficient, both operationally and environmentally.

Modernisation will enable UK aviation to reap the benefits of the latest technologies such as Performance Based Navigation (PBN). A route system using PBN standards allows more flexible positioning of routes and enables aircraft to fly them more accurately. This helps improve operational performance in terms of safety and capacity, and also offers environmental benefits.

The environmental benefits of route flexibility including noise management by positioning some routes away from population centres or other sensitive areas, and more scope to minimise fuel burn and CO_2 emissions by shortening and/or raising flight paths.

Modernising the system can also help improve resilience by enabling a quicker recovery from events that close runways and generate delay (such as emergencies and bad weather).

Given FAS and the upcoming European legislation, the change to a PBN environment is inevitable …

The CAA's policy as to changes in airspace

5.17 The CAA has set out its policy as to how it approaches balancing the factors relevant to a decision to make changes in airspace structures: CAA Guidance on the Application of the Airspace Change Process, CAP 725.

5.18 As set out above in paragraph 3.29, CAP 725 sets out a seven stage process from development of a proposal and consultation through to approval, promulgation by notification, implementation and subsequent operational review.

5.19 As to assessment of the change in the environmental impact, and in particular in relation to noise, CAP 725 provides that in the case of a proposed airspace change, "*Change Sponsors must produce Leq, 16 hours, noise contours*[20] *for airports where the proposed option entails change to departure and arrival routes for traffic below 4,000 feet based on the published minimum departure and arrival gradients*." It explains that "*the height of 4,000 feet agl was selected as*

[20] See Chapter 3 above.

the criteria for Leq contours because aircraft operating above this altitude are unlikely to effect the size or shape of Leq contours." It also explains that "*Contours must be portrayed from 57dBA Leq, 16 hours, at 3dB intervals. DfT policy is that 57dBA Leq, 16 hours represents the onset of significant community annoyance … Contours should not be produced at levels below 54dBA Leq 16 hours because this corresponds to generally low disturbance to most people …*"

5.20 CAP 725 also provides that 56 SEL footprints[21] must be used when the proposed airspace includes changes to the distribution of flights at night below 7,000 feet agl and within 25 km of a runway. Night is defined here as the period between 2300 and 0700 local time. If the noisiest and most frequent night operations are different, then footprints should be calculated for both of them. A separate footprint for each of these types should be calculated for each arrival and departure route. SEL footprints may be used when the airspace change is relevant to daytime only operations. If SEL footprints are provided, they should be calculated at both 90dBA SEL and 80dBA SEL.

5.21 As set out above, CAP 725 provides as follows in relation to Post Implementation Reviews:

The purpose of the operational review meeting will be to assess and validate the success of an airspace arrangement and its progress to date to identify any operational issues that may have arisen since the introduction of the change.

This is necessary in order to identify any subsequent requirements to bring about further changes to ATC patterns and procedures, and indeed further changes to airspace structures, the need for which can only be determined through operational experience.

5.22 The CAA has a policy on PBN SID Replication for SID Replacement dated 19 August 2013, so it came into force after the decision in respect of which this is the PIR. The express purpose of the policy is to provide outline guidance as to specific consultation, environmental assessment and airspace change proposal requirements when change sponsors intend to replicate conventional SIDs with SID designs using PBN. It expressly acknowledges that track keeping on some conventional SIDs results in deviations from the NPR, and that this potentially creates an issue where PBN compliant SIDs are being designed.

5.23 The policy summarises the requirements thus:

The introduction of replicated SIDs to replace existing conventional SIDs requires an Airspace Change Proposal (ACP) as defined in CAP 725 … In this instance the use of Local Airport Consultative Committees (LACC), together with any additional stakeholders deemed appropriate (e.g. local environmental

[21] See Footnote 14 in Chapter 3 above.

groups etc), may target consultation to those directly affected thus avoiding un-necessary consultation with stakeholders who will not be affected by the introduction of a PBN replication of a conventional SID.

…

At any stage during the IFP design process, if it is determined that PBN designs require more controlled airspace, change sponsors must follow the airspace change process guidance regarding requirements for new controlled airspace as defined in CAP 725 …

…

It should be noted that introduction of replicated SIDS may, or may not result in a need to re-align existing NPRs; in the event of NPR re-alignment, this requirement still necessitates the airspace change process to be followed. Subsequently, this process may also be used to propose re-alignment of NPRs to reflect a replication…

For DfT designated airports, sponsors are required to brief the DfT on track keeping issues, NPR re-designation and plans for conventional SID replacement with replicated PBN SIDs, and obtain agreement from the DfT on NPR change proposals before progressing with their consultation … Following consultation and airspace change proposal submission, subsequent NPR changes will therefore be subject to agreement from the Secretary of State.

5.24 As to environmental assessment, the policy includes the following:

If it is agreed with the CAA that a proposed PBN SID represents the replication of a conventional SID the following requirements will apply:

- Analysis of a PBN replication should normally consist of track, fleet and NPR assessments. This is deemed to meet the requirements for environmental assessment of CAP 725.
    - The track analysis considers the degree of correlation between the centrelines of the PBN replication SID and the conventional SID.
    - The fleet analysis considers the forecast change in the concentration in traffic actually flown on the new PBN replication SID. This should consider both horizontal and vertical profiles.

5.25 The NPR analysis considers the relationship between the established NPR (both centreline and compliance monitoring swathe) for the centrelines of both the conventional SID and the PBN replication SID.

Chapter 6

Summary of decision and therefore of the airspace change approved

Gatwick's proposal and its objectives

6.1 In 2013 Gatwick submitted an airspace change proposal for new RNAV-1 SIDs at Gatwick Airport. The proposal was to eventually replace the conventional SIDs from Gatwick Airport with SIDs that achieved more concentrated, predictable aircraft tracks, utilising the improved navigational capabilities associated with new RNAV-1 technology. A copy of the proposal is at http://www.caa.co.uk/default.aspx?catid=2111&pagetype=90&pageid=16983. The proposal included material gathered by Gatwick as a result of trialling SIDs on four of the nine routes that were the subject of the request for an airspace change.

6.2 The proposal included the following acknowledgement of its potential effects on those overflown:

The improved track-keeping ability of P-RNAV will result in less dispersal of flights across the NPR swathes. Thus the noise impact of the over-flying aircraft will affect less people. However those who are directly beneath the flight path will experience a greater number of over-flights.

6.3 The proposal stated that it was in line with the FAS (the objectives of which in relation to RNAV-1 technology are set out above in Chapter 5) and that it was also supported by the airlines for the following reasons:

- Procedures designed to PBN specifications allow airlines to use their Flight Management System equipment to its full capability to assure predictable flight paths.
- More predictable flight planning.
- Improved standardisation of flight profiles in accordance with standard operational procedures.
- The move away from reliance on ground navigational aids.

6.4 The proposal also noted that:

Aircraft following P-RNAV SIDs are expected to self-navigate to a greater extent than is the case for those following conventional SIDs. Hence the number of tactical interventions from the air traffic controllers (radio calls) is reduced. In congested airspace, this aids efficiency, expedition and safety.

6.5 The factors identified in this and the preceding paragraph were all consistent with the objective of improving airspace management and safety identified in the 2002 Guidance.

6.6 The proposal noted that improved track keeping and air traffic being more concentrated close to the route centreline is in accordance with the Department for Transport's recommendations for minimising the impact of overflying aircraft on the population.

6.7 Under the heading Environmental Issues the proposal said this:

Noise pollution is recognised as being the most significant impact of overflying aircraft at low levels. Government policy for minimising the impact of noise pollution from aircraft at low level on the population is to encourage concentration of flights in a few narrow corridors as opposed to dispersal across wider areas.

6.8 The proposal noted that the proposed Route 4 of the new RNAV-1 SIDs would not remain within the NPR compliance monitoring swathe (as it had not when this new SID was trialled in 2007) but that it did replicate the existing conventional SID route reasonably closely, since the existing route was outside the NPR compliance monitoring swathe and had been so for a period of years.

6.9 It also noted that the feedback from consultation it had carried out in relation to the proposed RNAV-1 Route 4 was generally positive: 6 responses in support, 57 stating "no objection or no comment" and only 3 objections.

The CAA's decision on the proposal

6.10 Copies of the decision letter and its annexes appear here http://www.caa.co.uk/default.aspx?catid=2111&pagetype=90&pageid=16983.

6.11 The CAA's decision letter dated 14 August 2013 summarised the purpose of the proposal thus:

The introduction of the RNAV SIDs was in line with CAA Performance-based Navigation Policy as set out in the Future Airspace Strategy, to introduce RNAV operations in London Terminal Airspace in order to facilitate growing demand and safe operation. At the same time RNAV SIDs will contribute towards Government policy to achieve better track-keeping accuracy and concentrate traffic where possible and to reduce the number of people overflown.

6.12 The decision was taken in light of all the materials produced pursuant to the CAP 725 process, including operational, technical and environmental reports prepared by the CAA[22], as well as the relevant law, guidance and policy.

[22] On CAA's website http://www.caa.co.uk/default.aspx?catid=2111&pagetype=90&pageid=16983.

6.13 Of these materials in particular, the report of the Environmental Research and Consultancy Department of the CAA, a summary of which was attached to the decision letter, concluded that whilst an overall anticipated environmental benefit could not be demonstrated as a result of the changes it would be unlikely that there would be any significant consequential detriment either.

The impacts that we anticipated

6.14 We anticipated that the introduction of the proposed RNAV-1 SIDs would result in fewer people being overflown, albeit in greater concentration, consistent with long-standing Government policy. In summary, at the time we made the decision in 2013 our view was that of the environmental impacts expected, none was anticipated to be significant (within the meaning of Paragraph 9 of the 2001 Directions from the Secretary of State to the CAA) for the following reasons.

- Since the airspace change required no changes to ground infrastructure, we considered that there were no effects on land-take and biodiversity.
- Since the airspace change was to replicate the existing conventional SIDs, we considered that there were no effects on the number of aircraft operations or the distance flown, and consequently no effect on carbon emissions.
- Since the RNAV-1 replication did not alter operations below 1000ft AMSL we considered it would have no effect on local air quality.
- We did anticipate that the change we decided to approve for Route 4 would lead to an increased overflight of the Surrey Hills Area of Outstanding Beauty (AONB) but that the number of such overflights would be very small.
- We did not consider that the changes would have a significant effect on the level or distribution of noise in the vicinity of the airport. The Government's Aviation Policy Framework stated that they will "*continue to treat the 57dB LAeq 16 hour contour as the average level of daytime aircraft noise marking the approximate onset of significant community annoyance*." We assessed the anticipated effect of the RNAV-1 replications on the 2013 average summer day LAeq 16 hour contours (2013 decision Environmental Report Appendix 2[23]) and determined that they would have no effect on the area of the 57dB LAeq 16 hour contour[24] and estimated it would decrease the population within that contour by approximately 50 people (this figure is rounded to the nearest 50).

[23] Available at http://www.caa.co.uk/default.aspx?catid=2111&pagetype=90&pageid=16983.

[24] See further explanation on this analysis method in Chapter 3.

- We did consider there would be a change to aircraft tracks on Route 4 below 4000ft AMSL (and therefore in the locations exposed to the noise of the aircraft). However we did not consider that the change in noise levels at such location would be significant.
- We did consider there would be a change to aircraft tracks on Route 4 (and therefore in the locations exposed to the noise of the aircraft). However we did not consider that the change in noise levels at any location would exceed 1dB until noise exposure levels are below 54dB LAeq.

6.15 In terms of the anticipated dispersion of aircraft on the proposed Routes 1, 3, and 5 - 9, it was expected to be similar to that on the conventional SIDs. In relation to Routes 2 and 4, the anticipated dispersion was different from that on the conventional SIDs, although still largely within the NPR compliance monitoring swathe on Route 2. Where on Route 4 it was anticipated that aircraft would fly outside the NPR compliance monitoring swathe, it was anticipated it would be by about 500m, and those flying outside the NPR compliance monitoring swathe would only do so for about 20 seconds. The anticipated magnitude of the potential noise change below 4000ft AMSL – no more than 0.5dB – was far below that which would ordinarily be considered significant when assessing the impact of a change in aircraft noise. By comparison, on the conventional SID, a small proportion of aircraft flew outside the NPR compliance monitoring swathe below 4000ft AMSL as a result of changes over time.[25] So the Route 4 RNAV-1 SID was not anticipated to be dissimilar from the conventional SID in the location and extent to which it was expected to cause departure from the NPR compliance monitoring swathe. There was no anticipated impact on Leq 16 noise contours and SEL footprints as it is anticipated that any changes would be to areas that experienced lower aircraft noise, well outside the 57dB noise contour. When making our decision we therefore concluded that the changes occasioned by the proposal were unlikely to have a significant environmental impact.

6.16 The decision on the proposal took into account the results of Gatwick's consultation, which had taken place having regard to the requirements of CAPs 724 and 725, and the CAA. The CAA's conclusions of the consultation included the following.

- The ambit of the consultation was proportionate to the proposal.
- Whilst there had been criticism of the maps presented by Gatwick in the consultation, this was rectified during the consultation process so that it was adequate overall.

[25] Data received from Gatwick in this PIR indicates approximately 6% of aircraft exceed the NPR compliance monitoring swathe (below 4000ft AMSL) when flying the conventional SIDs before the change.

- The use of the consultative committee was helpful.

6.17 The consultation report prepared by the CAA as part of the process of making the decision to make the airspace change that is the subject of this PIR[26] acknowledged that there were general concerns as to noise, greater concentration of aircraft tracks over the ground and impact on property prices. It also acknowledged there were specific concerns amongst members of the public expressed during the consultation which included the following.

- Residents in the Dormansland area were concerned about a change in dispersion within the NPR compliance monitoring swathe, and a condition was therefore imposed on the CAA's decision requiring Gatwick to monitor the impact of the change particularly along that route (see paragraph 7.2 below).
- Residents in the East Grinstead area were concerned about an eastwards shift in the track, and it was found that there was an anticipated shift of about 0.75 km, with narrower dispersion, but that it was within the NPR compliance monitoring swathe.
- In relation to Route 4, one member of the public from Leigh objected to the additional noise resulting from a greater concentration of aircraft overflying his village, and Capel Parish Council objected to the proposal on the grounds of increased noise and concentration arising from increased numbers of aircraft overflying the area.
- A number of members of the public asked upon what basis a review of the new SIDs would lead to a decision to withdraw them.

6.18 The operational and technical reports prepared by the CAA as part of the process of making the decision to make the airspace change that is the subject of this PIR[27] considered modification of the RNAV-1 SIDs in order to minimise the anticipated impact identified by the environmental report and the concerns expressed by members of the public in the consultation. In particular, it was concluded that a SID could not be designed for Route 4 that maintained all aircraft inside the NPR compliance monitoring swathe without reducing the design speed of the SID. This would require aircraft flying at slower speeds necessitating an aircraft configuration with extension of high-lift devices[28] for longer, with a consequent impact of creating more noise to communities overflown. A proposed reduction in design speed was discussed with Gatwick air traffic control who advised that there would be a significant impact on the

[26] http://www.caa.co.uk/default.aspx?catid=2111&pagetype=90&pageid=16983.

[27] http://www.caa.co.uk/default.aspx?catid=2111&pagetype=90&pageid=16983.

[28] High-lift devices are mechanisms which increase lift beyond that obtainable from the main aircraft components i.e. the aircraft wing. The most common high-lift device is the flap, a movable portion of the wing that can be lowered to produce extra lift at the slower speeds associated with the take-off and early part of the climb.

intervals between departing traffic on the different departure routes which in turn, would cause delays at the airport with both arrivals and departures. The option to consider slower speeds for the initial turns was therefore discounted by both CAA and Gatwick as not being operationally viable, given the impacts on delays, and potential increased noise which would be encountered.

6.19 The decision letter[29] set out the CAA's reasons for its decision in light of the material before it. They included the following.

- The proposed RNAV-1 SID designs were appropriate and met ICAO and CAA design requirements.
- Since the RNAV-1 SIDs were intended to replicate as closely as possible the existing conventional SIDs it was anticipated that departure swathes would become more concentrated thus reducing the number of people overflown in line with Government policy.

6.20 In conclusion it became apparent to the CAA during our consideration of the proposal that the conventional SID for Route 4 no longer operated so that aircraft following the SID flew wholly within the NPR compliance monitoring swathe. The data obtained during the PIR tells us that approximately 6% of departures on the conventional SID flew outside the NPR compliance monitoring swathe for a small period before reaching 4000ft AMSL once the upper limit of the NPR is exceeded and aircraft then may be vectored by air traffic control. The RNAV-1 SID for Route 4 could not be designed so that aircraft would fly completely within the NPR compliance monitoring swathe because of technical and safety requirements, as detailed in the reports annexed to the decision letter (referred to in paragraph 6.18 above).

6.21 The CAA decided that the anticipated impact of the introduction of the RNAV-1 SID for Route 4 was not significant because the excursion from the NPR compliance monitoring swathe caused by it was *"for such a short duration … broadly consistent with existing traffic patterns, and … only for a very small distance away from the NPR swathe."* The decision letter recorded that that view was supported by the Department for Transport.

6.22 It stated its overall conclusion thus:

> *… I am satisfied that the implementation of RNAV SIDs is fully justified, consultation has been appropriate, and whilst the environmental analysis indicates that an overall environmental benefit cannot be demonstrated, standard noise metrics under CAP 725 guidelines would be unlikely to show any change, and equally, there is unlikely to be any adverse impact on CO_2 emissions and LAQ. The implementation is in line with Government guidance*

[29] http://www.caa.co.uk/default.aspx?catid=2111&pagetype=90&pageid=16983.

to concentrate traffic, and whilst some people will experience more concentration, others will see less overflight.

6.23 It should be noted that the CAA took its decision when the 2002 Guidance was still in force. The decision was taken applying the 2002 Guidance, and in particular the objectives of preserving existing route structures as far as possible, and only introducing new structures that overfly as few people as possible.

6.24 New Guidance was published in 2014 and is being applied in this PIR.

6.25 The CAA explained at the time of the decision that it would apply its post-implementation review process to this airspace change. The decision letter stated that "should any RNAV-1 SID be deemed to be of detrimental effect, it could be withdrawn".

6.26 The decision letter also acknowledged that "in due course, it may be possible to design alternating respite procedures within existing NPR [compliance monitoring] swathes, but this will be very much dependent on strict RNAV-1 design criteria and the plans of Gatwick".

6.27 Gatwick was advised to monitor departure tracks in particular along Route 5.

6.28 Before the CAA made its decision to approve the change it informed the Secretary of State that it was minded to approve the change and that in its view the environmental impacts of the change were not significant within the meaning of Paragraph 9 of the 2001 Directions from the Secretary of State to the CAA. However, the CAA advised the Secretary of State that on one route (Route 4) it was anticipated that the proposed decision would entail the CAA approving a SID which resulted in a small (between 1-5%) proportion of aircraft briefly leaving the NPR on the outside of a turn right. The CAA informed the Secretary of State because, as set out in paragraph 3.12, establishment and enforcement of NPRs at designated airports is a matter for the Secretary of State, and not a function of the CAA.

6.29 Therefore, as requested by the Secretary of State, specifically in relation to Route 4, the decision included the following:

With regard to Route 4, on 25 June 2013, the Department for Transport issued a consultation on its proposed new environmental guidance from the Secretary of State to the CAA on its environmental objectives. Following SARG discussions with the DfT, the DfT has advised that the approval on Route 4 is subject to the condition that the airspace change relating to Route 4 will take into account the new guidance from the Secretary of State when this is issued, and in particular ensure that there is an appropriate match between the Standard Instrument Departure Procedure and the Noise Preferential Route. G[atwick] will need therefore to review and assess whether Route 4 meets the parameters of Noise Preferential Routes as defined within the new guidance

and consult within a 12 month period, commencing from the publication date of the new guidance, (which is expected to be before the end of 2013), on any changes necessary to ensure that Route 4 meets the parameters of Noise Preferential Routes as defined there.

6.30 The proposal was to be implemented from 14 November 2013.

Chapter 7

Post implementation conditions and actions

Post implementation conditions contained in the decision letter

7.1 Under the heading Post Implementation Review, the CAA's decision letter contained the following:

"Given that the proposal includes a post implementation management oversight process, and that a number of comments responding to the consultation made comment on the methodology to be adopted for withdrawing RNAV SIDs if major issues arise, the CAA needs to be appraised of the methodology to be adopted. Details are to be clarified with the SARG Case Officer as detailed in Annex A.

The potential for Route 5 to have an impact on Dormansland remains to be seen; given the very small amount of feedback from Dormansland, Gatwick needs to review the impact of the new Route 5 RNAV SID and determine what (if any) action is required to address any post implementation issues. Requirements are detailed in Annex A.

Requirements regarding implementation of RNAV SIDs on Route 4 are subject to a conditional approval from DfT. Requirements are at Annex A.

Requirements for a Post Implementation Review for all ACPs (normally one year after implementation) are detailed to a DAP (now SARG) Policy Statement as published on the CAA Web."

7.2 Annex A to the CAA's decision letter contained the conditions which we set out below together with the actions taken with respect to them.

	Annex A condition	**Post implementation action**
1	*"Following implementation of Route 5 RNAV SIDs … GAL … is to monitor track-keeping of departures in relation to the existing conventional SID track dispersion and nominal track, and determine if there is an impact to Dormansland … If there is a detrimental impact to Dormansland, GAL is to consider repositioning waypoint KKE 02 to improve track dispersion to better*	In the information it submitted to the CAA as part of this PIR, Gatwick advised that the consultation responses it received in 2014 indicated to Gatwick that there was no appetite in the community for any modifications to this RNAV-1 SID. Gatwick therefore had no plans to propose to change this SID. This route (as with all of the routes) has been reviewed as part of

	replicate the conventional traffic distribution, advise the CAA, and arrange for a design revision to be submitted to the CAA for regulatory approval."	the PIR and the CAA's conclusions are set out below.
2	*"GAL is to advise the CAA of the specific post implementation track keeping assessment methodology (as highlighted in the consultation) prior to implementation. As a post implementation management oversight process proposed that should any RNAV1 SID be deemed to be of such detrimental effect, it could be withdrawn, GAL is to confirm these arrangements and provide clarity to the CAA (SARG) on what GAL deems to be a detrimental effect."*	The CAA was not provided with any information that Gatwick carried out this work.[30] We know that Gatwick did not instruct any of its airport users to cease using any of the SIDs. It is for the CAA to consider whether any of the RNAV-1 SIDs should be withdrawn, which we have considered as part of this PIR – see below.
3	*"GAL Monthly reports are to be provided to the SARG in a format to be agreed until such time the CAA no longer require further updates."*	Gatwick provided informative data for the first four weeks after implementation and the CAA did not request any further reports be sent to us prior to requesting data as part of this PIR.
4	*"A Post Implementation Review (PIR) is to be completed one year after implementation in accordance with the DAP Policy Statement."*	This is the report of that PIR.
5	*"Following the implementation of the following RNAV1 SIDs: Rwy 26 CLN, DVR … GAL are specifically to provide track dispersion plots for one month of departing traffic to illustrate details required in Appendix 1."*	In light of data received after the first month, no further information was deemed to be required.
6	*"GAL to is comply with a DfT conditional requirement in respect of Route 4 NPR as follows:"* *'On 25 June 2013, the Department for*	See paragraph 7.3 et seq below.

[30] As part of this PIR the CAA was advised by Gatwick that Gatwick had analysed preliminary data on the number of people overflown.

	Transport issued a consultation on its proposed new guidance from the Secretary of State to the CAA on its environmental objectives. The approval on Route 4 is therefore given subject to the condition that the airspace change relating to Route 4 will take into account the new guidance from the Secretary of State when this is issued, and in particular ensure that there is an appropriate match between the Standard Instrument Procedure and the Noise Preferential Route. G[atwick] will need therefore to review and assess whether Route 4 meets the parameters of Noise Preferential Routes as defined within the new guidance and consult within a 12 month period, commencing from the publication date of the new guidance to the CAA on its environmental objectives (which is expected to be before the end of 2013), on any changes necessary to ensure that Route 4 does meet the parameters of Noise Preferential Routes as defined within the new guidance.'	
7	*"In light of the 2012 CAP232 aerodrome survey obstacle date which necessitated revisions to the RNAV SID designs (inclusion of an additional altitude constraint), G[atwick] as owner of the SIDs, is to instigate a review of the existing conventional SIDs and then submit to SARG IFT for approval as detailed in CAP 785 no later than 31 January 2014."*	This was not complied with and consequently forms part of the requirements that flow from this PIR – see Chapter 10 below.
8	*"G[atwick] is to make arrangements with NATS LTC is advised to remind ATC staff that, as with existing conventional SIDs, controllers are to take action necessary to ensure aircraft using the HARDY1X …. will remain within CAS (the replicated SIDs result in flight*	This condition did not relate directly to the implementation of the RNAV-1 SIDs or to our review of them in this PIR. The CAA is not aware whether Gatwick advised NATS as set out in this condition.

	outside CAS towards the end of the SID profiles).”	

Gatwick’s consultation 23 May – 14 August 2014 following the CAA’s decision

7.3 It was a condition of the decision that Gatwick consult on any required amendments to the NPR in relation to Route 4.

7.4 Gatwick carried out such consultation together with consultation into other matters including low altitude options, noise contours and footprints, population counts for the NPR compliance monitoring swathes, respite options, geographical areas not captured in the initial consultation and potential adaptations of the Department for Transport noise abatement requirements, including a change in the width of NPR compliance monitoring swathes and centring of the NPRs.

7.5 In relation to Route 4, the consultation document said:

“Most modern aircraft have performance characteristics that make it difficult to follow the tight turn of the existing NPR whilst still flying in an efficient manner. As a consequence the flight paths of aircraft on this route have gradually shifted to the north over a number of years; this gradual shift means that many flight paths are now outside the historic NPR swathe. This shift was formalised in November 2013 when the new PBN route was drawn, because the PBN design criteria take modern aircraft performance capabilities into account.

Correcting this anomaly by re-centring and narrowing this one route to 2km causes a net increase of approximately 200 people within the full length NPR swathe. Whilst this is only a small net change there is a significant shift in terms of populations affected; with 7,200 newly affected with the full length NPR whereas 7,000 who were in the historic NPR would no longer be so…

…This and the other revised NPRs would not affect where aircraft fly in any way…

7.6 Gatwick’s report on the consultation in relation to a potential change in the NPR includes the following:

Broadly, a majority of respondents stated that they the preferred none of the options or did not know. The principal concern of respondents was noise.

Most respondents were against any change in the NPRs. The principal concerns of respondents were noise, and the impact on house prices of a change in an NPR.

7.7 Gatwick has not asked the Department for Transport to vary the NPR or its associated compliance monitoring swathe that corresponds to Route 4.

Chapter 8

CAA work undertaken during the review

Sources of information

Gatwick – the airspace change sponsor

8.1 The CAA wrote to Gatwick on 7 November 2014 commencing this PIR and asking Gatwick for data and other information. Further requests for information were sent as the PIR continued. A summary of those requests has been published on the CAA's website http://www.caa.co.uk/default.aspx?catid=2111&pagetype=90&pageid=16983. The information received will be published on the CAA's website.

Operators and Airlines

8.2 The CAA had been engaged in communications about the operation and flyability of the new RNAV-1 SIDs from an operator's perspective ever since they were introduced. Gatwick Airport was the first UK airport to introduce RNAV-1 SIDs and the CAA learned a great deal from their implementation and operation that was relevant to the policy and requirement to introduce performance-based navigation (of which RNAV-1 is one type) across the UK prior even to the commencement of the PIR. However, formal requests for information in respect of the PIR from operators commenced on 7 November 2014. The request has been published on the CAA's website at http://www.caa.co.uk/default.aspx?catid=2111&pagetype=90&pageid=16983. A summary of the material received will be published on the CAA's website.

NATS

8.3 NATS is the air navigation service provider (ANSP) currently providing air traffic control services for departures at Gatwick Airport. The CAA requested information from NATS regarding practices by their air traffic controllers controlling aircraft departing Gatwick Airport on the RNAV-1 SIDs in July 2015. The request is published on the CAA's website at http://www.caa.co.uk/default.aspx?catid=2111&pagetype=90&pageid=16983 and the response will be published on the CAA's website.

Groups and residents local to Gatwick Airport

8.4 In CAP 725[31] and the CAA policy statement on PIRs[32] the CAA has not previously contemplated seeking feedback and material from communities local

[31] http://www.caa.co.uk/docs/33/CAP725.PDF.

to an airport affected by an airspace change during a PIR. The reason for this was that prior to this airspace change, it had always been considered that the right time to take into account residents' feedback was before the change was made (in the Stage 4 consultation). However, the CAA, Gatwick, the Department for Transport and NATS had all been receiving feedback from groups and residents from summer 2014 much of which was directly related to the issues that the CAA required to be considered under the terms, scope and objective of this PIR.

8.5 During Autumn 2014 representatives from the CAA attended a number of meetings attended by local resident representative groups and GATCOM.[33] At those meetings the CAA was able to provide information and background on the reasons for the introduction of the RNAV-1 SIDs and to receive feedback on the impact of their implementation on local communities. The CAA was also able to provide some information and clarity on other events that were occurring simultaneously. Some information on these is provided earlier in this report and they include the ADNID trial, the Davies Commission on extra runway capacity in the South East (which includes an aspiration by the owners of Gatwick Airport to build a second runway) and Gatwick's 2014 consultation which included a consultation on the NPRs at Gatwick Airport but also a consultation on ideas for airspace change that are not directly related to the introduction of RNAV-1 SIDs that had occurred in November 2013.

8.6 Notwithstanding the PIR process that had hitherto been the norm, the CAA recognised that groups and residents had a great deal of feedback that they wanted the CAA to take into account when carrying out this PIR.

8.7 Up until that time feedback was coming into many different personal email accounts across the CAA. The CAA opened a specific email account for a notified but limited period of time. On reflection, an email account was not a very sophisticated means of receiving feedback. Receiving unconstructed feedback in the free text of an email increased the time it took to learn and identify what the groups and residents that had provided feedback were saying to us. We had to build structures and processes to ensure that all the information was assimilated and could therefore effectively be taken into account by the CAA. This is discussed in more detail in the PIR Correspondence Assessment attached to this report.

8.8 The information and material we have learned and taken into account from this feedback is discussed in more detail below. Tables illustrating how we have categorised and organised the material that we received are included in the PIR Correspondence database attached to this report.

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32 http://www.caa.co.uk/docs/33/20111031PIRPolicyStatement.pdf.

33 See paragraph 3.30 for more information about GATCOM.

Other information

8.9 The CAA also had access to Gatwick's noise and track keeping data known as 'Casper Noise'.

Actions carried out by the CAA during this PIR

8.10 Using the material obtained from the sources above the CAA carried out a number of tasks in order to undertake various analyses. The CAA's analyses are recorded in detail in five reports (plus a PIR Correspondence database) that are attached to this report. These are

- A PIR Route Analysis report
- A PIR Environmental Analysis report
- A PIR Operational and Technical report
- A PIR Correspondence Assessment
- CAA IFP Recommendations report

8.11 The detail as to how the CAA carried out its analyses is set out in the reports and those reports should be read as the CAA's statement on this. However, by way of summary only:

PIR Route Analysis report

8.12 An airspace regulator and staff from the CAA's environmental department of the CAA visually compared the flight track charts and plots provided by Gatwick to the CAA at the time the airspace change proposal was submitted to the CAA and the material submitted as part of this PIR. The objective of this comparison was to interpret where the aircraft were flying after the changes had been implemented compared with where they were flying before the changes were implemented and how they were responding to the RNAV-1 SID design. This comparison includes a qualitative assessment of aircraft behaviour and descriptions of where aircraft are flying by reference to locations on the ground which are visible on the associated charts for each route.

PIR Environmental Analysis report

8.13 Staff from the CAA's environmental department reviewed the analysis in the PIR Route Analysis report and considered the environmental impact of the change. This includes the impact on CO_2 emissions, local air quality, tranquillity, as well as the impact of aircraft noise after the change. In order to consider noise impact consideration was given to aircraft tracks over the ground and the height they pass over the ground. Consideration of the noise impact included:

- An assessment of population overflown;

- A comparison of noise contours and noise footprints;
- A comparison of achievement rates for each Noise Preferential Route.

8.14 In some cases the CAA used radar data from Gatwick's noise and tracking keeping system (Casper Noise) in order to undertake "gate" analysis which plots the height of aircraft above the ground passing through a theoretical "gate" drawn as a line across the ground on a map. Analysis was also undertaken in some cases for individual noise events.

PIR Operational and Technical report

8.15 The PBN Implementation Lead compiled a Technical and Operational report to place in context, the aircraft navigation performance standards applied, the Instrument Flight Procedure Design and the CAA's role in applying both UK Government and CAA guidance. This includes the notion of aircraft fly-ability and how the CAA undertakes regulatory oversight of the procedure design and its validation. The Report also documents the CAA's own investigations with the major operators at Gatwick Airport including individual responses to a CAA questionnaire. Responses have also been included from Boeing in respect of specific aircraft technical issues and the MET Office in respect of wind data for Gatwick Airport over approximately a 15 year period. The Report also contains a list of acronyms and an Appendix comprising extracts from the UK Aeronautical Information Publication of the individual Standard Instrument Procedure charts and navigation database coding for each of the nine Gatwick Airport RNAV-1 routes.

PIR Correspondence Assessment

8.16 In order to receive the comments, complaints and feedback that groups such as action groups or parish councils and residents around Gatwick Airport wanted us to take into account we opened a specific email address. We received a huge number of individual emails in the time the email address was open to receive comments. A full description of the process used is set out in the PIR Correspondence Assessment attached as an Annex.

8.17 In brief, the process involved reading every submission, email and hard copy letter received. Where possible we correlated the place of the sender's residence to the RNAV-1 SID nominal tracks and plotted that data point onto Ordnance Survey maps, so as to identify the types of comments made and how often different comments were made. A summary of the information provided to us is included in the PIR Correspondence Assessment. We produced a database of the comments received which is also attached to this report as the PIR Correspondence database.

CAA IFP Recommendations report

8.18 Taking into account all the evidence and material that the CAA had access to, and its analysis of that evidence as set out in the four reports above, a CAA Instrument Flight Procedure airspace regulator at the CAA produced recommendations of the conclusions the CAA should reach on whether the RNAV-1 SIDs were acceptable and should be confirmed or whether modifications were required. At the same time recommendations and requirements in relation to the conventional SIDs were produced. All these conclusions, requirements and recommendations are set out in the CAA IFP Recommendations report which is attached to this report. The conclusions are summarised later in Chapter 10 of this report. However, the actual conclusions of the CAA are those set out in the CAA IFP Recommendations report.

Chapter 9

CAA observations and conclusions on the information analysed

9.1 When we made our decision we took into account and considered the anticipated environmental impact of the change. We did so for two reasons. First, we needed to form an opinion on whether the change would have the significant environmental impacts identified in paragraph 9 of the 2001 Directions from the Secretary of State to the CAA in order to decide whether the Secretary of State's consent would be needed to promulgate the change should the CAA agree to the airspace change proposal or whether the decision was solely a matter for the CAA. Secondly, we needed to assess the anticipated environmental impact in order to take it into account together with our other duties (including the duty to make the most efficient use of airspace),

9.2 The purpose of this PIR is not to reopen our decision in those two respects. However, we do need to form an opinion on whether there is a difference between the actual and anticipated impacts in order that we can reach a conclusion on whether the impacts of our decision will remain in place (i.e the RNAV-1 SIDs remain as published) or whether we require modifications to or the withdrawal of any of the RNAV-1 SIDs.

9.3 For each route (and each SID of each route) we considered whether the aircraft were flying where we anticipated they would be flying at the time at which we approved the airspace change. As the objective of the change was to implement RNAV-1 SIDs that replicated so far as possible the nominal tracks of the conventional SIDs we identified where the aircraft were flying in comparison to the nominal track of the conventional SID. The evidence we had available to us was the track data supplied by Gatwick as part of the PIR data request submission and the feedback we received from groups and residents. This enabled us to reach a conclusion on whether the RNAV-1 SIDs had adequately achieved the replication that was the overall objective.

9.4 For each route we also considered where the aircraft were flying after the change as compared to where they were flying before the change. We noted that, before the change, some aircraft on some routes were not closely matched to the nominal track of the conventional SID and, as a consequence of conventional navigation, aircraft tracks were dispersed around their mean track to varying extents – see the PIR Route Analysis report.

9.5 This enabled us to reach conclusions for the purpose of this PIR on the environmental impact (in noise terms) of the change. In turn this allowed us to

consider whether, in our view, the environmental impact of the change had been significant (within the meaning of the term significant in the context of Paragraph 9 of the Directions from the Secretary of State to the CAA dated 2001).[34] This also enabled us to consider our original decision and the impacts of it in light of, or through the lens of, the 2014 Guidance on carrying out our s70 Transport Act environmental duty (for the reasons set out above)[35] – see the PIR Environmental Analysis report.

9.6 For each route we considered what factors, including operational and technical factors, may have caused or contributed to the outcomes and impacts we had identified. We also considered what operational and technical factors would influence our range of, and ultimate selection between, options for conclusions for this PIR – see the PIR Operational and Technical report.

9.7 Our analysis and conclusions in relation to these points is set out in detail in the reports referred to above. These reports should be treated as our statement on our findings. However, to enable as many as possible of the stakeholders interested in this PIR to understand the conclusions that the CAA has reached and why, we have set out a summary of our findings in respect of each route below.

9.8 For each route we cross-refer to some of the charts that were provided to us by Gatwick. Some charts were included within the 2012 consultation carried out by Gatwick (and provided by Gatwick to CAA within the airspace change proposal) and some were provided to the CAA as part of the PIR material. All these charts (along with others that formed part of the CAA's analysis) are attached to the PIR Route Analysis report.

CAA findings common to all routes

Post change coincidence of aircraft mean track with the nominal track RNAV-1 SID above 4000ft AMSL

9.9 We analysed the flight and location over the ground of aircraft departing on the SIDs in respect of each route. We observed one feature common to all the routes. Once aircraft reach the vertical limit of an NPR (3000ft or 4000ft AMSL, as applicable) they are no longer constrained by the lateral parameters of the NPR. Air traffic controllers are then at liberty to vector the aircraft to achieve the most efficient tactical outcome e.g. vectoring an aircraft on the most efficient route towards its final destination. Notwithstanding this, no matter what the shape or parameters of the SID we observed that departing aircraft, as they continued their climb away from the airport, tended to remain closer to or

[34] See paragraph 4.37 above re CAA policy on the meaning of those directions and the reasons for that policy.

[35] See paragraph 4.17 et seq.

coincident with the nominal track of the SID longer, between the 4000-7000ft AMSL portion of their climb, than before the change. At the time the CAA made its decision in 2013 this was not an impact we had anticipated. We consider this is a consequence of the improved accuracy of the RNAV-1 technology.

Environmental impact of the change

9.10 At the time we decided to approve the changes that are the subject of this PIR we had been told by Gatwick in the airspace change proposal, and we accepted (as a consequence of the trial data that we had received), that once aircraft could be vectored by air traffic control (above 3000ft or 4000ft AMSL as applicable) they would continue to be so such that there would be no change to the environmental impact of aircraft for local communities under these parts of the SIDs. For this reason our assessment of the environmental impact of the change for these communities was that there would be no change arising from traffic above 4000ft AMSL. The PIR has provided an opportunity to review if that is the case and in any event to assess the actual impact of the changes on all local communities above and below 4000ft AMSL.

9.11 The CAA's conclusion in this PIR is that there has been no significant environmental impact as a consequence of the implementation of any of the RNAV-1 SIDs on any of the routes.

9.12 That said, we do accept and acknowledge the experience of the groups and residents that have written to the CAA with their feedback on the impact on them of these changes.

9.13 When we say that we do not consider there has been any significant environmental impact as a result of the changes that are the subject of this PIR, we mean that we have not found on investigation any environmental impact of the change that exceeds the "significant" threshold (within the meaning of Paragraph 9 of the 2001 Directions from the Secretary of State to the CAA). We have analysed the size and shape of the noise contours of those areas/locations that experience more than an average of 57dB per day (average over 16 hours) which is the extant central Government standard for onset of "significant community annoyance". We have observed that this contour has not materially changed as a consequence of these changes (see Tables 2, 3, and 4 and the diagram at Appendix B of the PIR Environmental Analysis report). As a consequence we have determined that no community within the 57dB Leq 16 hour noise contour has experienced an increase in that average of more than 3dB as a result of this airspace change. Based on these measures there has been no significant change to the environmental impact.[36] That is of course not to say that some groups or residents are not annoyed as a result of the changes,

[36] See paragraph 4.37.

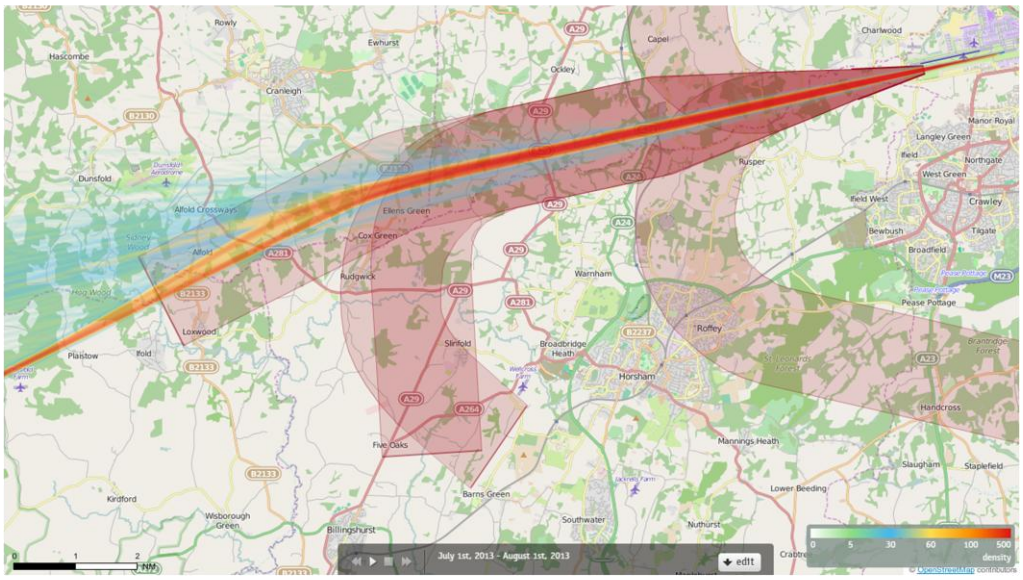
or experience an impact with which they are very unhappy. Furthermore that is not to say that some groups or residents beyond the noise contour do not sometimes experience single noise events (aircraft passing near to them) whose peak noise level is more than 57dB. Finally we acknowledge that traffic has increased at Gatwick Airport. This means some local communities have experienced more noise as a result of traffic increases.

9.14 When making the decision we were analysing the anticipated environmental impact of the change. As part of this PIR we have analysed the actual environmental impact of the change now that we know where the aircraft are in fact flying. We have not only considered environmental impacts that are significant (as defined above in paragraph 9.13). As set out above in paragraph 9.5, when considering these impacts as part of the PIR we have taken into account the Secretary of State's 2014 Guidance to the CAA on carrying out its environmental duty, whereas the 2002 Guidance was in force at the time of the decision.

Route 1

Figure 5 Route 1 heat map showing the density and distribution of flights before and after the change

26SOUTHAMPTON Density July 2013
1550 Aircraft – Showing CONVENTIONAL Departures Only



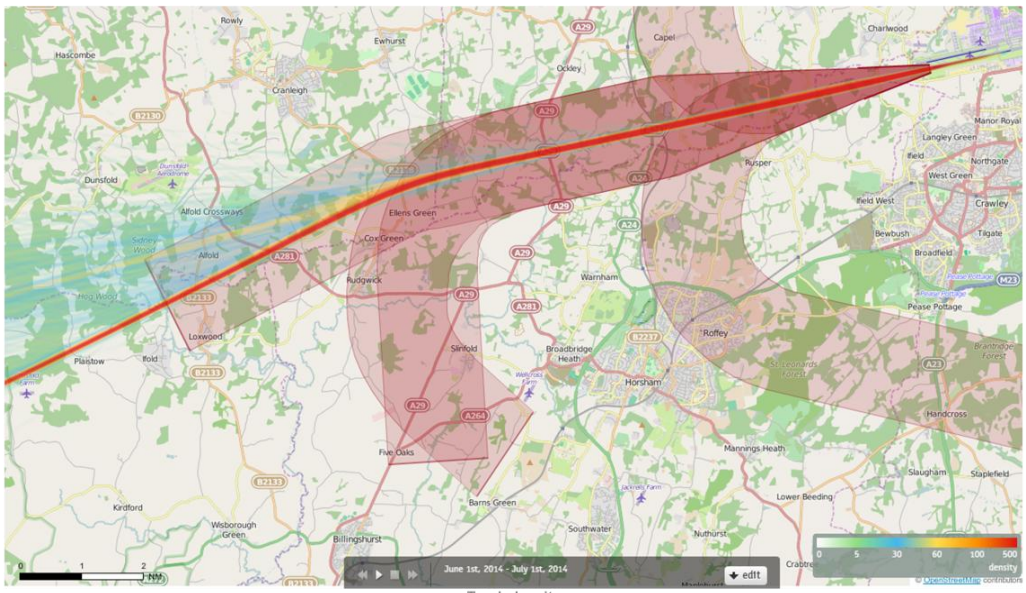
Track density

Each track is drawn as a line which has a width of just a few pixels and each pixel on the screen counts how often a 'track line' comes across this pixel when drawing all the tracks.

When all the tracks have been drawn, each pixel decides upon its colour based on the number of times a 'track line' has come across that pixel. The conversion from "count" to "colour" is guided by the numbers and colours given in the current Palette.

Counts in between are mapped to colours in between. If 100 were orange and 200 where red, then 150 would be coloured some orangy red.

26SOUTHAMPTON Density June 2014
1577 Aircraft – Showing P-RNAV Departures Only



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Counts in between are mapped to colours in between. If 100 were orange and 200 where red, then 150 would be coloured some orangy red.

The following is a summary. Please refer to the PIR Route Analysis report, PIR Environmental Analysis report, PIR Operational and Technical report, PIR Correspondence Assessment and CAA IFP Recommendations report attached for the CAA's detailed conclusions

9.15 In addition to the points made in paragraphs 9.9 - 9.14 above, our review of the flight track data set out in the PIR Route Analysis report attached at Annex 1 has lead us to conclude that the aircraft using Route 1 are flying where we anticipated they would as a result of this change. The aircraft are broadly flying the same flight tracks as before but are more concentrated. This route was one of the trial RNAV-1 SIDs before the airspace change proposal was consulted upon and submitted to the CAA. In this case the trial data was a good indicator of the outcome of implementing the change. The stated aim of introducing an RNAV-1 SID design, the effect of which was to result in actual aircraft tracks that replicate the nominal track of the existing conventional SID, was achieved to an acceptable standard. The maps in paragraph 8 of the CAA PIR Correspondence Assessment attached to this report illustrates the number of correspondence items the CAA received which we consider relate to the aircraft using the Route 1 SIDs.

9.16 The SIDs on this route all begin with a relatively long straight section to the west followed by a slight 10-20 degree left-hand turn slightly towards the south-west.

9.17 The environmental impact of the change as regards the noise experienced by local communities was as anticipated by us when we made our decision in 2013.

9.18 As regards areas where aircraft overfly below 4000ft AMSL we observed an expected concentration of aircraft over the nominal track of the conventional SID. For the reasons set out at paragraphs 9.11 - 9.13 above we have concluded that the environmental impact of this concentration is not significant (within the meaning of Paragraph 9 of the Secretary of State's 2001 Directions to the CAA).

9.19 As regards areas where aircraft overfly between 4000-7000ft AMSL we observed aircraft dispersing around the RNAV-1 SID nominal centreline (as was the case when aircraft were flying the conventional SIDs before the change), once air traffic controllers vectoring choices are no longer constrained by the NPRs imposed by the Secretary of State. However, we noted that since the change aircraft are tending to disperse later in flight and remain more concentrated for longer along this SID (as set out above at paragraph 9.9). For example this was identified occurring between Ellens Green and Plaistow. For the reasons set out at paragraphs 9.11 - 9.13 above we have concluded that the environmental impact of this concentration is not significant (within the meaning of Paragraph 9 of the Secretary of State's 2001 Directions to the CAA).

9.20 As set out above[37], when deciding whether to approve or refuse an airspace change we have a statutory duty to balance a number of factors. The objective of these changes was to enable the future realisation of airspace management and design benefits of RNAV-1 (a form of performance-based navigation). As we are required to do, we balanced our duty to approve changes which make the most efficient use of airspace along with our other duties including taking account of the Secretary of State's Guidance on our environmental objectives. We have taken into account the Secretary of State's guidance to limit the number of people significantly affected by noise. After carrying out this PIR we have concluded that, on balance, the environmental impact of the changes to Route 1's SIDs identified above should not be a reason to require a change to, or withdrawal of, the Route 1 SIDs.

[37] Chapter 6

Route 2

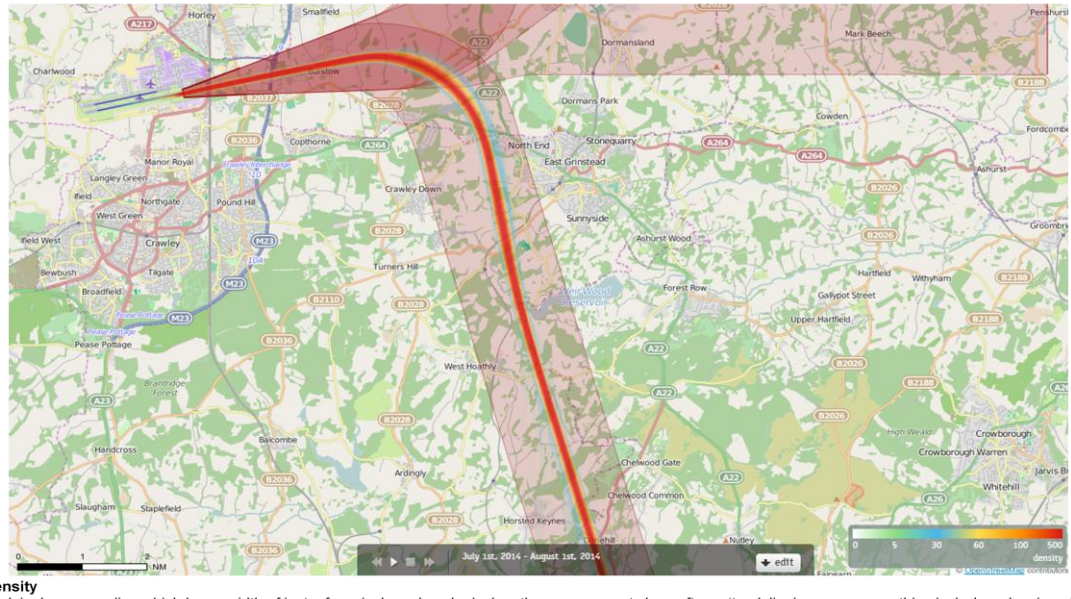
Figure 6 Route 2 heat map showing the density and distribution of flights before and after the change

08SEAFORD Density June 2013
1052 Aircraft – Showing CONVENTIONAL Departures Only

Track density
Each track is drawn as a line which has a width of just a few pixels and each pixel on the screen counts how often a 'track line' comes across this pixel when drawing all the tracks.

When all the tracks have been drawn, each pixel decides upon its colour based on the number of times a 'track line' has come across that pixel. The conversion from "count" to "colour" is guided by the numbers and colours given in the current Palette.
Counts in between are mapped to colours in between. If 100 were orange and 200 where red, then 150 would be coloured some orangy red.

08SEAFORD Density July 2014
1227 Aircraft – Showing P-RNAV Departures Only



Track density
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When all the tracks have been drawn, each pixel decides upon its colour based on the number of times a 'track line' has come across that pixel. The conversion from "count" to "colour" is guided by the numbers and colours given in the current Palette.

Counts in between are mapped to colours in between. If 100 were orange and 200 where red, then 150 would be coloured some orangy red.

The following is a summary. Please refer to the PIR Route Analysis report, PIR Environmental Analysis report, PIR Operational and Technical report, PIR Correspondence Assessment and CAA IFP Recommendations report attached for the CAA's detailed conclusions

9.21 In addition to the points made in paragraph 9.9 - 9.14 above, our review of the flight track data, set out in the PIR Route Analysis report attached at Annex 1, has lead us to conclude that aircraft flying this route are not entirely where we expected them to be after implementing this change. Nonetheless for the reasons set out here we have concluded the stated aim of introducing an RNAV-1 SID design, the effect of which was to result in actual aircraft tracks that replicate the nominal track of the existing conventional SID, was achieved to an acceptable standard.

9.22 The SIDs on this route all begin with a short flight east after take-off and then an almost 90 degree right-hand turn south.

9.23 Before the change was implemented, the charts provided to the CAA indicated that aircraft were concentrated on the straight portion of flight, then quite dispersed as they turned right before coming back towards the nominal track of the SID after 4000ft AMSL. The charts also indicated that the mean track of the flight was inside the curve of the turn, i.e. to the west and inside the nominal track of the conventional SID.

9.24 This route was the subject of a trial before the airspace change proposal was consulted upon and submitted to the CAA. The CAA therefore received charts indicating where it was anticipated the aircraft would fly based upon trial results, after the change was implemented, when aircraft were flying the RNAV-1 SIDs. These charts indicated the aircraft would continue to be concentrated on the straight portion of the SID before the turn, but also be much more concentrated and less dispersed, around the turn and that the mean track of the concentration would be further east, further to the outside of the turn, and outside of the nominal track of the RNAV-1 SID.

9.25 The charts received as part of the PIR showing the actual impact of the change indicated that the aircraft are quite concentrated around the turn but not as concentrated as we expected from an RNAV-1 SID (and as has been achieved on some of the other RNAV-1 SIDs that were part of this change). The evidence all indicates that the mean track of the traffic using this route is slightly further east than anticipated, towards the outside of the turn, similar to where the mean track was before the change, but more concentrated. Therefore before the change was implemented aircraft deviated from the nominal track of the conventional SID on the first right-hand turn. It was expected that the change would replicate the nominal track better than the aircraft flying the conventional

SID before the change. In addition, it was also expected that the aircraft would be more concentrated.

9.26 The changes made to this route were trialled, which meant the CAA had actual data from which to assess the likely outcome. However, as in any trial, not all operators flew the trialled SID and so the actual outcome can differ from the results of the trial. In the case of this route, since implementation of the RNAV-1 SIDs (which are flown by nearly all aircraft on the route) adherence to the nominal track of the RNAV-1 SID has improved compared to aircraft flying the conventional SID before the change. However, it is noted that there is still some (although less than before the change) widening out or away to the east from the nominal track of the RNAV-1 SID, over the west side of East Grinstead.[38] The maps in paragraph 8 of the PIR Correspondence Assessment attached to this report illustrates the number of correspondence items the CAA received which we consider relate to the aircraft using the Route 2 SIDs.

9.27 Accordingly the environmental impact of the change as regards the noise experienced by local communities was not entirely as anticipated when the decision was made in 2013.

9.28 Although concentration was forecast, it was anticipated that the centreline of that concentration would shift east as compared to the situation before the RNAV-1 was implemented on the first turn in the SID. In fact, the flight track evidence indicates that this is not the case and that the mean track of the aircraft is much closer to the pre-implementation track of aircraft than expected.

9.29 As regards areas where aircraft overfly below 4000ft AMSL we observed a concentration of aircraft over the nominal track of the RNAV-1 SID, in broadly the same location as where the aircraft had been prior to the change. For the reasons set out at paragraphs 9.11 - 9.13 above we have concluded that the environmental impact of this concentration is not significant (within the meaning of Paragraph 9 of the Secretary of State's 2001 Directions to the CAA).

9.30 As regards areas where aircraft overfly between 4000-7000ft AMSL we observed that a large proportion of all aircraft using this route are above 4000ft AMSL as they complete the right-hand turn of these SIDs. We observe that there is less, but still slightly more than we expected, dispersing of traffic (and consequently aircraft outside the NPR compliance monitoring swathe) than before the change implementing RNAV-1 SIDs. We have observed that aircraft tracks are similar, albeit more concentrated, to their position before the change. However, we noted that since the change, aircraft are tending to disperse later in flight and remain more concentrated for longer along this SID. For the reasons set at

[38] See the PIR Environmental Analysis report. 99.2% of aircraft complied with the NPR compliance monitoring swathe before the change and 99.6% afterwards.

paragraphs 9.11 - 9.13 above we have concluded that the environmental impact of this concentration is not significant (within the meaning of Paragraph 9 of the Secretary of State's 2001 Directions to the CAA).

9.31 As set out above[39], when deciding whether to approve an airspace change we have a statutory duty to balance a number of factors. The objective of the change was to enable the future realisation of airspace management and design benefits of RNAV-1 (a form of performance-based navigation). As we are required to do, we balanced our duty to approve changes which make the most efficient use of airspace along with our other duties including taking account of the Secretary of State's Guidance on our environmental objectives. We have taken into account the Secretary of State's guidance to limit the number of people significantly affected by noise. After our carrying out this PIR we have concluded that on balance the environmental impact of the changes to Route 2's SIDs identified above should not be a reason to require a change to, or withdrawal of, the Route 2 SIDs.

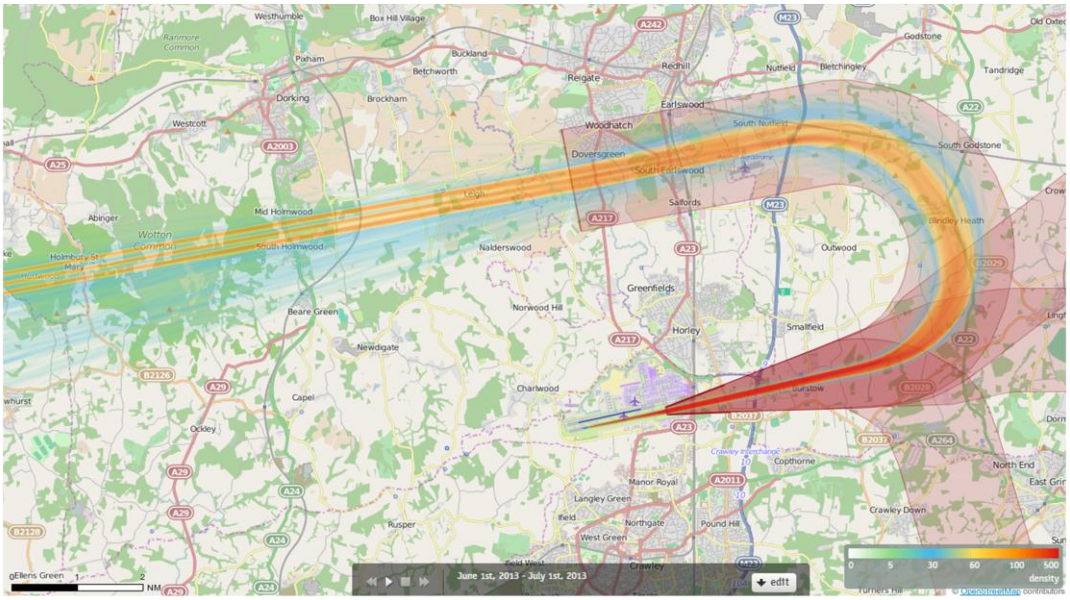
9.32 Nonetheless we have decided to require Gatwick to investigate modifications designed to achieve better replication of the nominal track of the conventional SID, namely to explore whether it is possible to design a SID that achieves a more concentrated tighter turn as was anticipated – see Chapter 10.

[39] Chapter 6.

Route 3

Figure 7 Route 3 heat map showing the density and distribution of flights before and after the change

08 KENET Density June 2013
1098 Aircraft – Showing CONVENTIONAL Departures Only



Track density
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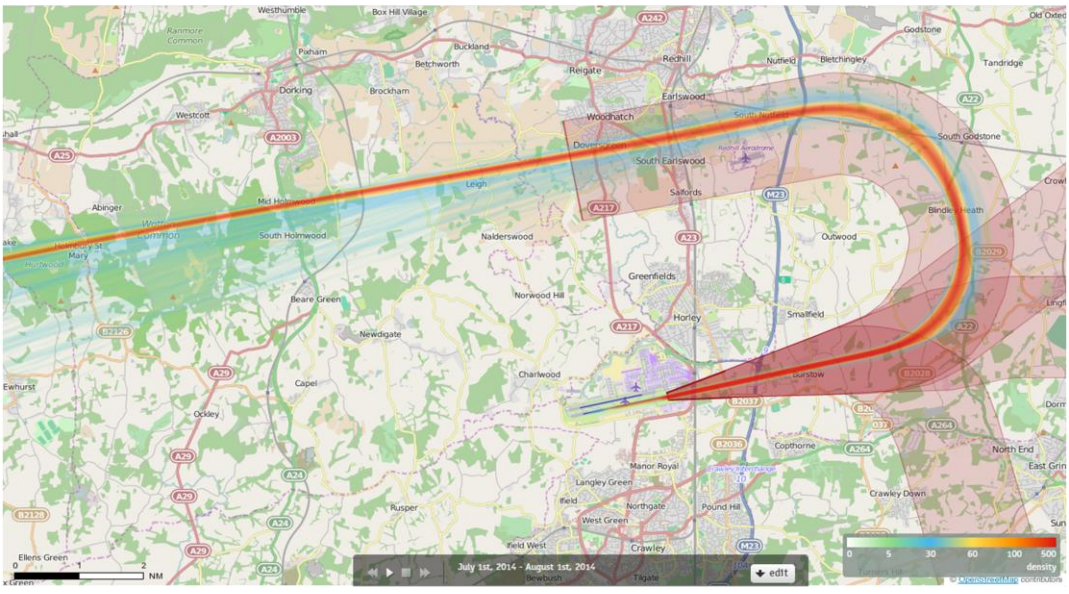
Counts in between are mapped to colours in between. If 100 were orange and 200 where red, then 150 would be coloured some orangy red.

08KENET Density July 2014
1029 Aircraft – Showing P-RNAV Departures Only



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Counts in between are mapped to colours in between. If 100 were orange and 200 where red, then 150 would be coloured some orangy red.

The following is a summary. Please refer to the PIR Route Analysis report, PIR Environmental Analysis report, PIR Operational and Technical report, PIR Correspondence Assessment and CAA IFP Recommendations report attached for the CAA's detailed conclusions

9.33 In addition to the points made in paragraphs 9.9 - 9.14 above, our review of the flight track data, set out in the PIR Route Analysis report attached at Annex 1, has lead us to conclude that the aircraft using this route are flying where we anticipated they would as a result of this change. The aircraft are broadly flying the same flight tracks as before but more concentrated. This route was one of the trial RNAV-1 SIDs before the airspace change proposal was consulted upon and submitted to the CAA. In this case the trial data was a good indicator of the outcome of implementing the change. The stated aim of introducing an RNAV-1 SID design, the effect of which was to result in actual aircraft tracks that replicate the nominal track of the existing conventional SID, was achieved to an acceptable standard. The maps in paragraph 8 of the PIR Correspondence Assessment attached to this report illustrates the number of correspondence items the CAA received which we consider relate to the aircraft using the Route 3 SIDs.

9.34 This route consists of a short portion of straight flying east followed by a left-hand 180 degree turn to the south-west. Before the change was implemented the mean track of the aircraft was concentrated before commencing the turn located over the nominal track of the conventional SID. During the turn (which up to 15% of the aircraft completed below 4000ft AMSL) there was a dispersion of the aircraft tracks albeit centred over the nominal track of the conventional SID. The tracks then re-concentrated as the aircraft flew the straight leg of the SID, towards the south-west. However, the concentration was less than the eastbound initial leg of the SID which occurred immediately after take-off.

9.35 This route was the subject of a trial. The CAA therefore received charts indicating where it was anticipated the aircraft would fly after the change was implemented, when aircraft were flying the RNAV-1 SIDs. This chart indicated the aircraft would continue to adhere to the nominal track of the SID, that they would be similarly concentrated on the east bound leg, much more concentrated than before around the turn and they would remain concentrated on the final south-west bound leg.

9.36 The charts received as part of the PIR showing the actual impact of the change indicated that the aircraft tracks were broadly as anticipated. We noted that aircraft were more concentrated until they reached approximately 5000ft AMSL after which altitude aircraft appear equally as dispersed as before the change. That is the flight track data showed that aircraft were more concentrated until a few seconds later in to the flight.

9.37 Some of the residents of communities affected by aircraft on the final westbound leg of the SID from Leigh and South Holmwood submitted their views to the CAA that aircraft were being held lower, longer than they were before the change to introduce the RNAV-1 SIDs. The CAA therefore undertook further gate analysis[40] to assess the vertical climb profile on this route. We determined that the aircraft climb profiles were broadly similar both before and after the change, although in some cases there was an improvement. Aircraft were held at or below south-westerly departures from easterly runways at Heathrow by air traffic controllers in order to ensure that the two flows of traffic did not come into conflict with one another.

9.38 The environmental impact of the change as regards the noise experienced by local communities was as anticipated by us when we made our decision in 2013.

9.39 As regards areas where aircraft overfly below 4000ft AMSL we observed a concentration of aircraft over the nominal track of the RNAV-1 SID, in broadly the same location as where the aircraft had been prior to the change, save that aircraft on the final westerly leg moved slightly further north. For the reasons set out at paragraphs 9.11 - 9.13 above we have concluded that the environmental impact of this concentration is not significant (within the meaning of Paragraph 9 of the Secretary of State's 2001 Directions to the CAA).

9.40 As regards areas where aircraft overfly between 4000-7000ft AMSL, mainly aircraft on the final westerly leg of the SID, we observed aircraft dispersing around the RNAV-1 SID nominal centreline (as was the case when aircraft were flying the conventional SIDs before the change), once air traffic controllers vectoring choices are no longer constrained by the NPRs imposed by the Secretary of State). However, we noted that since the change, aircraft are tending to disperse later in flight and remain more concentrated for longer along this SID (as set out above). For the reasons set out at paragraphs 9.11 - 9.13 above we have concluded that the environmental impact of this concentration is not significant (within the meaning of Paragraph 9 of the Secretary of State's 2001 Directions to the CAA). As a consequence of our analysis, we have noted that due to the re-dispersal of traffic on Route 4 (which takes off in the opposite direction and also includes a 180 degree turn, to the north-east), areas under the respective north-east bound and south-west bound legs are now co-incident and that this could account for a number of the noise complaints from groups and residents that have been received. See the separate sections on Route 4 in Chapters 9 and 10.

[40] Gate analysis is explained in Chapter 3. The CAA uses noise and track data collected by Gatwick to investigate the altitude of each aircraft that passes through a nominal gate or line across the ground.

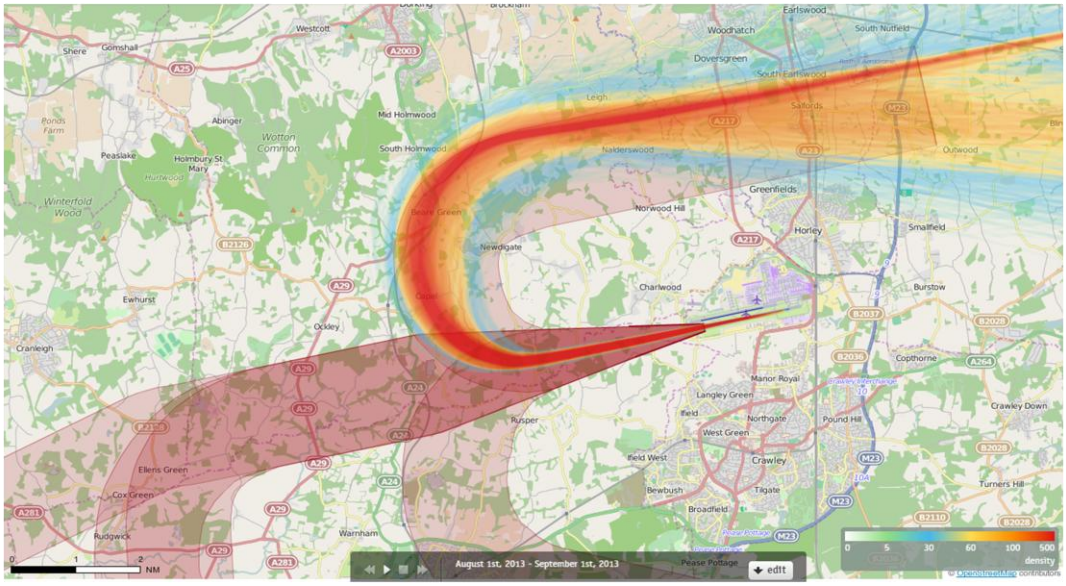
9.41 As set out above[41], when deciding whether to approve an airspace change we have a statutory duty to balance a number of factors. The objective of the change was to enable the future realisation of airspace management and design benefits of RNAV-1 (a form of performance-based navigation). As we are required to do, we balanced our duty to approve changes which make the most efficient use of airspace along with our other duties including taking account of the Secretary of State's Guidance on our environmental objectives. We have taken into account the Secretary of State's guidance to limit the number of people significantly affected by noise. After carrying out this PIR we have concluded that, on balance, the environmental impact of the changes to Route 3's SIDs identified above should not be a reason to require a change to, or withdrawal of, the Route 3 SIDs.

[41] Chapter 6.

Route 4

Figure 6 Route 4 heat map showing the density and distribution of flights before and after the change

26LAMBOURNE Density August 2013
4092 Aircraft – Showing CONVENTIONAL Departures Only



Track density

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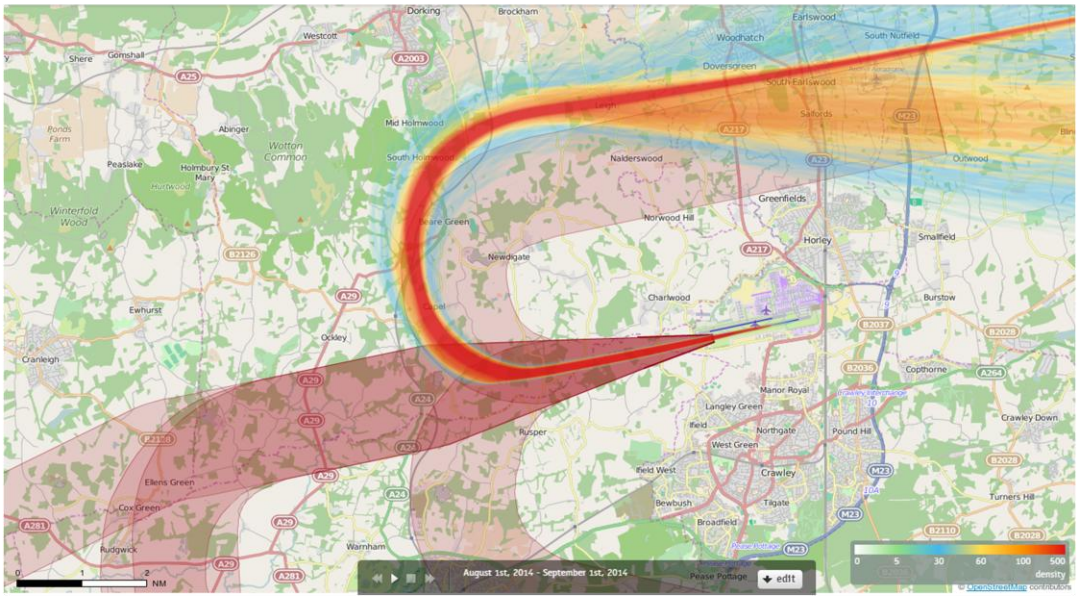
Counts in between are mapped to colours in between. If 100 were orange and 200 where red, then 150 would be coloured some orangy red.

26LAMBOURNE Density August 2014
4364 Aircraft – Showing P-RNAV Departures Only



Track density

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Counts in between are mapped to colours in between. If 100 were orange and 200 where red, then 150 would be coloured some orangy red.

The following is a summary. Please refer to the PIR Route Analysis report, PIR Environmental Analysis report, PIR Operational and Technical report, PIR Correspondence Assessment and CAA IFP Recommendations report attached for the CAA's detailed conclusions

9.42 In addition to the points made in paragraphs 9.9 - 9.14 above, our review of the flight track data, set out in the PIR Route Analysis report attached at Annex 1, has lead us to conclude that the location and proportion of aircraft are not entirely as we had anticipated when we made our decision in 2013. The stated aim of introducing an RNAV-1 SID design, the effect of which was to result in actual aircraft tracks that replicate the nominal track of the existing conventional SID has not been achieved to an acceptable standard.

9.43 This route consists of a short portion of straight flying west followed by a 180 degree right-hand turn to the north-east. Before the change was implemented before commencing the turn, the mean track of the aircraft was concentrated close to the nominal track of the conventional SID. During the turn there was a wide dispersion of the aircraft tracks outside (i.e. to the west) of the nominal track of the conventional SID. A very small proportion (6%) of the aircraft were dispersed so far as to be more than 1.5km from the NPR centreline (i.e. outside of the NPR compliance monitoring swathe). As the aircraft continued to climb most (more than 90%) had passed 4000ft AMSL by the time they had completed the turn onto the north-east bound leg and were consequently available for vectoring by air traffic control.

9.44 The nominal track of the conventional and RNAV-1 SIDs are both to the west, i.e. to the outside of the turn of the NPR and they leave the NPR compliance monitoring swathe briefly.

9.45 The tracks of the conventional SIDs were briefly to the west and outside of the turn of the NPR compliance monitoring swathe. This route was the subject of a trial before the airspace change proposal was consulted upon and submitted to the CAA. As a result of our review of the trial charts (submitted to the CAA as part of Gatwick's airspace change proposal) the CAA anticipated that the aircraft flying the RNAV-1 SIDs would adhere to the nominal track of the SID before and into the first stages of the turn and would be very concentrated when doing so. The chart of the trial indicated that the aircraft tracks would still be along the edge of the outside of the NPR compliance monitoring swathe but more concentrated than before the change. Further, as aircraft began to climb it was anticipated they would complete the second half of the turn further west and it was anticipated that a small percentage, 1-5%, (approximately the same percentage as before the change) would continue to leave the NPR compliance monitoring swathe, albeit in a slightly different position over the ground before reaching an altitude of 4000ft AMSL The trial data indicated that aircraft would concentrate on the final easterly leg of the SID after they had completed the run.

9.46 The charts received as part of the PIR showing the actual impact of the change indicated that the anticipated increased concentration around the turn occurred. The charts also demonstrated that the mean track of the RNAV-1 traffic carrying out the turn was to the north-east of the tracks before the change and more concentrated. However more of the aircraft were further north-east than anticipated on the second half of the turn. This took approximately 15% of the aircraft outside the NPR compliance monitoring swathe below 4000ft AMSL (more than anticipated) and more aircraft than anticipated over communities such South Holmwood and areas of the Surrey Hills AONB.

9.47 The charts received as part of the PIR also indicate that aircraft above 4000ft AMSL continuing on the final easterly leg of the SID are concentrated, but further north than they were before the change. Therefore, albeit above 4000ft AMSL, more traffic has moved closer to communities such as Leigh, Reigate[42] and Redhill. We note from the map at paragraph 8 of the CAA PIR Correspondence Assessment (that sets out the plottable postcodes of those that provided information to the PIR) that a material number of residents from the relatively densely-populated areas of Reigate and Redhill chose to submit feedback to the CAA as part of this PIR, albeit for this SID these areas were routinely overflown at altitudes in excess of 4000ft AMSL.

9.48 As regards aircraft on the SID both below 4000ft AMSL and between 4000-7000ft AMSL, we note that the environmental impact is not as expected. We anticipated the concentration of the aircraft tracks that have been observed. But we did not anticipate as many aircraft exceeding the NPR swathe below 4000ft AMSL, albeit for short periods of time, and we did not anticipate the final easterly leg to have shifted north in the way in which it has. This has also had the effect of placing the south-westerly track of Route 3 and the north-easterly leg of Route 4 in an area which is co-incident as opposed to geographically separate as was the case before the implementation of the RNAV-1 SIDs. See Chapter 9 Route 3.

9.49 Nonetheless for the reasons set out at paragraphs 9.11 - 9.13 above we have concluded that the environmental impact of this concentration and of the shift in traffic is not significant (within the meaning of Paragraph 9 of the Secretary of State's 2001 Directions to the CAA) and after carrying out this PIR we have concluded that on balance the environmental impact of the changes to Route 4's SIDs identified above should not be a reason to require withdrawal of the Route 4 SIDs.

9.50 However, as set out below in Chapter 10 Route 4, we do not consider that this SID is an acceptable replication of the nominal track of the conventional SID.

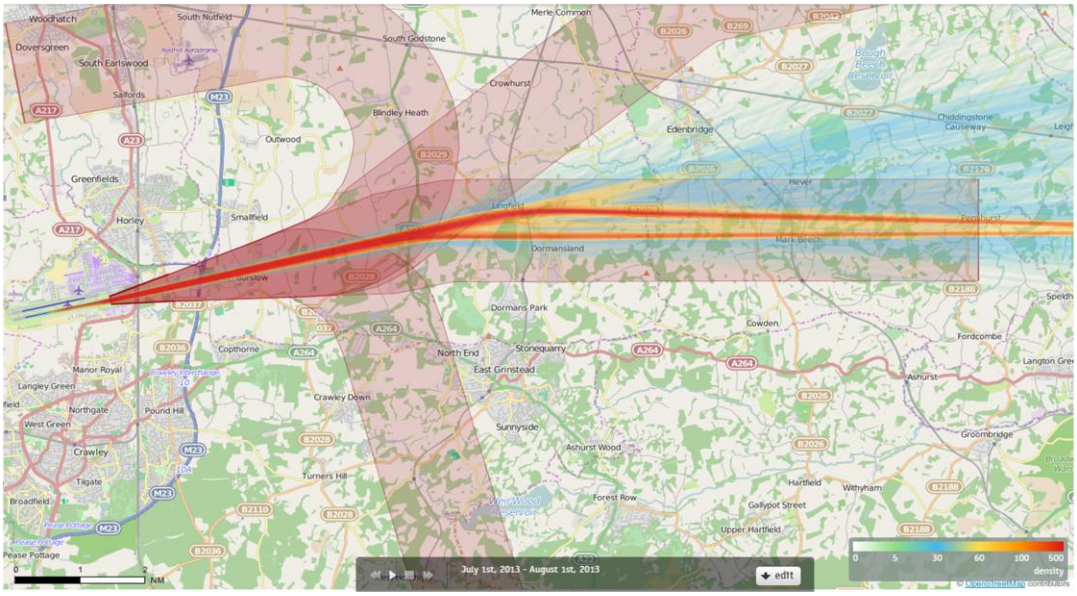
[42] We note that aircraft using the SIDs on Route 3 above 4000ft AMSL are also passing slightly closer to Reigate when the airport is utilising easterly departures.

The CAA requires modifications to the design of the RNAV-1 SID on this route to achieve an initial turn that is closer to the existing nominal track of the existing conventional SID and, if successful, we consider this will also have the effect of bringing the mean track of the final north-easterly leg of the traffic on the SID further south, further away from communities such as Leigh, Reigate and Redhill, that is more in line with where we expected traffic to be and as was the case prior to the introduction of the RNAV-1 SIDs.

Route 5

Figure 7 Route 5 heat map showing the density and distribution of flights before and after the change

08CLACTON Density July 2013
2076 Aircraft – Showing CONVENTIONAL Departures Only



Track density

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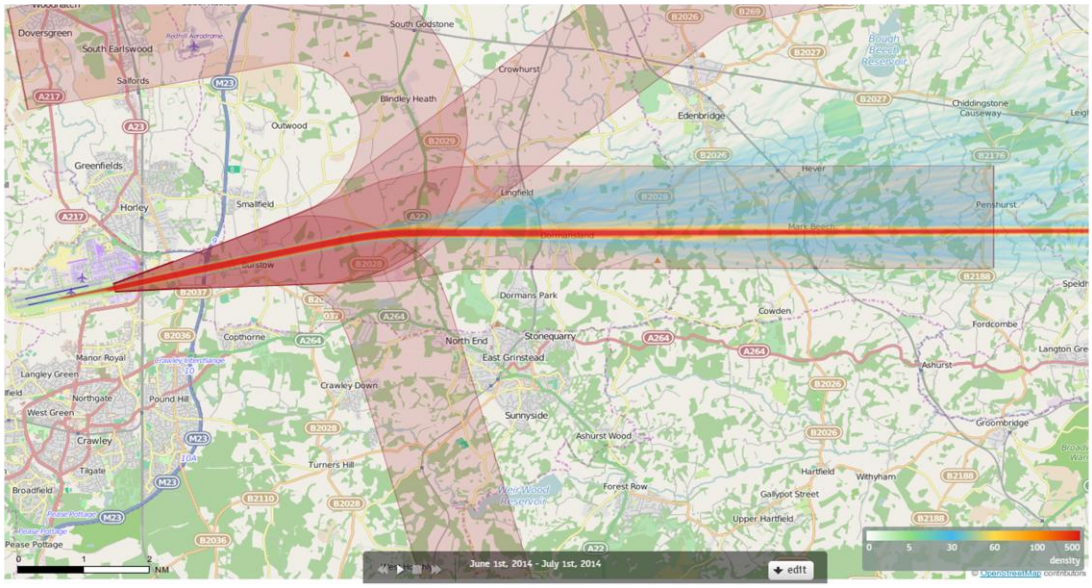
Counts in between are mapped to colours in between. If 100 were orange and 200 where red, then 150 would be coloured some orangy red.

08CLACTON Density June 2014
1903 Aircraft – Showing P-RNAV Departures Only



Track density

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When all the tracks have been drawn, each pixel decides upon its colour based on the number of times a 'track line' has come across that pixel. The conversion from "count" to "colour" is guided by the numbers and colours given in the current Palette.
Counts in between are mapped to colours in between. If 100 were orange and 200 where red, then 150 would be coloured some orangy red.

The following is a summary. Please refer to the PIR Route Analysis report, PIR Environmental Analysis report, PIR Operational and Technical report, PIR Correspondence Assessment and CAA IFP Recommendations report attached for the CAA's detailed conclusions

9.51 In addition to the points made in paragraphs 9.9 - 9.14 above, our review of the flight track data, as set out in the PIR Route Analysis report attached at Annex 1, has lead us to conclude that the aircraft are not flying exactly where we anticipated when we made the decision in 2013. However, we do consider that the stated aim of introducing an RNAV-1 SID design the effect of which was to result in actual aircraft tracks that replicate the nominal track of the existing conventional SID was achieved to an acceptable standard.

9.52 This Route consists of aircraft flying straight ahead and then turning approximately 15 degrees right. There was no trial of this SID. Before the change was implemented aircraft were concentrated as they flew the initial straight-ahead part of the SID but then deviated from the nominal track of the conventional SID (the mean track lying to the north of that nominal track) as they made the turn to the right.

9.53 The nominal track of the proposed RNAV-1 SID has an almost identical lateral position to the nominal track of the conventional SID. Some respondents to the consultation in 2012 said that they considered the aircraft would as a result of the change move further south towards their community. They were advised by Gatwick, and it was expected by the CAA when we made our decision, that in fact the aircraft would not move further south but remain in a similar position to the mean track of where the aircraft were flying before the change. We expected that the aircraft would be more concentrated on this track.

9.54 The charts received as part of the PIR which show the actual impact of the change show that the aircraft have remained concentrated on the first straight-ahead part of the SID but are commencing the turn slightly sooner meaning that the aircraft coming out of the turn, which are typically still below 4000ft AMSL by this stage in the flight profile, are further south than they were before. Over the ground this has meant there has been a shift of the mean track of aircraft south. In particular aircraft have moved south away from the community of Lingfield towards Dormansland. Aircraft are typically at 6000ft AMSL as they pass near to Dormansland. The CAA has received feedback from residents as to the impact of the noise of aircraft on them since the implementation of this change. The maps in paragraph 8 of the CAA PIR Correspondence Assessment attached to this report illustrates the number of correspondence items the CAA received which we consider relate to the aircraft using the Route 5 SIDs.

9.55 The environmental impact of the change as regards the noise experienced by local communities was not as anticipated when the decision was made in 2013

(see paragraph 9.57). Although concentration was forecast, it was anticipated that the centreline of that concentration would remain largely where the mean track of aircraft was before the RNAV-1 SID was implemented. In fact the flight track evidence, and comments received from groups and residents referred to above, evidences that this is not the case and that, although the SID is an acceptable replication, it has not achieved the mean track of the aircraft being where it was anticipated the design would cause them to be.

9.56 As regards areas where aircraft overfly below 4000ft AMSL we observed a concentration of aircraft over the nominal track of the conventional SID in broadly the same location as where the aircraft had been prior to the change. For the reasons set out at paragraphs 9.11 - 9.13 above we have concluded that the environmental impact of this concentration is not significant (within the meaning of Paragraph 9 of the Secretary of State's 2001 Directions to the CAA).

9.57 As regards areas where aircraft overfly between 4000-7000ft AMSL we observed that these aircraft are further south than expected, albeit concentrated as expected. Nonetheless for the reasons set out at paragraphs 9.11 - 9.13 above we have concluded that the environmental impact of neither this concentration nor the southerly shift of the traffic is significant (within the meaning of Paragraph 9 of the Secretary of State's 2001 Directions to the CAA).

9.58 As set out above[43], when deciding whether to approve an airspace change we have a statutory duty to balance a number of factors. The objective of the change was to enable the future realisation of airspace management and design benefits of RNAV-1 (a form of performance-based navigation). As we are required to do, we balanced our duty to approve changes which make the most efficient use of airspace along with our other duties including taking account of the Secretary of State's Guidance on our environmental objectives. As set out above we have taken into account the Secretary of State's guidance to limit the number of people significantly affected by noise. After our carrying out this PIR we have concluded that on balance the environmental impact of the changes to Route 5's SIDs identified above should not be a reason to require withdrawal of the Route 5 SIDs.

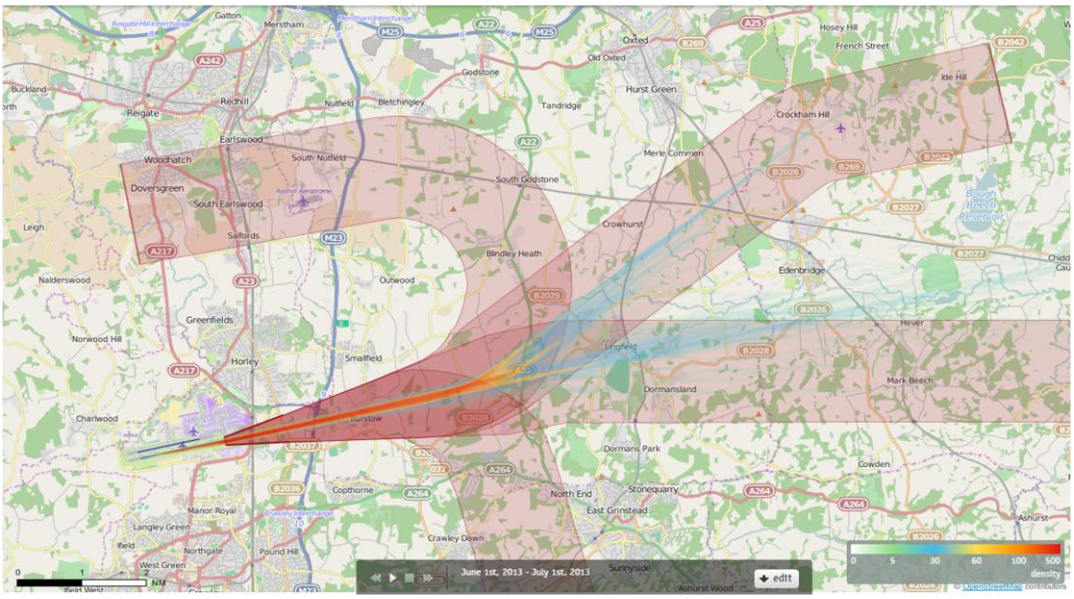
9.59 Nonetheless, we have decided to require that Gatwick look into modifications designed to achieve better the expected outcome of the replication of the nominal track of the conventional SID, namely to explore whether it is possible to design a SID that achieves a slightly later start to the turn as was anticipated when we decided to approve this change in 2013 and one that is likely to result in a positioning of traffic that is closer to the nominal track of the existing conventional SID. See Chapter 10.

[43] Chapter 6.

Route 6

Figure 10 Route 6 heat map showing the density and distribution of flights before and after the change

08DAVENTRY Density June 2013
542 Aircraft – Showing CONVENTIONAL Departures Only



Track density

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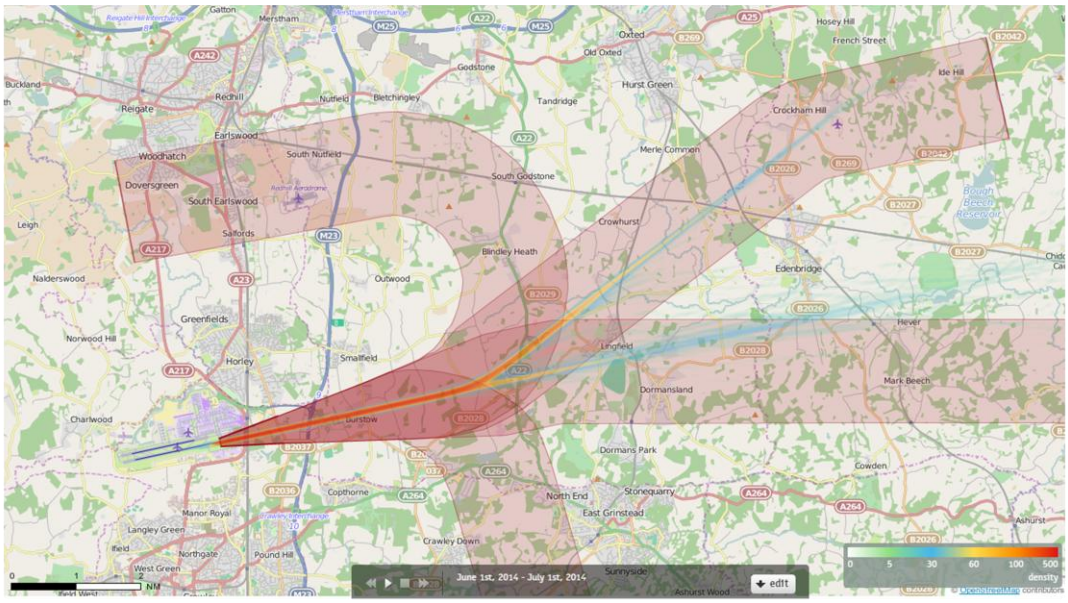
When all the tracks have been drawn, each pixel decides upon its colour based on the number of times a 'track line' has come across that pixel. The conversion from "count" to "colour" is guided by the numbers and colours given in the current Palette.
Counts in between are mapped to colours in between. If 100 were orange and 200 where red, then 150 would be coloured some orangy red.

08DAVENTRY Density June 2014
468 Aircraft – Showing P-RNAV Departures Only



Track density

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When all the tracks have been drawn, each pixel decides upon its colour based on the number of times a 'track line' has come across that pixel. The conversion from "count" to "colour" is guided by the numbers and colours given in the current Palette.
Counts in between are mapped to colours in between. If 100 were orange and 200 where red, then 150 would be coloured some orangy red.

The following is a summary. Please refer to the PIR Route Analysis report, PIR Environmental Analysis report, PIR Operational and Technical report, PIR Correspondence Assessment and CAA IFP Recommendations report attached for the CAA's detailed conclusions

9.60 In addition to the points made in paragraphs 9.9 - 9.14 above, our review of the flight track data, as set out in the PIR Route Analysis report attached Annex 1, has lead us to conclude that the aircraft using this route are flying where we anticipated they would as a result of this change. The aircraft are broadly flying the same flight tracks as before but more concentrated. The stated aim of introducing an RNAV-1 SID design, the effect of which was to result in actual aircraft tracks that replicate the nominal track of the existing conventional SID, was achieved to an acceptable standard. The maps in paragraph 8 of the PIR Correspondence Assessment attached to this report illustrates the number of correspondence items the CAA received which we consider relate to the aircraft using the Route 6 SIDs.

9.61 The SIDs on Route 6 consist of an initial straight-ahead phase to the east and then a 25 degree left-hand turn towards the north-east. There was no trial of this SID so no trial data to inform our analysis of the expected impacts at the time we made our decision.

9.62 Before the change the aircraft tracks were concentrated over the nominal track of the conventional SID. At the turn the majority of the aircraft appeared not to make the turn but to continue straight (albeit none appeared to go outside the NPR compliance monitoring swathe below 4000ft AMSL when doing so, being above 4000ft AMSL just as the aircraft approached the edge of the swathe). A much smaller proportion of the aircraft did make the turn and did so accurately on the nominal track of the conventional SID. Therefore before the change, at the point of the turn in the SID the traffic separated into two distinct forks of traffic.

9.63 At the time we made the decision in 2013 we anticipated that the traffic flying the RNAV-1 SID would behave in the same way as before the change.

9.64 The PIR data that shows the actual impact of the change shows that after the change aircraft did split into the same two forks, but were more concentrated than before the change.

9.65 Therefore, the environmental impact of the change as regards the noise experienced by local communities was as anticipated by us when we made our decision in 2013.

9.66 As regards areas where aircraft overfly below 4000ft AMSL and between 4000-7000ft AMSL we observed the expected concentration of aircraft over the nominal track of the conventional SID, including the left-hand turn and another,

more concentrated, track continuing straight on. Notwithstanding this observed concentration, for the reasons set out at paragraphs 9.11 - 9.13 above we have concluded that the environmental impact of this concentration is not significant (within the meaning of Paragraph 9 of the Secretary of State's 2001 Directions to the CAA).

9.67 As set out above[44], when deciding whether to approve an airspace change we have a statutory duty to balance a number of factors. The objective of the change was to enable the future realisation of airspace management and design benefits of RNAV-1 (a form of performance-based navigation). As we are required to do, we balanced our duty to approve changes which make the most efficient use of airspace along with our other duties including taking account of the Secretary of State's Guidance on our environmental objectives. As set out above, we have taken into account the Secretary of State's guidance to limit the number of people significantly affected by noise. After our carrying out this PIR we have concluded that on balance the environmental impact of the changes to Route 6's SIDs identified above should not be a reason to require a change to, or withdrawal of the Route 6 RNAV-1 SIDs.

[44] Chapter 6.

Route 7

Figure 8 Route 7 heat map showing the density and distribution of flights before and after the change

26BOGNA Density August 2013
2913 Aircraft – Showing CONVENTIONAL Departures Only

Track density
Each track is drawn as a line which has a width of just a few pixels and each pixel on the screen counts how often a 'track line' comes across this pixel when drawing all the tracks.

When all the tracks have been drawn, each pixel decides upon its colour based on the number of times a 'track line' has come across that pixel. The conversion from "count" to "colour" is guided by the numbers and colours given in the current Palette.
Counts in between are mapped to colours in between. If 100 were orange and 200 where red, then 150 would be coloured some orangy red.

26BOGNA Density October 2014
2784 Aircraft – Showing P-RNAV Departures Only

Track density
Each track is drawn as a line which has a width of just a few pixels and each pixel on the screen counts how often a 'track line' comes across this pixel when drawing all the tracks.

When all the tracks have been drawn, each pixel decides upon its colour based on the number of times a 'track line' has come across that pixel. The conversion from "count" to "colour" is guided by the numbers and colours given in the current Palette.

Counts in between are mapped to colours in between. If 100 were orange and 200 where red, then 150 would be coloured some orangy red.

The following is a summary. Please refer to the PIR Route Analysis report, PIR Environmental Analysis report, PIR Operational and Technical report, PIR Correspondence Assessment and CAA IFP Recommendations report attached for the CAA's detailed conclusions

9.68 In addition to the points made in paragraph 9.9 - 9.14 above, our review of the flight track data, as set out in the PIR Route Analysis report attached at Annex 1 has lead us to conclude that the aircraft were flying where we expected them to below 4000ft AMSL, but were more concentrated than we expected them to be above 4000ft AMSL, since the change was implemented. We have concluded that the stated aim of introducing an RNAV-1 SID design the effect of which was to result in actual aircraft tracks that replicate the nominal track of the existing conventional SID was achieved to an acceptable standard.

9.69 The SIDs on this route consist of a relatively long straight-ahead first leg towards the south-west and then a turn directly south. There was no trial of this route. The nominal track of the conventional SID and the RNAV-1 SID coincide except on the turn where the RNAV-1 SID is slightly further out or west than the nominal track of the conventional SID.

9.70 Before the change the mean track of the aircraft flying the SIDs on that route was concentrated over the straight potion of the track and more than 90% of aircraft were above 4000ft AMSL before they commenced the turn and all of the aircraft were above 4000ft AMSL as they began the first stages of the turn south. Above 4000ft AMSL the aircraft appeared to distribute into two forks some continuing straight-ahead and some taking the turn south. The aircraft which turn south, which are typically above 5000ft AMSL or more as they turn, were quite dispersed. The dispersed aircraft spread over an area over the ground from Alfold Crossways to Slinfold. That is Slinfold was on the outer, eastern edge of dispersed aircraft flying at typically 7000ft AMSL or above.

9.71 We anticipated that the change would result in aircraft remaining concentrated on the first stage of the flight profile as before, being more concentrated into the turn, but similarly dispersed as before the change once the aircraft reached 4000ft AMSL, partly due to the effects of radar vectoring as aircraft reached the vectoring limit.

9.72 The PIR data that shows the actual impact of the change, has shown that the aircraft do remain concentrated at the beginning of the flight profile, and most aircraft turn on a concentrated flight path south following the centreline of the nominal track of the RNAV-1 SID. However, we have identified that the mean track of the southern leg of concentration has moved marginally on the eastern side of the old dispersion of tracks. That is, the aircraft have concentrated to the east of the pre-change dispersed tracks and not in the centre of the pre-change dispersed tracks.

9.73 We also observed that some aircraft are being vectored by air traffic control (once the aircraft are above 4000ft AMSL and air traffic control are no longer constrained by the NPR from doing so) to the east of the RNAV-1 SID nominal track over Slinfold.

9.74 The maps in paragraph 8 of the CAA PIR Correspondence Assessment attached to this report illustrates the number of correspondence items the CAA received which we consider relate to the aircraft using the Route 7 SIDs. As part of this PIR the CAA received strong feedback from groups and residents that more aircraft are overflying the village of Slinfold.

9.75 As a result of our observations in respect of the analysis of the flight track data and the feedback referred to above, the CAA undertook some further detailed analysis of flights in this area. This is described in more detail in Appendices E and F of the PIR Environmental Analysis report attached to this report. Our analysis concluded that aircraft are at an average height of approximately 7200ft AMSL when they pass by or over Slinfold. We also concluded that more aircraft are flying the southern track somewhat closer to Slinfold than before the change as a result of the aircraft concentrating. Air traffic controllers are free to vector aircraft away from the nominal track of the RNAV-1 SID well before this point in the aircraft's track but are tending not to do so. We calculated that the proportion of aircraft departing on this route in the vicinity of Slinfold has increased from 1% to 3%.

9.76 We obtained information from NATS on whether their vectoring practices had been changed by them after implementation of this change. NATS confirmed that no change of instruction had been given to their air traffic controllers. Therefore the effect we were seeing was, in our view, not a result of vectoring interventions or decisions being made by air traffic controllers. Instead, in our view, it was a result of the greater concentration with which aircraft reach or present at the minimum altitude at which they can then be vectored.

9.77 Below 4000ft AMSL we observed the aircraft were where we expected them to be and concentrated as expected over the nominal track of the RNAV-1 SID. Notwithstanding this observed concentration, for the reasons set out at paragraphs 9.11 - 9.13 above, we have concluded that the environmental impact of this concentration is not significant (within the meaning of Paragraph 9 of the Secretary of State's 2001 Directions to the CAA).

9.78 Nevertheless we fully acknowledge that the residents of Slinfold were impacted adversely by the, now withdrawn, ADNID trial SID which did have the effect of routing more aircraft over Slinfold thereby causing greater disturbance. As set out in Chapter 3, this trial, although not related to this airspace change, was occurring, based on the information received from groups and residents, at the same time that the effects of this airspace change were first being observed.

9.79 Between 4000-7000ft AMSL we observed more concentration albeit there was still evidence of some dispersion around the turn but then concentration on the southern leg, and marginally further to the east than anticipated, as described above. In addition to the further analysis described above we also calculated that the average noise level for an aircraft above Slinfold has increased by 0.2dBA. We also observed and have taken into account that, based on the two predominant aircraft types that fly from Gatwick, the noise level of an aircraft passing over Slinfold would be between 59dBA – 64dBA.

9.80 We have given lengthy consideration to all the analysis and the comments received from members of the public to decide whether we should require a modification to the RNAV-1 SID as a consequence of the environmental impacts that have been noted and the Secretary of State's 2014 Guidance to the CAA in respect of its environmental duty when carrying out our airspace functions.

9.81 We particularly noted that the aircraft when they passed Slinfold were typically above 7000ft AMSL. Therefore, notwithstanding the impact described by the groups and residents and the charts summarised above the policy framework within which the CAA makes its airspace decision did not indicate that a modification should be made for environmental reasons.

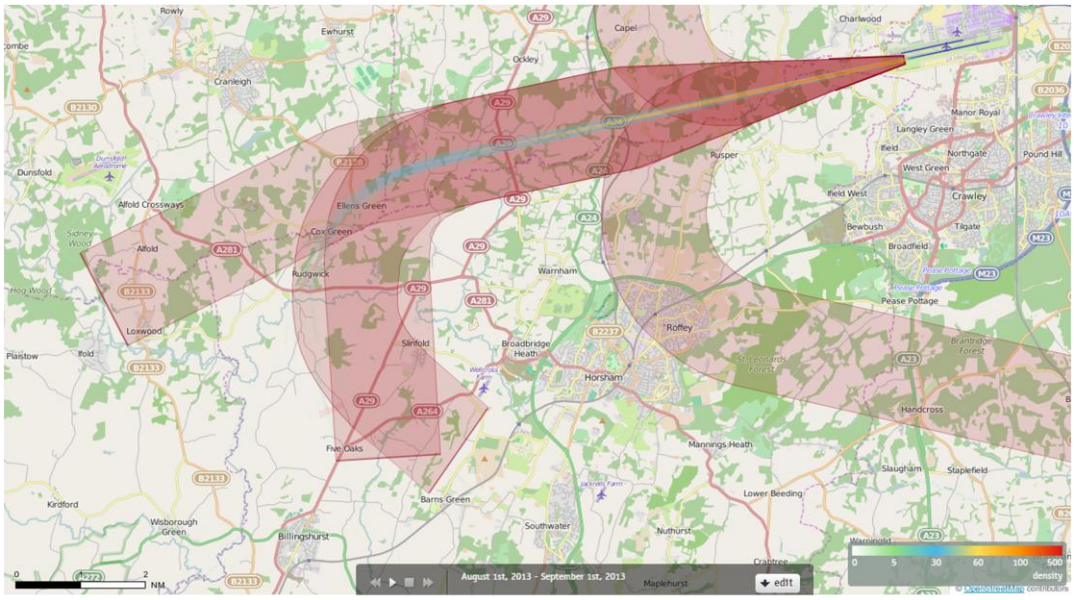
9.82 In conclusion, we consider that this RNAV-1 SID is an acceptable replication in accordance with the original objectives of the change. As set out above[45], when deciding whether to approve an airspace change we have a statutory duty to balance a number of factors. The objective of the change was to enable the future realisation of airspace management and design benefits of RNAV-1 (a form of performance-based navigation). As we are required to do, we balanced our duty to approve changes which make the most efficient use of airspace along with our other duties including taking account of the Secretary of State's Guidance on our environmental objectives. As set out above we have taken into account the Secretary of State's guidance to limit the number of people significantly affected by noise. After carrying out this PIR we have concluded that on balance the environmental impact of the changes to Route 7's RNAV-1 SIDs identified above should not be a reason to require a change to, or withdrawal of the Route 7 SIDs.

[45] Chapter 6.

Route 8

Figure 9 Route 8 heat map showing the density and distribution of flights before and after the change

26SEAFORD Density August 2013
110 Aircraft – Showing CONVENTIONAL Departures Only



Track density
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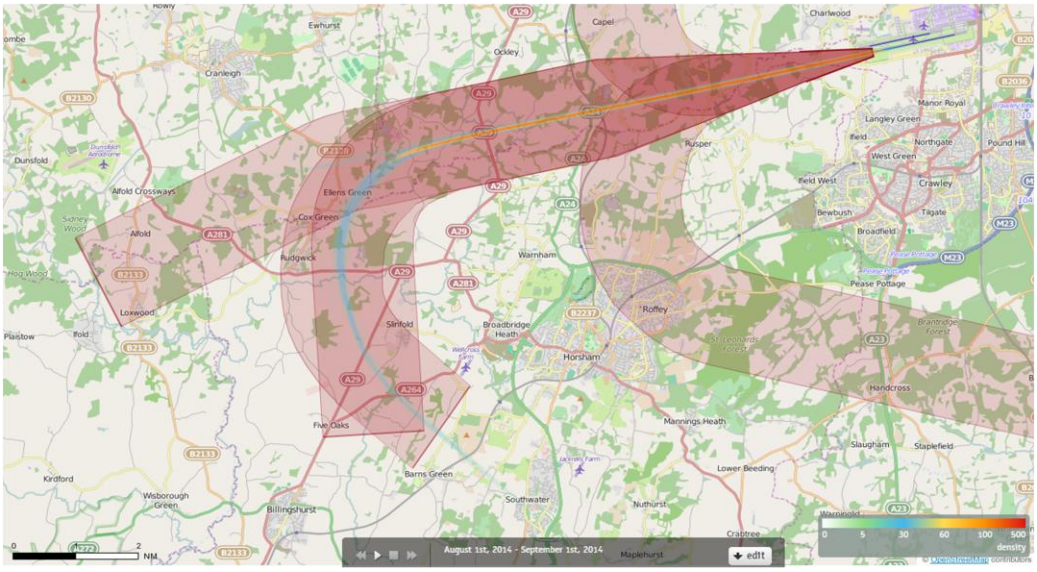
Counts in between are mapped to colours in between. If 100 were orange and 200 where red, then 150 would be coloured some orangy red.

26SEAFORD Density August 2014
160 Aircraft – Showing P-RNAV Departures Only
N.B. During this period the ADNID trial was in operation, therefore only 160 aircraft operated on SEAFORD



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Counts in between are mapped to colours in between. If 100 were orange and 200 where red, then 150 would be coloured some orangy red.

The following is a summary. Please refer to the PIR Route Analysis report, PIR Environmental Analysis report, PIR Operational and Technical report, PIR Correspondence Assessment and CAA IFP Recommendations report attached for the CAA's detailed conclusions

9.83 In addition to the points made in paragraphs 9.9 - 9.14 above, our review of the flight track data, as set out in the PIR Route Analysis report attached at Annex 1, has lead us to conclude that the aircraft are flying where we expected them to after the change was implemented. We have concluded that the stated aim of introducing an RNAV-1 SID design the effect of which was to result in actual aircraft tracks that replicate the nominal track of the existing conventional SID was achieved to an acceptable standard.

9.84 The SIDs on this Route consist of a fairly long straight-ahead first leg towards the west and then a turn of more than 90 degrees to the south and then to the south-east. This route is an overload[46] route that is only rarely used.

9.85 Before the change the aircraft on this route were concentrated down the first straight-ahead leg of the SID and continued in a straight line and did not take the southern turn left at all. Approximately 1-5% of the aircraft were still below 4000ft therefore when they travelled out of the NPR compliance monitoring swathe.

9.86 There was no trial of this route. We anticipated that aircraft flying the RNAV-1 SID would follow the same tracks and the same small proportion of aircraft would exceed the NPR compliance monitoring swathe before they had climbed to 4000ft AMSL.

9.87 When the PIR data which showed the actual impact of the change was received we identified that the aircraft before the change were making the turn south, but much later in the flight, and therefore wider than the design of the nominal track of the conventional SID and at altitudes above 4000ft AMSL. The PIR data also demonstrated that the aircraft flying the RNAV-1 SID took the same left-hand turn (and generally did not carry on straight ahead) but completed a tighter and more concentrated turn. After the change the mean aircraft tracks followed the nominal track of the SIDs closer than before the change. The maps in paragraph 8 of the CAA PIR Correspondence Assessment attached to this report illustrates the number of correspondence items the CAA received which we consider relate to the aircraft using the Route 8 SIDs.

9.88 As regards areas where aircraft overfly below 4000ft AMSL, we observed a concentration of aircraft over the nominal track of the conventional SID, in broadly the same location as where the aircraft had been prior to the change.

[46] This means it is only used when Gatwick Airport is experiencing very high demand and circumstances dictate it is necessary to use this route in order to ensure safe departures.

For the reasons set out at paragraphs 9.11 - 9.13 above we have concluded that the environmental impact of this concentration is not significant (within the meaning of Paragraph 9 of the Secretary of State's 2001 Directions to the CAA).

9.89 As regards areas where aircraft overfly between 4000-7000ft AMSL we observed that the aircraft achieved a tighter turn in line with the SID than before the change and that the tracks were more concentrated than before the change. For the reasons set out at paragraphs 9.11 - 9.13 above we have concluded that the environmental impact of this concentration is not significant (within the meaning of Paragraph 9 of the Secretary of State's 2001 Directions to the CAA).

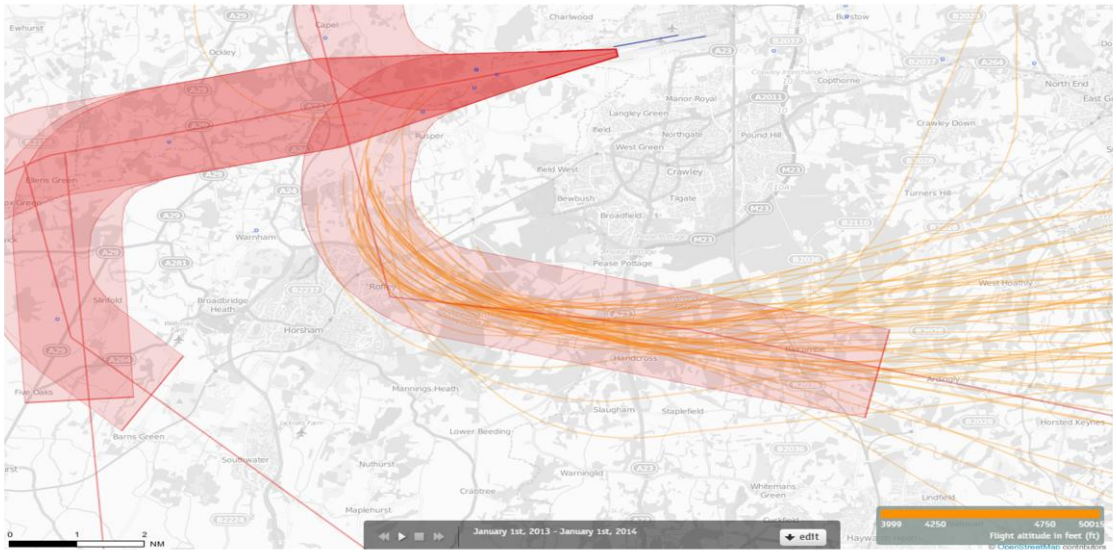
9.90 As set out above[47], when deciding whether to approve an airspace change we have a statutory duty to balance a number of factors. The objective of the change was to enable the future realisation of airspace management and design benefits of RNAV-1 (a form of performance-based navigation). As we are required to do, we balanced our duty to approve changes which make the most efficient use of airspace along with our other duties including taking account of the Secretary of State's Guidance on our environmental objectives. As set out above, we have taken into account the Secretary of State's guidance to limit the number of people significantly affected by noise. As part of our carrying out this PIR we have concluded that on balance the environmental impact of the changes to Route 8's RNAV-1 SIDs identified above should not be a reason to require a change to, or withdrawal of the Route 8 RNAV-1 SIDs.

[47] Chapter 6.

Route 9

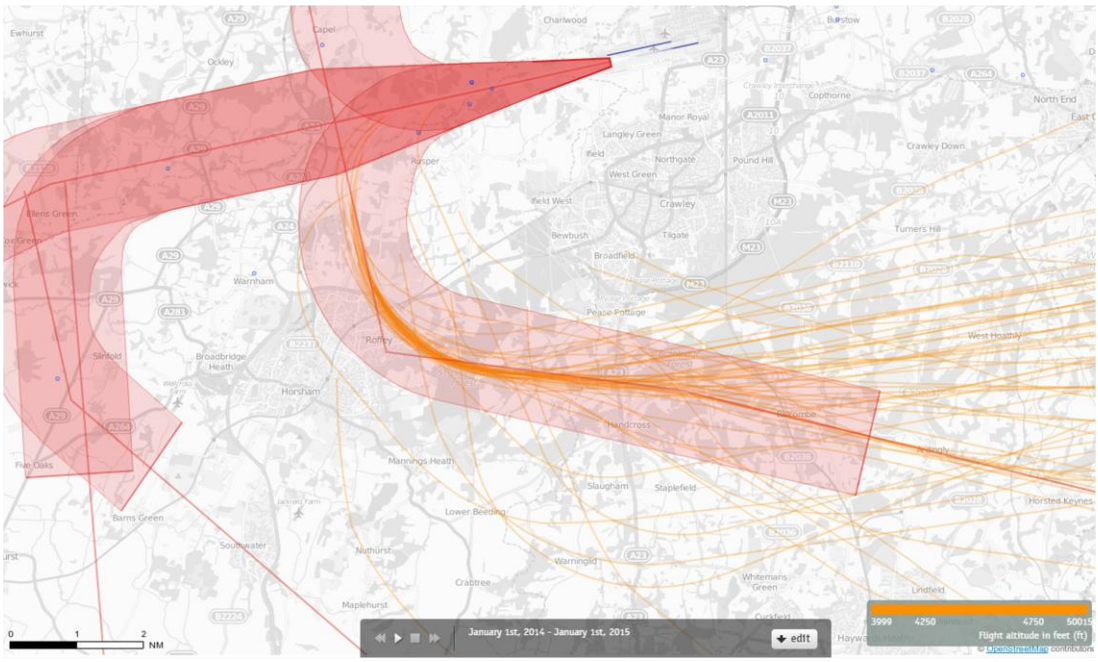
Figure 10 Radar track chart showing the tracks of all aircraft on Route 9 between 4000-5000ft AMSL

26 WIZ Departures January 1st - December 31st 2013
4000-5000 feet (57 Aircraft – CONVENTIONAL ONLY)



Orange plots show the points at which an aircraft was between 4000 and 5000ft altitude.

26 WIZ Departures January 1st - December 31st 2014
4000-5000 feet (57 Aircraft – P-RNAV ONLY)



Orange plots show the points at which an aircraft was between 4000 and 5000ft altitude.

The following is a summary. Please refer to the PIR Route Analysis report, PIR Environmental Analysis report, PIR Operational and Technical report, PIR Correspondence Assessment and CAA IFP Recommendations report attached for the CAA's detailed conclusions

9.91 This route is very rarely used (only at night) and we had very little data relating to it before the change or provided to us for the purpose of the PIR. The SIDs on this route consist of a short straight-ahead leg to the west and an approximately 150 degree turn to the south and then east.

9.92 Before the change aircraft were concentrated, aligned with the conventional SID, on the short leg, quite dispersed around the turn and very dispersed after the turn, as they cleared 4000ft AMSL and were vectored on direct routings by air traffic control.

9.93 There was no trial data. We anticipated that we would see similar, but more concentrated, aircraft tracks after the change below 4000ft AMSL.

9.94 In addition to the points made in paragraphs 9.9 - 9.14 above, the PIR data has shown that this change has had the anticipated impact. Aircraft are more concentrated around the turn but there is wide dispersion, due to air traffic control vectoring, after the turn.

9.95 This change has therefore led to the expected concentration and therefore the expected environmental impact. For the reasons set out at paragraphs 9.11 - 9.13 above we have concluded that the environmental impact of this concentration is not significant (within the meaning of Paragraph 9 of the Secretary of State's 2001 Directions to the CAA) and is not a reason to require a change to, or withdrawal of the Route 9 RNAV-1 SIDs.

Chapter 10

Options for Requirements and Recommendations and Final Conclusions, Requirements and Recommendation

10.1 As a consequence of our review and analysis referred to in Chapter 9 above, for each route, we reached a number of conclusions, that included:

- Whether the changes achieved their objective. If not why not; and
- whether the changes had the expected impacts on the environment, and in particular the noise impact on groups and residents.
- How the actual impact (rather than the impact anticipated at the time of the original decision) compared with the altitude-based priorities given to the CAA by the Secretary of State in the 2014 Guidance.
- Whether the actual impact (rather than the anticipated impact at the time of the original decision) was significant within the meaning of the Secretary of State's 2001 Directions and as discussed in more detail in Chapter 4 of this report.

10.2 For each route, as applicable, we considered the following options, taking into account those conclusions:

1. Whether we should we leave the RNAV-1 SIDs in place unaltered.
2. Whether we should remove or withdraw the RNAV-1 SIDs completely. Pursuing this option would mean that the aircraft departing on that route would revert to flying the conventional SID[48], albeit most likely through a coded overlay procedure.[49] To attempt to introduce RNAV-1 on that route again would require a proposer commencing a new airspace change proposal as Gatwick's airspace change requested 30 November 2012 (as amended 9 January 2013) would have concluded.
3. Whether we should require alterations to the RNAV-1 SIDs as part of this PIR process.

[48] A conventional SID is defined by reference to ground-based navigation aids. The departure procedure can be flown manually by direct reference to conventional navigation instruments on the aircraft or alternatively as a coded overlay using the aircraft's Flight Management System.

[49] A coded overlay is a conventional instrument procedure that has been interpreted by a commercial aeronautical navigation database provider, contracted to the airlines, and a coding produced for loading onto the aircraft's FMS. A coded overlay falls outside of the regulatory oversight provided in an airspace change process. In endeavouring to replicate the conventional procedure design, the FMS coding can be subtly different according to the airline's operational procedures and aircraft types. This could result in a varied track dispersion for aircraft departing from airports using non-RNAV-1 procedures.

a. If yes, what outcomes would we require to be demonstrated?

b. If yes, would we withdraw the RNAV-1 SID if these outcomes could not be demonstrated? We would have two options (either of which would be the conclusion of this airspace change proposal).

i. Go back to the RNAV-1 SID; or

ii. withdraw the RNAV-1 SID, which would lead to aircraft flying the conventional SIDs on that route, albeit probably through a coded overlay, noting that further attempts to introduce RNAV-1 SIDs would require a new airspace change proposal to be submitted to the CAA.

4. Whether any alterations we require to the RNAV-1 SIDs include alterations so as to provide respite[50] for local communities overflown (consideration of respite being a condition subsequent to the original decision and in some of the 2014 Guidance).

5. If we require alterations to the RNAV-1 SIDs should we suspend the RNAV-1 SIDs whilst the work on those alterations is being carried out (meaning the conventional SIDs only were flown on that route in the interim period, albeit probably through the use of coded overlays of the conventional procedures).

10.3 Our actual consideration of the options is set out in detail in the CAA IFP Recommendations report. That document is the actual record of the CAA IFP's assessment and recommendations. However the following paragraphs are a summary of that assessment. Our final decisions are set out in letters sent to Gatwick dated 28 September 2015, 1 October 2015 and 10 October 2015. However the following paragraphs are a summary of those decisions.

General decisions

10.4 We have decided not to withdraw any RNAV-1 SIDs at this time. For all the reasons set out in Chapter 4 and Chapter 5[51], performance-based navigation which RNAV-1 is but one version) will have to be introduced into UK airspace as a consequence of both national and international policy requirements. The CAA has therefore decided that all stakeholders' efforts should be focused on developing the best RNAV-1 SIDs possible, having regard to all of our statutory duties, including our environmental duty, rather than reverting to old technology which is not sustainable in the long-term. That said, in the circumstances set out

[50] Where respite is used in general terms in this report, it is understood to mean where two or more versions of a route are designed and usage rotated in a predictable manner. In addition, runway alternation of multiple runways may also offer respite. Having predictability means that local communities can plan around known periods when each route will be inactive. However, simply moving traffic away from an area will not necessarily provide communities the respite they expect. The extent of the respite offered will depend on how far routes are moved and at what height the aircraft are.

[51] In particular see paragraph 5.2 et seq.

in more detail below, the CAA may conclude that one of the route's SIDs cannot be amended so as to achieve the original objective of the change whilst being consistent with the application by the CAA of its statutory duties, including our environmental duty. In which case, and in the circumstances set out below, the CAA will withdraw that RNAV-1 SID (that is delete it from the AIP).

No interim suspension of RNAV-1 SIDs

10.5 Where we have decided that Gatwick must look at modifications to the RNAV-1 SIDs, we have decided that we will not suspend the RNAV-1 SIDs in the meantime. We have taken this decision accepting and acknowledging that local communities will continue to be impacted in the current manner in the meantime. It was possible for the CAA to suspend any of the RNAV-1 SIDs, which would mean that aircraft departing on that route would have to use the conventional SIDs (that remain published in the AIP). Because of the nomenclature that is used to describe SIDs each new iteration of the procedure is given a unique name to clearly delineate it from the previous version, such as a Runway 26 Dover 5P would become, in the next change, a Runway 26 Dover 6P. As such there is the possibility of confusion over which is the extant departure, particularly when there are a series of changes in quick succession. This can lead to confusion on the flight deck or in air traffic control about which SID the pilot has acknowledged and read-back and then the time taken in radio calls to resolve that confusion; this adds to workload on an already busy frequency and can cause distractions which may have safety ramifications. Furthermore, all changes to the air traffic control system have to be safety managed through a process that involves the airlines, the airport and air traffic control as the transition hazard of moving from one procedure or process to another has to be managed and co-ordinated properly. As a consequence there is a significant workload associated with any change and so doing it only once is highly preferable to two changes in a short period of time. Therefore in our view, on balance it is not sensible or appropriate to suspend the RNAV-1 SIDs which are operating safely.

No modifications required to the RNAV-1 SIDs to plan in, or design, respite for local communities near to where aircraft fly at lower levels below 4000ft AMSL

10.6 As referred to above in Chapter 6 we acknowledged at the time of our decision in 2013 that it may be possible to design alternating respite procedures within existing NPR compliance monitoring swathes but this will be very much dependent upon the particular RNAV-1 design criteria employed. However, this was not the stated intent of this airspace change proposal which was designed to provide RNAV-1 SIDs that replicated the nominal track of the conventional SIDs that they replaced to the greatest extent possible. As described above, respite in

this context may mean having more than one SID nominal track for each current SID, and alternating the use of the alternative SIDs during the day, or every other day, so that local communities get predictable respite from the noise of aircraft.[52]

10.7 We certainly acknowledge that the experience of implementing RNAV-1 SIDs at Gatwick Airport has demonstrated to us how accurate aircraft tracks can be, especially if accompanied by the use of appropriate design parameters and operational procedures which can deliver repeatable and consistent tracks in all wind conditions. We therefore consider that an appropriate form of RNAV-1 can be used to plan or design respite. However, in the same time frame as this PIR has been progressing we have been looking at what forms of respite PBN routings may afford in various scenarios at airports more generally. One of our conclusions from that work, which has not yet become formal policy, is that it may be difficult to achieve meaningful respite in noise reduction terms, when aircraft are at 2000-4000ft AMSL and the tracks are still relatively close together. Indeed the evidence would suggest that meaningful respite would only be delivered if the tracks were at least 1.5km apart and, as such, it would not be possible to provide respite options within the NPR compliance monitoring swathe.

10.8 We have therefore not required any modification of the SIDs, as part of this PIR, that will achieve respite for those impacted by the aircraft flying the SIDs. However, we do consider that when the airspace in the south-east of England is redesigned in future, the introduction of more advanced forms of RNAV-1 technology, will make it possible to plan some degree of respite into the overall design.

The conventional SIDs

10.9 CAP 785[53] sets a 5-yearly requirement for the review of all SIDs. It was a condition of our original decision in respect of the RNAV-1 SIDs that the conventional SIDs be reviewed (to ensure that their design remained up to date taking into account changing factors such as obstacles on the ground and changes to magnetic variation) by 31 January 2014. This work has not yet been done. Consequently, it is an overarching requirement of the conclusions of this PIR that the conventional SIDs are withdrawn within six months of the publication of this PIR, or refreshed conventional SID designs are submitted to the CAA within this same period. Where the CAA is requiring modifications to be considered in respect of the RNAV-1 SIDs, as set out in the route specific comments below, the requirements regarding the conventional SIDs are slightly different.

[52] Note runway alternation is used at Heathrow to provide respite from noise to local communities.

[53] https://www.caa.co.uk/docs/33/CAP785.pdf.

Route specific decisions

Route 1

10.10 Based on the conclusions summarised in paragraph 9.15 et seq above, the CAA does not consider that a better replication by the RNAV-1 SID of the conventional SID could reasonably be achieved. Therefore from the perspective of the original objective of the change, the CAA will not require any change to the RNAV-1 SID.

10.11 Based on our conclusions as to the environmental impact of the change summarised in Chapter 9 above, taking into account the 2014 Guidance from the Secretary of State to the CAA in carrying out our environmental duty, we have concluded that no changes are required to the RNAV-1 SIDs from the perspective of our environmental duty, in particular the noise impact of the change, and our overall duties. Therefore from the perspective of the environmental impact of the change, the CAA will not require any change to the RNAV-1 SIDs.

10.12 Therefore, we have concluded that the RNAV-1 SIDs at Route 1 should remain notified in the AIP, that is, they will remain in place. As a consequence, the CAA's airspace change process in respect of Gatwick's airspace change request dated 30 November 2012 (as amended 9 January 2013) in respect of the SIDs on this route has now concluded.

Route 2

Requirements in respect of Route 2 RNAV-1 SIDs

10.13 Based on the conclusions summarised in Chapter 9 above the CAA considers that a better replication of the nominal track of the existing conventional SID can be achieved. That is, the CAA considers that it may be possible to modify the design of the RNAV-1 SID to achieve greater concentration of aircraft tracks around the turn. (See the detail in the CAA IFP Recommendations report for more detail on those modifications). The CAA therefore requires Gatwick to investigate a modified design to achieve more accurately the replication aimed for. Once the modified design has been implemented and operated for six months the CAA will conduct a further assessment as part of the on-going PIR. If the modifications do not achieve more accurate replication than was achieved by the original RNAV-1 design, i.e. less dispersion around the turn, the RNAV-1 design implemented in November 2013 will be retained. If the modifications do, in the view of the CAA, achieve more accurate replication, that modified RNAV-1 SID will be confirmed. That will be the conclusion of Gatwick's airspace change request dated 30 November 2012 (as amended 9 January 2013) in respect of the Route 2 SIDs. In the interim period the published RNAV-1 SIDs for this route will remain notified in the AIP.

10.14 Based on our conclusions as to the environmental impact of the change summarised at paragraphs 9.11 - 9.13, and taking into account the 2014 Guidance from the Secretary of State to the CAA in carrying out its environmental duty, we have concluded that no changes are required to the RNAV-1 SIDs from the perspective of the noise impact of the change, our overall duties and in particular our environmental duty. Therefore from the perspective of the environmental impact of the change, the CAA does not require any change to the RNAV-1 SIDs. However, any modified design proposed to the CAA in respect of the requirement for considering modifications referred to at paragraph 10.13 above will need to take the Secretary of State's 2014 Guidance into account, both by Gatwick when designing the modification, and by the CAA when reviewing it.

Specific Requirements in relation to Route 2 Conventional SIDs

10.15 As noted above at paragraph 9.25, before the change, the tracks of the aircraft flying the conventional SIDs were also deviating from the nominal track of those SIDs, albeit they were remaining within the compliance monitoring swathe of the NPR. We have decided that Gatwick should consider whether a modification to the speed restriction imposed on the conventional SIDs on the right-hand turn would improve that track keeping (more details are set out in the CAA IFP Recommendations report), and submit revised designs to the CAA within six months.

10.16 Revised designs in compliance with the CAP 785 5-yearly requirement to keep SIDs up to date must be submitted to the CAA in six months in any event.

Route 3

10.17 Based on the conclusions summarised at paragraphs 9.33 et seq above, the CAA does not consider that a better replication could reasonably be achieved. Therefore from the perspective of the original objective of the change, the CAA will not require any change to the RNAV-1 SIDs.

10.18 Based on our conclusions of the environmental impact of the change summarised at paragraphs 9.11 - 9.13, and taking into account the 2014 Guidance from the Secretary of State to the CAA in carrying out its environmental duty, we have concluded that no changes are required to the RNAV-1 SIDs from the perspective of having regard to the noise impact of the change, our overall duties and in particular our environmental duty. Therefore from the perspective of the environmental impact of the change, the CAA will not require any change to the RNAV-1 SIDs.

10.19 Therefore we have concluded that the RNAV-1 SIDs at Route 3 should remain notified in the AIP, that is, they will remain in place. As a consequence, the CAA's airspace change process in respect of Gatwick's airspace change request

dated 30 November 2012 (as amended 9 January 2013) in respect of the SIDs on this route has now concluded.

Route 4

10.20 Based on the conclusions summarised at paragraph 9.42 et seq the CAA has decided that the RNAV-1 SID does not achieve actual aircraft tracks that adequately replicate the nominal track of the existing conventional SID. However, we do consider that replication to an acceptable standard may be achievable. Therefore Gatwick is required to modify the design of the RNAV-1 SID to achieve the original aim of the change, as above. The technical information relating to how this may be achieved are set out in CAA IFP Recommendations report. Notwithstanding their stated desire to consult with local communities, Gatwick is required to submit the modified design to the CAA by 20 November 2015.

10.21 There will be a number of months between receipt by CAA of the modified design and implementation, that is when the aircraft start to fly the modified design. During this time the CAA will be reviewing and then testing the design, for example with simulator tests. When assessing the design the CAA will continue to have in mind all of its duties in respect of airspace decisions, one of which is its environmental duty, which includes giving consideration to the impact on local communities of the noise of aircraft that will be flying the modified designs. If, and once, the CAA is satisfied with the modified design there is a period of notice to airlines and air traffic controllers before the modified design will come into effect, (known as the AIRAC cycle, under which there are a fixed number of days a year when airspace structures and design can change throughout the world, such that design and coding houses can co-ordinate their activities with airlines and air navigation service providers).

10.22 If, and once, the modified design has been implemented and flown for six months the CAA will conduct a further assessment as part of this PIR. At its conclusion, if the CAA is of the view that the RNAV-1 design has not achieved, to an acceptable standard, its original stated aim, then the Route 4 RNAV-1 SID will not be confirmed and will be de-notified by the CAA, i.e. removed from the AIP. That will be the end of the airspace change process commenced by Gatwick's airspace change request dated 30 November 2012 (as amended 9 January 2013) in respect of the Route 4 RNAV-1 SIDs. Gatwick will, of course, be able to submit a further application in respect of the route but this will be subject to a new and separate airspace change proposal submission.

10.23 For the reasons set out above at paragraph 10.5, in the period from now until the implementation of the modified design the published RNAV-1 SIDs for this route will remain notified in the AIP.

10.24 As a result of our conclusions as to the environmental impact of the change summarised at paragraphs 9.11 - 9.13 and taking into account the 2014 Guidance from the Secretary of State to the CAA in carrying out its environmental duty, we have concluded that no changes are required to the RNAV-1 SIDs from the perspective of the noise impact of the change, our overall duties and in particular our environmental duty. We have taken into account the impact of the existing design on an area of outstanding natural beauty and consider that if a modified design that achieves the outcome referred to above can be achieved, the impact on the affected AONB will be improved.

Route 5

Requirements in respect of Route 5 RNAV-1 SIDs

10.25 Based on the conclusions summarised at paragraph 9.51 et seq the CAA considers that a better replication of the nominal track of the conventional SID can be achieved. That is, the CAA considers that it may be possible to modify the design of the RNAV-1 SID to better replicate the existing conventional SID (which would also have the effect of moving the mean track of aircraft further north so that it lies equidistant between Lingfield and Dormansland). (See the detail in the CAA IFP Recommendations report for more detail on those modifications). The CAA therefore requires Gatwick to investigate a modified design to achieve more accurately the replication aimed for. Once the modified design has been implemented and operated for six months the CAA will conduct a further assessment as part of the on-going PIR. If the modifications do not achieve more accurate replication than was achieved by the original RNAV-1 design, Gatwick will be required to revert to the RNAV-1 design implemented in November 2013. If the modifications do, in the view of the CAA, achieve more accurate replication, that modified RNAV-1 SID will be confirmed. That will be the conclusion of Gatwick's airspace change request dated 30 November 2012 (as amended 9 January 2013) in respect of the Route 5's RNAV-1 SIDs. In the interim period the published RNAV-1 SIDs for this route will remain notified in the AIP.

10.26 Based on our conclusions of the environmental impact of the change, summarised in Chapter 9, and taking into account the 2014 Guidance from the Secretary of State to the CAA in carrying out its environmental duty, we have concluded that no changes are required to the RNAV-1 SIDs from the perspective of having regard to the noise impact of the change, our overall duties and in particular our environmental duty. Therefore from the perspective of the environmental impact of the change, the CAA will not require any change to the RNAV-1 SIDs. However, any modified design proposed to the CAA in respect of the requirement for considering modifications referred to at paragraph 10.25 above will need to take the Secretary of State's 2014 Guidance into account,

both by Gatwick when designing the modification, and by the CAA when reviewing it.

Specific Requirements in relation to Route 5 Conventional SIDs

10.27 Revised designs in compliance with the CAP 785 5-yearly requirement to keep SIDs up to date must be submitted to the CAA in six months in any event.

Route 6

10.28 Based on the conclusions summarised at paragraph 9.60 et seq above, the CAA does not consider that a better replication by the RNAV-1 SID of the conventional SID could reasonably be achieved. Therefore from the perspective of the original objective of the change, the CAA will not require any change to the RNAV-1 SIDs.

10.29 Based on our conclusions of the environmental impact of the change summarised in Chapter 9 above, and taking into account the 2014 Guidance from the Secretary of State to the CAA in carrying out its environmental duty, we have concluded that no changes are required to the RNAV-1 SIDs from the perspective of having regard to the noise impact of the change, our overall duties and in particular our environmental duty. Therefore from the perspective of the environmental impact of the change, the CAA will not require any change to the RNAV-1 SIDs.

10.30 Therefore we have concluded that the RNAV-1 SIDs at Route 6 should remain notified in the AIP, that is, they will remain in place. The CAA's airspace change process in respect of Gatwick's airspace change request dated 30 November 2012 (as amended 9 January 2013) in respect of the SIDs on this route has now concluded.

Route 7

10.31 Based on the conclusions summarised in at paragraph 9.68 et seq Chapter 9above, the CAA does not consider that a better replication by the RNAV-1 SID of the conventional SID could reasonably be achieved. Therefore from the perspective of the original objective of the change, the CAA will not require any change to the RNAV-1 SIDs.

10.32 Taking into account our conclusions as to environmental impact of the change summarised in Chapter 9 above, and the 2014 Guidance from the Secretary of State to the CAA in carrying out its environmental duty, we considered whether we should require a modification to the design of the RNAV-1 SID to reduce the environmental impact on the residents of Slinfold, notwithstanding that the RNAV-1 SID adequately replicated the nominal track of the conventional SID as was the intention of the change. We have taken into account the fact that the impact is the consequence of aircraft typically flying above 7000ft AMSL. We have taken into account our conclusion that the impact does not exceed the

significant threshold as regards the CAA's interpretation of that test set out in the Secretary of State's 2014 Guidance to the CAA. We have further concluded that the 2014 Guidance from the Secretary of State to the CAA on carrying out its environmental duty does not lead us to conclude that we should require a modification of the RNAV-1 SIDs on environmental grounds.

10.33 Nonetheless we did consider what modifications might reduce the noise impact on Slinfold, whilst taking account of the aim to replicate the route and the scale of the noise impact at Slinfold. We considered whether we could delay the turn initiation point onto the southerly track in order to move the mean track slightly further to the west. However, we concluded that such changes in RNAV-1 SID design would be likely to result in a less accurate replication of the conventional SID and were unlikely to achieve a meaningful change in the environmental impact on the residents of Slinfold in any event as aircraft are typically above 7000ft AMSL at that point in the departure. Moreover, air traffic controllers would be free to decide on each aircraft's routing and would not be compelled to follow the SID track once the vectoring altitude has been achieved and this typically occurs well before the Slinfold area.

10.34 We have therefore concluded that no changes are required to the RNAV-1 SIDs from the perspective of having regard to the noise impact of the change, our overall duties and in particular our environmental duty. Therefore from the perspective of the environmental impact of the change, the CAA will not require any change to the RNAV-1 SIDs.

10.35 Therefore we have concluded that the RNAV-1 SIDs at Route 7 should remain notified in the AIP, that is, they will remain in place. The CAA's airspace change process in respect of Gatwick's airspace change request dated 30 November 2012 (as amended 9 January 2013) in respect of the SIDs on this route has now concluded.

Route 8

Requirements in respect of Route 8 RNAV-1 SIDs

10.36 Based on the conclusions summarised in at paragraph 9.83 et seq Chapter 9above, the CAA does not consider that a better replication by the RNAV-1 SID of the conventional SID could reasonably be achieved. Therefore from the perspective of the original objective of the change, the CAA will not require any change to the RNAV-1 SIDs.

10.37 Based on our conclusions of the environmental impact of the change summarised at paragraphs 9.11 - 9.13, and taking into account the 2014 Guidance from the Secretary of State to the CAA in carrying out its environmental duty, we have concluded that no changes are required to the RNAV-1 SIDs from the perspective of having regard to the noise impact of the change, our overall duties and in particular our environmental duty. Therefore

from the perspective of the environmental impact of the change, the CAA will not require any change to the RNAV-1 SIDs.

10.38 Therefore we have concluded that the RNAV-1 SIDs at Route 8 should remain notified in the AIP, that is, they will remain in place. The CAA's airspace change process in respect of Gatwick's airspace change request dated 30 November 2012 (as amended 9 January 2013) in respect of the SIDs on this route has now concluded.

Specific Requirements in relation to Route 8 Conventional SIDs

10.39 We have decided that Gatwick should consider whether a modification to the speed restriction imposed on the conventional SIDs is necessary (more details are set out in the CAA IFP Recommendations report), and submit revised designs to the CAA within six months.

Route 9

10.40 Based on the conclusions summarised at paragraph 9.91 et seq above, the CAA does not consider that a better replication by the RNAV-1 SID of the conventional SID could reasonably be achieved. Therefore from the perspective of the original objective of the change, the CAA will not require any change to the RNAV-1 SIDs.

10.41 Based on our conclusions of the environmental impact of the change summarised in Chapter 9, and taking into account the 2014 Guidance from the Secretary of State to the CAA in carrying out its environmental duty, we have concluded that no changes are required to the RNAV-1 SIDs from the perspective of having regard to the noise impact of the change, our overall duties and in particular our environmental duty. Therefore from the perspective of the environmental impact of the change, the CAA will not require any change to the RNAV-1 SIDs.

10.42 Therefore we have concluded that the RNAV-1 SIDs at Route 9 should remain notified in the AIP, that is, they will remain in place. The CAA's airspace change process in respect of Gatwick's airspace change request dated 30 November 2012 (as amended 9 January 2013) in respect of the RNAV-1 SIDs on this route has now concluded.

Decisions in respect of Gatwick's fulfilment of the conditions of the original decisions

10.43 In Chapter 7 we identified that we had no information to confirm that the conditions that attached to the decision we made in 2013 had all been fulfilled by Gatwick. Where these conditions continue to attach to this on-going airspace change, in particular in respect to the review of the conventional SIDs they have been included in the requirements set out above in this chapter.

Communications with Gatwick regarding the conclusions, requirements and recommendations of this PIR

10.44 Gatwick received notification of the requirements and recommendations in respect of the RNAV-1 SIDs in letters dated 28 September and 1 October 2015 (available on the CAA's website http://www.caa.co.uk/default.aspx?catid=2111&pagetype=90&pageid=16983).

10.45 Gatwick received notification of the requirements and recommendations in respect of the conventional SIDs in a letter dated 10 October 2015 (available on the CAA's website http://www.caa.co.uk/default.aspx?catid=2111&pagetype=90&pageid=16983).

10.46 Gatwick received a draft of this PIR report and its annexes on 28 October 2015. This was not an opportunity for Gatwick to amend our conclusions, it was to check for factual errors.

Chapter 11

Feedback and Challenge to the CAA. Learning by the CAA. Improvements put in place by the CAA

Why has this process taken so long and will the next PIR take such a long time?

11.1 Since the SIDs that are the subject of this PIR have been implemented and in use the CAA has been receiving or has had access to material relating to them. Some of that material is referred to in this report (e.g. data and information from airlines and operators that fly from Gatwick Airport, aircraft track data collected by Gatwick and information from members of the public.)

11.2 However, the CAA formally commenced the PIR in November 2014, one year after implementation which is the usual period after which we start a PIR.

11.3 It has therefore taken the CAA almost a year to carry out this PIR and publish this report.

11.4 We recognise that all concerned would have liked this to have been sooner.

11.5 After our initial data request to Gatwick we analysed the material with which we had been provided. This lead us to make further requests for information from Gatwick and also requests to NATS. We also requested material from operators that fly from Gatwick Airport. Data collection throughout this PIR has been an iterative process.

11.6 At the same time we received large amounts of material from groups and residents. We have already described in this report (and in the PIR Correspondence Assessment attached to this report) how we had not received such a volume of material in a PIR before and needed to build and resource a process for compiling and analysing the material that was contained in those comments.

11.7 We took on four contractors to help us. With this help, and as set out on our web page[54], it took six months to process and analyse the material once we had devised a system to do it.

11.8 As set out in this report, one outcome of our analysis of the material is that it caused us to make further enquiries and request further material from stakeholders.

[54] http://www.caa.co.uk/default.aspx?catid=2111&pagetype=90&pageid=16983.

What practical lessons have we learned from this exercise?

11.9 We have identified that in some airspace changes we would be able to complete the PIR in a more timely manner if we had collected material from the change sponsor during the first year of operation as opposed to the majority of the material being requested by us and sent to us a year after implementation. This would have enabled us to begin processing and analysing information earlier. It would also have enabled us to make on-going evidence-lead requests.

11.10 We now know that groups and residents will want to send us comments to take into account during some PIRs. In the future we will seek to identify those PIRs earlier in the process. In those cases we will explore a better method by which groups and residents can send us their views which removes much of the work, and therefore the time, that was incurred by our designing and building a process to analyse the material. We also consider that a more structured entry point to the CAA will enable the CAA to take the material into account more efficiently. We have already put in place a system to address this. Correspondents to the CAA are now asked to send their comments about the use of UK airspace (including complaints as to how it affects them) via a portal which allows us to process the information.[55]

11.11 Other lessons learned include:

- Understanding fully what PBN procedures can and cannot deliver with particular regard to the criticality of RNAV design in terms of procedure design, coding and flight deck operations in producing tracks over the ground to some very tight parameters.
- The need for absolute consistency and clarity in the use of terminology associated with PBN flight procedure design and references to Standard Instrument Departures and Noise Preferential Routes and how we communicate this in order to prevent misunderstanding or confusion.
- Better understanding of relative noise terms used in airspace change and their meaning in practical terms, i.e. what does 57dB Leq 16 hour actually feel like to the average listener on the ground.

[55] https://www.caa.co.uk/application.aspx?catid=33&pagetype=65&appid=11&mode=form&id=6596.

We have received feedback that the delay in publishing this report has lead to concerns that the conclusions of the report will not be fair and reasoned

11.12 We have always been aware that there was significant interest in the process and outcome of this PIR. We have tried to be as transparent as possible. We have built a web page that sets out the steps we have taken which has been regularly updated to show our progress through them. We have published our records that relate to the original decision. We have uploaded copies of the data requests made. As part of the process of publishing this report we will publish the material that we have received. We would welcome feedback on any suggestions as to how we could have better kept those interested in the outcome informed of our progress.

11.13 We met with a number of representative groups and local members of Parliament during the period in which we carried out the PIR. However, most often this was in response to a request that we attend. This was notwithstanding that we were not, at the times of the meetings, able to discuss our findings as we were still processing the material and considering our response to it, we believe that those attending the meetings found our participation useful. We also valued the feedback we received and it helped us to address those issues on our website information page, on an ongoing basis.

11.14 In future PIRs we would give consideration to our stakeholder communication plan from the outset. We would make sure that we identify the right groups and residents to meet with in order that our communications reach as many of those that are interested in hearing from the CAA as possible. We consider that some predictability on the timing of those communications may allay the concerns that nothing is happening.

Consumer Panel

11.15 As well as receiving feedback on the progress of the PIR from groups and residents we have sought feedback from the CAA's Consumer Panel. The CAA Consumer Panel was established in October 2012. The Panel has internal independence from the CAA and acts as a 'critical friend', scrutinising and challenging all of the CAA's work.[56]

11.16 Towards the end of the PIR process the Consumer Panel was asked to consider the work carried out by the CAA in the PIR.

[56] More information on the CAA's consumer panel is available at http://www.caa.co.uk/default.aspx?catid=2488&pagetype=90.

11.17 The Consumer Panel's response to the CAA made two important recommendations. The first is that what is an incredibly technical subject must be presented (in this report) in a readable form to a non technical audience. The second is that the costs and benefits to the consumer must be articulated.

11.18 On the first point, the CAA has addressed this with the format of the report. The subject is technical and as a consequence the subject experts have produced technical reports detailing the CAA's analyses. The full versions of the technical reports are attached to this report. However, the main report has aimed to summarise in a more understandable way the technical information contained in those reports. This is the first occasion on which a PIR report has been written for, and designed to be read by, a non technical audience. We would welcome any feedback on the format of the report so that we could take it into account for subsequent PIRs.

11.19 On the second point we have endeavoured to make clear our view on the consumer cost of noise impact in this report (in particular Chapter 9) and in more detail in the technical reports attached to this report. As regards consumer benefits, we have also tried to make clear in this report that this airspace change was an enabler and that for the most part the consumer benefits will only be realised in the future.

11.20 For example, it is very difficult to extract the contribution to a reduction (if any) in delays at Gatwick Airport attributable to just the RNAV-1 procedures. There are numerous other factors at play including weather, overall London airspace traffic loads, changes in scheduling etc. Furthermore, the Gatwick Airport RNAV-1 SIDs are replications of conventional departure procedures and, subject to the conclusions reached in Chapter 9 and Chapter 10 above, for the most part, maintain the same flight trajectories as before. RNAV-1 procedures are very much the foundation stone. We would not expect to see any marked reduction in delays as a consequence of this airspace change because an improvement in the efficient use of airspace will not materialise until we are able to also put other changes in place including raising Transition Altitude[57] and redesigning how the departure and arrival routes interact with each other and with the surrounding airports. It is a complex model and whilst the overall objectives are to achieve a more efficient use of airspace and minimise delays, RNAV-1 (and PBN in general), is only one of the contributing factors.

Plain language

11.21 As set out above at paragraph 11.15 et seq the CAA's Consumer Panel encouraged us to write this report as clearly as possible.

[57] See paragraph 5.12.

11.22 Moreover, as set out in the PIR Correspondence Assessment and PIR Correspondence database attached to this report, one complaint made by many of the correspondents that submitted comments to the CAA, was that even if they had known about and read the consultation Gatwick carried out before this airspace change proposal was submitted, they would not have understood it. Or even that they did know about and read the consultation but due to the technical language they did not understand the anticipated effect on them.

11.23 We have explained above at paragraph 11.18 that our approach has been to include all the technical material but also to provide a summary of it and of the conclusions the CAA has reached in reliance on it in as understandable way as possible.

11.24 Nevertheless, when summarising a technical subject there is always a risk that explaining it in more accessible terms can alter the meaning. For that reason the definitive version of our assessment and conclusions is in the attached technical reports. However, we have produced a report written so far as possible in plain language and explaining background information that would not necessarily be well known by those outside the aviation industry.

Chapter 12

Information gathered by the CAA from the correspondence and from carrying out this review not directly related to the functions of a PIR

12.1 Our review and analysis of the correspondence that was sent to the CAA has provided a great deal of information on what matters are important to the public's quality of life and when the public feel that is being infringed.

12.2 We have acknowledged within this report the law, the guidance which the CAA has received from the Secretary of State and policy and the impact they have had on the conclusions that we have reached within this PIR. Nonetheless information on what is important to members of the public is valuable for policy makers and we have shared it with the Department for Transport. We regularly have discussions with and provide advice to the Secretary of State as he/she considers policy options for the future and the relevant information we have learned from this PIR has contributed to that advice and those discussions.

12.3 As referred to in Chapter 11, some of the comments we received indicated that members of the public did not know about the consultation on this change when it was carried out in 2012. The purpose of the PIR is not to re-open our assessment of the adequacy of the consultation. Nonetheless, the information we received has informed our policy on consultation. For example, in the digital age there are now a wide variety of ways that a change sponsor can ensure that the consultation is brought to the attention of those who may want to participate in it. We have taken these comments into account when advising airspace change sponsors currently considering a consultation of the parameters and features of an adequate consultation. This includes the need to ensure that the consultation can be understood by those outside the aviation industry and that the reader can understand the anticipated effect of the change on him/her.

12.4 We also acknowledge the hitherto lack of accessibility of our decision-making process. We are certain that more transparency leads to better decision making. However we are aware that our decisions, and the information we analyse in order to make them, could impact on competitiveness in a number of markets such as the design of instrument flight procedures or the provision of tower control air traffic control services at the UK's airports. We are therefore aware that on a case by case basis we must also consider those impacts and safeguard to ensure that our drive for transparency does not disrupt the competition in those markets.

12.5 We acknowledge that prior to carrying out this PIR the only publicly available information was Gatwick's consultation and the CAA's decision letter. We have therefore already put in place revised airspace pages on our website which:

- make clearer the different roles of the parties involved;
- provide explanation of the aviation terms used;
- provide explanation of the effects that might be experienced and why;
- as regards CAA decisions, publishes all the information the CAA took into account when reaching its decision, and its own analyses of that information.

12.6 In relation to the material that airspace change sponsors provide to us, it is our intention to work with change sponsors so that the material can readily be published on the CAA's website.

12.7 We also acknowledge that, perhaps caused by our lack of accessibility, the comments that we have received during this PIR, have indicated that there is a lack of trust in the impartiality, fairness and even integrity of our decision-making process. In early 2015 therefore we contracted with Helios to carry out a review of the CAA's airspace change process and to make recommendations.[58] Having set the Terms of Reference, the CAA has allowed Helios to conduct a fully independent review of the airspace change process and we will respond to the report's recommendations, which are expected to be published before the end of 2015, when we consult upon changes to the airspace change process in 2016.

12.8 We also acknowledge that some of the comments most often received in the PIR relate to other matters outside the scope of the PIR.

12.9 These include:

- opposition to the assumption that it was an acceptable objective to increase the number of aircraft that can arrive and depart at Gatwick Airport;
- opposition to a second runway at Gatwick Airport; and
- Flight profiles relating to other airports, notably Heathrow.

12.10 As set out in this report, it is the CAA's duty, when carrying out its airspace function, to make the most efficient use of airspace. Fulfilling that duty includes maximising use of the UK's limited airspace. Therefore, in the absence of a change in the law, it will remain the CAA's objective to make decisions taking this duty into account, albeit balancing it as the law requires with our other duties.

[58] Helios has been contracted by the CAA to undertake an independent review of the airspace change decision-making process.

12.11 The CAA has no decision-making role in respect of a second runway at Gatwick Airport.

12.12 As regards issues such as these therefore, as set out above, they have informed our policy advice and discussions with the Department for Transport, but they are not matters within the CAA's control.

How to provide feedback on the form and content of this Post Implementation Review

12.13 As set out in paragraph 11.10 we would request anyone that wishes to provide comments about the form and content of this PIR, or any issues relating to the use of UK airspace, do so using our portal at https://www.caa.co.uk/application.aspx?catid=33&pagetype=65&appid=11&mode=form&id=6596. Information received via this entry point will be assessed and taken into account by the CAA.

List of Figures

Figure 1 Extract from airspace change proposal showing the nominal track of the Routes and the conventional SIDs 17
Figure 2 Example Heat Map Route 1 provided by Gatwick during the PIR 19
Figure 3 Radar Track Chart of Route 1 provided by Gatwick during the PIR 20
Figure 4 Gatwick Airport's NPRs and associated compliance monitoring swathes 21
Figure 5 Route 1 heat map showing the density and distribution of flights before and after the change 72
Figure 6 Route 2 heat map showing the density and distribution of flights before and after the change 75
Figure 7 Route 3 heat map showing the density and distribution of flights before and after the change 79
Figure 8 Route 4 heat map showing the density and distribution of flights before and after the change 83
Figure 9 Route 5 heat map showing the density and distribution of flights before and after the change 87
Figure 10 Route 6 heat map showing the density and distribution of flights before and after the change 90
Figure 11 Route 7 heat map showing the density and distribution of flights before and after the change 93
Figure 12 Route 8 heat map showing the density and distribution of flights before and after the change 97
Figure 13 Radar track chart showing the tracks of all aircraft on Route 9 between 4000-5000ft AMSL 100

List of Tables

Table 1: The 7-stage process of the airspace change that is the subject of this PIR 27
Table 2: Other events taking place at the same time 30

List of Annexes

1. PIR Route Analysis report
2. PIR Environmental Analysis report
3. PIR Operational and Technical report
4. PIR Correspondence Assessment
5. PIR Correspondence database
6. CAA IFP Recommendations report

List of Attachments

1. Civil Aviation Authority (Air Navigation) Directions 2001 (the 2001 Directions)
2. Section 70 Transport Act 2000
3. Guidance to the CAA on Environmental Objectives Relating to the Exercise of its Air Navigation Functions, published in 2002 (the 2002 Guidance)
4. Guidance to the CAA on Environmental Objectives Relating to the Exercise of its Air Navigation Functions, published in 2014 (the 2014 Guidance)

APPENDIX A

Glossary

	2001 Directions	Civil Aviation Authority (Air Navigation) Directions 2001
	2002 Guidance	The Secretary of State's Guidance to the CAA on Environmental Objectives Relating to the Exercise of its Air Navigation Functions published in 2002
	2014 Guidance	The Secretary of State's Guidance to the CAA on Environmental Objectives Relating to the Exercise of its Air Navigation Functions published in 2014
A	A330	Airbus 330 Aircraft
	A380	Airbus 380 Aircraft
	a/c	Aircraft
	AAL	Above Aerodrome Level
	ACP	Airspace Change Process
	AIC	Aeronautical Information Circular
	AIP	Aeronautical Information Publication
	Alt	Altitude Above Mean Sea Level
	AMSL	Above Mean Sea Level
	ANO	Air Navigation Order
	ANSP	Air Navigation Service Provider
	AONB	Area of Outstanding Beauty
	APD	Approved Procedure Designer
	APF	Aviation Policy Framework
	ARINC 424	Airlines Electronic Engineering Committee - Navigation System Data Base
	ATC	Air Traffic Control
	ATM	Air Traffic Management
	ATS	Air Traffic Service
B	B747-400	Boeing 747-400 Aircraft

	B777	Boeing 777 Aircraft
C	CAA	Civil Aviation Authority
	CF leg	Course To Fix leg
D	dB	Decibel units
	dBA	Decibel units measured on an A-weighted scale
	DfT	Department for Transport
	DEM	Digital Elevation Model
	DER	Departure End of Runway
	DET	Detling D/VOR
	DME	Distance Measuring Equipment
	DVOF	Digital Vertical Obstruction File
	DVOR	DME/VOR Navigational Aid D DVR – Dover D/VOR (plus a number D21) = 21 nautical miles from the VOR
	DVR	Dover D/VOR
	D (plus 2 or 3 digit no.)	DME range from a navigational aid (eg DVR D21 = 21 nms from the specified beacon, in this case the Dover D/VOR)
E	EGKK	ICAO Location Indicator for Gatwick Airport
F	FAS	Future Airspace Strategy
	FB WP	Fly-by waypoint
	FDR	Flight Data Recorder
	FIR	Flight Information Regions
	FL	Flight Level
	FMC	Flight Management Computer
	FMGC	Flight Management Guidance Computer
	FMS	Flight Management System
	FO WP	Fly-over waypoint
	FTE	Flight Technical Error
G	Gatwick	Gatwick Airport Limited
	GE	General Electric

	GNSS	Global Navigation Satellite System
	GPS	US DoD Global Positioning System
H	HDGs	Headings
	hPa	Hectopascal – 1 hectopascal is equivalent to 1 millibar
I	ICAO	International Civil Aviation Organisation
	IFP	Instrument Flight Procedure
	ILS	Instrument Landing System
	IRS	Inertial Reference System
J	JAA	Joint Aviation Authorities
K	KIAS	Indicated Air-speed in Knots
	Kts	Knots
L	Leq	Equivalent continuous sound level
	LAMP	London Airspace Management Programme
	LHR	London Heathrow
M	M	Magnetic
	Mag Var	Magnetic Variation
	MID	Midhurst D/VOR
	MSD	Minimum Stabilisation Distance
	MSL	Minimum Segment Length
N	NADP	Noise Abatement Departure Procedures
	NATS	The group of companies that includes NERL and NATS Services Limited
	NERL	NATS (En Route) plc
	ND	Navigation Display
	NOTAM	Notice to Airmen
	NPR	Noise Preferential Route
	NMS or nms	Nautical Miles
	NSE	Navigation System Error
P	PANS OPS	Procedures for Air Navigation Services Operations

	PBN	Performance-based Navigation
	PDE	Path Definition Error
	PF	Pilot Flying
	PIR	Post Implementation Review
	PIRG	PIR Group
	PM	Pilot Monitoring
	PNF	Pilot Not Flying
	PRNAV	Precision Area Navigation
	PT	Path Terminator
R	R plus 3 digit number	Radial (No:) from a VOR (eg. R260 = 260 degree radial from a specified point)
	RF Turns	Radius to Fix Turns
	RNAV-1	Area Navigation
	RNP	Required Navigation Performance
	RNP APCH	PBN approach procedure
S	SAM	Southampton D/VOR
	SEL	Sound Exposure Level
	SFD	Seaford D/VOR
	SID	Standard Instrument Departure
	STAR	Standard Terminal Arrival Route
	SW	South West
T	TF leg	Track to Fix leg
	TSE	Total System Error
V	VI leg	Vector to Intercept leg
	VOR	Very High Frequency Omnidirectional Radio Range
W	WP	Waypoint

THE CIVIL AVIATION AUTHORITY (AIR NAVIGATION) DIRECTIONS 2001

These directions are hereby given to the Civil Aviation Authority ("the CAA") by the Secretary of State for the Environment, Transport and the Regions in exercise of the powers conferred by Section 66(1) of the Transport Act 2000 ("the Act").

These directions are given in respect of that airspace comprising all airspace of the United Kingdom and all airspace outside the United Kingdom for which the Government of the United Kingdom has assumed responsibility under international arrangements (together "UK airspace").

CAA's Air Navigation Functions

1. It shall be the duty of the CAA to develop, promulgate, monitor and enforce a policy for the sustainable use of UK airspace and for the provision of necessary supporting infrastructure for air navigation.

2. In particular the CAA shall:

(a) provide or procure the provision of such advice as the Secretary of State for the Environment, Transport and the Regions and the Secretary of State for Defence, or both, may reasonably require;

(b) discharge the responsibilities of the UK Meteorological Authority -
(i) in accordance with ICAO Annex III and other international obligations; and
(ii) subject to international obligations, in such a manner as the CAA may determine from time to time;

(c) be responsible for the form and content of the UK Aeronautical Information Publication and ensure that an Aeronautical Information Service is provided in accordance with international obligations and any additional requirement the CAA may determine from time to time;

(d) determine and procure the provision of a Lower Airspace Radar Service in UK airspace;

(e) prepare and maintain a co-ordinated strategy and plan for the use of UK airspace for air navigation;

(f) develop national policy for the classification of UK airspace, including design criteria, rules, guidelines and common procedures;

(g) classify UK airspace in accordance with the national policy developed in accordance with (f) above, keep such classification under review and make modifications as necessary;

(h) co-ordinate, determine and promulgate temporary changes in the utilization of UK airspace to meet special air navigation requirements;

(i) provide support for the analysis and categorisation of pilot and controller reported risk-bearing occurrences;

(j) develop, monitor and enforce national policy for the use and assignment of civil aeronautical radio frequencies and Secondary Surveillance Radar codes; and

(k) in relation to international air navigation, contribute to the development thereof and provide such assistance, as the Secretary of State may request, including, subject to section 2(4) of the Civil Aviation Act 1982, international representation.

Organisation of the Directorate of Airspace Policy

3. (a) The CAA shall establish a Directorate of Airspace Policy to carry out its air navigation functions as set out in these directions and this Directorate shall be headed by the person nominated under section 66(3) of the Act.

(b) The CAA shall make such arrangements as it considers appropriate for the role of the Ministry of Defence ("the MOD") in the joint and integrated civil/military provision of air traffic services and will ensure that these arrangements are documented in a Memorandum of Understanding between the CAA and the MOD.

(c) The CAA shall enter into arrangements with the MOD to second and resource an appropriate number of personnel of the appropriate rank and experience from the MOD as the MOD contribution to the functioning of the Directorate and will ensure that these arrangements are documented in a Resource and Interface Arrangement.

Consultation and liaison arrangements

4. The CAA shall establish and operate such institutional arrangements with regard to air navigation as seem to the CAA to be necessary to:

(a) promote safe, effective and efficient, integrated operation of air traffic service providers, particularly between military providers and a licence holder under Part I of the Act;

(b) where the proposed exercise of air navigation functions may affect the requirements imposed on any air traffic service provider, ensure that such air traffic service provider is consulted on the proposed exercise

of those functions;

(c) where following consultation referred to at subparagraph (b) above broad consensus is not reached as to either the nature, extent or remuneration of any such service and the matter which has been the subject of consultation would have a material financial impact on an air traffic service provider, ensure that the consideration of the matter by the CAA shall be by its Members if the air traffic service provider so requests; and

(d) without prejudice to section 67 of the Act and if the members of the CAA fail to reach a conclusion, following a request to consider under subparagraph (c) above or if it appears to the Members of the CAA that substantial issues of public policy might arise, ensure that the matter is referred to the Secretary of State.

5. The CAA shall publish details of mechanisms for consultation with representatives of air users, aerodrome operators and providers of air traffic services and other bodies and individuals as appropriate who may be materially affected by any changes proposed by the CAA in UK air navigation arrangements in the Official Record of the Civil Aviation Authority.

The Joint Air Navigation Services Council

6. The CAA shall ensure the continuation of the body known as the Joint Air Navigation Services Council ("the JANSC") and the constitution and functions of the JANSC are set out in the appendix hereto.

Consultation with and Approval of the Secretary of State for Defence.

7. Without prejudice to section 67 of the Act, where it appears to the CAA that there is a need to increase the volume, or alter the classification, of controlled airspace; and that to do so might, in the opinion of either the CAA or MOD, have an adverse effect on the ability of the MOD to maintain its operational capability:

(a) the CAA shall seek the approval of the Secretary of State for Defence before implementing its proposals;

(b) where the Secretary of State for Defence is content, the CAA shall then carry out such further consultation on its proposals as these Directions require under paragraph 4(b) or (c) above before implementing its proposals subject to any direction given under section 68(3) of the Act;

(c) where the Secretary of State for Defence is not content with the CAA's proposals, the CAA shall not implement such proposals if not in accordance with directions given by the Secretary of State under section 68(3) of the Act.

Environmental impact of air operations

8. Subject to section 70 of the Act the CAA shall perform its air navigation functions in the manner it thinks best calculated to take into account:

(a) the Guidance given by the Secretary of State on the Government's policies both on sustainable development and on reducing, controlling and mitigating the impacts of civil aviation on the environment, and the planning policy guidance it has given to local planning authorities;

(b) the need to reduce, control and mitigate as far as possible the environmental impacts of civil aircraft operations, and in particular the annoyance and disturbance caused to the general public arising from aircraft noise and vibration, and emissions from aircraft engines;

(c) at the local, national and international levels, the need for environmental impacts to be considered from the earliest possible stages of planning and designing, and revising, airspace procedures and arrangements; and

(d) the requirements of directions given under section 39 of the Act to licence holders, an authorised person or authorised persons generally.

9. Where changes to the design or to the provision of airspace arrangements, or to the use made of them, are proposed, including changes to air traffic control procedures, or to the provision of navigational aids or the use made of them in air navigation, the CAA shall: Substituted in 2004

(a) where such changes might have a significantly detrimental effect on the environment, advise the Secretary of State for the Environment, Transport and the Regions of the likely impact and of plans to keep that impact to a minimum;

(b) where such changes might have a significant effect on the level or distribution of noise and emissions in the vicinity of a civil aerodrome, ensure that the manager of the aerodrome, users of it, any local authority in the neighbourhood of the aerodrome and any other organisation representing the interests of persons in the locality, have been consulted (which might be undertaken through the consultative committee for the aerodrome where one exists);

(c) where such changes might have a significant effect on the level or distribution of noise and emissions under the arrival tracks and departure routes followed by aircraft using a civil aerodrome but not in its immediate vicinity, or under a holding area set aside for aircraft waiting to land at a civil aerodrome, ensure that the manager of the aerodrome and each local authority in the areas likely to be significantly affected by the proposed changes, have been consulted; and

(d) refrain from promulgating such changes without first securing the approval of the Secretary of State.

10. The CAA shall advise the Secretary of State on the airspace aspects of any proposal to establish new, modify existing, or reactivate disused, civil or military aerodromes, including their associated traffic patterns.

11. In relation to its air navigation duties, the CAA shall maintain its capability to provide expert technical advice to the Secretary of State on environmental matters.

12. The CAA shall provide a focal point for receiving and responding to aircraft related environmental complaints from the general public.

International relations

13. The CAA shall propose international agreements in relation to air navigation for the approval of the Secretary of State.

14. The CAA shall ensure that close co-operation is maintained in relation to air navigation with international organisations and the civil and military aviation authorities of other States.

Citation and Commencement

15. These Directions may be cited as the Civil Aviation Authority (Air Navigation) Directions 2001 and shall come into force on 1 April 2001.

Given this 29 day of March 2001 by the Secretary of State for the Environment, Transport and the Regions

Secretary of State for the Environment, Transport and the Regions

Secretary of State for Defence

Paragraph 6

APPENDIX

Constitution of the Joint Air Navigation Services Council ("the JANSC")

1) The JANSC shall comprise a Chairman, who is to be the person nominated under section 66(3) of the Transport Act 2000, and a representative from each of the following:

(i) the body responsible for military air traffic operations
(ii) each holder of an air traffic services licence under Part I of the Transport Act 2000 ("a licence holder").

2) The Chairman shall be accountable, in respect of the JANSC responsibilities, to the CAA.

Functions of the JANSC:

3) To enable the CAA to oversee, in accordance with the Civil Aviation Authority (Air Navigation) Directions 2001 and the obligations set out in section 70 of the Transport Act 2000, the arrangements between a licence holder and the Secretary of State for Defence so as to ensure that air traffic services continue to be provided on a joint and integrated basis.

4) To meet at least every six months, or at more frequent intervals as required by the Chairman, to review the provision of joint and integrated air traffic services.

5) To submit a written report annually to the CAA setting out the effectiveness of the Operating Protocol between the Secretary of State for Defence and a licence holder in sustaining and improving joint and integrated air traffic services.

6) To act as the initial arena for discussing and resolving differences of opinion and disputes between a licence holder and the Secretary of State for Defence, excluding matters directly covered by commercial contracts between the Secretary of State for Defence and any licence holder which are subject to resolution in other fora, concerning arrangements set out in the Operating Protocol and seeking to keep to a minimum the occasions on which disputes are referred to the CAA.

From the Secretary of State

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20 OCT 2004

25 OCT 2004

In March 2001, John Prescott, then Secretary of State, issued to your predecessor the Civil Aviation Authority (Air Navigation) Directions 2001, under section 66(1) of the Transport Act 2000.

I am writing to advise you of a variation to those Directions under sections 66(1) and 104 (2) of the Transport Act 2000. The Civil Aviation Authority (Air Navigation) (Variation) Direction 2004 is enclosed.

The variation remedies a defect in the wording of the 2001 Directions which has only recently come to light. Its effect is to replace paragraph 9 of the 2001 Directions so as to make it clear that my approval is required for airspace changes only where the changes might have a significantly detrimental effect on the environment, or a significant effect on the level or distribution of noise and emissions in the vicinity of a civil aerodrome, or under the arrival tracks, departure routes or holding areas. This therefore maintains the position as it was prior to 2001 and as has been operated by the Authority for many years.

ALISTAIR DARLING

Flag A

THE CIVIL AVIATION AUTHORITY (AIR NAVIGATION) (VARIATION) DIRECTION 2004

This direction is hereby given to the Civil Aviation Authority ("the CAA") by the Secretary of State for Transport in exercise of the powers conferred by Sections 66(1) and 104(2) of the Transport Act 2000.

This direction is given in respect of that airspace comprising all airspace of the United Kingdom and all airspace outside the United Kingdom for which the Government of the United Kingdom has assumed responsibility under international arrangements.

Variation of the Civil Aviation Authority (Air Navigation) Directions 2001

1. For paragraph 9 of the Civil Aviation Authority (Air Navigation) Directions 2001 there shall be substituted:

"9. Where changes to the design or to the provision of airspace arrangements, or to the use made of them, are proposed, including changes to air traffic control procedures, or to the provision of navigational aids or the use made of them in air navigation, the CAA shall:

(a) where such changes might have a significantly detrimental effect on the environment, advise the Secretary of State for Transport of the likely impact and of plans to keep that impact to a minimum;

(b) where such changes might have a significant effect on the level or distribution of noise and emissions in the vicinity of a civil aerodrome, ensure that the manager of the aerodrome, users of it, any local authority in the neighbourhood of the aerodrome and any other organisation representing the interests of persons in the locality, have been consulted (which might be undertaken through the consultative committee for the aerodrome where one exists);

(c) where such changes might have a significant effect on the level or distribution of noise and emissions under the arrival tracks and departure routes followed by aircraft using a civil aerodrome but not in its immediate vicinity, or under a holding area set aside for aircraft waiting to land at a civil aerodrome, ensure that the manager of the aerodrome and each local authority in the areas likely to be significantly affected by the proposed changes, have been consulted;

and where such changes might have one or more of the effects specified in paragraphs 9 (a), (b) and (c) of this Direction, the Civil Aviation Authority shall refrain from promulgating the change without first securing the approval of the Secretary of State."

Citation and Commencement

2. This Direction may be cited as the Civil Aviation Authority (Air Navigation) (Variation) Direction 2004 and shall come into force on 20th October 2004.

Flag A

Given this [2d] day of [1d] 2004 by the Secretary of State for Transport

Alistair Darling
Secretary of State for Transport

Geoffrey Hoon
Secretary of State for Defence

Transport Act 2000

2000 CHAPTER 38

PART I

AIR TRAFFIC

CHAPTER III

AIR NAVIGATION

70 General duty.

(1) The CAA must exercise its air navigation functions so as to maintain a high standard of safety in the provision of air traffic services; and that duty is to have priority over the application of subsections (2) and (3).

(2) The CAA must exercise its air navigation functions in the manner it thinks best calculated—

(a) to secure the most efficient use of airspace consistent with the safe operation of aircraft and the expeditious flow of air traffic;

(b) to satisfy the requirements of operators and owners of all classes of aircraft;

(c) to take account of the interests of any person (other than an operator or owner of an aircraft) in relation to the use of any particular airspace or the use of airspace generally;

(d) to take account of any guidance on environmental objectives given to the CAA by the Secretary of State after the coming into force of this section;

(e) to facilitate the integrated operation of air traffic services provided by or on behalf of the armed forces of the Crown and other air traffic services;

(f) to take account of the interests of national security;

(g) to take account of any international obligations of the United Kingdom notified to the CAA by the Secretary of State (whatever the time or purpose of the notification).

(3) If in a particular case there is a conflict in the application of the provisions of subsection (2), in relation to that case the CAA must apply them in the manner it thinks is reasonable having regard to them as a whole.

(4) The CAA must exercise its air navigation functions so as to impose on providers of air traffic services the minimum restrictions which are consistent with the exercise of those functions.

(5) Section 4 of the [M1]Civil Aviation Act 1982 (CAA's general objectives) does not apply in relation to the performance by the CAA of its air navigation functions.

Annotations:

Commencement Information

I1 S. 70 wholly in force at 1.2.2001, see s. 275(1)(2) and S.I. 2001/57, art. 3(1), **Sch. 2 Pt. I** (subject to the transitional provision and saving in Sch. 2 Pt. II)

Marginal Citations

M1 1982 c. 16.

Changes to legislation:
There are outstanding changes not yet made by the legislation.gov.uk editorial team to Transport Act 2000. Any changes that have already been made by the team appear in the content and are referenced with annotations.

Changes and effects yet to be applied to the whole Act associated Parts and Chapters:

- Act applied by S.I. 2007/2799 art. 4(2)
- Act applied (with modifications) (temp.) by SI 2007/2053 art. 6 (as added) by S.I. 2008/757 art. 5
- Act power to amend conferred by S.I. 2005/1455 (N.I.) art. 4(a)
- Blanket amendment words substituted by S.I. 2011/1043 art. 3 4
- Blanket amendment words substituted by S.I. 2011/1043 art. 3 6

Whole provisions yet to be inserted into this Act (including any effects on those provisions):

- s. 109A(5) repealed by S.I. 2007/1388 Sch. 1 para. 88
- s. 113A(1) words substituted by 2008 c. 26 s. 10(6)
- s. 113B(1) words substituted by 2008 c. 26 s. 10(6)
- s. 126A inserted by 2008 c. 26 s. 22(1)
- s. 126B inserted by 2008 c. 26 s. 23
- s. 126C-126D inserted by 2008 c. 26 s. 24
- s. 126E inserted by 2008 c. 26 s. 25
- s. 127A 127B inserted by 2008 c. 26 s. 27(1)
- s. 127A transfer of functions by S.I. 2015/65 art. 2(2)(a)
- s. 127A(2) word substituted by S.I. 2015/65 Sch. 1 para. 5
- s. 127B transfer of functions by S.I. 2015/65 art. 2(2)(b)
- s. 127B(1) word substituted by S.I. 2015/65 Sch. 1 para. 5
- s. 131A inserted by 2008 c. 26 s. 31
- s. 131B inserted by 2008 c. 26 s. 32(1)
- s. 131C inserted by 2008 c. 26 s. 33
- s. 131D inserted by 2008 c. 26 s. 34
- s. 131E inserted by 2008 c. 26 s. 35
- s. 131E transfer of functions by S.I. 2015/65 art. 2(2)(c)
- s. 131E(2) word substituted by S.I. 2015/65 Sch. 1 para. 5
- s. 131E(3)(b) word substituted by S.I. 2015/65 Sch. 1 para. 5
- s. 131E(5) word substituted by S.I. 2015/65 Sch. 1 para. 5
- s. 131F inserted by 2008 c. 26 s. 36
- s. 131F transfer of functions by S.I. 2015/65 art. 2(2)(d)
- s. 131F(2) word substituted by S.I. 2015/65 Sch. 1 para. 5
- s. 132A inserted by 2008 c. 26 s. 38
- s. 132A transfer of functions by S.I. 2015/65 art. 2(2)(f)
- s. 132A(2) word substituted by S.I. 2015/65 Sch. 1 para. 5
- s. 132A(3)(b) word substituted by S.I. 2015/65 Sch. 1 para. 5
- s. 132A(5) word substituted by S.I. 2015/65 Sch. 1 para. 5
- s. 132B inserted by 2008 c. 26 s. 39
- s. 132B transfer of functions by S.I. 2015/65 art. 2(2)(g)
- s. 132B(2)(a) word substituted by S.I. 2015/65 Sch. 1 para. 5
- s. 132B(3) word substituted by S.I. 2015/65 Sch. 1 para. 5
- s. 132C 132D inserted by 2008 c. 26 s. 40(1)
- s. 134A inserted by 2008 c. 26 s. 43
- s. 134B inserted by 2008 c. 26 s. 44(1)
- s. 145A and cross-heading substituted for s. 145 by 2007 c. 13 s. 1
- s. 145B inserted by 2007 c. 13 Sch. 2 para. 11
- s. 165A inserted by 2008 c. 26 s. 106
- s. 165A(1)(b) words inserted by 2009 c. 20 Sch. 6 para. 105
- s. 166A inserted by 2008 c. 26 s. 108
- s. 166A(1)(b) words inserted by 2009 c. 20 Sch. 6 para. 107(2)

- s. 166A(3)(b) words inserted by 2009 c. 20 Sch. 6 para. 107(3)
- s. 172A and cross-heading inserted by 2008 c. 26 s. 114
- s. 177A inserted by 2008 c. 26 s. 117(1)
- s. 177A(1) words substituted by 2009 c. 20 Sch. 6 para. 111
- Sch. 16 para. 34(4)(a) para. 34(4)(b) (c) repealed by 2005 c. 14 Sch. 13 Pt. 1

Commencement Orders yet to be applied to the Transport Act 2000
Commencement Orders bringing legislation that affects this Act into force:

- S.I. 2003/766 art. 2 Sch. commences (2002 c. 40)
- S.I. 2003/1397 art. 2(1) Sch. commences (2002 c. 40)
- S.I. 2003/1900 art. 2 Sch. 1 2 commences (2003 c. 21)
- S.I. 2003/2093 art. 2 Sch. 1 2 commences (2002 c. 40)
- S.I. 2003/3142 art. 2-4 Sch. 1 2 commences (2003 c. 21)
- S.I. 2004/641 art. 2-5 commences (2003 c. 37)
- S.I. 2004/827 art. 2-4 commences (2003 c. 20)
- S.I. 2004/1572 art. 2 3 commences (2003 c. 20)
- S.I. 2004/3281 art. 2 commences (2004 c. 36)
- S.I. 2005/1444 art. 2 commences (2005 c. 14)
- S.I. 2005/1909 art. 2 commences (2005 c. 14)
- S.I. 2005/2040 art. 2-4 commences (2004 c. 36)
- S.I. 2005/2714 art. 2-4 commences (2003 c. 37)
- S.I. 2005/2812 art. 2 Sch. 1 2 commences (2005 c. 14)
- S.I. 2006/1014 art. 2 Sch. 1 2 commences (2005 c. 4)
- S.I. 2006/1060 art. 2 commences (2004 c. 34)
- S.I. 2006/1403 art. 2 commences ()
- S.I. 2006/1535 art. 2 commences (2004 c. 34)
- S.I. 2006/1951 art. 2 commences ()
- S.I. 2006/2911 art. 2 Sch. commences (2005 c. 14)
- S.I. 2007/2053 art. 2 3 commences (2004 c. 18)
- S.I. 2007/2799 art. 2 3 commences (2007 c. 13)
- S.I. 2007/3174 art. 2 Sch. commences (2004 c. 18)
- S.I. 2008/757 art. 3 amendment to earlier commencing SI 2007/2053 art. 1(2) 3(2)
- S.I. 2008/3068 art. 2-5 commences (2008 c. 17)
- S.I. 2009/107 art. 2-5 Sch. 1-5 Commencement Order
- S.I. 2009/579 art. 2 commences (2008 c. 26)
- S.I. 2009/803 art. 2-10 commences (2008 c. 17)
- S.I. 2009/3242 art. 2 commences (2008 c. 26)
- S.I. 2009/3294 art. 2 commences (2008 c. 26)
- S.I. 2009/3318 art. 2-4 commences (2009 c. 20)
- S.I. 2010/862 art. 2 3 commences (2008 c. 17)
- S.I. 2010/2317 art. 2 3 commences (2010 c. 15)
- S.S.I. 2010/401 art. 2-4 commences (2009 asp 6)
- S.R. 2006/21 art. 2 commences (S.I. 2005/1455 (N.I.))
- S.R. 2006/22 art. 2-7 transitional provisions for effects of SR 2006/21

GUIDANCE TO THE CIVIL AVIATION AUTHORITY ON ENVIRONMENTAL OBJECTIVES RELATING TO THE EXERCISE OF ITS AIR NAVIGATION FUNCTIONS

January 2002
Department for Transport, Local Government and the Regions

GUIDANCE TO THE CIVIL AVIATION AUTHORITY ON ENVIRONMENTAL OBJECTIVES RELATING TO THE EXERCISE OF ITS AIR NAVIGATION FUNCTIONS

Given by the Secretary of State
under Section 70(2)(d) of the Transport Act 2000

Inquiries about this guidance may be made to
Aviation Environmental Division
Aviation Directorate
Department of Transport, Local Government and the Regions
Great Minster House, 76 Marsham Street
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GUIDANCE TO THE CIVIL AVIATION AUTHORITY ON ENVIRONMENTAL OBJECTIVES RELATING TO THE EXERCISE OF ITS AIR NAVIGATION FUNCTIONS

Section 70(2)(d) of the Transport Act 2000 requires the Civil Aviation Authority in carrying out its air navigation functions to take account of any guidance on environmental objectives given by the Secretary of State.

Introduction

Air navigation functions

1. In exercising its air navigation functions the Civil Aviation Authority (CAA) must give priority to maintaining a high standard of safety in the provision of air traffic services in accordance with section 70(1) of the Transport Act 2000 (the 2000 Act). Otherwise it exercises these functions in the manner it thinks best calculated to meet the requirements set out in (a) to (g) of section 70(2) of the 2000 Act, in no particular order of importance:

(a) to secure the most efficient use of airspace consistent with the safe operation of aircraft and the expeditious flow of air traffic;

(b) to satisfy the requirements of operators and owners of all classes of aircraft;

(c) to take account of the interests of any person (other than an operator or owner of an aircraft) in relation to the use of any particular airspace or the use of airspace generally;

(d) to take account of any guidance on environmental objectives given to the CAA by the Secretary of State after the coming into force of this section;

(e) to facilitate the integrated operation of air traffic services provided by or on behalf of the armed forces of the Crown and other air traffic services;

(f) to take account of the interests of national security;

(g) to take account of any international obligations of the United Kingdom notified to the CAA by the Secretary of State (whatever the time or purpose of the notification).

If there is a conflict inherent in the application of these provisions, the CAA must apply them in the manner it thinks is reasonable having regard to them as a whole.

Director of Airspace Policy

2. The CAA is organised so that the exercise of its air navigation functions are discharged by the Director of Airspace Policy (DAP). The DAP has responsibility for the definition, development, approval, promulgation, regulation, monitoring and enforcement of policy for the allocation and use of UK airspace and its supporting infrastructure so as to secure the most effective use of the airspace in a way which, as far as practicable, meets the needs of all users, having regard for national security, economic and environmental factors, while maintaining a high standard of safety.

Directions given to the CAA under Section 66(1)

3. The Secretary of State has given Directions to the CAA under section 66(1) of the 2000 Act in respect of all United Kingdom airspace. Those Directions are concerned with, amongst other things, the environmental impact of air operations, and require that:

8. Subject to section 70 of the Transport Act 2000 the CAA shall perform its air navigation functions in the manner it thinks best calculated to take into account:

a) the Guidance given by the Secretary of State on the Government's policies both on sustainable development and on reducing, controlling and mitigating the impacts of civil aviation on the environment, and the planning policy guidance it has given to local planning authorities;

b) the need to reduce, control and mitigate as far as possible the environmental impacts of civil aircraft operations, and in particular the annoyance and disturbance caused to the general public arising from aircraft noise and vibration, and emissions from aircraft engines;

c) at the local, national and international levels, the need for environmental impacts to be considered from the earliest possible stages of planning, designing, and revising airspace procedures and arrangements; and

d) the requirements of directions given under section 39 of the Transport Act 2000 to licence holders, an authorised person or authorised persons generally.

9. Where changes to the design or the provision of airspace arrangements, or to the use made of them, are proposed, including changes to air traffic control procedures, or to the provision of navigational aids or the use made of them in air navigation, the CAA shall:

a) where such changes might have a significantly detrimental effect on the environment, advise the Secretary of State for Transport, Local Government and the Regions of the likely impact and of plans to keep that impact to a minimum;

b) where such changes might have a significant effect on the level or distribution of noise and emissions in the vicinity of a civil aerodrome, ensure that the manager of the aerodrome, users of it, any local authority in the neighbourhood of the aerodrome and other organisations representing the interests of persons in the locality, have been consulted (which might be undertaken through the consultative committee for the aerodrome where one exists);

c) where such changes might have a significant effect on the level or distribution of noise and emissions under arrivals tracks and departure routes followed by aircraft using a civil aerodrome but not in its immediate vicinity, or under a holding area set aside for aircraft waiting to land at a civil aerodrome, ensure that the manager of the aerodrome and each local authority in the areas likely to be significantly affected by the proposed changes, have been consulted; and

d) refrain from promulgating such changes without first securing the approval of the Secretary of State.

Aim of the Secretary of State's Guidance

4. The guidance sets out a clear framework within which the Director of Airspace Policy (DAP) will operate in discharging the CAA's air navigation functions. It includes advice on the Government's strategy for sustainable development, information about the guidance given to local planning authorities where this is relevant to the DAP's functions, and guidance on particular environmental objectives. It draws on:

- the 1998 White Paper on the Future of Transport, *A New Deal for Transport: Better for Everyone*,
- the 1999 White Paper - *A Better Quality of Life; a strategy for Sustainable Development in the UK*,
- the 2000 White Paper - *Delivering an urban renaissance: Our towns and cities*,
- the 2000 White paper - *Our countryside: the future, A fair deal for rural England*,
- the *National Air Quality Strategy*.

5. The guidance is divided into the following sections:

A. The Government's policies on sustainable development (paragraphs 7 to 13)
B. Planning Policy Guidance to local planning authorities (paragraphs 14 to 22)
C. Specific aviation environmental objectives (paragraphs 23 to 29)
D. Factors relevant to departures (paragraphs 30 to 46)
E. Factors relevant to arrivals (paragraphs 47 to 50)
F. Changes to airspace arrangements and procedures (paragraphs 51 to 59)
G. Directions to providers of air traffic services under section 39 (paragraph 60)

It is the intention to review and reissue this guidance following publication of the Government's white paper on the future of aviation.

Devolved administrations

6. Devolution has brought changes to the role of Government in the United Kingdom. Regulation of aviation and air transport, including regulation of safety, air navigation and economic matters, are "reserved" matters for the UK Parliament and Government.[1] The

[1] Scotland Act 1998.
The Scotland Act 1998 (Transfer of Functions to the Scottish Ministers etc.) Order 1999, No. 1750.
Government of Wales Act 1998.
Northern Ireland Act 1998.

responsibilities of the devolved administrations vary. The Scottish Executive has certain powers relating to aerodromes, including on certain environmental and planning issues. The National Assembly for Wales has planning powers, including those that affect aerodrome matters. The Northern Ireland Assembly and the Northern Ireland Executive have powers relating to aerodrome issues, and, subject to the consent of the Secretary of State, can legislate on civil aviation matters.

A. The Government's policies on sustainable development

7. Sustainable development is often defined as development which meets the needs of the present without compromising the ability of future generations to meet their own needs[2]. But quite simply it aims to ensure **a better quality of life for everyone, now and for generations to come**. Economic growth is vital for delivering a better quality of life, but in the past economic activity has tended to mean more pollution and a wasteful use of resources, which impairs quality of life. In addition, too many people have been left behind, excluded from the benefits of development but often suffering the adverse side effects. For the future, the Government's aim is to achieve economic, social and environmental objectives at the same time, and to consider the longer term implications of decisions. The White Paper - *A Better Quality of Life; a strategy for Sustainable Development in the UK* [3] sets four objectives:

- **maintenance of high and stable levels of growth and employment**
  The UK has a strong aviation industry, including airlines, airports, aerospace manufacturers and supporting industries. They make a significant contribution to national GDP, as well as facilitating growth in other industries. The aviation industry also provides many jobs, both directly and indirectly.

- **social progress which recognises the needs of everyone**
  Aviation brings benefits through employment, cultural exchange and opportunities for travel. Foreign travel and holidays are now within reach of a broad cross-section of the population for education, leisure and visiting friends and families.

- **prudent use of natural resources**
  Aviation consumes many natural resources - in particular, fossil fuels and the raw materials necessary for producing aircraft. Airport development can also involve significant land use (including for access by surface transport) and urbanisation of the surrounding area.

- **effective protection of the environment**
  Aviation affects climate change, local air quality (particularly around airports which may harm human health), noise levels near airports and under flightpaths, energy use, waste and water. There are also environmental impacts associated with travel to and from airports.

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[2] *Our Common Future (The Bruntland Report)* – Report of the 1987 World Commission on Environment and Development, Oxford University Press, 1987.
[3] Cm 4345, May 1999

8. Government polices also take account of ten guiding principles and approaches examined in Chapter 4 of the White Paper:

- putting people at the centre;
- taking a long term perspective;
- taking account of costs and benefits;
- creating an open and supportive economic system;
- combating poverty and social exclusion;
- respecting environmental limits;
- the precautionary principle;
- using scientific knowledge;
- transparency, information, participation and access to justice; and
- making the polluter pay.

9. Aviation has implications at the global, national, regional and local level for all four pillars of sustainable development. The challenge facing civil aviation is to deliver economic, social and environmental objectives while ensuring that the industry continues to operate safely, efficiently and effectively. In particular, negative effects on the environment should be minimised, taking account of land-use planning and conservation policies, whilst the contribution of air transport to the economy should be maximised. Additional capacity should be provided only where this is economically and environmentally justified. This necessarily involves striking a balance between the needs of an efficient air transport industry, providing jobs and serving the local, regional and national economy, and minimising the impacts on the environment and on the communities around aerodromes and under their flight paths. It is necessary to act proportionately, for example, by recognising that environmental dis-benefits may be justified when all sustainable development objectives are taken into account.

10. The CAA can contribute towards achieving the aims and objectives of sustainable development by seeking to optimise the benefits and minimising the harm to the environment, taking account of the likely costs and benefits of particular options or courses of action. When considering the design and use of existing airspace arrangements and changes to those arrangements, the DAP should proceed in a manner that is:

comprehensive – by utilising the most up-to-date and comprehensive information available, including on engineering, navigational, aeronautical and demographic factors;
rigorous – by identifying and reviewing all significant environmental effects of proposed changes, assessing their environmental impact, technical feasibility, any health and safety implications, cost-effectiveness, and carrying out a thorough examination of the options for minimising and reducing aircraft noise and emissions;
forward looking – by taking account of likely future as well as current planned operations, with a view to delivering stability in airspace arrangements as far as practicable;
transparent – by utilising clear assessment methodologies and making relevant information accessible through consultation or otherwise in accordance with open Government principles; and which is
aimed at seeking improvements – by not confining policy and activity to measures which prevent a worsening of the environmental impacts of aviation, but also seeking ways of reducing those impacts and improving the environment where possible.

11. Sustainable development indicators have been developed by the Government to help measure progress in achieving the sustainable development objectives. For example, a headline indicator for measuring progress against the objective of reducing air pollution and maintaining and improving air quality over the longer term, is "the number of days when air pollution is moderate or high". Noise levels are a key indicator for the objective of building sustainable communities.

12. Sustainable development objectives and principles underpin each area of public policy, including the Government's Rural White Paper — *Our countryside: the future - A fair deal for rural England*[4] and the Urban White Paper — *Our towns and cities: the future - Delivering an urban renaissance*[5]. These recognise that the environment, both local and global, requires increased protection. A key element of the Government's vision for creating a high quality of life is "good design and planning which makes it practical to live in a more environmentally sustainable way, with less noise, pollution and traffic congestion". The White Paper on the Future of Transport — *A New Deal for Transport: Better for everyone*[6] sets out a framework for:

- reducing pollution including greenhouse gas emissions from transport;
- improving air quality;
- reducing noise and vibration from transport;
- limiting the visual intrusion caused by transport (including light pollution)[7];
- ensuring that the environmental impacts are taken fully into account in investment decisions and in the price of transport,

and includes the Government's commitment to develop new policies on civil aviation and a new UK airports policy, which will be brought together in a new White Paper.

13. In December 1999 the EU Commission published *Air Transport and the Environment: Towards meeting the challenges of sustainable development* [8] which sets out proposals for driving environmental performance in the aviation sector. The communication addressed three key specific issues:

- improving technical standards,
- implementing economic instruments and
- assisting airports to improve their performance.

The two key targets for this policy are the control of noise around aerodromes and emissions. The UK broadly welcomed the communication.

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[4] Cm 4909, November 2000
[5] Cm 4911, November 2000
[6] Cm 3950, July 1998
[7] Visual intrusion, including light pollution, is a more important issue for other modes of transport. In most situations, aircraft noise will be regarded as a more serious issue than visual intrusion and therefore should be given more weight. But as recognised in paragraph 55, visual intrusion may be an important issue in certain cases, such as in a national park or an AONB, at heights where aircraft noise is not normally considered a problem. Light pollution from airports can also be a problem, but is an airport planning matter that falls outside the scope of this guidance.
[8] COM 1999

B. Planning Policy Guidance *(to local planning authorities)*

14. Planning policy guidance notes (PPGs) set out the Government's policies on different aspects of land-use planning, including National Planning Policy Guidelines (NPPGs) in Scotland. Local authorities must take their content into account when preparing their development plans and determining planning applications. They also give developers an indication of the factors to take into account when preparing proposals for development. Land-use policy around aerodromes and under their principal arrival tracks and departure routes is an important factor in helping to minimise the adverse impacts of aviation, particularly from aircraft noise. However, while a local planning authority may take a close interest in the air navigation arrangements likely to be associated with an airport planning proposal and may seek advice on them from the air traffic service (ATS) provider or the CAA, it may not make a planning condition which has a direct effect on those arrangements. Several PPG notes have a bearing on how the CAA exercises its air navigation functions, for example PPG 24 *Planning and Noise* and, in Scotland - Planning Advice Note PAN 56 *Planning and Noise*, are particularly important. It is recommended that the DAP keep abreast of the PPGs issued by the DTLR and corresponding guidance issued by the devolved administrations. The full library of planning guidance and circulars is available on the DTLR's website and the websites of the devolved administrations. The following are the most relevant to the CAA's air navigation functions:

PPG 1 - General Policies and Principles

15. This reaffirms the role of the planning system in meeting the needs of a growing and competitive economy, in providing for new development and in protecting the natural and built environment. It emphasises the contribution of the planning system to achieving sustainable development. In Scotland the equivalent note is NPPG 1 *The Planning System* (revised 2000).

PPG 11 - Regional Planning

16. This requires regional planning bodies (RPBs) to consider including in their regional transport strategies (RTSs), integral to Regional Planning Guidance (RPGs), a strategic steer on the role and future development of airports in their region, in accordance with the principles of sustainable development and in the light of national policy. The DAP should be aware of the RPG/RTSs as they influence the location, scale, density, design, mix of land uses and surface access, and make use of this strategic framework in its airspace planning. For this reason the DAP should seek to be involved in the development of the RPG/RTS, and in any associated transport studies, which impact on its interests.

PPG 12 - Development Plans

17. This gives advice on how to achieve integrated land-use and transport policies. Local authorities may seek advice from the CAA in connection with the development of their plans.

PPG 13 - Transport

18. This requires local planning authorities in England to integrate planning and transport in ways which promote accessibility and more sustainable transport choices, and reduce the need to travel. In Scotland the equivalent note is NPPG 17 *Transport and Planning* (1999). The DAP should be aware that in relation to airport development, PPG 13 advises that in preparing development plans and in determining planning applications, local planning authorities should consider the extent to which development is related to the operation of the airport and is sustainable, plan surface access needs as part of the wider transport strategy for

the local area, and consider carefully the environmental impacts of aviation proposals. Local planning authorities consult DTLR's Airports Policy Division (APD) on draft development plans, policies and proposals relating to airports and airfields, so as to avoid development close to an airport or airfield that is incompatible with any existing or potential aviation operations. The DAP should also contribute to this process as its understanding of the airspace arrangements will assist in the preparation of local development plans and policies.

PPG 23 - Planning and Pollution Control

19. This gives advice on the relevance of pollution controls and air quality considerations to the exercise of planning functions in England. It is due to be updated. In Scotland the equivalent note is PAN 51 *Planning and Environmental Protection* (1997).

PPG 24 - Planning and Noise

20. Issued in September 1994 (updating earlier guidance issued in 1973), PPG 24 gives advice to local planning authorities in England on the use of their planning powers to minimise the adverse impacts of noise (from all modes of transport and from heavy industry)[9]. In Scotland, Planning Advice Note (PAN) 56 - *Planning and Noise* (1999) fulfils a similar role. They set out the considerations to be taken into account in determining planning applications for noise sensitive developments and for those activities that will generate noise. It specifies noise exposure categories for residential development and recommends appropriate levels for exposure to different sources of noise (drawing on WHO[10] guidance). While it is important, wherever practicable, that noise sensitive developments (such as housing, hospitals and schools) should be separated from major sources of noise such as air transport, it is equally important that new developments involving noisy activities should, if possible, be situated away from noise-sensitive land uses.

21. The guidance in PPG 24 is principally addressed to local planning authorities. However, the core principles should also inform the DAP's consideration of airspace procedures and modifications to them. In the vicinity of established aerodromes the local planning authorities will have taken particular account of the final approach tracks and established departure procedures in granting planning permission for noise-sensitive development. Therefore, it is important that proposals for changes to departure procedures should include careful consideration of the impact on areas beneath the proposed track, as they may contain a legacy of noise sensitive development.

22. It is anticipated that final approach tracks will, for the foreseeable future, remain aligned with the runway centre line, so that any change to a final approach track would arise only as the consequence of a proposal to realign a runway. If the development of new instrument approach aids in future makes possible the introduction of curved approaches or variable rates of descent on the glideslope, their introduction at particular aerodromes should be considered on the same basis as any other change to the local airspace arrangements.

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[9] Some contact details have changed since PPG 24 was issued. References to CA4 of the Department of Transport should now be read as being to Aviation Environmental Division 4, DTLR, at Zone 1/33, Great Minster House, 76 Marsham Street, London, SW1P 4DR (Tel: 020 7944 5462); and references to DSEE of the CAA should now be read as being to ERCD at 45-59 Kingsway, London, WC2B 6TE (Tel. 020 7453 6086). The then Welsh Office issued a similar guidance note in October 1997 *Planning Guidance (Wales) - Technical Advice Note (Wales) 11,* ISBN 0-7504-2266-1.

[10] World Health Organisation.

C. Specific aviation environmental objectives

23. Among the main environmental impacts of aviation are:

- the effects of aircraft emissions on climate change and on levels of ozone in the upper troposphere and lower stratosphere,
- the effects on local air quality around airports, and
- the effect of aircraft noise on people living near airports and under flightpaths.

The Government's objectives include reducing the environmental impacts of aviation, in particular of:

- greenhouse gas emissions and ozone depleting substances,
- local air pollution (to ensure that air quality continues to improve over the longer term and polluting emissions do not cause harm to human health or the environment), and
- noise.

24. At the global level, aviation is a growing contributor to emissions of the greenhouse gas emissions that cause climate change. Emissions from domestic flights are included within individual countries' targets agreed under the Kyoto Protocol process, but emissions from international aviation (and shipping) is not. In the meantime, countries are expected to limit or reduce emissions from international air services working through the International Civil Aviation Organisation. The UK's climate change programme[11] outlines some of the options that are being explored for reducing emissions. Ones most relevant to the DAP involve improvements to air traffic management and associated operating procedures. The Intergovernmental Panel on Climate Change has estimated that these measures have the potential to reduce aviation fuel burn by between 6% and 12% over the next 20 years. In particular, work to improve operational efficiency from departure gate to arrival gate, for example by better air traffic management and better ground control at airports, should minimise flight times and distances flown as well as helping to reduce emissions of greenhouse gases and ozone depleting substances.

25. At the local level the key impacts of aviation are noise and emissions.

26. Aircraft are currently responsible for a relatively small overall share of emissions of pollutants of most concern. For example, nationally, aircraft contribute around 1% of total NO_x emissions, but this increases to about 30% in the vicinity of large airports. The relative contribution of aircraft is forecast to increase as air traffic grows and major sources such as road traffic reduce as vehicles become cleaner. Aircraft emissions and their contribution to local air quality is an important issue around some major airports. Local authorities are responsible under Part IV of the Environment Act 1995 for monitoring levels of pollutants in the vicinity of airports and for drawing up action plans, in partnership with airport operators where appropriate, to improve air quality where it falls below nationally prescribed target levels. The DAP is in a position to contribute towards reducing aircraft emissions generally by developing airspace arrangements and procedures that will enable aircraft to climb efficiently, allow direct routings

[11] *Climate Change - The UK Programme*, November 2000, Cm4913. Department of the Environment, Transport and the Regions, Scottish Executive, The National Assembly for Wales, and Department of the Environment in Northern Ireland.

where possible, reduce holding times, and facilitate the consistent use of continuous descent and low power/low drag approach procedures. However, such measures are not expected to have a significant influence on local air quality in the immediate vicinity of airports.

27. The Government's Air Quality Strategy for England, Scotland, Wales and Northern Ireland was published in January 2000.[12] It sets health-based air quality objectives for eight key air pollutants[13] to be achieved between 2003 and 2005, and in one case by 2008. Where the public is likely to be exposed to poor air quality exceeding these levels, local authorities are currently working towards achieving the objectives through the local air quality management process, and in collaboration with major airport operators where necessary. It is also necessary for the UK to meet the requirements set out in EU legislation. The EU has legislated to control emissions of air pollutants and to establish air quality objectives. The Air Quality Framework Directive (96/62/EC) sets a strategic framework for tackling air quality consistently across the EU by setting legally binding limit values for each of 12 pollutants in a series of daughter directives. The first daughter directive, covering sulphur dioxide, nitrogen dioxide, particles and lead was agreed in April 1999. Without further measures being taken to reduce levels of air pollution, parts of the UK, including areas around some airports, will have difficulty achieving the 2010 limit values for NO_2 and particles.

28. Most noise impacts from air traffic occur in the vicinity of airports where aircraft operate in closest proximity to people's homes, schools, hospitals and other noise sensitive receptors. It is widely recognised to be one of the most objectionable impacts of airport development and an important environmental issue for those living close to airports as well as further afield under the main arrival and departure tracks. For many airports, taking effective measures to control and mitigate aircraft noise is fundamental to their sustainable development.

29. The Government's approach to tackling aircraft noise has four main strands and is consistent with the "balanced approach" to aircraft noise management described in ICAO Resolution 14/1 [14]. The first is to seek reductions in noise at source by exploiting and encouraging developments in aircraft and engine technology. This is primarily a matter for international negotiation and agreement, implemented by EU and national regulation. The second, through the application of land-use planning and management policies (described in Section B above), is to direct the location of new noise sensitive development away from major sources of noise and to limit the encroachment of incompatible development into noise-sensitive areas. The third strand is to apply (and to encourage and assist airports and operators of aircraft to apply) noise abatement operational procedures, to the extent possible without affecting safety, in order to control operational noise and to mitigate its worst effects. The fourth and final strand is to provide the necessary legal framework for operating restrictions to be applied on the numbers and types of aircraft that may operate at particular airports or at particular times. The DAP has an important role to play in supporting the second and third strands. That role is set out in more detail in the following paragraphs.

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[12] *The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Working Together for Clean Air.* Cm 4548.

[13] Benzene; 1,3-Butadiene; Carbon monoxide (CO); Lead; Nitrogen dioxide (NO_2); Ozone; Particles (PM_{10}); Sulphur dioxide (SO_2).

[14] ICAO Resolution 14/1, a consolidated statement of continuing ICAO policies and practices related to environmental protection, agreed at the 33rd ICAO Assembly, Montreal – 5 October 2001.

D. Factors relevant to departures

Concentration of air traffic and noise

30. Airspace management considerations give rise to a concentration of departures along a limited number of fixed departure routes due to the requirement to maintain safe separation between successive departures, the need to minimise conflicts with inbound aircraft that call for tactical resolution by air traffic control (ATC), and the need to make efficient use of runway capacity (by minimising timed separation between departures). Standardising departure procedures also helps in reducing radio telephony (RT) and ATC workload, both of which contribute to safe and efficient use of the available capacity. Combined with practical issues arising from the position of navigational aids, these considerations unavoidably give rise to a concentration of departing traffic along a relatively small number of tracks. **It therefore makes sense to arrange for these routes to avoid densely populated areas as far as possible**. This is expected to remain the case for the foreseeable future, notwithstanding the introduction of new technologies, navigation techniques and procedures.

31. Government policy on the design of departure routes is informed by the work of two Noise Advisory Council (NAC) working groups in the 1960s and 1970s. In examining the fundamental question of concentration versus dispersal, from both an ethical and practical perspective, the NAC concluded that the best environmental outcome was to concentrate departures on the least practical number of routes which were designed specifically to minimise the number of people over-flown. Practical airspace management considerations were found to preclude both "perfect concentration" (directing all traffic along a single departure route over-flying the least number of people) and "perfect dispersal" (sharing noise disturbance equitably between all areas surrounding an airport).

32. It has therefore been the view of successive Governments that:

> **the balance of social and environmental advantage lies in concentrating aircraft taking off from airports along the least possible number of specified routes, consistent with airspace management considerations and the overriding need for safety.**

33. This policy has general application (it is not confined to the three designated London airports[15]). In the case of Heathrow, Gatwick and Stansted the policy is given effect by the Secretary of State's requirement for most departing aircraft to follow the noise preferential routes (NPRs) which form the initial part of the Standard Instrument Departures (SIDs). These NPRs are promulgated in notices published in the UK-AIP[16]. Many other airports have also required pilots to adhere to NPRs (in some cases called minimum noise routes) or similar procedures designed to reduce disturbance in the vicinity of the airport.

34. While the DAP should follow the principles in paragraphs 30-32 in most instances, there may be local circumstances where it is impossible to concentrate traffic over less populated areas and where the advantage lies in dispersing traffic to avoid the concentration of noise over noise sensitive areas. It is important to take account of the local circumstances.

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[15] These are the three airports presently designated under section 80 of the Civil Aviation Act 1982 for the purposes of section 78 of that Act, giving rise to the descriptor "designated airports". Section 78 empowers the Secretary of State (and, in Scotland, the Scottish Ministers) to regulate noise and vibration connected with aircraft taking off or landing at designated airports.

[16] UK Aeronautical Information Publication (Air Pilot).

Importance of stability in the relationship between airspace and land-use planning

35. Airspace planning and land-use planning in the vicinity of airports should continue to be mutually informed processes. The position of departure routes and the alignment of arrival tracks are important factors that inform local authorities' development control functions (cf. paragraphs 20-22 concerning PPG 24), and the legacy of past planning decisions will usually provide compelling arguments for preserving established route structures where possible. When considering changes to airspace arrangements, the DAP should:

> **place a high value on the legacy of planning decisions and the location of noise-sensitive development, and generally should recognise the importance of the long-term stability of the route structure in the vicinity of airports, since people need to know where significant aircraft noise will be experienced.**

36. Changes to airspace arrangements (which includes procedures for the use of controlled airspace in addition to its design) should:

> **be made after consultation, only where it is clear that an overall environmental benefit will accrue or where airspace management considerations and the overriding need for safety allow for no practical alternative.**

Existing boundaries to controlled airspace should not be a constraint if a satisfactory environmental outcome can be achieved only by taking additional airspace into control.

Compliance with Noise Preferential Routes

37. The requirements for pilots to adhere to NPRs vary from airport to airport and in some cases from route to route; for example, they can preclude radar vectors below specified altitudes or over specified areas (other than for the purposes of avoiding immediate danger, including severe weather), and may require a minimum climb performance[17]. Such requirements form part of the balance struck between efficient airspace management and environmental considerations. The Government has not specified performance standards for the accuracy of track-keeping on Heathrow, Gatwick or Stansted NPRs and has no plans to do so, but it does offer advice to the public (including local maps) indicating where direct over-flight by departing aircraft can normally be expected. At the three designated airports these are expressed in the form of swathes extending 1½km either side of the nominal NPR centre line[18] (with a 20º 'funnel' leading from the runway) up to a specified altitude[19], and are used by

[17] A minimum of 4% in the case of the three designated airports.

[18] For as long as air navigation relies on radio beacons that transmit signals which correspond to the position of magnetic north, the nominal centre line of an NPR shown on a local map will not necessarily always correspond to the relevant VOR radial specified in the AIP, due to the drift of magnetic north and consequent need to recalibrate the VOR from time to time. It is important, whenever VORs are recalibrated, that DTLR and the relevant airport are advised and the necessary adjustments to the re-specification of NPRs and SIDs in the AIP are promulgated promptly. Similar action is necessary where NPRs rely on NDBs. This will contribute to reducing complaints about poor track-keeping. Normally, following a recalibration, the nearest VOR radial to the nominal NPR centre line shown on the published map should be specified in the AIP, but there may be occasions when it would be preferable to specify a different radial or to make no change at all if doing so would reduce over-flight of a noise sensitive area; e.g. because the VOR is some distance from the noise sensitive area and the radials are spread widely apart.

[19] This altitude may vary from route to route and at different times of the day and night.

the airports for the purposes of monitoring performance. Vectoring is permitted above specified altitudes.

38. Most large airports and many medium sized ones are under pressure from local communities to improve track-keeping on departure routes. Licensed aerodromes currently have the power, under section 38 of the 1982 Act, to fix their charges in relation to aircraft noise, or to the inconvenience resulting from such noise. The Government is proposing to amend section 38(1) to make it clearer that these charges can relate, for example, to compliance with NPRs. The DAP should:

> **examine ways of improving the specification of departure procedures, including taking fuller advantage of modern navigation technologies, to assist operators to achieve a high standard of track-keeping performance.**

39. The design of departure procedures closer to an airport, where aircraft are lower and noise levels are higher, should generally be given greater weight over their design further afield in circumstances where a trade-off between the two cannot be avoided. However, the relative size of the populations affected in such cases should also be weighed in the balance, along with the differences in noise levels at points along the route.

40. It is also desirable to design departure procedures so that they do not replicate the final approach tracks of landing aircraft (when the airport is operating on the opposite runway) where the final approach track passes over built-up areas, in order to provide periods of relief from aircraft noise for those living under the approach track.

Climb gradients

41. Departure procedures should:

> **be designed to enable aircraft to climb quickly and not be inhibited from climbing by conflicts with other traffic, including holding positions, taking into account the overriding need for safety.**

42. Steeper climb gradients can have environmental advantages and disadvantages depending on the local circumstances of the airport. Where steeper climb gradients immediately after take-off are considered necessary for ATC purposes, consideration should be given to the effect this may have on the use of noise reduction take-off procedures (including use of "cut-back"). Maximum permitted noise limits for aircraft taking off have been set by the Secretary of State at Heathrow, Gatwick and Stansted, and by airport operators elsewhere (in some cases in compliance with planning conditions). Certain types of aircraft are able to comply with these limits only by following noise reduction take-off procedures, including use of "cut-back".

Number and position of ground navigation aids

43. The development of new systems and procedures for navigation will provide opportunities to review and reduce the number of ground based navigation beacons, and allow the land to be released for alternative uses. It may also be necessary to supplement existing navaid coverage in other areas to facilitate the use of the new navigation systems and procedures. The process of continuous review of navaid coverage should include as a priority

the importance of maintaining a stable route structure in the vicinity of airports, a good standard of track-keeping, and minimising impacts on the environment.

44. It is the Government's aim in connection with development of 'Area Navigation' (RNAV) procedures for use in terminal areas, to preserve the established route structures as far as possible in the vicinity of airports. Where it is not possible to do so, because the new technologies cannot be configured to support accurate navigation along an existing route to the required standard, the aim should be to introduce modified routes that over-fly as few people as possible. It will be necessary in all cases to tailor the new procedures to suit local circumstances; a one-size-fits-all solution is unlikely to be a viable environmental option.

Over flight of National Parks and Areas of Outstanding Natural Beauty (AONBs)

45. The National Parks and Access to the Countryside Act 1949 (which established AONBs and extends to England and Wales only) and planning policy guidance PPG 7 "The Countryside and the Economy" and PPG 24 "Planning and Noise" do not preclude over-flight of National Parks or AONBs, as it is often impractical to do so. Government policy will continue to focus on minimising over-flight of more densely populated areas below 7000ft. However, where it is possible to avoid over-flight of National Parks and AONBs below this altitude without adding to environmental burdens on more densely populated areas, it clearly makes sense to do so.

46. There is pressure to protect and preserve tranquil areas. In the Rural White paper - *Our countryside: the future, A fair deal for rural England*, the Government sets out its vision of a protected countryside in which the environment is sustained and enhanced for all to enjoy. The aim is to preserve all things which make the countryside attractive and special, which includes tranquillity. The Government's aim is to give stronger protection to the most valued landscapes in designated national parks and areas of outstanding natural beauty. Therefore, whenever practicable the DAP should:

> **pursue policies that will help to preserve the tranquillity of the countryside where this does not increase significantly the environmental burdens on congested areas.**

E. Factors relevant to arrivals

47. Where airports are close to populated areas, landing noise is increasingly regarded as a more serious problem than departure noise. This is because of the much improved climb performance of modern jet aircraft (especially twin-engined aircraft) and the dispersal of departures between several routes, in contrast to landing aircraft which must follow a straight final approach track at comparatively lower altitudes (for a given range from the airport). The noise climate under the approach tracks to busy airports, and particularly under the final approach tracks, can be inferior to that under departure routes, and is increasingly the focus of concern.

48. A number of factors determine the level and distribution of noise from landing aircraft; (i) the alignment of the runway, (ii) the angle of the glidepath, and (iii) the position of holding areas in relation to the final approach tracks and the associated procedures for integrating landing traffic in the initial and intermediate approach phases. For the foreseeable

future, measures targeted at the last of these will continue to offer the greatest potential for reducing noise from landing aircraft. The Government's aim is that radar manoeuvring areas and the positions of stacks are designed and managed in ways that will assist and promote the consistent use of "continuous descent approach" (CDA) and "low power/low drag" (LP/LD) operating procedures.

49. The DAP should:

ensure that consideration is given to how the use of CDA and LP/LD procedures can be promoted in the course of developing new procedures and when considering proposals for changes to existing airspace arrangements.

50. Both procedures should be regarded as "best practice" for use at all airports where local circumstances (such as terrain clearance) do not preclude it. The procedures also reduce fuel consumption and emissions.

F. Changes to airspace arrangements and procedures

51. Where changes are proposed to the design of controlled airspace, or to the use made of it, the DAP should ensure that adequate consultation is carried out in accordance with the Directions given under section 66(1) of the 2000 Act, either by ensuring that the promoter of the change(s) undertakes the consultation, or by undertaking the consultation itself. In exceptional cases involving one or more of the designated airports, the DTLR may wish to be involved in the consultation or may even take the lead, and the DAP should check with the DTLR at an early stage to ascertain whether this is likely to be the case.

52. As a public corporation, the CAA is encouraged to follow the Government's code of practice on written consultation.[20] This advocates that the timing of any consultation should be built into the planning process from the start, so that it has the best prospect of improving the proposals concerned. It should be clear who is being consulted, about what issues, to what timescale and for what purpose. It should be as simple and concise as possible, include a summary of the main questions on which views are sought, and make it as easy as possible for readers to respond, make contact or complain. Sufficient time should be allowed for considered responses from all groups with an interest. Twelve weeks should be the standard minimum period for consultation unless there is a particular and justifiable urgency to implement the airspace changes quickly. Responses should be analysed carefully, the results made available to consultees and others on request, including a summary of the views expressed, and the reasons should be given for the decisions finally taken.

53. The method, form and extent of the consultation may vary depending on the circumstances of each case, but as a minimum the DAP should consider including the manager of the aerodrome and its principal users (where the changes relate to a particular aerodrome), other principal users of the airspace (which may be done through representative

[20] Last updated on 1 January 2001 and available on the Cabinet Office consultation website. The code does not have legal force.

bodies), local authorities[21] in the neighbourhood of the aerodrome or, as the case may be, local authorities in other areas likely to be affected by the proposed changes, and other organisations and individuals (if any) who may represent the interests of people living there. It may be the case that all of the above interests are directly or indirectly represented on the airport consultative committee[22] where one exists. However, the DAP should be alert to the possibility that some members may not attend all committee meetings and that meetings may be held infrequently; so the DAP should take the precaution of also inviting views on the proposals directly from the organisations in question (e.g. from the Chief Executive Officer of the local authority), making clear the intention is to consult through the airport consultative committee, but not precluding the expression of views by others.

54. The DAP should be cautious in accepting a 'nil return' from a leading local authority in the area affected or any other major party as silently indicating support for the changes proposed. The proposals may have gone astray or been incorrectly addressed. Consulting in parallel through the aerodrome consultative committee where one exists, as well as directly with the key organisations likely to have an interest, can help to avoid such problems. Where a respondent introduces relevant new issues to the consideration of the proposals, the DAP should ensure these are considered and taken into account in reaching a decision, or, as the case may be, before referring the case to the DTLR for approval by the Secretary of State.

55. Consultation will usually be necessary where the proposed changes concern controlled airspace (classes A to E) at or below a height of 7000ft agl or could have significant knock-on effects on how traffic uses adjoining class F or G airspace at or below the same altitude. Visual intrusion by aircraft above 7000ft may be a consideration in exceptional cases, such as National Parks and AONBs. The DAP should exercise his judgement when considering the need for consultation where proposed change(s) would result in a general improvement in noise levels; consultation may not be necessary in such cases.

56. Where the proposed changes may have a significant effect on the level and distribution of noise in the vicinity of an aerodrome, and would be expected to alter the size or shape of the standard daytime noise contours in use at the aerodrome, or the shape of noise footprints of the noisiest aircraft operating there at night, the consultation should include assessments of those effects on the basis of contemporary traffic levels and forecast levels where appropriate (e.g. where the change(s) would enable substantial growth in traffic or where that growth is already planned).[23] Vibration from aircraft is unlikely to be a consideration except in the immediate vicinity of an aerodrome.

57. A consultation should usually include an examination of more than one option and reasons should be given if one option is strongly favoured over the others. An explanation should be given of the factors that will be taken into account in reaching a decision, but not so that these preclude consideration of relevant information and comments received from respondents. If safety factors preclude consideration of an option that would have a significantly better environmental impact, those factors should be explained. Where compliance with internationally recognised procedures is a factor in the development of the

[21] For these purposes, county, district or borough and unitary authorities only need be consulted. If parish or town councils wish to respond directly, rather than through one of the aforementioned, they should be allowed to do so, but they should be consulted if they have made their interest known.

[22] Established pursuant to section 35 of the Civil Aviation Act 1982, as amended.

[23] Either INM or ANCON2 may be used, but ANCON2 should be used when it is currently in use at the aerodrome for other purposes.

proposals, it should be made clear whether compliance with them is mandatory, and if not whether United Kingdom practice in the case in question is always to comply with the internationally recommended procedure.

Promulgation

58. Where procedures are recommended or required for noise mitigation purposes, whether by the airport operator, the ATS provider or the Secretary of State, the DAP should ensure that suitable provision is made in the UK-AIP so that pilots have every opportunity to comply.

Membership of airport consultative committees

59. Most airport consultative committees have been established by the aerodrome manager to discharge the requirement placed on them to provide adequate facilities for consultation. Some 50 aerodromes have been designated under section 35 of the 1982 Act for this purpose.[24] The CAA is not required to be represented on such committees, but may be invited to attend meetings on specific issues such as consideration of airspace changes.

G. Directions to ATS Providers under section 39

60. The DAP should take into account any requirements placed on ATS providers by the Secretary of State using the powers contained in section 39 of the 2000 Act. The DTLR will consult the CAA before the Secretary of State issues or amends directions to an ATS provider if they require a licence holder or an authorised person to do or not to do a particular thing.

Department for Transport, Local Government and the Regions

January 2002

[24] The Aerodromes (Designation) (Facilities for Consultation) Order 1996 No. 1392

Department for Transport

Guidance to the Civil Aviation Authority on Environmental Objectives Relating to the Exercise of its Air Navigation Functions

January 2014

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Contents

Foreword 5

1. Introduction 6
Purpose of Guidance 7
Definition of altitude in this Guidance 8

2. Emissions and local air quality 9
Emissions 9
Local air quality 10

3. Noise 11

4. Specific navigational guidance 13
Altitude-based priorities 13
Departure procedures 14
Continuous Climb Operations 14
Arrival procedures 14
Continuous Descent Operations 15
Navigational accuracy 15
Performance Based Navigation (PBN) 16
Helicopters 17
Other relevant legislation, policy and guidance 17

5. Noise Preferential Routes (NPRs) 19
Origin and definition of an NPR 19
The role of NPRs 19
Ownership of NPRs 20
Publication of NPRs 20
Use of NPR swathes by airports 21
General guidance on all NPRs 21
Specific guidance on both the replication and redesign of conventional SIDs at the designated airports 22
New NPRs at airports 23
Approval for new or amendments to existing NPRs at the designated airports 23

6. Role of the Secretary of State on proposals to amend UK airspace arrangements 24
Specific guidance on the NPRs at the noise designated airports 24
Specific guidance on proposed airspace changes which may have a significant detrimental impact on the environment 25

7. Concentration versus dispersal 27
General background on concentration v dispersal 27
Specific guidance on concentration v dispersal 27
Respite 28

8. Other relevant environmental issues 30
National Parks and Areas of Outstanding Natural Beauty (AONB) 30
Tranquillity 30

9. Changes to airspace arrangements 32
Permanent airspace changes 32
Temporary airspace changes 33
Approved operational airspace trials 34
Consultation arrangements for temporary airspace arrangements and operational airspace trials 34

10. Revision of Guidance and enquiries 35
Revision/amendment of Guidance 35
Enquiries about this Guidance 35

Annex A: Section 70(2) Transport Act 2000 36
70 General duty 36

Annex B: The Civil Aviation Authority (Air Navigation) Directions 38
Environmental impact of air operations 38

Foreword

I am very pleased to be able to present to the Civil Aviation Authority (CAA) this revised Guidance on how it should exercise its air navigation functions.

Our airspace is a vitally important national asset and it needs to be managed safely, efficiently, with due regard to the needs of both airspace users and the wider general public, and consideration for the environment. Indeed, the long-standing success of the UK's aviation industry would not have been possible without these requirements being met.

Since the Guidance was first issued to the CAA in 2002, there have been significant developments, such as the creation of the CAA's Future Airspace Strategy, the establishment of the Single European Sky and our functional airspace block with Ireland, the publication of the Government's Aviation Policy Framework and the Airports Commission Interim Report. In addition, there have been numerous aviation technical and procedural developments which will have an impact on how aircraft are flown in the future in our airspace.

This new Guidance is therefore a timely update. We consulted on a draft in June 2013 and respondents were clear that a revised version is needed. The Airports Commission's Interim Report has also stressed the need to drive forward the implementation of the Future Airspace Strategy. This Guidance should assist in delivering both this Strategy as well as ensuring that local communities continue to be involved in the decision making process for airspace changes that may affect them.

The CAA has a distinguished track record in ensuring that the requirements placed upon it by the Government are met. I hope that the revised Guidance will enable it to maintain this high standard, whilst ensuring that the efficiency of our airspace is improved and an appropriate balance is maintained between the needs of all concerned.

Robert Goodwill MP

Parliamentary Under-Secretary of State for Transport

1. Introduction

1.1 Section 70(2) of the Transport Act 2000[1] requires the Civil Aviation Authority (CAA) to take account of any guidance on environmental objectives given to it by the Secretary of State. In 2001, the Secretary of State gave directions[2] to the CAA under Section 66(1) of the Transport Act 2000 setting out the circumstances when the CAA must also seek the approval of the Secretary of State for airspace changes which might have a significant effect on the level or distribution of noise and emissions. This was followed in January 2002 when the then Department for Transport, Local Government and the Regions issued specific guidance to the CAA which has subsequently formed the basis of how the CAA interprets its environmental duties in respect of approving changes to the UK's airspace structure. Since 2002, there have been a number of significant events which have, or will do so in the foreseeable future, affect UK airspace. These are:

a. in December 2003, the Department for Transport issued The Future of Air Transport White Paper which recognised the need to improve the efficiency of UK airspace and it looked to the CAA, as the independent regulator responsible for the planning and regulation of UK airspace, to bring forward a structured programme for the redesign of UK airspace. The White Paper also recognised the importance of the need to take into account the environmental impacts arising from airspace changes. The need to develop a more strategic approach on airspace was endorsed subsequently by the Transport Select Committee in its 2009 report on "the use of airspace";

b. since 2009, the CAA has been leading work, with support from the Department for Transport, the Ministry of Defence, NATS and the Irish Aviation Authority[3] to develop the Future Airspace Strategy (FAS) for the period up to 2030. The CAA's primary objective is to develop a "safe, efficient airspace that has the capacity to meet reasonable demand, balances the needs of all users and mitigates the impact of aviation on the environment". This national strategy is aligned fully with our commitments under the Single European Sky (SES) legislation including implementation of the Single European Sky Air Traffic Management Research (SESAR) programme and our engagement with the Irish on the UK/Ireland Functional Airspace Block (FAB). Following development and consultation with industry, the Strategy was presented in June 2011 and set out the need to address: existing pressures on airspace; the challenges arising from future air traffic growth; the development and implementation of new technology; and the requirement to mitigate

[1] Section 70(2) of the Transport Act 2000 can be found at Annex A of this Guidance.
[2] The relevant sections of the Directions can be found at Annex B of this Guidance.
[3] The Irish Aviation Authority's involvement is because of the joint UK/Ireland Functional Airspace Block which was established in June 2008 under the Single European Sky initiative.

aviation's impact on the environment. The Strategy also took into account the Coalition's position on additional runways and its desire to reduce aviation's contribution to climate change, a factor which has become increasingly important since 2002;

c. in December 2012, the industry-led FAS Industry Implementation Group launched its plan for delivering Phase 1 of the FAS up to c2025. A considerable component of the plan is the need to redesign UK's terminal airspace to make it more efficient by using new procedures such as Performance-Based Navigation (PBN) and better queue management techniques;

d. in March 2013, the Government launched its Aviation Policy Framework[4] which set out the Government's objectives and principles to guide plans and decisions at the local and regional level, including with respect to airspace. This document replaced the 2003 Future of Air Transport White Paper[5]; and

e. in December 2013, the Airports Commission published its interim report[6] which expressed its support for: the Future Airspace Strategy; the introduction of PBN; the continued need for local communities to be involved in the decision making process for airspace changes that might affect them; and for the CAA be given more delegation to decide airspace changes.

1.2 It is therefore now appropriate that the Government revisits and refreshes the 2002 Air Navigation Guidance to the CAA to take into account these policy and technical developments whilst remaining consistent with the overall legislative framework.[7]

1.3 Underpinning this new Guidance are two key objectives. The first is the recognition that the UK needs to improve the efficiency of our UK airspace network and that includes mitigating the environmental impact of aviation. Secondly, is a reaffirmation of the need to consult local communities near airports when airspace changes are being considered in the vicinity of these airports. The Government recognises that it is not an easy task to always balance the interests of local communities and relevant stakeholders with those of the aviation industry, but we are confident that the CAA will continue to play an active role in ensuring that an appropriate balance is maintained in the future.

Purpose of Guidance

1.4 The purpose of this Guidance is to provide the CAA and the aviation community with additional clarity on the Government's environmental objectives relating to air navigation in the UK. However, when considering airspace changes, there may be other legitimate operational objectives, such as the overriding need to maintain an acceptable level

[4] Aviation Policy Framework, Department for Transport, March 2013.
[5] The Future of Air Transport, Department for Transport, December 2003.
[6] Airports Commission Interim Report, Department for Transport, December 2013.
[7] This was one of the key messages to come out of the consultation on the proposed air navigation guidance, Consultation on Guidance to the CAA on Environmental Objectives relating to the Exercise of its Air Navigational Functions, Department for Transport, June 2013.

of air safety, the desire for sustainable development,[8] or to enhance the overall efficiency of the UK airspace network, which need to be considered alongside these environmental objectives. We look to the CAA to determine the most appropriate balance between these competing characteristics.

Definition of altitude in this Guidance

1.5 Throughout this document, altitude is expressed in feet above mean sea level (amsl) in order to provide a common datum. However, we require airspace change sponsors to take account of the altitude of the specific surface level involved when developing their proposals. This is particularly the case when airspace changes involve an altitude lower than 7,000 feet (amsl).

[8] Sustainable development has both environmental and economic connotations, the need to enable aviation to grow sustainably if the UK economy is to remain competitive and achieve the objective for growth and employment.

2. Emissions and local air quality

Emissions

2.1 At the global level, aviation is a growing contributor to greenhouse gas emissions (GHG) that cause climate change. The Government's climate change strategy on aviation is to ensure that the aviation sector makes a significant and cost effective contribution towards reducing global emissions. While the Government, in 2012, decided to postpone a decision about requiring emissions from international aviation and shipping to be taken into account in the setting of carbon budgets (as required by the Climate Change Act 2008) until it comes time to set the fifth carbon budget, it did reaffirm its overall commitment to the 2050 target and recognised that emissions from international aviation and shipping should be treated the same as emissions from all other sectors, in order to reach our long-term climate goals.[9]

2.2 The Aviation Policy Framework sets out the priorities for action on climate change at global, EU and national levels in the aviation context. The focus is expected to remain on actions to target CO_2 emissions in the near future but as scientific evidence of the effects of non-CO_2 emissions becomes clearer it is likely that the approach taken will be revised. The CAA should therefore keep abreast of the Government's climate change strategy and priorities as well as broader developments in climate science, especially as they relate to aviation.

2.3 The CAA has the opportunity to contribute to the Government's aim of reducing CO_2 emissions by prioritising the most efficient use of airspace including procedures that enable aircraft to climb efficiently, allow direct routings, reduce holding times and facilitate the consistent use of continuous descent and low power/low drag procedures. The potential to maximise CO_2 efficiency is primarily above 7,000 feet (amsl) where local impacts are not a priority. CO_2 efficiency is also a consideration below 7,000 feet (amsl), although at these altitudes it must be balanced with other local impacts. More information on the altitude-based priorities is given in Chapter 4 of this Guidance.

2.4 Initiatives to enhance efficiency in the airspace across the UK, such as the SES and introduction of the UK-Ireland FAB, are expected to lead to an estimated reduction of 116,000 tonnes of fuel and 370,000 tonnes of

[9] International aviation and shipping emissions and the UK's carbon budgets and 2050 target, Department of Energy and Climate Change, December 2012. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65686/7334-int-aviation-shipping-emissions-carb-budg.pdf

CO_2 between 2012 and 2015.[10] Although this also includes savings in Irish airspace, it demonstrates the important contribution which a more efficient use of airspace can make to reduce the impact of aviation on the environment.

Local air quality

2.5 The Aviation Policy Framework sets out the Government's policy on air quality which is to "seek improved international standards to reduce emissions from aircraft and vehicles and to work with airports and local authorities as appropriate to improve air quality".[11]

2.6 Aircraft engines, airport related traffic on local roads and surface vehicles all contribute to air pollution around airports. Oxides of nitrogen (NOx) and particulate matter are the two most important emissions affecting the air quality around airports. Studies have shown that NOx emissions from aviation related operations reduce rapidly beyond the immediate area around the runway. Due to the effects of mixing and dispersion, emissions from aircraft above 1,000 feet (amsl) are unlikely to have a significant impact on local air quality. Therefore the impact of airspace design on local air quality is generally negligible compared to changes in the volume of air traffic, and local transport infrastructures feeding the airport.

2.7 While the CAA should prioritise noise below 4,000 feet (amsl), consistent with the altitude-based priorities and the Government's policy to give particular weight to the management and mitigation of noise in the immediate vicinity of airports,[12] there could be circumstances where local air quality may be a consideration because emissions from aircraft taking off, landing or whilst they are on the ground have the potential to contribute to overall pollution levels in the area. This could lead to a situation where prioritising noise creates unacceptable costs in terms of local air quality or might risk breaching legal limits. The CAA should therefore take such issues into account when it considers they are relevant.

[10] UK-Ireland FAB annual report 2011, jointly published by Irish Aviation Authority and NATS, May 2012. http://www.nats.co.uk/wp-content/uploads/2012/07/UK-Ireland-FAB-Report-2011.pdf
[11] Aviation Policy Framework, section 3.48, page 65, Department for Transport, March 2013
[12] Aviation Policy Framework, section 3.25, page 60, Department for Transport, March 2013.

3. Noise

3.1 Aircraft noise is one of the most important environmental impacts arising from aviation for communities living close to airports as well as those living further afield under the main arrival and departure tracks. The Government has made it clear therefore that it wants to strike a fair balance between the negative impacts of noise and the economic benefits derived from the aviation industry.[13] In addition, the benefits from any future growth in aviation are expected to be shared between the aviation industry and local communities.

3.2 The Government's overall policy on aviation noise, as established in the Aviation Policy Framework, is to limit, and where possible reduce, the number of people in the UK significantly affected by aircraft noise.[14] The UK aviation industry is expected therefore to address noise from low level air traffic as a local environmental priority in line with the altitude-based priorities set out in Chapter 4.1 of this Guidance. Individual airports should be encouraged to work with the appropriate air traffic service providers to give particular weight to the management and mitigation of noise in the immediate vicinity of their airports.[15] This principle is further clarified in the chapter on altitude-based priorities, but it is left to the CAA to determine what should be classed as the “immediate vicinity” taking account of individual circumstances such as location of the airport, height above sea level of the surrounding countryside, numbers of people likely to be affected by noise, and the size and operating characteristics of the aircraft involved.

3.3 In implementing this policy, the Government fully recognises the ICAO "balanced approach" principle to aircraft noise management.[16] The CAA has an opportunity to support the Government on the third principle "noise abatement operational procedures", particularly with regard to optimising how aircraft are flown and the routes they follow to reduce the noise impacts.

3.4 The CAA can also support those airports considering using the powers available to them to set suitable noise controls at their airports. In addition, the CAA should, where relevant and without compromising its independence, also support the efforts made by airports to mitigate noise where changes are planned which could adversely impact the noise

[13] Aviation Policy Framework, section 3.2, page 55, Department for Transport, March 2013.
[14] The Aviation Policy Framework states that the Government will continue to treat the 57dB LAeq 16 hour contour as the average level of daytime aircraft noise marking the approximate onset of significant community annoyance. However, it also makes clear that not all people within this contour will experience significant adverse effects from aircraft noise. Nor does it mean that no-one outside of this contour will consider themselves annoyed by aircraft noise.
[15] Aviation Policy Framework, section 2.25, page 60, Department for Transport, March 2013.
[16] Balanced approach to aircraft noise management, International Civil Air Organization. http://legacy.icao.int/env/noise.htm

climate, particularly in the case of proposals for new airport capacity or changes to operational procedures. In these cases, the Government expects the CAA to consider new and innovative approaches to regulation and for the industry to innovate in noise management techniques such as the provision of respite for communities already significantly affected by aircraft noise (see Chapter 7.9 of this Guidance).

4. Specific navigational guidance

Altitude-based priorities

4.1 The usual maximum altitude for a Noise Preferential Route (NPR) is 4,000 feet (amsl) and this reflects the long standing view that noise from aircraft flying above this level is much less likely to affect the key noise metrics used for determining significant community impacts. As aircraft continue to climb from 4,000 feet (amsl) their noise impact reduces. Set against this, there is also a need to ensure that aircraft operations are efficient and that their emissions are minimised. So when considering airspace change requests, the CAA should keep in mind the following altitude-based priorities:

a. in the airspace from the ground to 4,000 feet (amsl) the Government's environmental priority is to minimise the noise impact of aircraft and the number of people on the ground significantly affected by it;

b. where options for route design below 4,000 feet (amsl) are similar in terms of impact on densely populated areas the value of maintaining legacy arrangements should be taken into consideration;

c. in the airspace from 4,000 feet (amsl) to 7,000 feet (amsl), the focus should continue to be minimising the impact of aviation noise on densely populated areas, but the CAA may also balance this requirement by taking into account the need for an efficient and expeditious flow of traffic that minimises emissions;

d. in the airspace above 7,000 feet (amsl), the CAA should promote the most efficient use of airspace with a view to minimising aircraft emissions and mitigating the impact of noise is no longer a priority;

e. where practicable, and without a significant detrimental impact on efficient aircraft operations or noise impact on populated areas, airspace routes below 7,000 feet (amsl) should, where possible, be avoided over Areas of Outstanding Natural Beauty (AONB) and National Parks as per Chapter 8.1 of this Guidance; and

f. all changes below 7,000 feet (amsl) should take into account local circumstances in the development of airspace structures.

4.2 The concept of altitude-based priorities reflects the Government's desire that only significant environmental impacts should be taken into account when considering the overall environmental impact of airspace changes. Any environmental impacts that are not priorities based on the above altitude-based criteria do not need to be assessed since the assumption is that they would not be significant.

Departure procedures

4.3 Departure procedures should be designed to enable aircraft to operate efficiently and to minimise the number of people subject to noise nuisance on the ground, whilst taking into account the overriding need to maintain an acceptable level of safety.

4.4 Steeper climb gradients can have environmental advantages and disadvantages depending on the local circumstances of the airport. Where steeper climb gradients immediately after take-off are considered necessary for air traffic control (ATC) purposes, consideration should be given to the effect this may have on the use of noise reduction take-off procedures (including the use of "cut-back"). Maximum permitted noise limits for aircraft taking off have been set by the Secretary of State at Heathrow, Gatwick and Stansted, and by airport operators elsewhere (in some cases in compliance with planning conditions), and the CAA should be aware of these limits.

Continuous Climb Operations

4.5 The use of Continuous Climb Operations (CCO) has implications for both noise and CO_2/fuel efficiency. CCO is considered to have an overall neutral impact on noise, but it does involve the redistribution of noise with more noise at the beginning of the flight and less noise further away from the airport as aircraft do not level off at low altitudes.[17] Consequently, achieving CCO has the potential to reduce fuel burn as aircraft reach efficient cruising levels earlier thus leading to fuel savings and a reduction in the amount of emissions, including CO_2. CCO also means aircraft get above some of the most complex and congested low level airspace more quickly. Once clear of these areas there is generally more opportunity for aircraft to be routed directly onto their chosen path, and thus save flying time, track miles, and creating more efficient aircraft operations.

4.6 CCO forms a significant component of the FAS and the Government is keen to see it introduced across the UK over the coming years as part of the overall modernisation of the UK airspace network. The CAA is encouraged therefore to continue to work with the aviation community to introduce CCO more widely in the coming years.

Arrival procedures

4.7 Where airports are close to populated areas, landing noise is often seen as a more serious problem than departure noise. This is because of the much improved climb performance of modern jet aircraft and the dispersal of departures between several routes, in contrast to landing aircraft which must follow a straight final approach track at comparatively lower altitudes (for a given range from the airport).

[17] Reducing the Environmental Impacts of Ground Operations and Departing Aircraft: An Industry Code of Practice, http://www.heathrowairport.com/static/Heathrow/Downloads/PDF/Departures_code_of_practice-LHR.pdf, pg 21

4.8 A number of factors determine the level and distribution of noise from landing aircraft, such as the alignment of the runway, the location of the runway threshold, the angle of the glide path, the position of holding areas in relation to the final approach tracks, and the associated procedures for integrating landing traffic in the initial and intermediate approach phases. For the foreseeable future, measures targeted at the last of these factors are likely to offer the greatest potential for reducing noise from landing aircraft.

Continuous Descent Operations

4.9 Continuous Descent Operations (CDO) relate to continuous descent from cruising altitude. In the UK, CDO is more commonly known as Continuous Descent Approach (CDA), which typically starts from an altitude of 6,000 feet (amsl) and is thus a subset of a CDO. The Government's desire is that radar manoeuvring areas and the positions of holding stacks are designed and managed in ways that will assist and promote the consistent use of CDO and "low power/low drag" (LP/LD) operating procedures.

4.10 A code of practice for arriving aircraft was established to address the noise from approaching aircraft in 2001 (revised in 2006) and this includes advice on measures to reduce noise from arriving aircraft, including CDO and LP/LD.[18]

4.11 When a CDO procedure is flown the aircraft stays higher for longer (in comparison to a conventional approach), descending continuously from the bottom of the stack (or higher if possible) and having no more than one phase of level flight not longer than 2.5 nautical miles (nm) (which require increase engine thrust) of flight prior to intercepting the glide path. Being higher for longer and using less engine thrust means the noise impact on the ground is reduced (up to 5 decibels) in locations 10–25nm from the airport and directly under the approach path. The use of CDO procedures can also mean significant fuel savings and reduced emissions since less engine power is required.

4.12 Consideration should therefore be given to how the use of CDO and LP/LD procedures can be promoted in the course of developing new procedures and when considering proposals for changes to existing airspace arrangements. Both procedures should be regarded as "best practice" for use at all airports where local circumstances (such as terrain clearance) do not preclude it.

Navigational accuracy

4.13 Navigation has been identified as one of the five components of the overall airspace system as part of the FAS. At the moment the airspace route network in the UK is based on "conventional navigation" whereby required routes are aligned to ground based navigation aids. However, most aircraft in the UK have modern PBN technology that does not require ground based navigation aids, but there is no standardisation of

[18] Noise From Arriving Aircraft: An Industry Code of Practice, 2006, second edition.

how they interpret the conventional route structure. Consequently, different aircraft/operators on the same route can often be seen to overfly different areas. The FAS includes a plan to redesign UK airspace based on the use of PBN by 2020.

Performance Based Navigation (PBN)

4.14 PBN is the framework that defines the performance requirements for aircraft navigating on an air traffic service (ATS) route, terminal procedure or in a designated airspace. Its two main components are Area Navigation (RNAV) and Required Navigation Performance (RNP) specifications.

4.15 The use of PBN will enhance navigational accuracy and introduce a number of key benefits. These include: the ability to reduce the amount of ground-based navigational-related infrastructure needed; a safer and more efficient ATC system requiring less controller intervention; more efficient aircraft operations leading to less cost, flying time and emissions; and the ability to allow more predicable patterns of over flight as well as stabilised arrivals and approaches which can generate less noise. Moreover, if used appropriately, PBN offers the flexibility to circumnavigate densely populated areas. When combined, these benefits will enable a significant improvement to be made to the overall efficiency and capacity of the UK airspace network which will allow the sustainable development of the air traffic network to accommodate future traffic levels.

4.16 With PBN, the overall level of aircraft track-keeping is greatly improved for both approach and departure tracks, meaning aircraft will be more concentrated around the published route. This will mean noise impacts are concentrated on a smaller area, thereby exposing fewer people to noise than occurs with equivalent conventional procedures.

4.17 Improvements in aircraft track-keeping can also offer the potential for aircraft to be concentrated within a particular part of the NPR if desired, as well as providing the potential for tracks to be alternated to introduce an element of respite for those under the tracks, see Chapter 7.9 to 7.12 of this Guidance. Concentration as a result of PBN is likely to minimise the number of people overflown, but is also likely to increase the noise impact for those directly beneath the track as they will be overflown with greater frequency than if the aircraft were more dispersed. Equally, alternation is also likely to increase the number of people who are affected by aircraft noise (albeit in a more predictable manner) and so should always be introduced only following consultation with the relevant local communities and stakeholders in accordance with Chapter 9 of this Guidance.

4.18 The move to PBN will require the updating of existing route structures such as Standard Instrument Departures (SIDs), Standard Terminal Arrival Routes (STARS) and Initial Approach Procedures (IAPs). Updating individual routes in terminal areas can fall into one of two categories: "replication" where the existing route alignment is preserved as much as possible whilst catering for the greater navigational accuracy

of PBN, or "redesign" where seeking to optimise the introduction of PBN will require consideration of a different alignment. Redesign therefore covers a range of potential changes from relatively small adjustments to routes within the extent of the existing spread of air traffic and/or NPR swathe, to a major shift of the flight path. The appropriate approach to take will depend on the particular circumstances, including whether the airport is designated and if there is likely to be a significant detrimental impact on the environment.

4.19 For replication, the requirement is to preserve the existing route alignments as far as possible in the vicinity of airports. However, when a redesign of an airspace route is being considered, the environmental objective should be for the modified route to achieve the optimal package of benefits with respect to the altitude-based priorities presented in Chapter 4.1 of this Guidance.

4.20 In view of the importance which the Government attaches to delivering the benefits of PBN at the UK's busiest airports, Chapter 5.11 of this Guidance sets out special provisions for assisting the CAA to oversee its introduction at the designated airports. In addition, the CAA should continue to examine ways in which to take advantage of modern navigation technologies, especially those which have the potential to bring a net environmental benefit and to improve the efficiency of the overall airspace route network.

Helicopters

4.21 The CAA should recognise the unique noise characteristics of helicopters and their consequent environmental impact in terms of noise when a change to airspace is proposed under the CAA's Airspace Change Process. Where significant helicopter activity is involved, either where the proposal concerns the amendment to formally established helicopter routes within controlled airspace or where helicopters movements are a predominant factor, the CAA should encourage change sponsors, where operationally practicable, to consider options that minimise the environmental impact of helicopter activity and take account of that impact when assessing proposals.

4.22 Where the CAA is aware that airport/aircraft operators are considering local changes to helicopter routeings and procedures that fall outwith the Airspace Change Process, the CAA should promote the use of voluntary noise abatement procedures to minimise noise disturbance and which take into account local circumstances.

Other relevant legislation, policy and guidance

4.23 It is recommended that the CAA keep abreast of other relevant policy and guidance issued by the Government and devolved administrations, especially those regarding noise and air pollution.

4.24 In particular the CAA should be familiar with:

a. the National Planning Policy Framework[19] and associated guidance which sets out the Government's planning policies for England and how these are expected to be applied;
b. Scotland's National Planning Framework which provides the context for development plans and planning decisions and the Scottish Planning Policy which contains the Scottish Government's expectations for planning;
c. Planning Policy Wales which sets out the context for planning policy in Wales;
d. any relevant Planning Policy Statements issued by the Northern Ireland Department of Environment;
e. any guidance and advice notes issued by the Government or devolved administrations;
f. National Policy Statements for major infrastructure;
g. National Parks and Access to Countryside Act 1949;
h. Wildlife and Countryside Act 1981;
i. Countryside and Rights of Way Act 2000;
j. Natural Environment and Rural Communities Act 2006;
k. Noise Policy Statement for England 2010; and
l. Habitats Regulations 2010.

[19] National Planning Policy Framework, Department for Communities and Local Government, March 2012.

5. Noise Preferential Routes (NPRs)

Origin and definition of an NPR

5.1 The concept of NPRs was first established at a number of major UK airports in the early 1960s, but over time the exact definition and purpose of an NPR has become less than clear. This Guidance therefore seeks to provide some clarity on what the Government considers is the purpose of an NPR and to establish a mechanism for adding new or amending existing NPRs at UK airports.

5.2 In the early 1960s, it began to be the custom to draw a line on the map to try and identify the preferred route for aircraft to fly in order to minimise their noise profile on the ground in the immediate vicinity of the airport, subject to operational requirements. The effect was to create routes, often coincident with SIDs, that up to a specified distance and altitude from the airport would form an NPR and this also had the effect of concentrating departures on a number of dedicated routes. The initial stages of a SID would often be described as an NPR and share the same characteristics.

5.3 It was recognised that not all aircraft would fly the SID nominal track perfectly, since changing weather patterns, the navigational accuracy of pilots, and different aircraft types inevitably meant that many aircraft were flying some distance away from the specific centreline of the NPR. To try and compensate for the variance between the NPR centreline and the actual flight paths being flown by aircraft, it became an accepted practice to add a geographic swathe of airspace either side of some of the NPR centrelines. This had the effect of creating a containment area within which departing aircraft should ideally remain when flying below a given altitude as well as aiding the monitoring of compliance with track keeping. This is a common practice today, although a number of NPRs continue to have no swathe attached to them.

The role of NPRs

5.4 Since the 1960s, it has been the view of successive Governments that the balance of social and environmental advantage lies in concentrating departing aircraft along the least possible number of departure routes, whilst remaining consistent with airspace management considerations and the overriding need to maintain an acceptable level of safety. The Government's Aviation Policy Framework also recognised the important role which NPRs play in giving effect to this policy and managing the impact of aircraft noise by providing clarity to those living in the vicinity of

airports on the likelihood of disturbance from departure noise. Existing NPRs should therefore continue to operate, but the Government also recognises that with the adoption of new performance based navigation techniques many of the existing NPRs at UK airports may need to change to reflect either long-standing current practice or to benefit from the use of the new systems. Any proposals to change NPRs will, of course, need to be consistent with the legislative framework and with this Guidance.

Ownership of NPRs

5.5 The ownership of NPRs in the UK in operation today falls into three distinct categories:

a. **NPRs at the designated airports**. For many years, the Government has used Section 78 of the Civil Aviation Act 1982 to establish NPRs at the 3 largest London airports - Heathrow, Gatwick and Stansted which have been designated in law for the purpose of noise regulation (the so called “noise designated airports”). At present, these NPRs can only be introduced or amended with the approval of the Secretary of State;

b. **NPRs imposed by local authorities made under Section 106 of the Town and country Planning Act 1990**. Some local authorities have sought to mitigate the noise impact from aircraft on their communities by imposing special Section 106 orders on non-designated airports within their authority area. These orders set out the obligations imposed on the airport and establish a noise containment NPR which the airport needs to follow for its departing aircraft. These NPRs can only be approved or amended by the relevant local authority and the CAA; and

c. **NPRs imposed voluntarily by non-designated airports as good practice**. Some airports as a matter of good practice, and with a view to mitigating their local environmental impact, have established NPRs for their airports. These NPRs could be introduced or amended if approval is given by the CAA.

Publication of NPRs

5.6 Routes conforming to the NPRs at the designated airports are published by the Department for Transport in the UK Aeronautical Information Publication (AIP). Although the likely amount of noise disturbance is best illustrated in a relevant noise footprint and/or contour published by airport operators in their annual reports/websites, maps depicting NPRs and their associated swathes provide a simple means of conveying where departing aircraft are expected to operate, or at least were expected to be at the time when the NPR was first drawn.

5.7 Routes conforming to the NPRs at all the non-designated airports are also published in the UK AIP. This activity is coordinated by the CAA, though the information is sponsored by the relevant airport.

Use of NPR swathes by airports

5.8 Since the concept of NPRs was first used, a considerable number of airports in the UK have established NPRs for the initial part of the SID's nominal track for aircraft departing from their airports. In many cases, a lateral swathe has been defined either side of the NPR centreline which is defined by a specified amount of airspace emanating from the end of the runway. These lateral swathes are usually drawn to cover the areas over which aircraft are expected to fly up to a specified altitude. This is often 4,000 feet (amsl), but it can be higher or lower depending on the individual circumstances, and in some instances, locally defined NPRs have a set length rather than a defined altitude. The width of the NPR lateral swathe can also vary but is often 3km, ie 1.5km either side of the NPR centreline, which is then usually considered to be the NPR nominal track. As navigational accuracy improves, for example with the introduction of PBN, the width of the lateral swathe is expected to narrow significantly in the future.

5.9 For established NPRs, the centreline may no longer reflect the published SID route loaded into an aircraft's flight management system and flown. This is because of a range of operational and efficiency factors, but ideally in future, and where practicable, the NPR centreline and the published SID's nominal track should be the same. This means that when SIDs are developed, redesigned or replicated, consideration must be given to realigning any associated NPRs so that they reflect appropriately the SID being implemented or amended.

General guidance on all NPRs

5.10 In dealing with airspace change proposals involving an NPR, the CAA must take into account the following considerations:

a. the directions given to the Civil Aviation Authority by the Secretary of State under Section 66(1) of the Transport Act 2000;

b. the need to work collaboratively with airport operators to seek to ensure that NPRs and their swathes are used appropriately and that their dimensions are reasonable whilst ensuring that they reflect the departure flight paths of most aircraft;

c. that non-designated airports are encouraged to make use of powers in Section 38A-C in the Civil Aviation Act 1982 to ensure greater compliance by airlines in mitigating the effect of noise connected with the departure of aircraft at their airports;

d. that NPRs should, within operational constraints, be designed to minimise the noise impact for those living near the vicinity of the airport;

e. that the width of NPR swathes and the length and maximum altitude of the NPR should be commensurate with ensuring a high degree of compliance by operators and reflect the performance characteristics of modern aircraft;

f. that once established the NPR should be considered fixed unless removed/amended by a new airspace change request. As there can be

some movement of the promulgated route caused by magnetic drift,[20] this needs to be corrected since if uncorrected it could result in the location of the SID's nominal track becoming disassociated from the NPR, so altering who might be affected on the ground and thus not providing sufficient clarity for those living under or near the flight paths concerned;

g. that the CAA should encourage airports to adopt, as much as can be commensurate with operational efficiency and practicality, consistent operating procedures for NPRs;

h. that any proposal to change an existing NPR, or to introduce a new one, will be considered an airspace change and require appropriate consultation with the relevant airport, airspace users, and local authorities and communities in the vicinity of the airport. The consultation should also be in accordance with the Civil Aviation Authority (Air Navigation) Directions and with Chapter 9 of this Guidance;

i. when an airspace change involving an NPR is made, the change to a SID's nominal track is likely to require the NPR to also be moved to ensure that it is at least consistent and preferably coincident with the revised SID, providing that it is practicable and safe to achieve this;

j. when an airspace change is being planned which would involve alterations to an NPR, the possibility of introducing respite should also be considered where operationally feasible and the view of local communities taken into account (see also Chapter 9 of this Guidance);

k. the monitoring by airport operators of the use of NPRs by their customers and their noise impact is to be encouraged;

l. the precise location of the NPRs should be reviewed immediately if safety concerns regarding the use of the NPR are raised; and

m. any changes to NPRs must be published in the AIP as part of the airspace change process.

Specific guidance on both the replication and redesign of conventional SIDs at the designated airports

5.11 The designated airports have a large number of NPRs which have been established over many years. It is recognised that: most of the SIDs associated with these NPRs use conventional navigational techniques; a number of SID nominal tracks are no longer centred on the NPR; and the introduction of PBN is likely to require a significant number of the existing routes to be updated to reflect the use of the new PBN procedures. As many of the required amendments to the SIDs to make them PBN compliant will reflect the flight paths flown by aircraft already and to

20 A navigational compass points to magnetic north but this is not a fixed geographic point. As the position of magnetic north drifts, there is a need to make the necessary consequential adjustments to ensure navigational accuracy. As satellite–based navigation does not rely on magnetic north, this problem will be less of an issue in the future.

ensure a smooth process exists for handling the necessary airspace change applications, the CAA can approve both the replication and redesign of existing conventional SIDs using PBN at the designated airports providing that:

a. the new PBN-based SID is considered by the CAA to be an acceptable replication or redesign of the existing conventional SID and it does not create a net significant detrimental noise impact;

b. the opportunity afforded by the airspace change involving a replicated or redesigned SID should be used to evaluate the extent to which the NPR needs to be realigned to the new PBN-based SID to comply with Chapter 5.10 of this Guidance;

c. the Department is informed of the application and the decision reached by the CAA;

d. the airspace change sponsor should carry out appropriate consultation and assessment of the airspace change involving the PBN-based SID and NPR to the satisfaction of the CAA; and

e. it is the responsibility of the CAA to ensure that the details of any newly approved NPR and SID are published in the appropriate AIP.

5.12 For any proposed PBN-based airspace change at the designated airports which does not meet the criteria set out in Chapter 5.11 of this Guidance, the airspace change would require the approval of the Secretary of State (see Chapter 6 of this Guidance).

New NPRs at airports

5.13 For completely new NPRs at any airport, the expectation is that the NPR would be designed to reflect the SID's nominal track. The CAA can approve the location, length, altitude, and width of any proposed new or amended NPRs at the non-designated airports subject to the expectation that there will be no significant detrimental impact on the environment (see Chapter 6.6 to 6.9 of this Guidance).

Approval for new or amendments to existing NPRs at the designated airports

5.14 The Secretary of State will still be required to decide upon completely new NPRs or amendments to existing NPRs which are considered to have a significant detrimental impact on the environment at the designated airports. The process for seeking this approval is set out in Chapter 6.3 of this Guidance.

6. Role of the Secretary of State on proposals to amend UK airspace arrangements

6.1 There are two specific circumstances when approval must be sought from the Secretary of State for an airspace change. These are for an airspace change involving the need for a new NPR at a designated airport or when a replication or redesign is likely to have a net significant detrimental impact on the environment.

Specific guidance on the NPRs at the noise designated airports

6.2 The NPRs at the designated airports are decided by the Secretary of State under Section 78 of the Civil Aviation Act 1982. So any change to the location of an existing or new NPR at a designated airport will need to be approved by the Secretary of State.

6.3 Notwithstanding the need for the overall approval by the Secretary of State, Chapter 5.11 of this Guidance on the SIDs and NPRs at the designated airports enables the CAA to decide upon alterations to SIDs associated with NPRs when considering airspace change applications designed to introduce PBN-based routes which seek to redesign or replicate existing SIDs. However, for any airspace change proposal at a designated airport which the CAA considers to fall outside of the scope of the conditions set out in Chapter 5.11, the CAA will:

a. inform the Department for Transport that it has received such an application or other form of notification;

b. inform the applicant that it believes that the decision on the airspace change proposal rests with the Secretary of State and not the CAA;

c. ensure that the applicant follows the CAA's airspace change process and undertakes the appropriate consultation as set out in the Civil Aviation Authority (Air Navigation) Directions, in Chapter 9 of this Guidance, and in accordance with the CAA's consultation requirements; and

d. at the end of the assessment process recommend to the Secretary of State whether it considers the application should be approved or not. This recommendation must include an appropriate noise impact statement setting out clearly the expected number of people who may benefit or be affected by the airspace change, as well as providing

detailed information on the purpose of the application and the reasons underpinning the CAA's recommendation.

6.4 The Secretary of State will consider each recommendation by the CAA on its merits, and will provide a response to the CAA within 28 working days. This response could be to accept the CAA's recommendation, ask for further information or a fresh consultation to be undertaken, or to reject the proposed airspace change.

6.5 The CAA will be responsible for informing the airspace change applicant of the outcome of its application, and the Department for Transport will ensure that any changes to the NPRs at the designated airports will be promulgated in the AIP in a timescale to be agreed with CAA.

Specific guidance on proposed airspace changes which may have a significant detrimental impact on the environment

6.6 The Secretary of State has given directions (See Annex B of this Guidance) to the Civil Aviation Authority under Section 66(1) of the Transport Act 2000 setting out the circumstances when the CAA must also seek the approval of the Secretary of State for airspace changes which might have a significant effect on the level or distribution of noise and emissions. For example, this might be a proposal for an airspace change introducing a new route below 7,000 feet (amsl).

6.7 The CAA will:

a. inform the Department for Transport that it has received an application which is likely to have a significantly detrimental impact on the environment;

b. inform the applicant that as the airspace change proposal is likely to have a significantly detrimental impact on the environment the final decision rests with the Secretary of State and not the CAA;

c. ensure that the applicant follows the CAA's airspace change process and undertakes the appropriate consultation as set out in the Civil Aviation Authority (Air Navigation) Directions, in Chapter 9 of this Guidance, and in accordance with the CAA's consultation requirements; and

d. at the end of the assessment process recommend to the Secretary of State whether it considers the application should be approved or not. This recommendation must include an appropriate noise impact statement setting out clearly the expected number of people who may benefit or be affected by the airspace change, as well as providing detailed information on the purpose of the application and the reasons underpinning the CAA's recommendation.

6.8 The Secretary of State will consider each recommendation by the CAA on its merits, and will provide a response to the CAA within 28 working days. This response could be to accept the CAA's recommendation, ask for further information or a fresh consultation to be undertaken, or to reject the proposed airspace change.

6.9 The CAA will be responsible for informing the airspace change applicant of the outcome of its application, and will also ensure that any approved airspace changes will be promulgated in the AIP.

7. Concentration versus dispersal

General background on concentration v dispersal

7.1 Air traffic management considerations such as the requirement to maintain safe separation between departures, the need to minimise conflicts with inbound aircraft and the desire to make efficient use of runway capacity, inevitably give rise to a concentration of departures along a limited number of fixed routes. Standardising procedures also helps to reduce air traffic controller workload, which contributes to the safe and efficient use of available capacity. When combined with practical issues arising from the position of navigational aids, these considerations unavoidably give rise to a concentration of departing traffic along a relatively small number of routes.

7.2 It makes sense therefore that in order to mitigate the overall noise impact these routes should avoid densely populated areas as far as possible given operational constraints. Consequently, when examining the question of concentration versus dispersal from both an ethical and practical perspective, the Government's policy has for many years been that the best environmental outcome was derived from the concentration of departures on the least number of practical routes designed specifically to minimise the number of people over-flown at low levels.

7.3 The issue of concentration versus dispersal was also considered in the context of the Aviation Policy Framework.[21] The outcome was the acceptance that, in general, the balance of social and environmental advantage lies in concentrating aircraft taking off from airports along the fewest possible number of specified routes and that these routes should avoid densely populated areas as far as possible. The framework also stresses that any changes to departure routes should avoid significantly increasing the number of people affected by aircraft noise.

Specific guidance on concentration v dispersal

7.4 Airspace change proposals relating to the initial stages of departure routes should be considered in the context of the altitude-based priorities presented in Chapter 4.1 of this Guidance.

7.5 The Government supports the adoption of PBN as endorsed by FAS (see Chapter 4.13). PBN will mean that aircraft following a particular route will adhere to that route more consistently than they do the historic conventional routes. This will increase the concentration of traffic and impact over the areas directly beneath the published NPR, but will reduce the overall extent of the areas overflown, thereby offering the

[21] Aviation Policy Framework, sections 3.31 and 3.32, pages 61 and 62, Department for Transport, March 2013.

potential to reduce the number of people exposed to noise from aircraft flying below 7,000ft (amsl).

7.6 The policy on concentration versus dispersal has general application i.e. it is not confined to the designated airports. In the case of Heathrow, Gatwick and Stansted this policy is given effect by the Secretary of State's requirement for most departing aircraft to follow the NPRs which form the initial part of the SIDs. Many other airports also require pilots to adhere to NPRs or similar procedures designed to reduce disturbance in the vicinity of the airport.

7.7 The policy on concentration versus dispersal is focussed on departures because arrivals are generally already concentrated on the extended runway centreline by the time they reach lower levels. Notwithstanding this, where applicable, and in line with the altitude-based priorities presented in Chapter 4.1 of this Guidance, the above policy of concentration versus dispersal applies equally to arrivals.

7.8 While the CAA should follow a policy of concentration in most cases, the Government recognises that there may be local circumstances where the advantage lies in dispersing traffic, such as for the purposes of providing noise respite over areas which may be considered to be particularly noise sensitive. It is important that any decisions about whether to concentrate or disperse traffic take account of the local context alongside the operation and generic environmental objectives presented in this Guidance. This local context may become apparent through appropriate consultation with the local community (see Chapter 9 of this Guidance).

Respite

7.9 The Aviation Policy Framework also reaffirmed the Government's view that it is important to consider exploring options for respite wherever feasible for those already affected by noise, especially where frequency of movements has increased over time.[22] The Government therefore encourages airports and airlines to work with the CAA, NATS and their local communities to consider creative solutions to protect and enhance the use of respite as a means of mitigating the impact of aircraft noise.

7.10 One such example is with the shift to PBN which is expected to be introduced widely in the UK over the coming years. The Government would therefore like to encourage airports, along with NATS and the CAA, to consider how PBN could be used to introduce an element of alternation, for example for a day or a week, which could result in some noise benefits for parts of the local community.

7.11 Other opportunities for arrivals such as varying joining points and reducing the amount of airborne holding are also encouraged as are trials which seek to understand the benefits and impacts of respite measures on local communities.

7.12 When seeking opportunities to provide respite for those already affected by aircraft noise it is important that decisions about respite should

[22] Aviation Policy Framework, section 3.32, page 62, Department for Transport, March 2013.

always be made after considering the specific local circumstances and through engagement with the local community. Moreover, the introduction of respite should be consistent with the objective in the Aviation Policy Framework of limiting the number of people affected by aircraft noise, whilst providing an opportunity for some communities to benefit from relief of aircraft noise for an agreed time.

8. Other relevant environmental issues

National Parks and Areas of Outstanding Natural Beauty (AONB)

8.1 National Parks and AONB are designated areas with specific statutory purposes to ensure their continued protection in relation to landscape and scenic beauty.[23] The statutory purposes of National Parks are to conserve and enhance their natural beauty, wildlife, and cultural heritage and to promote opportunities for the understanding and enjoyment of their special qualities by the public. The statutory purpose of AONB is to conserve and enhance the natural beauty of their area. In exercising or performing any functions in relation to, or so as to affect, land in National Parks and AONB, the CAA is required to have regard to these statutory purposes under s.19 and Schedule 2 of the Civil Aviation Act 1982.[24]

8.2 Flights over National Parks and AONB are not prohibited by legislation as a general prohibition against over-flights would be impractical. Government policy will continue to focus on minimising the over-flight of more densely populated areas below 7,000 feet (amsl), but balanced with emissions between 4,000 and 7,000 feet (amsl), as set out in the altitude-based priorities in Chapter 4.1 of this Guidance. However, where it is practical to avoid over-flight of National Parks and AONB below 7,000 feet (amsl), the CAA should encourage this.

8.3 In line with the altitude-based priorities, the noise impact of flights above 7,000 feet (amsl) is unlikely to be significant and so no consultation is required on their noise impact at above this level.

Tranquillity

8.4 Tranquillity is a subjective concept usually linked to engagement with the natural environment. In 2007, the CPRE compiled a list of what the concept of tranquillity means to people and created a national tranquillity map for England.[25] There is growing pressure to protect and preserve tranquil areas and the Government has recognised that a sense of tranquillity contributes to people's enjoyment of the natural

[23] A list of designated National Parks in the UK can be found at www.nationalparks.gov.uk. A list of designated AONB can be found at www.landscapesforlife.org.uk.
[24] DEFRA, Duties on relevant authorities to have regard to the purposes of National Parks, Areas of Outstanding Natural Beauty (AONB) and the Norfolk and Suffolk Broads Guidance Note, 2005, http://archive.defra.gov.uk/rural/documents/protected/npaonb-duties-guide.pdf
[25] http://www.cpre.org.uk/what-we-do/countryside/tranquil-places/in-depth/item/1688-how-we-mapped-tranquillity

environment.[26] Therefore, whenever practicable and in line with the priorities presented in Chapter 4.1 of this Guidance, the CAA should also take into account the concept of tranquillity when making decisions regarding airspace below 7,000 feet (amsl).

[26] The natural choice: securing the value of nature, http://www.defra.gov.uk/environment/natural/whitepaper/

9. Changes to airspace arrangements

Permanent airspace changes

9.1 Where changes, other than temporary arrangements or short-duration trials, are proposed to the design or use of controlled airspace, the CAA should ensure that adequate consultation is carried out in accordance with the Directions given under Section 66(1) of the 2000 Act, either by ensuring that the promoter of the change(s) undertakes the consultation, or by undertaking the consultation itself. In exceptional cases involving one or more of the designated airports, the Department for Transport may wish to be involved in the consultation or might even take the lead, and the CAA should check with the Department at an early stage to ascertain whether this is likely to be the case.

9.2 The CAA shall ensure that an adequate level of consultation is undertaken for any given airspace change. The level of consultation required should take account of the scale and impact of the change, and the range of potential stakeholders involved as well as their ability to contribute either directly or through a representative body. The minimum requirements set by the CAA should meet the standards set out in the Cabinet Office Guidance on Consultation. The method, form and extent of the consultation will vary depending on the circumstances and expected impacts of each case taking account of the altitude-based priorities presented in Chapter 4.1 of this Guidance. Some airspace changes are of a technical nature and have no significant environmental impact, such as a change to airspace classifications which does not affect airspace usage, and therefore might require no consultation with environmental stakeholders. In all cases, however, the CAA should determine the appropriate level of consultation required for a given change. The expectation is that where there is potential for significant detrimental impact, for example a proposal to move a low-level route and its associated impacts to a different geographical location, the consultation process should, for example, include:

a. The manager of the relevant aerodrome and its principle users (where the changes relate to a particular aerodrome);

b. other principal users of the airspace (which may be done through representative bodies);

c. local authorities[27] in the neighbourhood of the aerodrome or directly underneath flight paths up to 7,000 feet (amsl) to which the proposed airspace change relates (changes above 7,000 feet (amsl) have no significant local impact and therefore local consultation is not usually going to be necessary);

d. other organisations and individuals (if any) who may represent the interests of people living in the immediate vicinity of the aerodrome or directly underneath flight paths up to 7,000 feet (amsl) to which the proposed airspace change relates;

e. any national or local environmental bodies that are considered to have a specific interest in the impacts of the proposed airspace change; and

f. the relevant airport consultative committee where one exists.

9.3 Consultation with environmental stakeholders will usually only be necessary where the proposed changes concern controlled airspace at or below an altitude of 7,000 feet (amsl) or could have significant knock-on effects on how traffic uses adjoining uncontrolled airspace at or below the same altitude. However, the CAA should exercise its judgement when considering the need or scope of the consultation where proposed change(s) would result in an overall improvement in noise levels for all those affected since consultation may not be necessary in such cases.

9.4 If the need for a consultation is deemed appropriate the CAA should ensure that the airspace change consultation is robust and sufficient in order to enable it to make an independent assessment of the proposal.

9.5 Where the proposed changes may have a significant detrimental effect on the level and distribution of noise in the vicinity of an aerodrome, or would be expected to significantly alter the size or shape of the standard daytime noise contours in use at the aerodrome, or the shape of noise footprints of the noisiest aircraft operating there at night, the consultation should include assessments of those effects based on both the traffic levels expected at the time of implementation and forecast traffic levels for future periods where these are considered appropriate.

Temporary airspace changes

9.6 A temporary airspace change is one that may, at the CAA's discretion, introduce new controlled airspace or modifications to existing structures or routes in order to provide temporary arrangements to cover specific events or operating conditions.

9.7 The airspace change will usually apply for a period of no longer than 90 days and the airspace will then revert back to its original state at the end of the designated period. Under extraordinary circumstances this may be extended but only with the express authorisation of the CAA. The

[27] For these purposes, county, district or borough and unitary authorities only need be consulted. If parish or town councils wish to respond directly, rather than through one of the aforementioned, they should be allowed to do so, but they should be consulted if they have made their interest known.

relevant consultation arrangements are set out in Chapters 9.10 and 9.11 of this Guidance.

Approved operational airspace trials

9.8 In addition to formal temporary airspace changes, there are operational trials which need the approval of the CAA. These trials are designed to validate proposals for new routes, the use of new technologies or operating procedures, as well as to develop the evidence base of their impact on the environment. As a consequence, they make a valuable contribution to the efficiency and effectiveness of the UK airspace network, and they will also form a key component of the successful implementation of the Future Airspace Strategy and the Single European Sky.

9.9 The Government therefore considers that operational trials should be encouraged by the CAA. In all cases, the trials should be approved by the CAA and have a confirmed start and end date, although the CAA may extend the period of the trial if it considers this appropriate. The relevant consultation arrangements are set out in Chapters 9.10 and 9.11 of this Guidance.

Consultation arrangements for temporary airspace arrangements and operational airspace trials

9.10 Due to the short term nature of temporary airspace changes and airspace trials, it will usually not be necessary or appropriate for the airspace change sponsor to consult on their proposals or to undertake the airspace change approval process. However, the likely impact of the proposed change on the environment should be considered by the sponsor prior to implementation and this information used to help the CAA to determine whether a proportionate consultation is required.

9.11 If a permanent or long-term arrangement for the temporary or operational trial airspace was to subsequently become necessary, the full airspace change process will need to be completed by the airspace change sponsor. Normally, the airspace should revert back to its original state until such time as the full airspace change process can be completed. However, it is not always practical or prudent to disestablish a temporary airspace change whilst steps are being taken to make it permanent. In such instances, the CAA may consider extending temporary arrangements whilst the airspace change process is being undertaken. Any extension to the temporary airspace arrangement or operational trial should be closely monitored by the CAA, and action taken to swiftly revert the airspace concerned to its original state if the airspace change process requirements cannot be met.

10. Revision of Guidance and enquiries

Revision/amendment of Guidance

10.1 This Guidance will be reviewed by the Department on a regular basis and may be amended or replaced as deemed necessary by the Secretary of State. Minor amendments may not need to be consulted on but any substantial changes to this document could be consulted on in line with the Government policy on consultations at the time the change was proposed.

Enquiries about this Guidance

10.2 Any enquiries about this Guidance should be directed to:

Department for Transport
Great Minster House
33 Horseferry Road
LONDON SW1P 4DR
Telephone – 0300 330 3000
Website – **www.gov.uk/dft**
General email enquiries **https://www.dft.gov.uk/about/contact/form/**

Annex A: Section 70(2) Transport Act 2000

Section 70(2) of The Transport Act 2000 sets out the following legislative framework for the CAA:

70 General duty

(1) The CAA must exercise its air navigation functions so as to maintain a high standard of safety in the provision of air traffic services; and that duty is to have priority over the application of subsections (2) and (3).

(2) The CAA must exercise its air navigation functions in the manner it thinks best calculated -

(a) to secure the most efficient use of airspace consistent with the safe operation of aircraft and the expeditious flow of air traffic;

(b) to satisfy the requirements of operators and owners of all classes of aircraft;

(c) to take account of the interests of any person (other than an operator or owner of an aircraft) in relation to the use of any particular airspace or the use of airspace generally;

(d) to take account of any guidance on environmental objectives given to the CAA by the Secretary of State after the coming into force of this section;

(e) to facilitate the integrated operation of air traffic services provided by or on behalf of the armed forces of the Crown and other air traffic services;

(f) to take account of the interests of national security;

(g) to take account of any international obligations of the United Kingdom notified to the CAA by the Secretary of State (whatever the time or purpose of the notification).

(3) If in a particular case there is a conflict in the application of the provisions of subsection (2), in relation to that case the CAA must apply them in the manner it thinks is reasonable having regard to them as a whole.

(4) The CAA must exercise its air navigation functions so as to impose on providers of air traffic services the minimum restrictions which are consistent with the exercise of those functions.

(5) Section 4 of the Civil Aviation Act 1982 (CAA's general objectives) does not apply in relation to the performance by the CAA of its air navigation functions.

Annex B: The Civil Aviation Authority (Air Navigation) Directions

In addition to Section 70(2) of the Transport Act, the Secretary of State has also exercised his powers under Sections 66(1) and 104(2) of the Transport Act 2000 in the Civil Aviation Authority (Air Navigation) Directions 2001, as amended by the Civil Aviation Authority(Air Navigation) (Variation) Direction 2004. The relevant parts of the Directions are sections 8 to 12:

Environmental impact of air operations

8. Subject to section 70 of the Act the CAA shall perform its air navigation functions in the manner it thinks best calculated to take into account:

   a. the guidance given by the Secretary of State on the Government's policies both on sustainable development and on reducing, controlling and mitigating the impacts of civil aviation on the environment, and the planning policy guidance it has given to local planning authorities;

   b. the need to reduce, control and mitigate as far as possible the environmental impacts of civil aircraft operations, and in particular the annoyance and disturbance caused to the general public arising from aircraft noise and vibration, and emissions from aircraft engines;

   c. at the local, national and international levels, the need for environmental impacts to be considered from the earliest possible stages of planning and designing, and revising, airspace procedures and arrangements; and

   d. the requirements of directions given under section 39 of the Act to licence holders, an authorised person or authorised persons generally.

9. Where changes to the design or to the provision of airspace arrangements, or to the use made of them, are proposed, including changes to air traffic control procedures, or to the provision of navigational aids or the use made of them in air navigation, the CAA shall:

   a. where such changes might have a significantly detrimental effect on the environment, advise the Secretary of State for Transport of the likely impact and of plans to keep that impact to a minimum;

b. where such changes might have a significant effect on the level or distribution of noise and emissions in the vicinity of a civil aerodrome, ensure that the manager of the aerodrome, users of it, any local authority in the neighbourhood of the aerodrome and any other organisation representing the interests of persons in the locality, have been consulted (which might be undertaken through the consultative committee for the aerodrome where one exists);

c. where such changes might have a significant effect on the level or distribution of noise and emissions under the arrival tracks and departure routes followed by aircraft using a civil aerodrome but not in its immediate vicinity, or under a holding area set aside for aircraft waiting to land at a civil aerodrome, ensure that the manager of the aerodrome and each local authority in the areas likely to be significantly affected by the proposed changes, have been consulted; and where such changes might have one or more of the effects specified in paragraphs 2 (a), (b) and (c) of this Direction, the Civil Aviation Authority shall refrain from promulgating the change without first securing the approval of the Secretary of State.

10. The CAA shall advise the Secretary of State on the airspace aspects of any proposal to establish new, modify existing, or reactivate disused, civil or military aerodromes, including their associated traffic patterns.

11. In relation to its air navigation duties, the CAA shall maintain its capability to provide expert technical advice to the Secretary of State on environmental matters.

12. The CAA shall provide a focal point for receiving and responding to aircraft related environmental complaints from the general public.