



# *Farnborough Airport*

## Airspace Consultation Feedback Report **Part B** The Proposed Airspace Design



## Feedback Report Part B

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## Executive Summary

This report is about the proposed airspace and flight-path changes in the vicinity of TAG Farnborough Airport. It discusses the consultation held in 2014, the actions we took following that consultation, and what will happen next.

The objective of this proposed change is to create a new operating environment with elements of 'controlled' airspace, which would offer all airspace users predictability and consistency of operation.

TAG Farnborough Airport wishes to thank all individuals and organisations who responded to the consultation on airspace changes. The preceding document, Feedback Report Part A, detailed the feedback acquired during the consultation and analysed the themes and issues raised. The consultation process relied on the acquisition of views, suggestions and comments about the potential impact of proposed changes. We were encouraged by the quantity, quality and breadth of responses to the consultation.

This document, Feedback Report Part B, takes these themes and issues and explains how we have considered them. In many cases, we have taken action such as redesigning part of a flight route or airspace volume.

A balanced approach has been taken in order to address conflicting issues. Compromises have been made, resulting in a proposal that strives to meet the needs of as many stakeholders as possible.

The consultation was conducted under the CAA's CAP725 Guidance on the Application of the Airspace Change Process. It presented a number of proposed changes to airspace and aircraft routings in relation to TAG Farnborough Airport. The proposed changes were developed to:

1. Improve the overall efficiency of the airspace
2. Increase safety
3. Reduce environmental impact

The consultation generated over **13,000** comments from more than **2,500** stakeholders. In addition, more than **700** documents were submitted in support of responses.

### What has been happening since Feedback Report Part A was published?

An essential part of the Airspace Change Process is to study the areas of concern raised in consultation and to act on them where possible.

We have been:

- a. Studying the consultation responses in depth to understand concerns and design ideas;
- b. Exploring potential mitigations and considering how they may be progressed;
- c. Re-engaging with some stakeholders to better understand specific elements of their response;
- d. Creating a significant redesign based on all this information;
- e. Simulating the redesign using Farnborough, NATS and RAF air traffic personnel, and analysing the results;
- f. Adjusting some details of the design based on the simulation results;
- g. Finalising the overall design;
- h. Documenting all the above.

The task of analysing and acting on the considerable volume of responses, ideas and design suggestions was extensive, reflected by the length of time taken.



The proposed areas of over-flight below 7,000ft, shown in green in the adjacent map, have been significantly reduced.

The justification for this proposal remains the same, but the extent of the controlled airspace required to support that justification has been cut down.

The lateral extent (area, square km) of the proposed airspace was reduced by 20%.  
The overall volume (cubic km) of the proposed airspace was reduced by 32%.

The airspace design developed as a result of the feedback from consultation represents a fair and balanced proposal which has understood, examined and taken into account the views of all stakeholders.

This final proposed design will be submitted to the CAA for their independent scrutiny. They will determine whether we have succeeded in balancing the needs of all stakeholders.

## **Benefits Summary**

### **Environment – People over-flown:**

Due to the accurate track-keeping potential of aircraft following these new, modernised routes, it has been possible to design flight-paths that reduce the over-flight of populated areas.

In particular, we made significant changes to departures to minimise the population over-flown at low altitude, based on the feedback we received.

Under this proposal 35% (199,000) fewer people than today would be over-flown below an altitude of 4,000ft, with 11% (56,000) fewer people over-flown from 4,000ft-7,000ft.

**Overall, 24% (255,000) fewer people would be affected by Farnborough aircraft.**

A smaller number of people would be likely to get over-flown more often, because the flight-paths would be more concentrated. For full details see Section 6 of this report.

### **Access to airspace:**

The proposed concept of operations (airspace, routes and procedures) relies upon Farnborough controllers providing pilots with regular, timely and consistent access to the airspace upon request.

TAG Farnborough is committed to ensuring that the fundamental requirements of introducing controlled airspace (known as 'Class D' airspace) are met or exceeded. This means that fair and equitable access will be provided to the maximum extent possible.

### **Safety:**

The airspace surrounding Farnborough is managed safely, but flight-paths are not very efficient or predictable and are often extremely complex.

The more consistent and predictable the routes, the more efficient they can be.

Reducing the complexity of air traffic management would reduce the workload for pilots and controllers, enhancing overall safety even further.

## Summary of routes and associated environmental benefits

Route	Benefit
Runway 06 departures below 5,000ft	Designed to avoid direct over-flight of <b>Guildford, Aldershot and Farnham</b> . Precise track-keeping will ensure that flights are consistently routed over sparsely populated areas as much as possible and at higher altitudes than currently achieved. (See page B16 for details).
Runway 24 departures below 5,000ft	Designed to avoid direct over-flight of <b>Church Crookham, Fleet, Ewshot, Crondall, Farnham, and Alton</b> . Precise track-keeping will ensure that flights are consistently routed over sparsely populated areas as much as possible, and at higher altitudes than currently achieved. (See page B18 for details).
Departures from both runways 5,000ft-7,000ft.	Designed to avoid major centres of population <b>Alton, Bordon, Liphook, Four Marks, Ropley and New Alresford</b> below 7,000ft. Precise track-keeping will ensure that flights are consistently routed over sparsely populated areas as much as possible, and at higher altitudes than currently achieved. (See page B20 for details).
Arrivals to both runways from south between 7,000ft-4,000ft	Arrivals would typically be <b>between 600ft and 1,000ft higher</b> than the current equivalent arrival, during the descent to 4,000ft. (See page B24 for details).
Runway 06 arrivals from north and south below 4,000ft	Arrivals would typically be <b>between 600ft and 1,000ft higher</b> than the current equivalent arrival until nearing final approach where standard approach altitudes would be flown. (See page B26 for details).
Runway 24 arrivals from north and south below 4,000ft	Arrivals would typically be <b>between 600ft and 1,000ft higher</b> than the current equivalent arrival until nearing final approach where standard approach altitudes would be flown. (See page 28 for details).

## What happens now?

We submit our formal Airspace Change Proposal (ACP) to the CAA.

The CAA will study our proposal and check we have considered the requirements laid out in CAP725 and the Government's environmental guidance to the CAA.

The CAA evaluation is expected to take until late 2015 to complete.

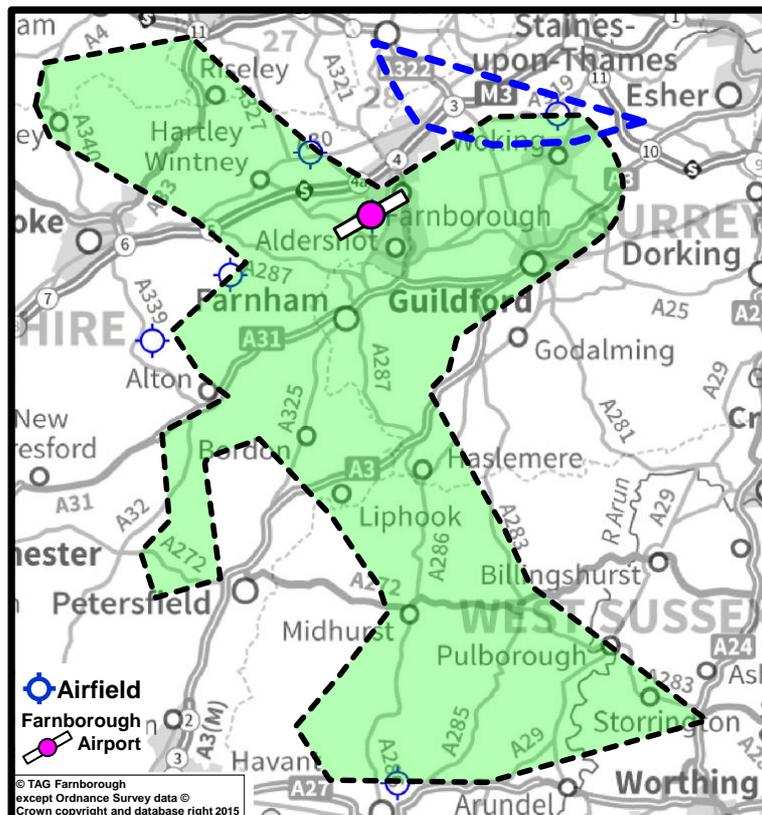
The CAA will then make their decision and announce it on their website. We will also announce it on ours - [www.consultation.tagfarnborough.com](http://www.consultation.tagfarnborough.com)

If CAA approval is granted, we plan to implement the change in late 2016.

Comments regarding the proposal should now be directed to the CAA.

## 1. Introduction to Feedback Report Part B

- 1.1. When changes to airspace arrangements are proposed, the sponsor must take into account Government guidance (Ref 1) and CAA guidance (Ref 2)<sup>1</sup>. This guidance highlights a number of factors that must be considered and balanced in the development of a proposal, ranging from safety and delay management, through to CO<sub>2</sub> efficiency, noise mitigation and impacts on other airspace users.
- 1.2. The CAA process for airspace change (Ref 2) states that consultation is about 'confirming and attaining opinions about the impacts of a proposed change'. Feedback Report Part A (Ref 4) published this information, including the numbers and types of responses received, the analysis methodology, the themes arising out of that analysis, the consultation process and its execution with respect to TAG Farnborough Airport. We have assumed the reader is familiar with all the Consultation Material (Ref 3) and the Feedback Report Part A (Ref 4).
- 1.3. In this document, Feedback Report Part B, we describe the airspace and route design that we will submit to the CAA. We also take the themes and issues raised in Feedback Report Part A (Ref 4) and describe how each has been considered in the overall design.
- 1.4. When interpreting these themes, the reader should note that the CAA has indicated that the aim of airspace consultation is not to gauge the popularity of a proposal. It is a process for identifying new and relevant information that should be taken into account in the proposal alongside the existing Government and CAA guidance (Refs 1 and 2). All relevant issues are therefore considered equally whether they are raised by a single respondent or by many.
- 1.5. The feedback we received provided us with new, relevant and specific information. Therefore, this consultation achieved its objectives - we were able to take this information and modify parts of the original routes and airspace accordingly. These modifications are described in Sections 4 and 5.
- 1.6. The extent of over-flight due to our proposal is shown by the green shaded area in Figure 1 below, with minor changes to some light aircraft tracks in the blue outlined area.



**Figure 1 The extent of this proposal**

<sup>1</sup> See Appendix A: References, Ref 1 and Ref 2 for Government and CAA guidance respectively.

## What is the history of TAG Farnborough's Airspace Change Proposal?

- 1.7. In early 2009 TAG Farnborough Airport published a Master Plan. Airport Master Plans are intended to provide an opportunity for local communities to engage with airports on future development. The Master Plan outlined how the airport proposed to make best possible use of existing infrastructure, whilst minimizing the environmental effects.

Paragraph 8.4.9 of the 2009 Master Plan explained that

*'...TAG will work with the CAA to explore the possibility of applying for an Airspace Change Proposal. If granted, this would result in TAG having a greater degree of control over a larger area of airspace around the Airport, and enable the introduction of procedures which could result in further noise mitigation.'*

- 1.8. In 2011 we acquired planning permission regarding the number of aircraft movements<sup>2</sup> at the airport. The previous limit of 28,000 per year was increased to 50,000 per year. These movements are reviewed and analysed annually, and then reported to Rushmoor Borough Council. We are obliged under Section 106 Part 2 of the planning permission (known as S106) that, if the annual reviews indicate so and if we consider it feasible, we shall *'...use reasonable endeavours to promote and support airspace changes in order to benefit local residents through the creation of greater amount of controlled airspace around the Site'*.
- 1.9. Initial discussions involved the Farnborough Aerodrome Consultative Committee (FACC), which best represents the 'local residents' specified in the S106 obligation. We also engaged local aviation stakeholders because the airspace design must meet as many of their requirements as possible whilst delivering the benefits to our operation, the desired outcome of which would be to the net benefit of local residents.
- 1.10. Several airspace and route design concepts were considered, and each was modified until a suitable option for consultation was agreed upon – this was known as 'Option 25' and is referred to as such in the consultation material (Ref 3). This material was published in February 2014. The consultation exercise itself ended in May 2014 and resulted in a large amount of data which we summarised in the Feedback Report Part A (Ref 4) published in August 2014. That report led to further stakeholder engagement, and the redesign of some parts of the airspace and routes.
- 1.11. The proposed changes bring a net benefit to local residents, and this is one of the primary reasons for this proposal, as required by the S106 obligation and as agreed with the FACC.
- 1.12. Nine further design iterations were explored, each refining individual areas, then ensuring the result works as a system.
- 1.13. The information in this document presents 'Option 34' which we believe will deliver environmental improvements to local residents whilst improving the overall efficiency of the airspace in the vicinity of the airport.
- 1.14. Option 34 will be submitted to the CAA as an Airspace Change Proposal (ACP).

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<sup>2</sup> One 'movement' is one aircraft taking off, or one aircraft landing. When an aircraft lands, picks up passengers, then takes off again it has used two movements.

## References and abbreviations

- 1.15. See Appendix A: References. These are referred to extensively in this report as 'Ref (number)' and it is recommended that the reader takes the time to become familiarised.
- 1.16. Abbreviations and terms used in these reference documents will be used here without introduction – we assume familiarity. For example, we will refer to CAS which is short for 'controlled airspace', introduced in the Consultation Material Part A (Ref 3).

## The Structure of Feedback Report Part B

- 1.17. This report provides our responses to the themes, comments and questions raised in Feedback Report Part A (Ref 4). It also provides a rationale for the design changes made as a consequence of consultation, and includes illustrations and maps.
- 1.18. Section 2 explains the evolution of the proposal with respect to NATS' airspace modernisation programme known as 'LAMP'. Section 3 provides our justifications for the proposal, and the objectives we used to support those justifications.
- 1.19. Section 4 explains the final design we are presenting to the CAA from the point of view of local residents. Section 5 explains the final design from the point of view of aviation specialists. These two sections are explained in simple terms where possible, assuming the reader is familiar with the consultation material Ref 3 and Feedback Report Part A Ref 4. Sometimes we must use technical language associated with the aviation industry – this is unavoidable when answering comments and questions submitted by aviation specialists.
- 1.20. Section 6 provides information on environmental impacts such as the numbers of people likely to be over-flown.
- 1.21. Sections 7 to 14 take the major themes raised during the consultation and breaks them down into sub-themes. Some are broken down even further, into more specific comments. These comments could have been raised by many stakeholders, or by just one. Primarily these themes, comments and issues are based on the analysis methodology explained in Section 19 of Feedback Report Part A (Ref 4), and are presented in the same order.
- 1.22. Section 15 draws the report to its conclusion and explains the next steps. The appendices provide reference material and additional background information.

## 2. The South Coast, LAMP, and NATS

- 2.1. As notified on our website mid-February 2015, TAG transferred progression of proposed airspace and route changes over the South Coast to NATS Terminal Control's London Airspace Management Programme (LAMP).
- 2.2. NATS took over this area because it includes changes required for the efficiency of the air route network as a whole, for which NATS is primarily responsible and NATS is seeking to address with changes scheduled for February 2016 (i.e. before this Farnborough proposal is planned to be implemented). These changes now form part of NATS' wider airspace modernisation in the region, LAMP, (including higher-altitude routes used by Southampton and Bournemouth airports, as per the South Coast Proposal), rather than relating exclusively to our local TAG Farnborough Airport operation. See NATS South Coast Feedback Report Part B (Ref 5) for full details.
- 2.3. With the agreement of TAG Farnborough, NATS has used the information contained in our Consultation Feedback Report Part A (Ref 4) to compile a document called 'NATS South Coast Feedback Report Part B' (Ref 5).
- 2.4. These changes over the south coast were covered in our consultation material (Ref 3), which stated that NATS' London Terminal Control (LTC) would be the controlling authority for these volumes of airspace<sup>3</sup>.
- 2.5. This transfer was with the full agreement of the CAA.  
The airspace change process has been complied with at all times.  
The rest of this document discusses our local airport operation, which will link into the wider LAMP South Coast network under NATS' control.
- 2.6. The South Coast changes affect the efficiency of the wider airspace network (Southampton and Bournemouth Airport arrivals known as 'Solent traffic', as well as arrivals to TAG Farnborough) and primarily affects airspace volumes starting at or above 6,500ft over the south coast.
- 2.7. See below for the evolution of TAG Farnborough and NATS South Coast Proposals:



<sup>3</sup> Consultation Material Part A para 9.3 and Part E para 5.31 (Ref 3).

### **3. Justifications and Objectives of this proposal**

- 3.1. Our justifications for this proposal remain as follows:
  - a. To bring benefits to our ATC operation and to other airspace users in the region.
  - b. To enhance aviation safety.
  - c. To reduce noise impact on the local population.
- 3.2. Our objectives supporting these justifications are:
  - a. To increase the predictability and efficiency of departure and arrival routes.
  - b. To reduce the complexity of aircraft interactions.
  - c. To establish a route structure that, as far as practicable:
    - Avoids towns and villages below 4,000ft; and
    - Avoids major population centres between 4,000ft and 7,000ft.
  - d. To encourage the general aviation community to use our air traffic services.

## 4. Airspace and Route Design: Local Residents

- 4.1. This section describes how the airspace and route design has been modified as a direct result of the feedback received during consultation.
- 4.2. It has been written with a non-technical audience in mind.  
Section 5 of this report discusses aviation technical matters and has been written with a technical audience in mind.
- 4.3. The modifications to the design were based on balancing priorities:
  - a. *Further reducing the overall number of local people over-flown*  
This includes the concept of concentrating flights into the narrowest consistent tracks where possible, climbing departing aircraft higher, quicker, and keeping arriving aircraft higher for longer.  
Above 7,000ft aircraft may be instructed to route directly to the air route network, because Government guidance (Ref 1) states that mitigating local noise impacts is not a priority.
  - b. *Reducing the impacts on other aviation users*  
This includes the Ministry of Defence (MoD), General Aviation and Sports and Recreational Aviation (GA/S&RA) users such as private pilots and gliders etc – see Section 5 for aviation technical information;
  - c. *Ensuring modifications were limited to the areas already over-flown, or consulted upon*  
This includes modifications in areas where there would be no noticeable difference below 7,000ft, or where differences below 7,000ft would cause a lesser impact than the current operation.
- 4.4. The consultation areas are shown in Figure 2 adjacent. The consultation from February to May 2014 covered the widest areas. Our proposal now only covers the green shaded area and the small dashed blue area.

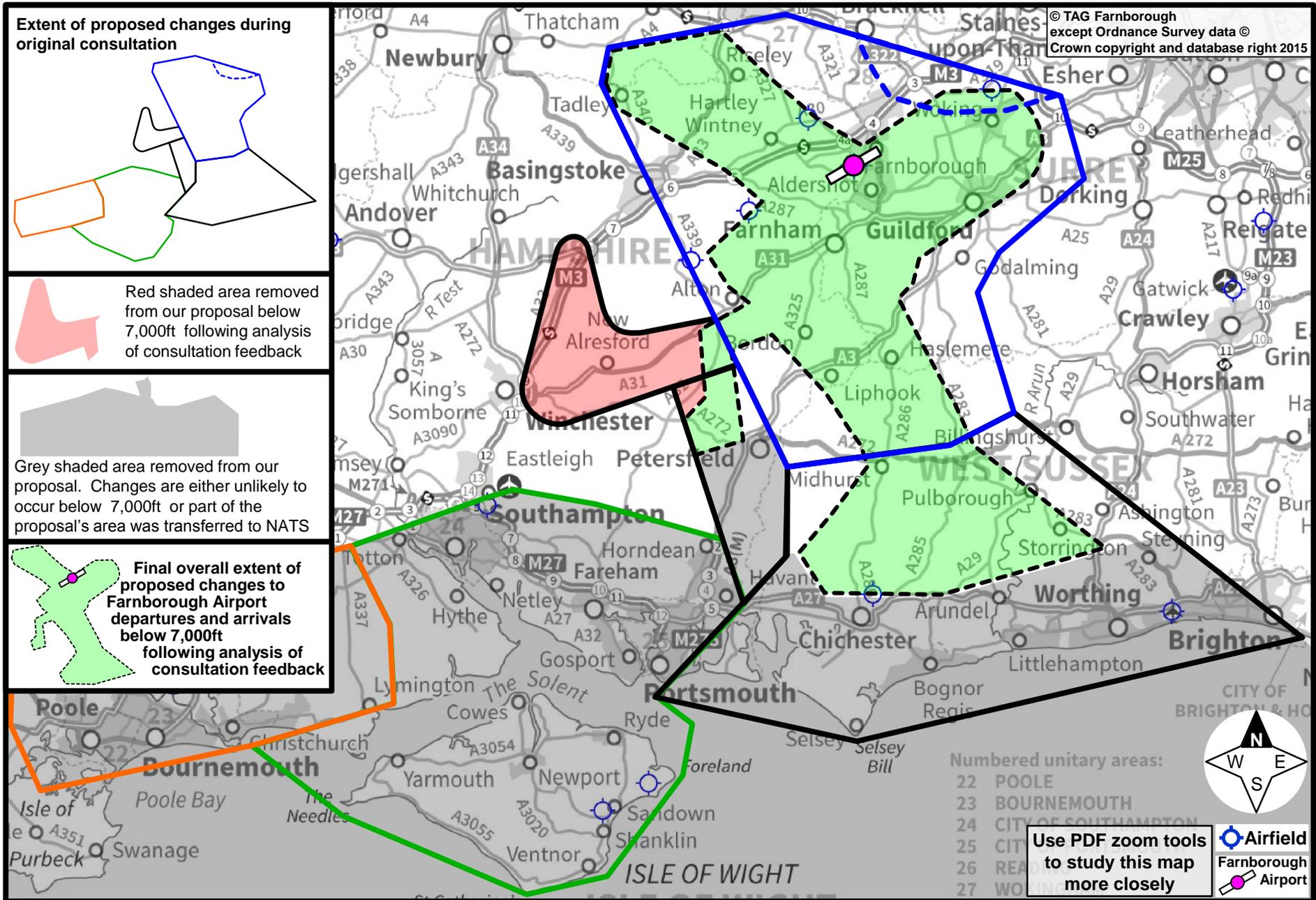


Figure 2 Original consultation areas vs extent of this proposal post-consultation

## Departure Routes (SIDs)

- 4.5. Figure 3 illustrates the extent of the proposed Standard Instrument Departure (SID) routes post-consultation. The originally-consulted-upon swathes have been refined into tight lines.
- 4.6. Figures 4-6 later in this section provide more details about the proposed tracks, and the typical climb profile we expect them to achieve.
- 4.7. The SIDs we propose to introduce are known as 'RNAV1 SIDs'. RNAV1 is a technical term for a navigational standard that means aircraft will be very likely to fly consistent, predictable tracks over the ground.
- 4.8. These SIDs are likely to be used in a 'procedural' way. Controllers are likely to allow the aircraft to follow the pre-programmed route with minimal intervention.
- 4.9. We expect the majority of departures to follow the two SID tracks shown here. Sometimes controllers will need to intervene for reasons of safety or efficiency. This 'tactical' intervention could mean issuing a turn off the pre-programmed route. We do not expect this to be common below 7,000ft.
- 4.10. These tracks have been designed to avoid as many population centres as possible, taking into account consultation feedback.
- 4.11. They will also be able to climb higher earlier, shortening the length of the track below 7,000ft, further mitigating noise impacts.
- 4.12. The predictability of the track means that the same places would be over-flown regularly, depending on the runway in use at the time. Runway 24 is used most often at Farnborough (about 80% of the time).
- 4.13. Over the next four years, RNAV1 is due to become the minimum navigational standard for this part of the UK's airspace.
- 4.14. Some aircraft may not be able to comply with the RNAV1 standard yet. In this case we will manually direct the departure along a track as close as possible to the SID route, by issuing the pilot with headings to fly. This will not be as accurate as a pre-programmed RNAV1 track, but the number of non-RNAV1 departures from Farnborough is expected to be small and to get smaller as the minimum navigational standard is implemented across this part of the UK. As per paragraphs 4.8-4.9, most departures would follow the pre-programmed track or be very close to it.

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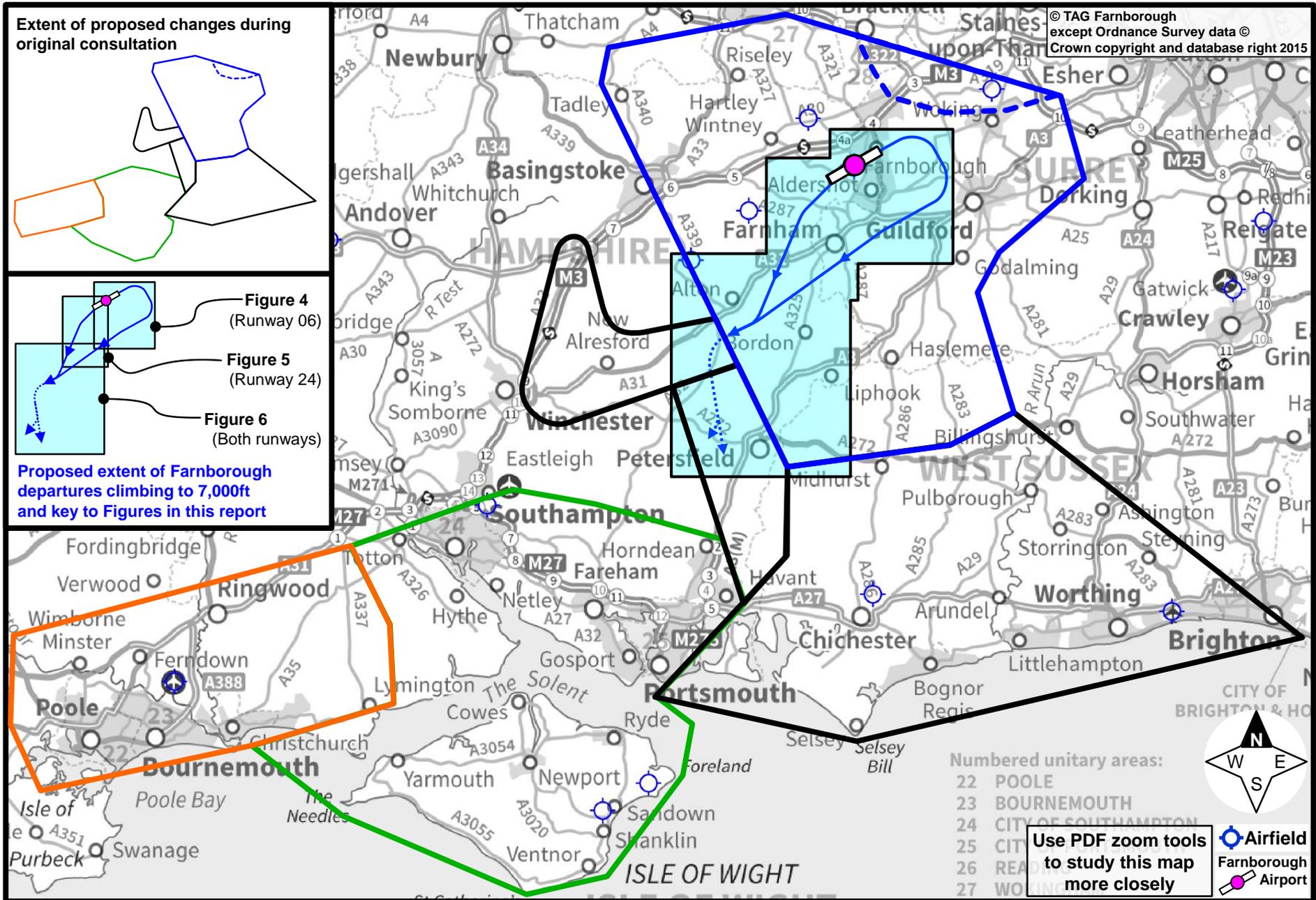


Figure 3 Extent of Farnborough departures to 7,000ft compared with original consultation areas

## Runway 06 SID up to 5,000ft

- 4.15. The route for departures from Runway 06 is shown in Figure 4.
- 4.16. It has been designed to avoid direct over-flight of Guildford, Aldershot and Farnham, consistently crossing sparsely populated areas as much as possible, and at higher altitudes than currently achieved.
- 4.17. It takes the following considerations into account:
- a. No change for the first 2,000ft of straight-ahead climb.
  - b. First turn between 2,000ft and 3,000ft starts before Pirbright, to keep the track close to the MoD ranges.  
This is at least 600ft higher than current departures achieve in the same area (red dashed arrow).
  - c. Departures may need to stay level at 3,000ft until making the second turn, due to possible Heathrow and Gatwick departures climbing through 4,000ft in the vicinity. If there are no other aircraft, our departure would be climbed above 3,000ft.  
This is at least 600ft higher than current departures achieve in the same area.
  - d. Second turn before Wood Street Village avoids the city of Guildford.
  - e. Departures should reach or exceed 4,000ft when crossing the A31 Hog's Back.  
At this point the departure reaches the Surrey Hills Area of Outstanding Natural Beauty and is about 1,000ft higher than current departures achieve in the same area.
  - f. Departures should reach or exceed 5,000ft when crossing the A287 in the vicinity of Gong Hill, south of the Lower Bourne area of Farnham.  
At this point the departure exits the Surrey Hills Area of Outstanding Natural Beauty and is about 1,600ft higher than current departures achieve in the same area.
  - g. The northern edge of the Surrey Hills Area of Outstanding Natural Beauty is over-flown for about 9km, about 1,000ft-1,600ft higher than current departures achieve in the equivalent area.
  - h. National Parks are not over-flown in this portion of the route up to 5,000ft.
- 4.18. See Figure 6 for information about the track as it climbs southwest of Farnham.
- 4.19. See also Appendix B: Forecasts of Numbers of Flights.

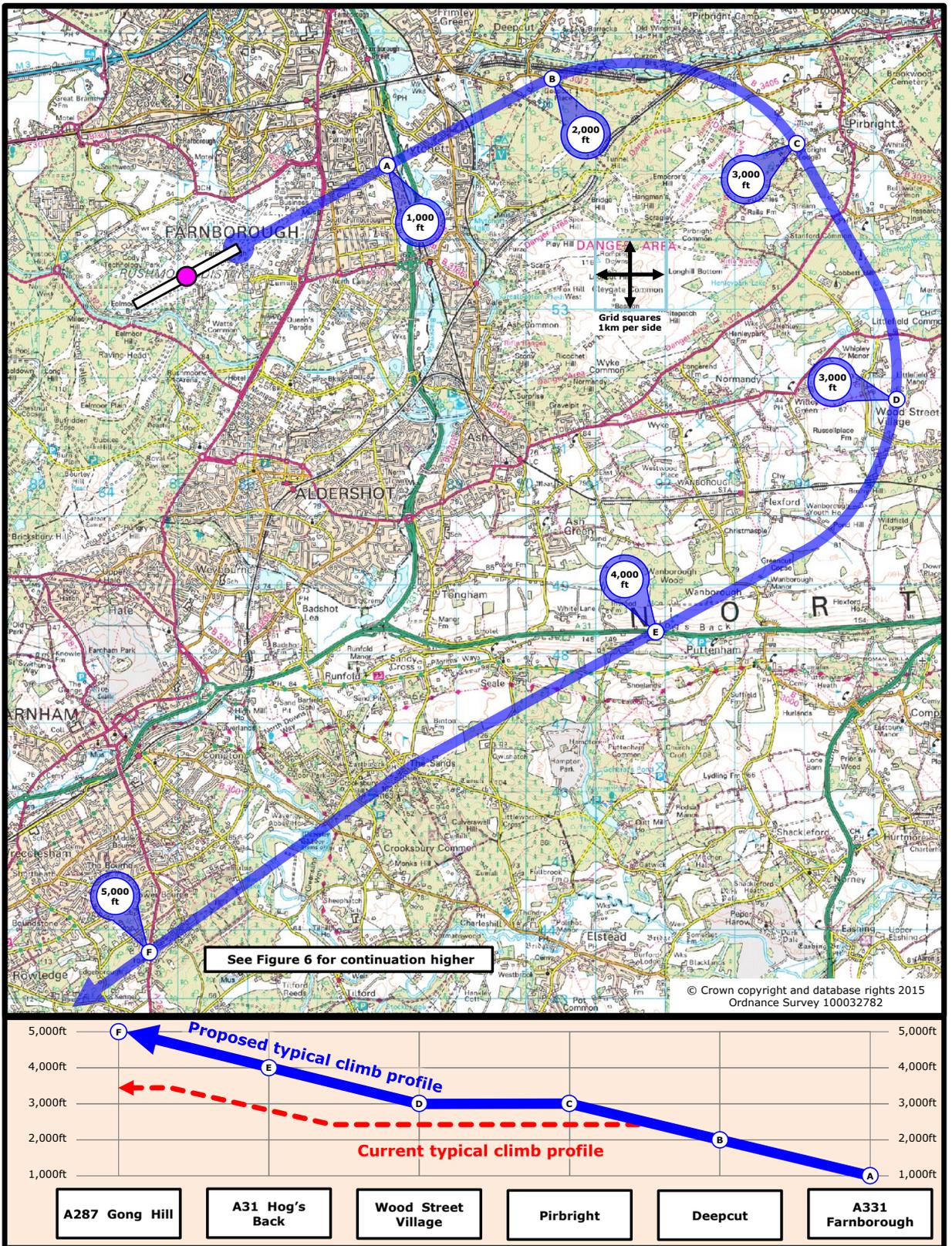


Figure 4 Proposed Runway 06 departure track up to 5,000ft

## Runway 24 SID up to 5,000ft

- 4.20. The route for departures from Runway 24 is shown in Figure 5.
- 4.21. It has been designed to avoid direct over-flight of Church Crookham, Fleet, Ewshot, Crondall, Farnham and Alton, consistently crossing sparsely populated areas as much as possible, and at higher altitudes than currently achieved.
- 4.22. It takes the following considerations into account:
- a. A new first turn immediately after take-off takes the track over the MoD training grounds, avoiding the population centres of Fleet and Church Crookham that are currently over-flown.
  - b. The next part of the track has been designed to avoid direct over-flight of Ewshot at as high an altitude as possible, minimum 2,000ft.
  - c. The track turns to avoid direct over-flight of Crondall at as high an altitude as possible, minimum 3,000ft.  
This is about 600ft higher than current departures achieve in the same area.
  - d. Departures should reach or exceed 4,000ft northeast of Bentley.  
This is about 1,600ft higher than current departures achieve in the same area.
  - e. Departures should reach or exceed 5,000ft when crossing the A31 or the railway line southwest of Bentley.  
This is about 1,600ft higher than current departures achieve in the same area.
  - f. Areas of Outstanding Natural Beauty and National Parks are not over-flown in this portion of the route up to 5,000ft.
- 4.23. See Figure 6 for information about the track as it climbs southwest of Bentley.
- 4.24. See also Appendix B: Forecasts of Numbers of Flights.

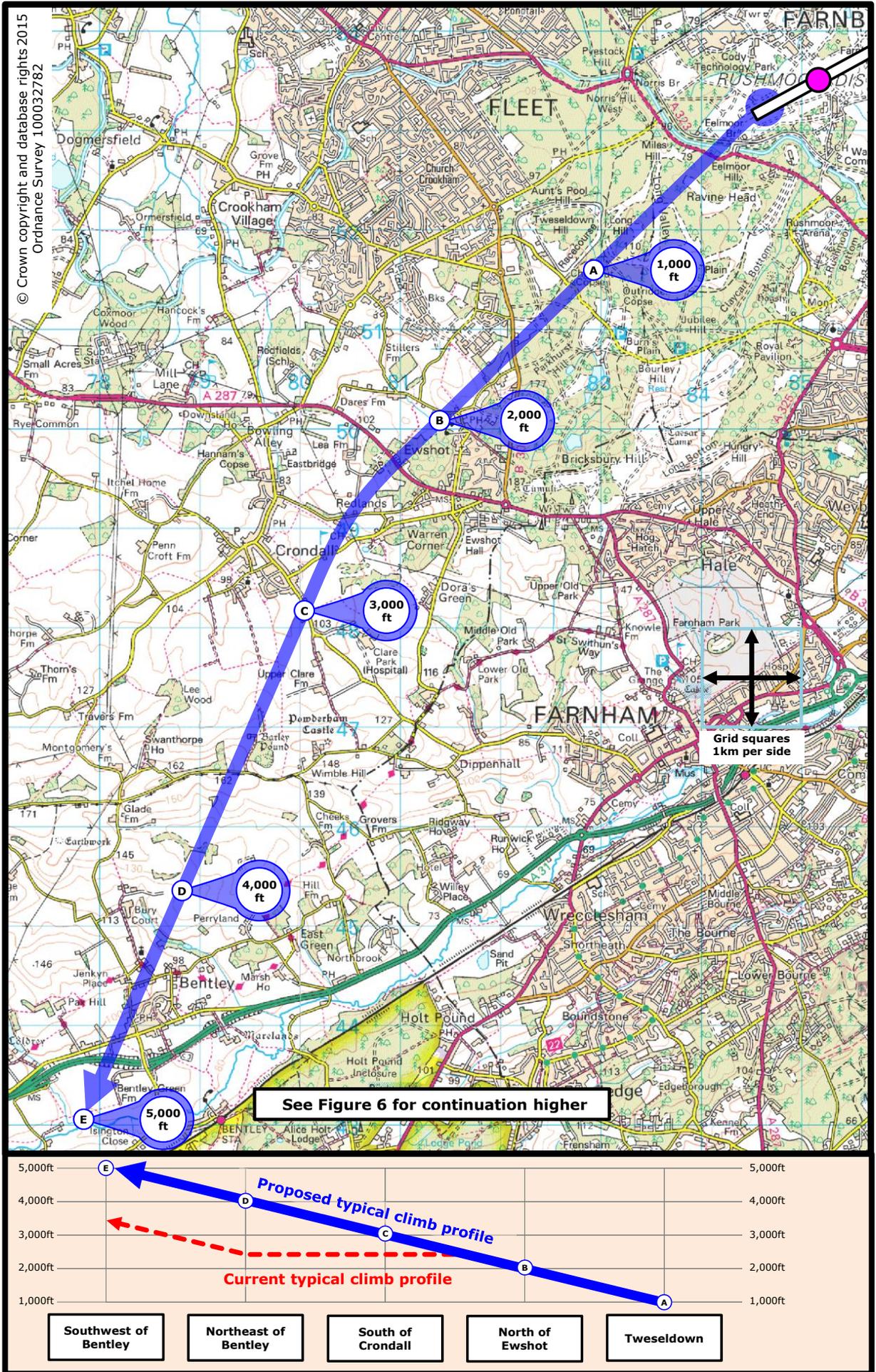


Figure 5 Proposed Runway 24 departure track up to 5,000ft

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## SIDs from both runways from 5,000ft to 7,000ft

- 4.25. Routes from both runways for departures from 5,000ft to 7,000ft are shown in Figure 6 adjacent.
- 4.26. It has been designed to avoid the major centres of population such as Alton, Bordon, Liphook, Four Marks, Ropley and New Alresford area below 7,000ft, consistently crossing sparsely populated areas as much as possible, and at higher altitudes than currently achieved.

### Most departures

- 4.27. About 85% of all departures from either runway would follow the thick blue arrow to reach 7,000ft in the vicinity of Upper Farringdon, with the dark blue markers illustrating the typical altitudes expected to be achieved.
- 4.28. This takes the following considerations into account:
- Runway 24 departures should reach or exceed 5,000ft crossing the A31 southwest of Bentley. On crossing the railway line shortly after, the departure reaches the South Downs National Park and is about 1,600ft higher than current departures would achieve due to the removal of current airspace restrictions. It remains within the National Park for about 7km before exiting at West Worldham, where it would reach or exceed 6,000ft.
  - Runway 06 departures should reach or exceed 5,000ft crossing the A287 in the vicinity of Gong Hill, south of the Lower Bourne area of Farnham, exiting the Surrey Hills Area of Outstanding Natural Beauty. On crossing the A325 at Alice Holt Forest, the departure reaches the South Downs National Park and is about 1,600ft higher than current departures would achieve due to the removal of airspace restrictions. It remains within the National Park boundary for about 9km before exiting at West Worldham, where it would reach or exceed 6,000ft.
  - South of West Worldham the two SID tracks combine<sup>4</sup> at about 6,000ft.
  - Departures should reach or exceed 7,000ft approaching Upper Farringdon.
  - On reaching or exceeding 7,000ft the departure could be turned off the SID in any direction to shorten its route to join the airway network.
- 4.29. See also Appendix B: Forecasts of Numbers of Flights.

### Some departures

- 4.30. About 15% of all departures from either runway would follow the same track to Upper Farringdon but could be 5,000ft-6,000ft at that point. They would continue along the thin dotted blue arrow, with the light blue markers illustrating the typical altitudes expected to be achieved.
- This dotted-line extended track is only expected to be used when Heathrow or Gatwick departures cause a temporary 'lid' to be placed on the climb of our aircraft. In this circumstance, our departure would climb in steps beneath the traffic above. As soon as that lid is lifted, our departure would continue to climb.
  - Aircraft should climb through 5,000ft-6,000ft between West Worldham and High Cross, and would reach or exceed 7,000ft in the vicinity of Ramsdean or Langrish. This is 1,000ft-2,000ft higher than originally consulted upon, when we explained our broad estimation of the impacts in these areas.
  - On reaching or exceeding 7,000ft the departure could be turned off the SID in any direction to shorten its route to join the airway network.

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<sup>4</sup> SIDs depend on the runway in use – both runways would not be used for simultaneous departures in opposite directions so there would not be aircraft on both SIDs at the same time.

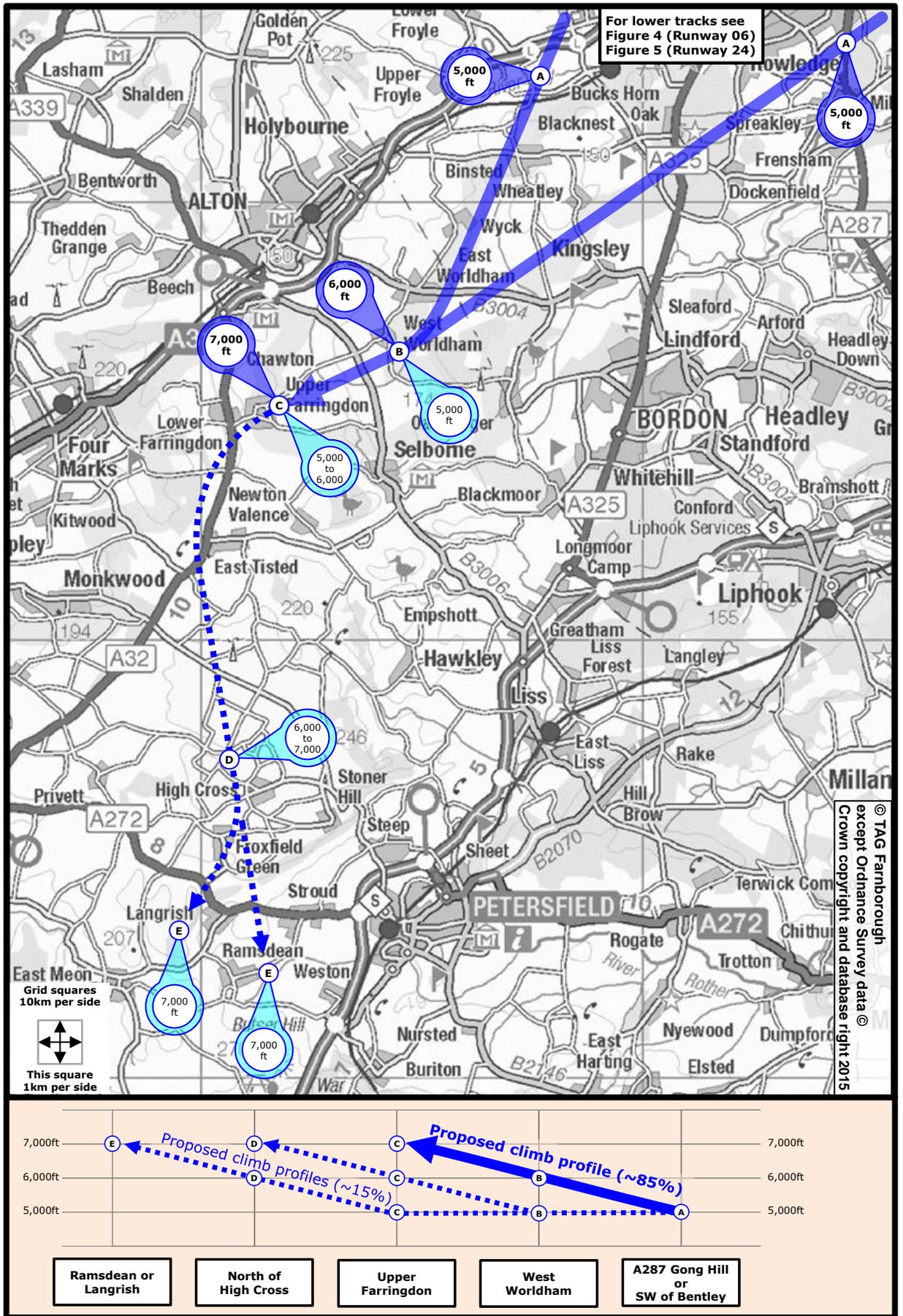


Figure 6 Departures from both runways from 5,000ft to 7,000ft

## Arrival Routes (STARs)

- 4.31. The dashed black lines in Figure 7 below illustrate the extent of the proposed arrival routes post-consultation. These routes are known as Standard Terminal Arrival Routes (STARs). The originally consulted upon wide swathes have been refined into narrower swathes.
- 4.32. Figures 8-10 later in this section provide more details about the proposed spread of arrivals, and the typical descent profile we expect them to achieve.
- 4.33. The two types of STARs we propose to introduce are known as 'RNAV1 STARs' and 'RNAV5 STARs'. Unlike the departure SIDs (see paragraphs 4.7-4.14) arriving aircraft will, more often than not, be taken off the pre-programmed arrival route and manually directed by ATC.
- 4.34. Controllers direct the individual aircraft to integrate them with other traffic, whilst maintaining separation during the intermediate part of their arrival. Controllers may instruct arrivals to leave the pre-programmed route and re-join it further along, or they may take full control of the navigation by instructing the pilot to fly compass headings.
- 4.35. This is known as 'tactical vectoring' and is standard procedure for aircraft arriving at most airports, with or without STARs.
- 4.36. Tactical vectoring by air traffic controllers results in variation of aircraft tracks. Because of this, our arrival routes are shown as swathes and not lines.
- 4.37. Tactical vectoring for this proposal is most likely to be caused by interactions between our arrivals from the south, and Gatwick departures heading west, across our arrival swathe.
- 4.38. These interactions already happen today. Air traffic controllers safely resolve the crossing tracks by changing the path of our arrival, keeping it clear of the Gatwick aircraft. This vectoring allows both flights to climb or descend more freely. The path chosen by the controller entirely depends on the specific air traffic situation at that moment. These interactions would continue under this proposal, to a different degree but in a similar manner.
- 4.39. Even though this track variation would occur (as it does today), the tracks flown by arrivals using this system would be far more consistent and predictable than the current system. Their expected typical spread would be narrower than today.
- 4.40. In our original consultation we wrote that certain areas would be more likely to experience over-flight more often than others, and that arrivals may be within the consultation area at any altitude. See Figures 8-10 for more details on how this applies post-consultation.

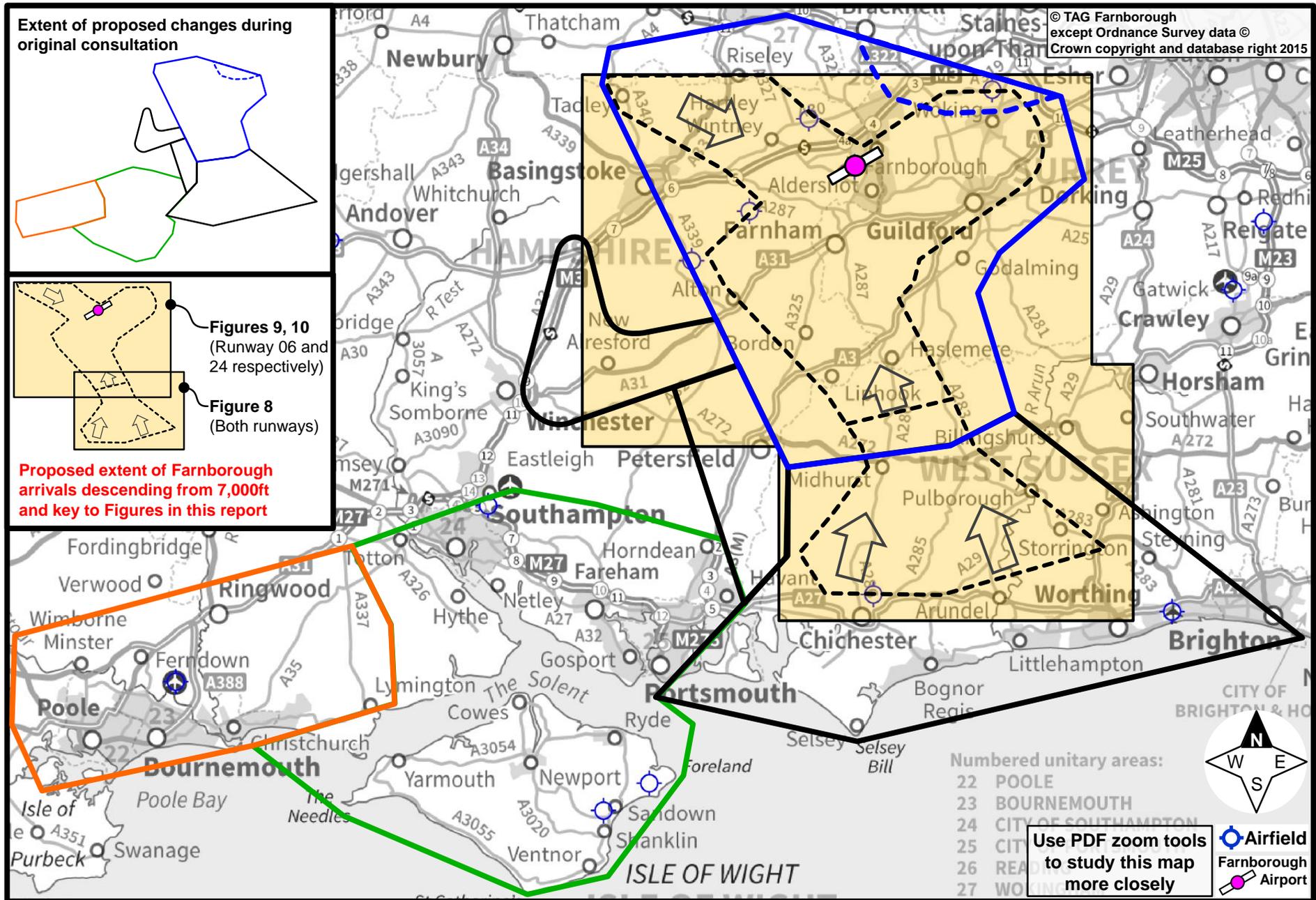


Figure 7 Extent of Farnborough arrivals from 7,000ft compared with original consultation areas

## Arrivals to both runways from the south, descending from 7,000ft to 4,000ft

- 4.41. The typical swathe for arrivals from the south is shown in Figure 8 below. It has been designed to be as narrow as possible whilst providing ATC with enough tactical flexibility to ensure arrivals can be integrated into the local traffic situation.
- 4.42. It takes the following considerations into account:
- a. The area over-flown by this proposed arrival swathe is smaller than, and is contained within, the current arrival swathe.
  - b. The route programmed into the aircraft's navigation system follows the middle of the 'funnel' shown in red. The complexity of air traffic control in this area is high, and controllers will regularly use tactical routeings as described in paragraphs 4.34-4.40.
  - c. It is possible that some parts of the pre-programmed route get used regularly, as controllers instruct aircraft to re-join that route once they are satisfied that tactical intervention is no longer required. This would cause a concentration over that portion of the route.
  - d. We expect an arrival would typically be between 600ft and 1,000ft higher than the current equivalent arrival, during the descent to 4,000ft in this area.
  - e. Arrivals:
    - *are most likely* to be positioned within the red lines at the typical altitudes shown by blue, pink and yellow shading; they:
    - *would usually* be within the black dashed lines; however they:
    - *may* occasionally be tactically positioned anywhere within the shaded areas at higher or lower altitudes than shown here. The impacts expected to be experienced by those on the ground due to these occasional flights would be either reduced or unchanged from today.
  - f. Arrivals would typically descend over the South Downs National Park within these smaller swathes at the typical altitudes indicated by the coloured shading, down to 4,000ft at its northern boundary. Currently this park is over-flown more widely, and typically at lower altitudes. There are no Areas of Outstanding Natural beauty within the shaded region below 7,000ft.
- 4.43. See Figures 9 and 10 for information about arrivals as they descend north towards Runways 06 and 24 respectively.
- 4.44. See also Appendix B: Forecasts of Numbers of Flights.

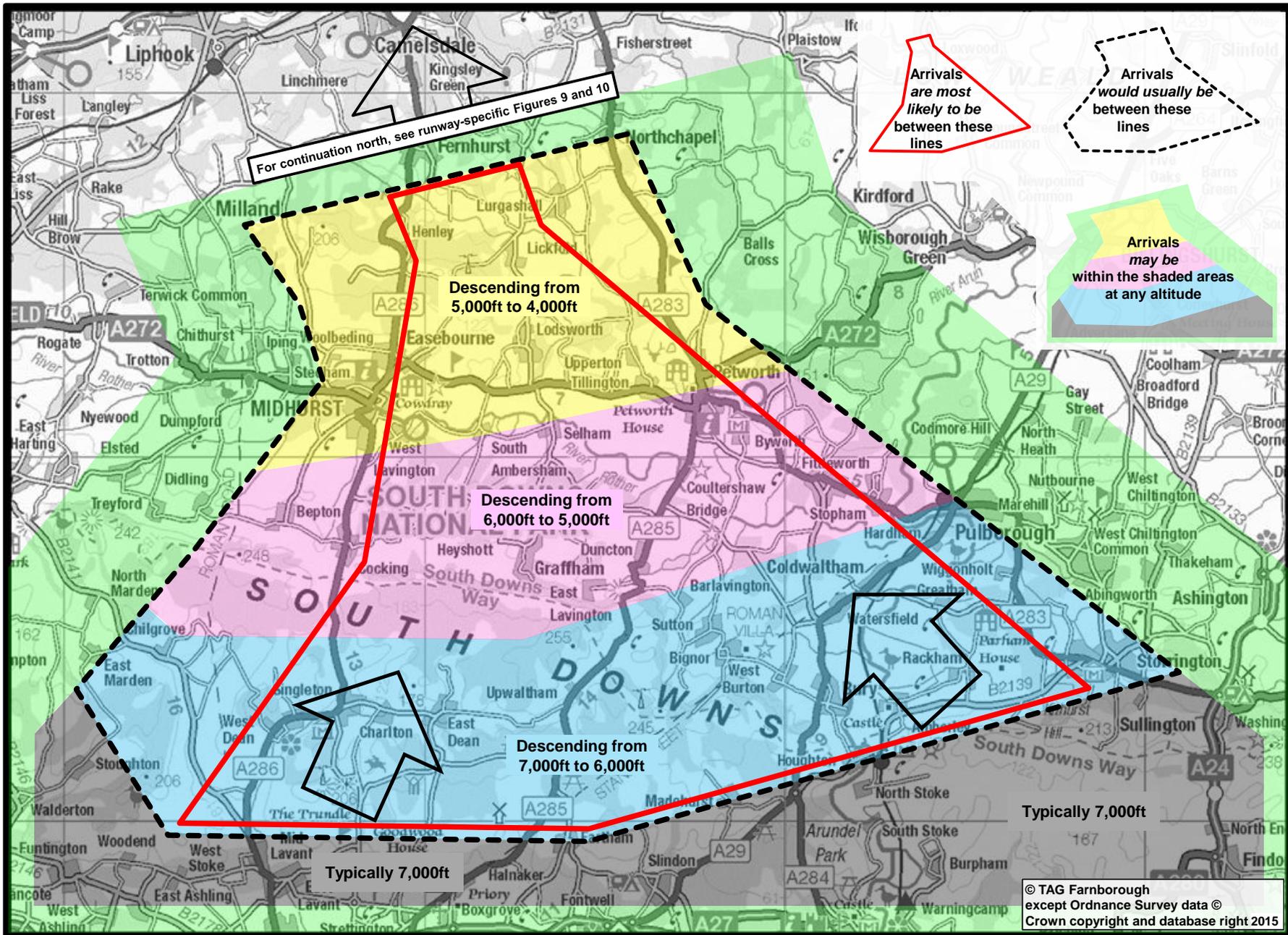


Figure 8 Arrivals to both runways from the south, descending from 7,000ft to 4,000ft

## Runway 06 arrivals from 4,000ft

- 4.45. The arrival swathe to Runway 06 is shown in Figure 9 below.
- 4.46. It takes the following considerations into account:
- a. Arrivals from the south would behave in a similar manner to current day operations, albeit typically in a narrower swathe - see also Figure 8 and associated text.
  - b. An arrival would typically be between 600ft and 1,000ft higher than the current equivalent arrival until nearing final approach where the standard approach altitudes would be flown.
  - c. Arrivals from the north would tend towards the southern edge of the red line, heading southeast to cross the airport (or the final approach track) at 3,000ft-4,000ft, and continue their arrival from the south side of the A31. They will no longer descend to the final approach track directly from the north in the vicinity of Crookham Village below 2,000ft, a manoeuvre they sometimes currently perform.
  - d. Once south of the airport they would then turn right to join a typical landing pattern similar to today, re-crossing the A31 in the vicinity of Upper and Lower Froyle. They would turn onto final approach near Long Sutton or Well, as the arrivals from the south do currently (and at similar altitudes).
  - e. In order of 'most likely' to 'least likely', the spread of arrivals is shown by the red lines, the black dashed lines, and the green shading - see paragraph 4.42.e for details.
  - f. As arrivals join final approach, their altitudes and tracks would become very similar to today.
  - g. The South Downs National Park and Surrey Hills Area of Outstanding Natural Beauty would continue to be over-flown by this portion of the arrival route, generally in a narrower swathe, and at altitudes similar to or higher than today.
- 4.47. See Figure 10 for arrival information to Runway 24.
- 4.48. See also Appendix B: Forecasts of Numbers of Flights.

TAG Farnborough Airspace Consultation

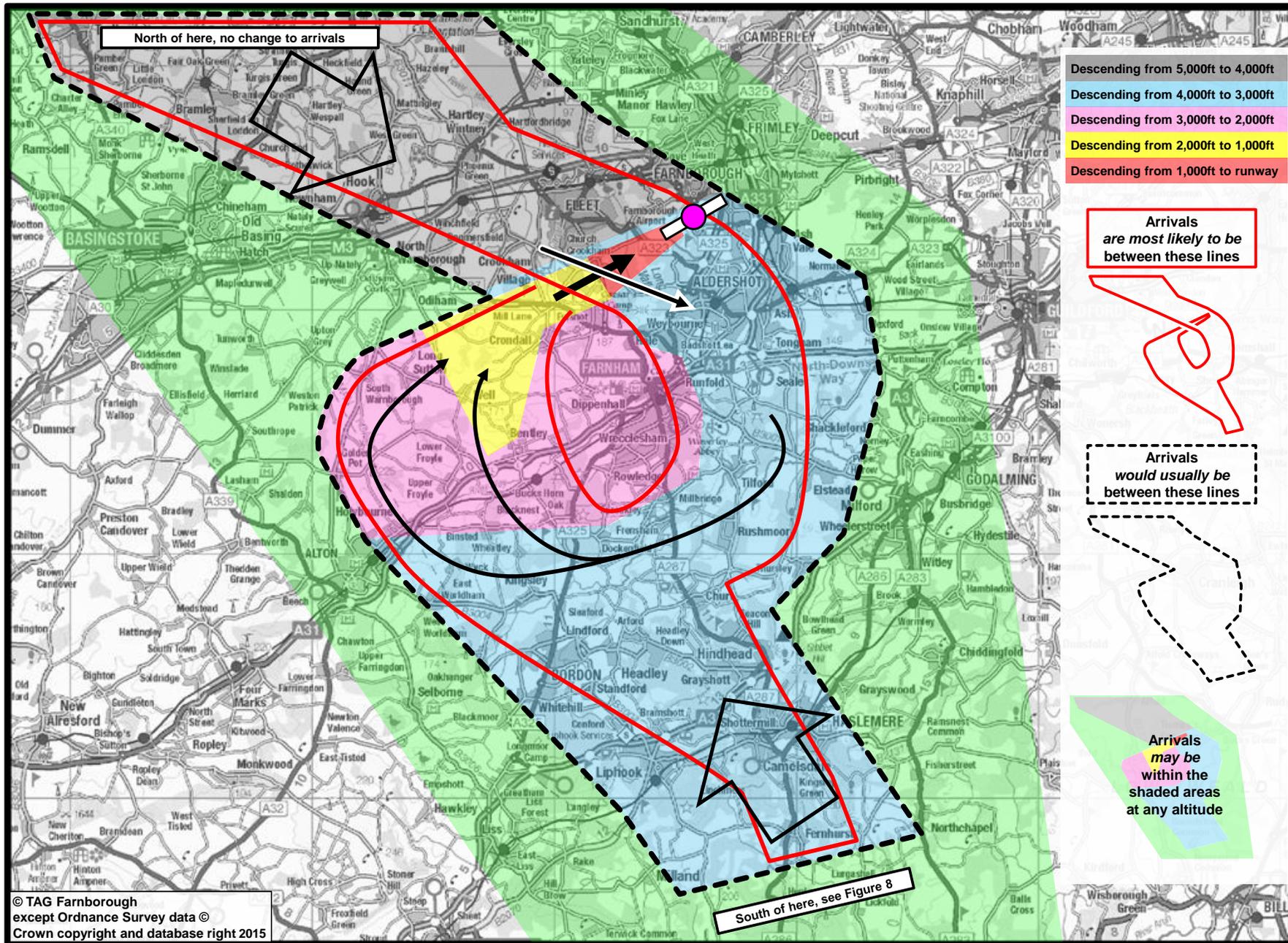


Figure 9 Arrivals to Runway 06, descending from 4,000ft to final approach

## Runway 24 arrivals from 4,000ft

4.49. The arrival swathe to Runway 24 is shown in Figure 10 below.

4.50. It takes the following considerations into account:

- a. Arrivals from the south would behave in a similar manner to current day operations, albeit typically in a narrower swathe - see also Figure 8 and associated text.
- b. An arrival would typically be between 600ft and 1,000ft higher than the current equivalent arrival until nearing final approach where the standard approach altitudes would be flown.
- c. Arrivals from the north would tend towards the southern edge of the red line, but from both north and south would generally behave in a similar manner to current day operations, flying towards the junction of the A3 with the A31.
- d. They would then turn left to join a typical landing pattern similar to today. They would expect to turn onto final approach near Knaphill, as they do currently.
- e. In order of 'most likely' to 'least likely', the spread of arrivals is shown by the red lines, the black dashed lines, and the green shading - see paragraph 4.42.e for details.
- f. As arrivals join final approach, their altitudes and tracks would become very similar to today.
- g. The South Downs National Park and Surrey Hills Area of Outstanding Natural Beauty would continue to be over-flown by this portion of the arrival route, generally in a narrower swathe, and at altitudes similar to or higher than today.

4.51. See Figure 9 for arrival information to Runway 06.

4.52. See also Appendix B: Forecasts of Numbers of Flights.

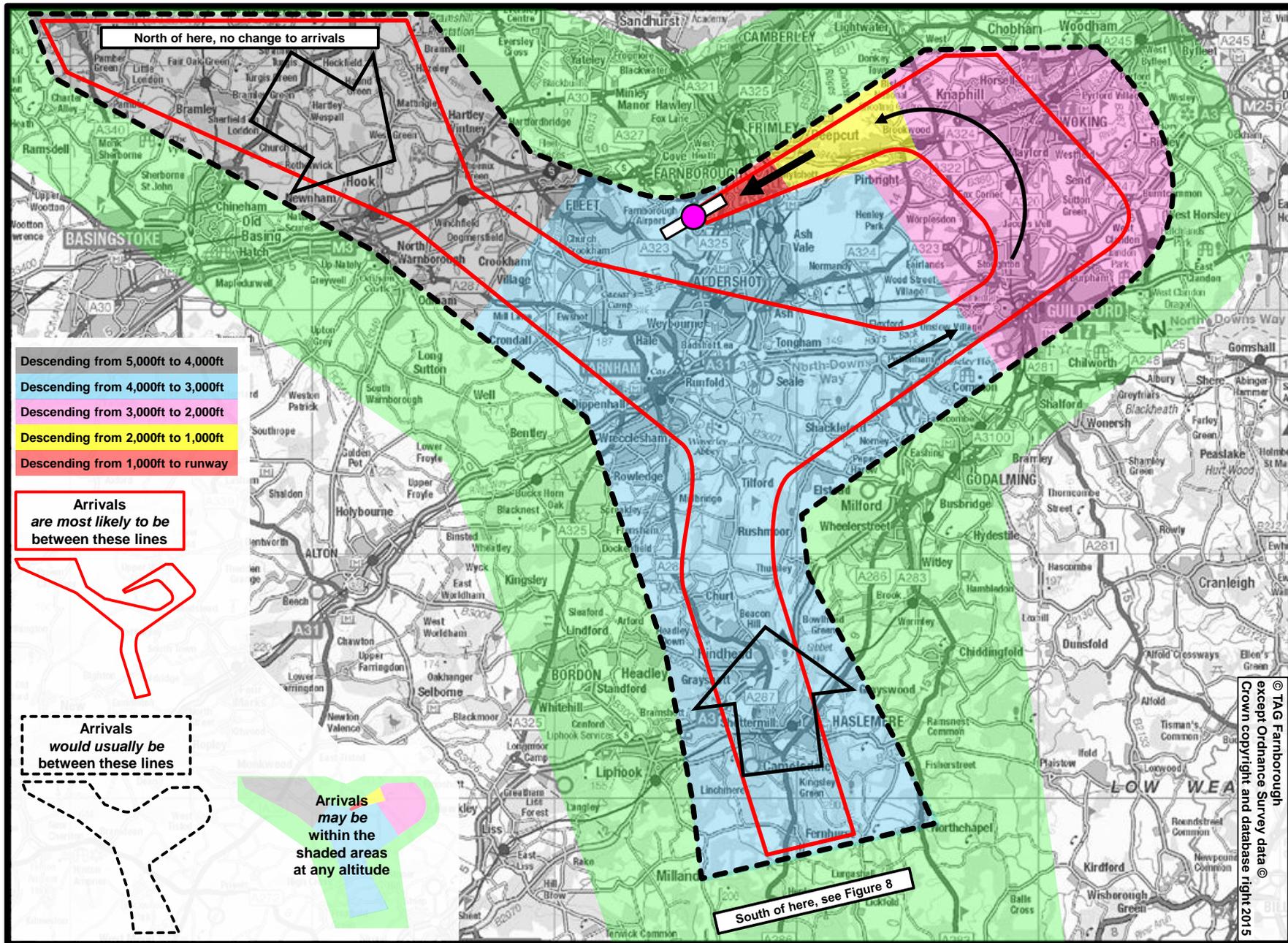
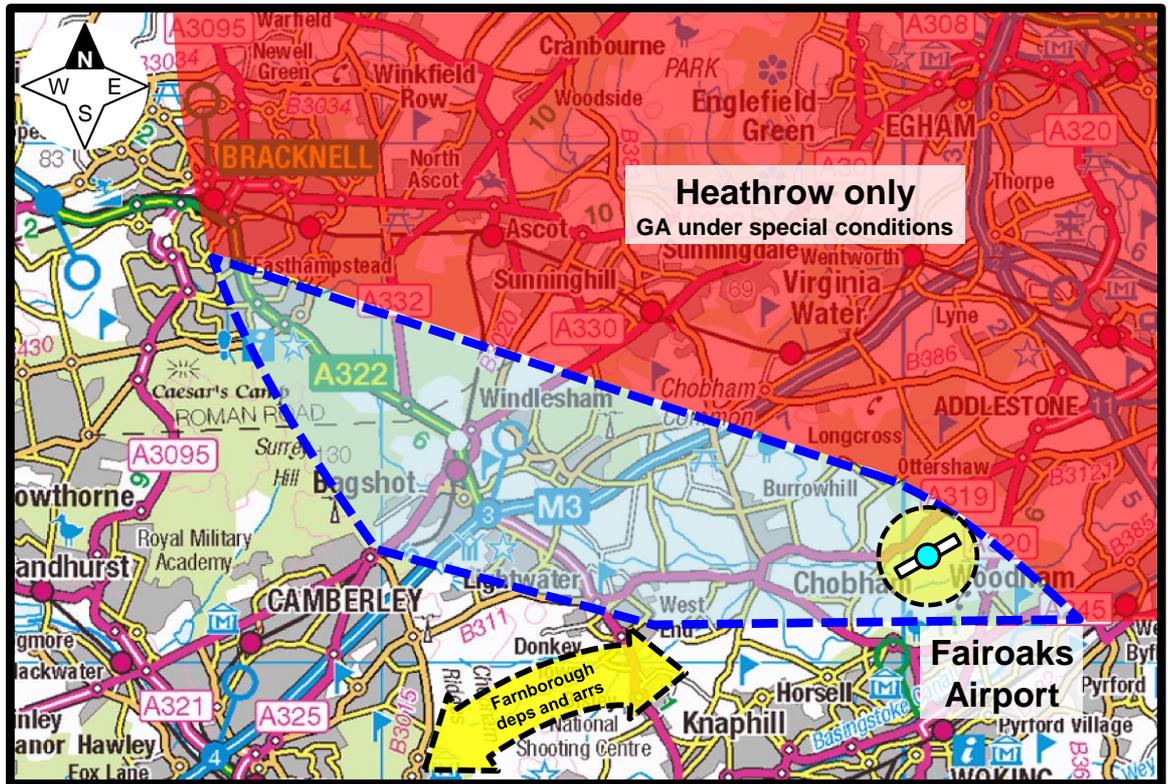


Figure 10 Arrivals to Runway 24, descending from 4,000ft to final approach

## Northern dashed blue area

- 4.53. The consultation material (Ref 3 Part B Section 5) explained our proposal to change some light aircraft arrangements within the northern dashed blue area (see Figure 2 for overview and Figure 11 below for details).
- 4.54. We said that the area illustrated below is currently used by some light GA/S&RA aircraft, including helicopters to/from London and flights to/from Fairoaks airport. We also stated that the consequence of increasing the efficiency in that area would be an increase in light GA/S&RA over-flight, most likely along the 'corridor' it creates between Fairoaks and the west. We gave our best estimate of the numbers of flights based on anecdotal evidence from local experts, including the likely variances due to weather and daylight.



**Figure 11 Northern dashed blue area for Fairoaks GA arrivals and departures**

- 4.55. We received comments regarding this, including objections to the current GA flights, maintenance of the status quo, and objections to the Fairoaks 'corridor' itself.
- 4.56. Some aviation-technical comments suggested releasing that volume/corridor to 'Class G' airspace, i.e. removing all restrictions entirely. That volume is controlled by Heathrow and is not ours to release, but Heathrow are willing to delegate air traffic services to us in that volume. Also, GA/S&RA flight patterns and hence noise impact in that corner would become less predictable than that consulted upon, if all airspace restrictions are removed. Therefore releasing that corner to all GA in an unrestricted manner is not considered further.
- 4.57. The proposal is to implement the corridor, with the same volume of airspace, but with control delegated to Farnborough. This brings advantages to Farnborough, Fairoaks and Heathrow ATC without disadvantages to other GA traffic.
- 4.58. On balance we believe the impact due to the revised arrangement is outweighed by these advantages. We are therefore progressing this part of the proposal.

## No change to RAF Odiham departure routes

- 4.59. The consultation material (Ref 3 Part B Section 6) detailed the predicted impact caused by a proposed change to RAF Odiham's operation. Originally we proposed a change to two departure routes known as the CPT Group 27 and the HAZEL/SAM 09 routes.

- 4.60. We stated that other RAF Odiham routes and procedures would be unlikely to change discernibly under the proposal. We also stated that Boeing CH-47 'Chinook' aircraft would be both the noisiest and the most likely users of the routes.
- 4.61. The GU10, GU34 and RG29 postcode areas were the most commonly reported in Feedback Report Part A (Ref 4), where the major environmental issue raised was a potential increase in aircraft noise.
- 4.62. Following the consultation, we revised our proposed CAS and departure routes. As a result we have removed the proposed changes to these two RAF Odiham routes. Hence they would remain unchanged under this proposal.
- 4.63. We have a close working relationship with RAF Odiham and we continue to ensure our operations integrate safely and efficiently.
- 4.64. Military aircraft may fly anywhere in the vicinity according to their operational need, and tend to fly relatively low as part of that operation. This situation would not change due to this proposal. Changes to their operational requirements are independent of this proposal.

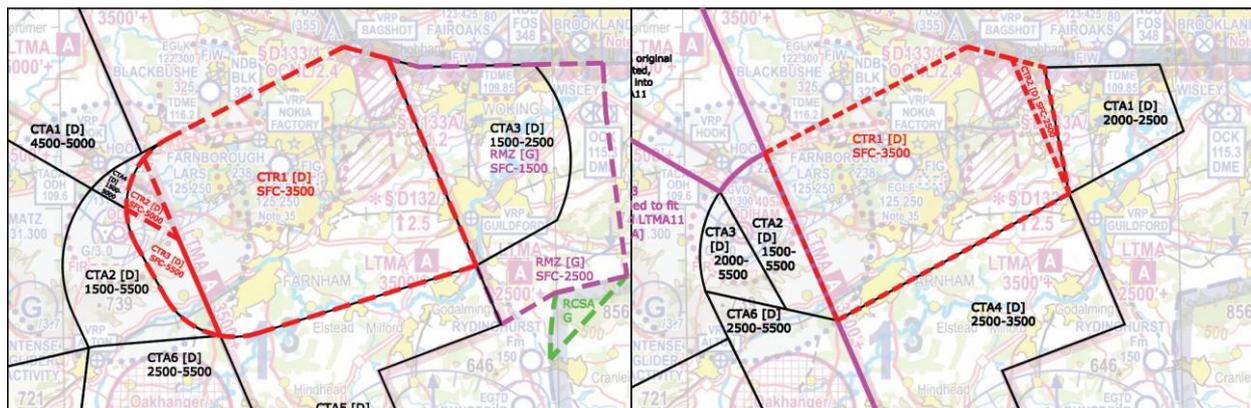
## 5. Airspace and Route Design: Aviation Technical

- 5.1. This section describes how the airspace and route designs have been modified as a direct result of the feedback received during consultation. It has been written with an aviation technical audience in mind. Section 4 of this report discusses general information and has been written with a non-technical audience in mind.
- 5.2. The modifications to the design were based on reducing the impacts on other aviation users. This includes the Ministry of Defence (MoD), General Aviation and Sports and Recreational Aviation (GA/S&RA) users such as private pilots and gliders etc.
- 5.3. The main drivers for modifying the proposal were:
  - a. Access and sustainability for the GA community, and near-replication of current flight patterns for those GA who routinely would not contact ATC;
  - b. Consideration of suggestions and concerns regarding over-flight by GA and MoD aircraft. This included displacement of GA and MoD aircraft either through compression or lateral movement (to ensure that these users did not have to start operating significantly differently and in different areas); and
  - c. GA safety concerns with regard to funnelling in two key areas.
- 5.4. We specifically targeted three areas of airspace to mitigate these concerns:
  - a. The Control Zone ('CTR', airspace that starts at the surface) and adjacent areas
    - Could the CTR be reduced in size to the southeast, to reduce potential GA funnelling near Gatwick?
    - Could the airspace base near Fairoaks/Guildford be raised and still provide for safe integration of aircraft within the CTR?
    - Could the CTR be reduced in size to the west, to facilitate RAF Odiham operations and Lasham gliding?
  - b. Exploit the high performance of departing Farnborough aircraft to release or raise airspace between Lasham and the South Coast.
    - Considerable discussion and simulation with NATS Terminal Control was required (who control the aircraft entering and leaving the high density complex of the London Terminal Manoeuvring Area), to reduce likely funnelling and compression in this area.
  - c. Review the remaining proposed airspace to further refine it by asking:
    - Is the airspace still required, once targets a. and b. above have been considered?
    - Could the bases be raised further whilst still meeting the objectives of the proposal?
    - Could the airspace be reduced in size whilst still maintaining safety?
    - Could the airspace be simplified to reduce charting complexity?
- 5.5. Using the points and questions above, we believe the design modifications address a significant number of concerns raised in consultation, and use many of the ideas, suggestions and information supplied.
- 5.6. The extent of new controlled airspace (CAS) required by the airspace system proposed here (Option 34) is significantly smaller than the original Option 25 as consulted upon.
- 5.7. The lateral extent (area, km<sup>2</sup>) of the proposed airspace was reduced by 20%. The overall volume (km<sup>3</sup>) of the proposed airspace was reduced by 32%.
- 5.8. The increased exploitation of climb performance reduces the airspace required to support the operation to the west and southwest in particular, because the 'one way system' sends departures in that direction. Arrivals from the south will tend to use the eastern side of the proposed airspace. The designation of airspace volumes has also been reviewed.
- 5.9. This mitigates the impacts on the GA community and the MoD, with the consequence that GA and MoD would be more likely to operate in the same or similar areas they do today. This leads to the noise impact from these aircraft being similar to today.

## Summary of key changes (see also Appendix C Aviation Charts)

### Control Zone (CTR) and Control Areas (CTA) in the immediate vicinity of Farnborough, Fairoaks and Blackbushe

- 5.10. The original small CTR was designed to protect our arrivals and departures, to be compatible with RAF Odiham and to allow for straightforward VFR transits. We were challenged to further reduce the impacts the CTR might have on other airspace users, primarily by suggesting it be made even smaller and the RMZ removed. These points came from consultation feedback, primarily via concerns about funnelling/ compression especially in the 'gap' between Guildford and Gatwick.
- 5.11. The proposed CTR has therefore been further reduced in size, the originally proposed RMZ has been removed and the CTAs to the immediate east and west have also been reduced in size and their bases raised by at least 500ft.
- 5.12. These modifications are still predicated on the regular provision of VFR transits. It would allow for a near-replication of current-day GA traffic patterns.



**Figure 12 CTR: Consulted Option 25 (L), Post-Consultation Option 34 (R)**

- 5.13. The reduction in overall width and length has been made possible by introducing a small sliver of CTR to the east (right hand illustration, CTR2) and by reducing the CTA/RMZ requirement in that area. Option 34's CTR2 is designed to reduce TCAS alerts between Farnborough aircraft on final approach to Runway 24 and aircraft operating beneath the revised CTA1 south of Fairoaks, the primary GA departure route from that airfield. We contend that the addition of CTR2 is far outweighed by the removal of significant volumes from the CTR/CTAs in the vicinity.

### Blackbushe and Fairoaks Airports

- 5.14. Both Blackbushe and Fairoaks airports have agreed in principle with Farnborough operational details to minimise impacts. These will become formal Letters of Agreement if our proposal is approved.
- 5.15. Fairoaks would gain an alternate arrival/departure route through the Heathrow CTR to the northwest of Bagshot, enhancing their operation and reducing the impacts on ours. The southwestern edge of the Heathrow CTR would be delegated to Farnborough ATC for Fairoaks traffic under this proposal.
- 5.16. The corridor would not be available for non-Fairoaks traffic, which should expect to transit the Farnborough CTR.

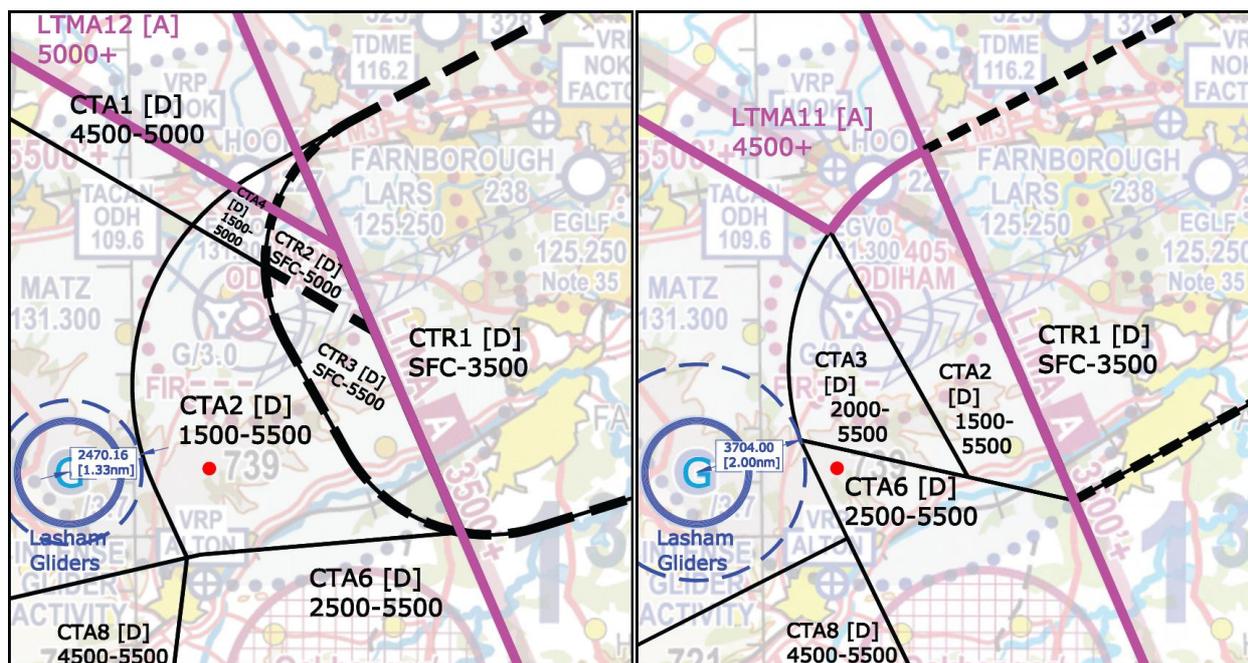
### Gatwick CTA corner

- 5.17. The potential to release the northwestern corner of the Gatwick CTA has not been progressed post-consultation.
- 5.18. Feedback was received that it did not add a significant advantage to the GA community due to the high ground adjacent.

5.19. The original reason for that option was to reduce the potential impact of funnelling caused by a CTA in the vicinity of OCK. That CTA (was CTA3 under Option 25, is now proposed as CTA1, see Figure 12) has subsequently been both raised vertically and shrunk laterally, mitigating those potential impacts.

### Vicinity of Lasham Aerodrome (including Lasham Gliding Society LGS and ATC Lasham Airliner Maintenance). Vicinity of RAF Odiham.

5.20. The airspace in this area requires a balance between protection for IFR aircraft inbound to our Runway 06 against the requirements of RAF Odiham and Lasham Gliding Society LGS. Note that there would be no negative impact on ATC Lasham's maintenance base for their commercial airliner servicing business. Our original consultation considered this balance and proposed a workable design, however we were challenged to improve that design in order to further reduce the impacts on these neighbouring airspace users.



(Left) Consulted Option 25

Post-Consultation Option 34 (Right)

Figure 13 Lasham-Odiham area

5.21. Lasham Gliding Society LGS suggested some options and gave us information about their operation, as follows:

- a. Farnborough should increase the maximum tailwind component from 5kt to 10kt to decrease the overall use of Runway 06 (which impacts LGS most);
- b. Farnborough should operate without CAS protection for approaches to Runway 06 (which would impact LGS most), but within a CTR of 5nm radius;
- c. Farnborough should design a visual approach with prescribed RNAV1 track, similar to that in the Israeli AIP for Tel-Aviv Ben-Gurion's KEREN arrival to their Runway 26. This would reduce potential impacts on LGS;
- d. LGS' circuit arrangement for novice glider pilots typically requires towing to an altitude of approximately 2,000ft, out to approximately 2nm from their airfield, so CAS within this area would be particularly impactful.

5.22. Their information was considered as follows:

- a. Tailwind component - Farnborough's larger types such as Boeing, Airbus and Gulfstream V would not be able to operate in a safe manner, increasing the likelihood of unstable approaches and runway excursions. A change to the maximum tailwind component cannot be progressed.  
Consequently the use of Runway 06 for our operations is likely to continue at about 20% (which is already about 10% lower than typical for an easterly runway in the South East of England).
- b. The consequence of a 5nm radius circular CTR would not provide adequate protection for the SIDs or approaches, would not significantly improve the predictability or efficiency of the operation, and would likely increase rather than decrease noise impacts in the local area due to these inefficiencies.  
See paragraph 5.10 for details of the proposed modifications to the CTR.
- c. The Tel-Aviv KEREN procedure could not be transposed to the UK because it does not use the same design criteria.  
The UK is required to use criteria known as ICAO DOC 8168 PANS OPS, whereas Tel Aviv uses FAA TERPS criteria for this procedure.  
We use a group of UK-qualified Procedure Design experts to produce the required charts and technical data for all our SIDs and STARs. This Procedure Design Group examined the Tel-Aviv KEREN procedure and declared it to be not viable using PANS OPS criteria.  
Therefore it is not possible to consider this type of procedure at Farnborough.
- d. The proposed CTAs between Lasham and Odiham originally extended to 1.3nm from the centre of Lasham's airfield, to 1,500ft (Figure 13 on the left).  
We took their information about circuits from the airfield and used it to revise the CTAs (Figure 13 on the right).  
The closest any proposed airspace is to Lasham's airfield centre is now 2nm at 2,000-2,500ft altitude.  
The spot-height of 739ft (red dot) is not only a useful reference point, but allows for a 1,761ft Class G vertical gap between the high ground and the modified CTA6 airspace base. We believe that this compromise goes some way to mitigating these concerns.

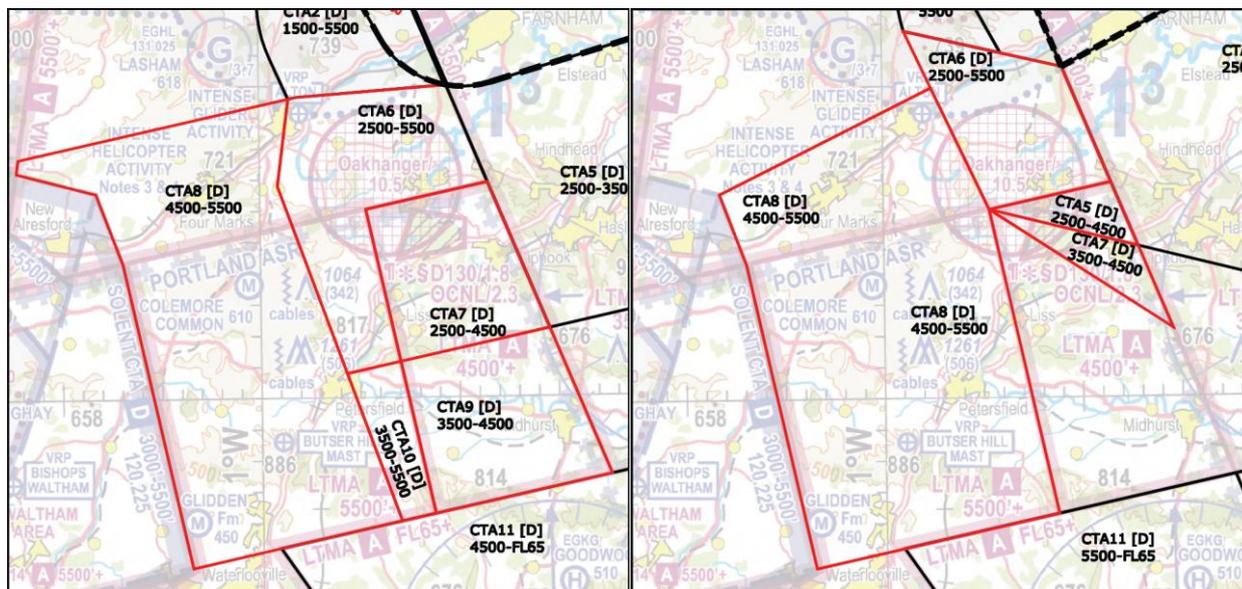
5.23. As with all our aviation neighbours, we are keen to pursue a working discussion with Lasham Gliding Society regarding operational details and practicalities.

### **RAF Odiham**

5.24. We have negotiated an agreement with RAF Odiham to enable the flexible use of the revised CTAs in this area, for their gliding operation. Other Farnborough-Odiham operational issues have been agreed equitably in principle and will become a formal Letter of Agreement if our proposal is approved.

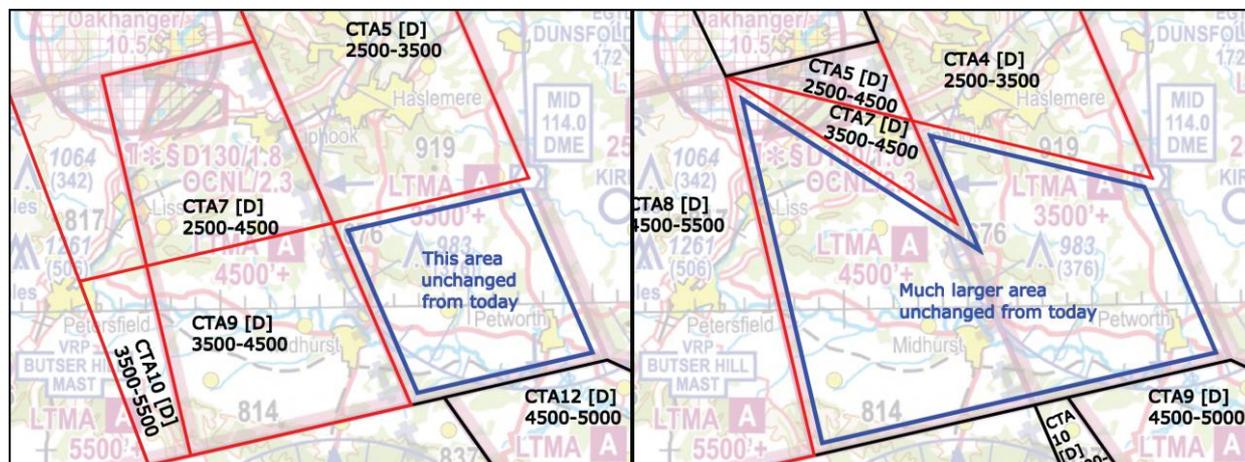
**Western and southern areas**

5.25. Airspace volumes impacting the gliding community and similar non-powered/ low powered aircraft have been reduced, their bases raised and their 'corridor' widened, to almost replicate how they currently fly to and from key sites, such as between Lasham and Parham.



**Figure 14 Western: Consulted Option 25 (L), Post-Consultation Option 34 (R)**

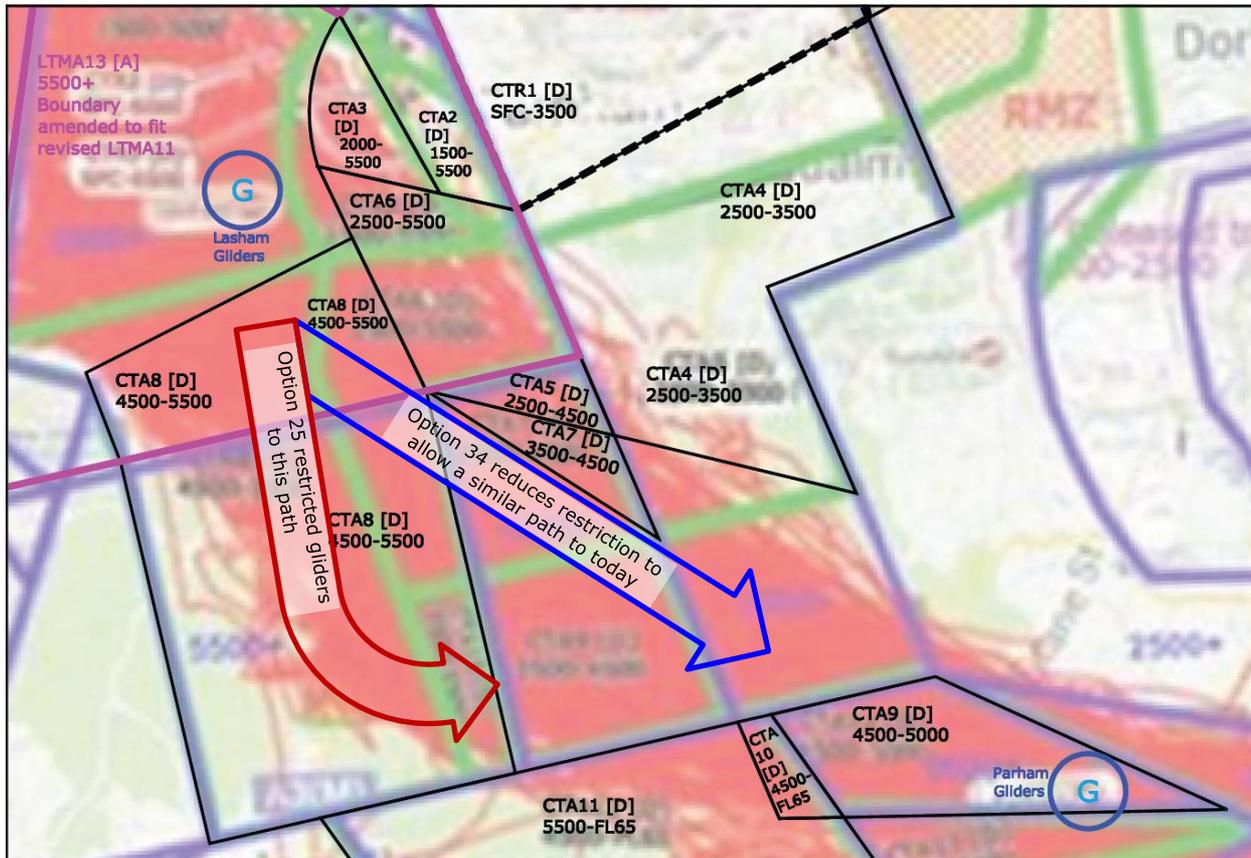
5.26. Note how the northern edge of CTA8 has been shifted south, away from Lasham, following consultation feedback.



**Figure 15 Southern: Consulted Option 25 (L), Post-Consultation Option 34 (R)**

5.27. Note how today's bases (blue) have been retained in a much larger area following consultation feedback.

- 5.28. The modifications to CTAs 4, 5 and 7 on the right hand chart in Figure 15 were made using information and data supplied to us by Southdown Gliding Club (SDGC) for this consultation (see adjacent and below).
- 5.29. Their information allowed us to increase the size of the unchanging areas, meaning the gliding transit 'corridor' could be near-replicated.

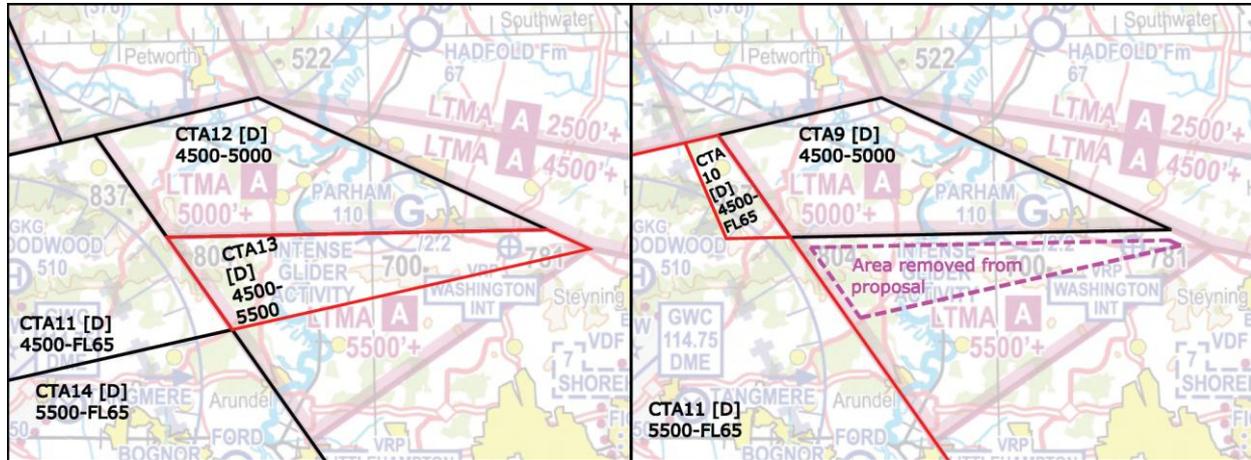


**Figure 16 Spread of glider corridor flying between Lasham and Parham**

- 5.30. The illustration above shows the current spread of gliders. We are grateful to SDGC for supplying the information, but are unable to enhance the quality of their image. The green outlines show that our original airspace would have funnelled gliders to the west, forcing an L-shaped path, increasing their flying distance and density. Our revised airspace would cause a far smaller reduction in width, allowing for a similar path to be flown, reducing funnelling and compression.
- 5.31. This reduces the overall impacts on gliders specifically, retaining today's 4,500ft and 3,500ft bases in key areas. The CTAs we propose are the smallest CTAs with the highest possible bases that would support our operation whilst significantly reducing the impacts on gliders transiting Lasham-Parham or vice-versa.

### Southern area overhead Parham gliding site

- 5.32. Option 25's CTA13 to the south of Parham was originally intended to allow our arrivals to descend through 6,000ft towards 5,000ft.
- 5.33. Following simulations and expert opinion, it was considered that the area would only occasionally be 'grazed' by arrivals under certain circumstances.
- 5.34. We took the opportunity to reduce the impact on Parham's south side by removing that volume.



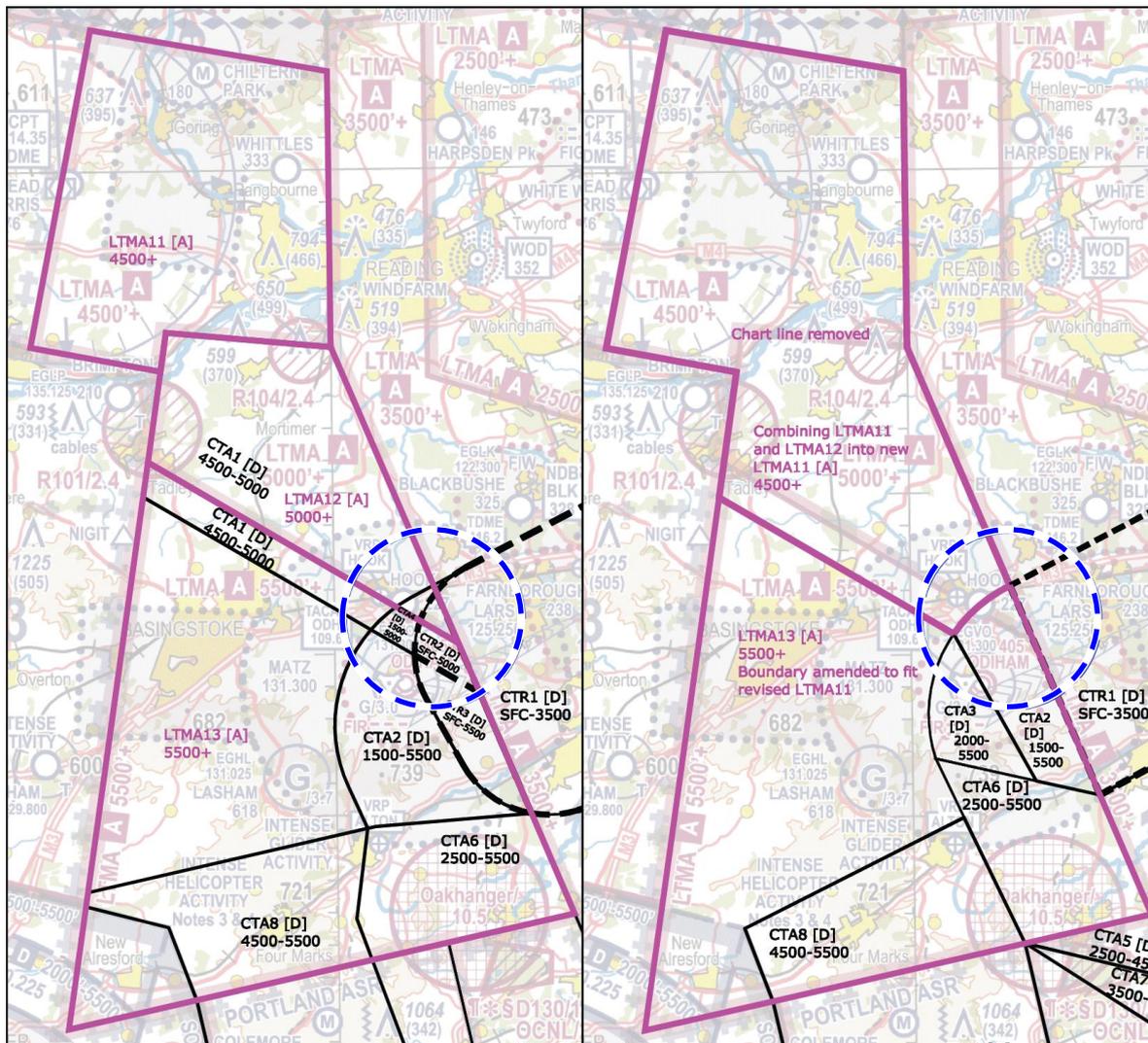
**Figure 17 Parham area: Consulted Option 25 (L), Post-Consultation Option 34 (R)**

- 5.35. The small sliver of Option 34's CTA10 (right hand illustration) is where our proposed arrivals may still descend through 6,000ft towards 5,000ft. This allowed us to raise the proposed base of Option 25's CTA11 (left hand illustration) amalgamating it with Option 25's CTA14, to create a single, higher, wider base. See Option 34 CTA11. This would also reduce the impact on Goodwood aerodrome by reducing the originally-proposed 2,000ft CAS base drop north of that airfield, to a 1,000ft base drop.
- 5.36. The area directly above Parham could not be changed (Option 25's CTA12, Option 34's CTA9). Note that the base is proposed to drop by only 500ft, minimising the impact as much as possible.

### Northwestern areas and LTMA12

- 5.37. This area was originally proposed to both protect, and to increase the predictability of, our arrivals from the northwest whilst minimising the impact on GA and MoD airspace users.
- 5.38. The originally proposed volume was the smallest and highest it could be to achieve the necessary protection for the arrival route – it measured only 500ft beneath, and 1nm wider than, LTMA12.
- 5.39. This would create an overall CAS base of 4,500ft, with a large volume of Class A thinly 'coated' with Class D. LTMA12 also includes part of the Heathrow Radar Manoeuvring Area RMA.
- 5.40. We received feedback regarding the complexity of airspace boundaries that would be introduced, potentially causing difficulty with VFR navigation.

- 5.41. We identified this area as a particularly complex confluence of Class A and Class D boundaries. See the area highlighted by dashed blue circles in Figure 18, comparing left with right:



**Figure 18 NW area: Consulted Option 25 (L), Post-Consultation Option 34 (R)**

- 5.42. We originally consulted upon Class D in the area beneath, and adjacent to, LTMA12. The decision was made at the time with the best intentions and knowledge. We believed it would be possible to provide some VFR access (albeit extremely limited due to the proximity of LTMA12).
- 5.43. Following simulations and discussions with LTC controllers, we identified that it would be extremely challenging to safely control VFR traffic in these two small volumes that closely adjoin a major piece of Class A LTMA. Due to the fact that we proposed minimal airspace dimensions, VFR access to these volumes of Class D could rarely have been achieved in practice. This came to light as the process developed.
- 5.44. In order to achieve the objective of the proposal and to react to the feedback, we propose a significant reduction in the complexity of these boundaries and consequently the charting issues raised by stakeholders. A matching volume of airspace is required – there is no opportunity to make the overall volume smaller in this area.
- 5.45. Therefore the best way to reduce the complexity whilst retaining the matching overall volume would be to create one single volume.

- 5.46. The consequence of this is that the volume would need to be Class A LTMA with a base of 4,500ft, subsuming the originally-proposed Class D slivers and rationalising the boundaries. This includes combining LTMA12 with LTMA11 at CPT, further reducing the number of CAS charting lines, and revising LTMA13's outline.
- 5.47. We contend that this is the best solution to a complex problem. The intended spirit of Class D is to provide VFR access, which would be impractical in those minute volumes so closely abutting Class A LTMA.
- 5.48. We have therefore not increased the impacts on other airspace users in this vicinity since consultation, and have simplified CAS boundary charting following feedback.

## **Other considerations**

### **Balloon Operators**

- 5.49. Balloon operators intending to operate within Class D CAS would be accommodated by prior arrangement or by tactical agreement as far as practicable.

### **Flight training schools**

- 5.50. All local aerodromes have flight training schools. The impacts on flight training at these schools match the impacts this proposal would have on the individual aerodrome. We would encourage flying instructors to use the CTR as an example of how to request VFR transit, if our proposal is approved.

### **Heathrow and Gatwick departure climb gradients**

- 5.51. In the consultation Part E Section 16 (Ref 3) we stated that a technical increase to the minimum gradient of Heathrow MID and SAM SIDs is required to ensure their separation from our proposed CAS. Heathrow Airport Ltd (HAL) agreed to this because it would make no material change to their departures.
- 5.52. We will continue to discuss the technical changes required with HAL. We are committed to enabling HAL to keep their local communities fully informed before these technical changes are implemented.
- 5.53. We also made a similar statement about Gatwick. However since we have modified our design, the Gatwick SID technical requirement has been removed from consideration.
- 5.54. There would be no noticeable change to Heathrow or Gatwick departures due to TAG Farnborough's proposal – this is a technical ATC change.

### **Visual Reference Points (VRPs)**

- 5.55. In the consultation Part E Section 9 (Ref 3) we proposed establishing six new VRPs (Godalming, Tongham, M3 J3, M3 J4, Wokingham and Fleet Pond) and disestablishing one (Nokia factory). Analysis of the feedback received regarding these VRPs was generally divided into 'Suitable' and 'Not suitable but no alternative provided' (Ref 4 page A69).
- 5.56. Now that the proposed CTR and CTA boundaries have changed due to feedback, two of the proposed VRPs have been removed and two others added. M3 J3, M3 J4, Fleet Pond and Tongham remain as per the consultation. Godalming and Wokingham have been removed from the proposal. Wisley disused airfield (already marked on VFR charts) is to be upgraded to VRP status. Nokia factory is still to be withdrawn. Farnham Castle and Frensham Great Pond have been newly added.
- 5.57. Both these newly-proposed points are well known to, and already regularly used by, local pilots. There are limited residential areas in the vicinity.

- 5.58. We will apply to establish these seven VRPs and to disestablish Nokia. The establishment of VRPs follows a different process to an ACP, and will be progressed before the ACP. These points will be useful to all VFR traffic in the area regardless of the outcome of this ACP.

**Standardised European Rules of the Air SERA:  
VMC, Special VFR**

- 5.59. In November 2014 the CAA announced that the UK intends to derogate from the VMC and Special VFR parts of SERA that would particularly impact GA/S&RA pilots. These parts of SERA were the ones causing comments and issues to be raised in this consultation. These impacts of SERA are now not relevant to this consultation.  
A CAA statement can be found by searching online for 'CAA announces SERA derogation'.

**SERA: Non-radio operations in the proposed CTR**

- 5.60. The CAA has considered the impact of SERA.6001(d), which requires continuous air-ground voice communications for all flights within Class D.
- 5.61. Their formal guidance to us is that Rules of the Air 2015 Rule 25 takes precedence, which allows for exceptions under certain conditions detailed in paragraph 3 of that Rule.
- 5.62. If our proposal is approved, we would endeavour to provide a service to non-radio aircraft within the Class D control zone, subject to prior agreement, workload and practicalities of the particular circumstances.

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## The local airspace system: Farnborough LARS and Approach Radar, GA flight analysis, simulations, funnelling and compression

### About Farnborough Lower Airspace Radar Service (LARS)

- 5.63. LARS is a safety-driven service that is cost-free to all users.
- 5.64. In 2014 over 100,000 flights received a service from Farnborough LARS. Almost 800 flights received assistance in avoiding CAS infringement. The latest data shows that, in May 2015, 130 flights avoided CAS infringement due to Farnborough LARS.
- 5.65. LARS works best when relevant information can be given to all parties, but those that participate are often given information on those that do not, benefitting both parties.
- 5.66. One of Farnborough LARS' purposes is to assist in areas where funnelling already happens, such as around and beneath the complex London TMA. It is a popular, heavily subscribed service with many pilots using it regularly, and we commit to supporting that service. However, many pilots prefer not to contact any air traffic unit.

### How were GA flight patterns and altitudes analysed?

- 5.67. We analysed GA flight patterns within 40nm of Farnborough. We used radar data, the Class G Airspace Modelling Feasibility Study by QinetiQ for the CAA/Airspace & Safety Initiative (Ref 7), and commissioned studies on GA flight patterns to inform the design of Option 25, as consulted upon.
- 5.68. This data and information ranged from gliders (and tugs) through the various types of low or non-powered flight, military users, powered flight, non-transponder equipped aircraft, aerobatic aircraft and balloons.
- 5.69. We combined this analysis with the extensive information acquired from aviation stakeholders during the consultation itself.
- 5.70. This informed our decisions on modifications to the proposed airspace, resulting in Option 34 presented here.

### How was the system concept designed, with respect to GA CTR transits?

- 5.71. Since its inception, TAG Farnborough has always made it clear that we expect to work with local airspace users in order to provide a transit service.
- 5.72. The efficiency of the proposed airspace system relies on pilots requesting transit, and ATC consistently providing clearance without delay. We intend to try to replicate the paths of today's GA flights as far as practicable because this would provide continuity for pilots and controllers alike.
- 5.73. June 2014's transponding VFR traffic was analysed in the LARS West area, including SSR conspicuity codes. This was the busiest LARS period that year, with 3,286 flights in the data sample.
- 5.74. We analysed the tracks transiting the vicinity of the proposed CTR - see bar graphs overleaf.
- 5.75. On average, about 6 per hour transited that area. However, the peak periods were typically between 10-18 equivalent transits per hour, some 2-3 times the average.
- 5.76. The typical transit altitudes were analysed.  
Those operating up to 1,500ft tended to be in the Blackbushe circuit.  
The majority operated between 1,500ft-2,500ft.  
About 10% operated from 2,500ft-3,400ft, where 3,500ft is the base of the LTMA.

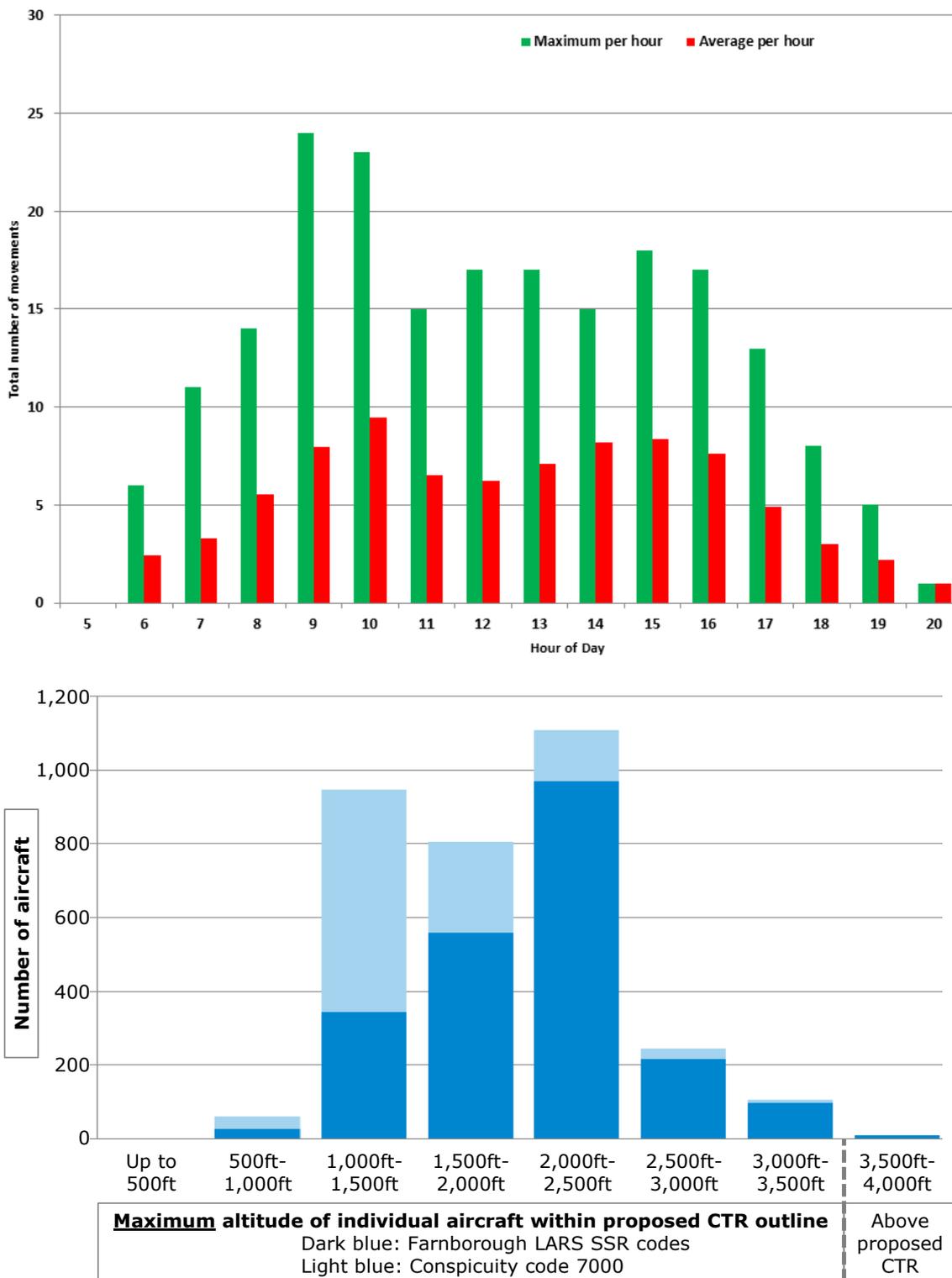


Figure 19 Analysis of transponding GA flights in vicinity of proposed airspace

(Top) Average per hour, and maximum per hour  
 (Above) Maximum altitude achieved by individual aircraft in the vicinity of the proposed CTR

5.77. We analysed all the other areas under the proposed CTAs and below current LTMA CAS in a similar way.

## Funnelling

- 5.78. A major concern raised in consultation was that pilots would not request a transit clearance because they expect to be denied, at the altitudes they wished to use. The perception was that Farnborough Radar would either be unable, or unwilling, to provide transit clearance.
- 5.79. If we denied access, we make everyone's job harder, which is against the spirit and intent of this proposal.
- 5.80. Denial of transits would increase the numbers of flights around the CTR, increasing the overall complexity of the system – especially if their intents are unknown, such as pilots who choose not to make contact and must avoid all CAS.
- 5.81. The CAA's guidance to GA pilots recommends planning for a 'denial' scenario but this does not mean denial will be the default reaction of our controllers. The opposite is most likely because it would help them manage the overall area more efficiently.
- 5.82. If pilots request a transit through the CTR at their desired altitude and track, they are highly likely to be issued a clearance conforming with their wishes without delay. This reduces the likelihood of funnelling. Other modifications to the proposed airspace have significantly reduced or eliminated funnelling in other key areas.

## Compression

- 5.83. The majority of transponding traffic operating today does so at levels below the proposed CAS bases.
- 5.84. For example, the altitude analysis of GA flights (see Figure 19 on previous page) shows that the majority (90%) fly up to 2,500ft *even* where the CAS base is 3,500ft.
- 5.85. The base of the majority of our proposed CAS volumes is 2,500ft or above.
- 5.86. This means that compression is less likely to happen than originally perceived, typically by 100ft for 90% of the GA flights.
- 5.87. The 10% of LARS-type flights that typically use higher altitudes would be accommodated upon request – they are highly likely to be issued a clearance conforming with their wishes without delay.
- 5.88. The vertical challenge for the gliding community is crucial – height gained enables more track miles to be flown, with a lower risk of off-field landings. The team met with local gliding clubs to better understand the critical infrastructure needed, and following the consultation further feedback was acquired, considered and actioned.
- 5.89. We are conscious that all glider types, including hang-gliders and para-gliders, need as high a ceiling as possible. We have endeavoured to keep the ceilings high in critical gliding areas, and their lateral dimensions as small as possible.
- 5.90. We wanted to ensure that those communities who do not usually communicate with ATC, such as gliders, could continue to operate in this way, attempting to provide for near-replication of current usage patterns as far as possible.

## How was the system simulation-tested and what were the results?

- 5.91. As per the analysis in paragraph 5.75, peak periods for CTR transit were between 10 and 18 per hour.
- 5.92. We simulated peak periods up to 15 transits per hour. There was little or no delay to CTR transits being granted.
- 5.93. We predict little or no delay for peak periods of up to 20 CTR transits per hour. Beyond 20 per hour some transit delays are predicted, which we contend is not unreasonable - 20+ transits per hour is classed as very heavy traffic.
- 5.94. To test the system robustly, our own traffic was also being simulated at levels nearly double that expected by our 'most likely' movements forecast for the year 2019. Also included was a busy period for RAF Odiham .

- 5.95. This shows that the modified airspace design works for all users and has been tested to levels beyond the maximum allowed by our planning permission, providing reassurance that traffic peaks can be handled.  
If approval is granted, we will be held accountable by the CAA regarding provision of access to Class D CAS, especially the CTR.

**How does TAG Farnborough plan to engage with the GA community, should approval be granted?**

- 5.96. Comprehensive engagement is planned with the GA community to allay concerns about requesting an ATC clearance. Examples proposed are sponsored fly-ins, presentation evenings, controller-pilot workshops, group briefing sessions, internet-based information packages and magazine articles.
- 5.97. We intend to engage GA organisations to help build an effective awareness programme which will focus on the end user – the GA pilot.  
TAG Farnborough will invest in resources to make the programme effective.

**Examples of planned improvements to support CAS access**

- 5.98. Planned Farnborough ATC system improvements include:
- a. Revised controller resource allocation for core VFR hours and for pre-organised GA special events;
  - b. Analysis of Farnborough LARS' internal boundaries between West, North and East sectors, to optimise controller resourcing;
  - c. Additional specific-purpose SSR codes for LARS and Approach Radar including;
  - d. An 'intent to request transit' SSR code to wear when approaching the CTR, pre-warning the controllers to expect a call, increasing the likelihood of a quick and simple VFR transit.
- 5.99. These would reduce the overall impacts on GA and MoD whilst retaining a safe and efficient operation, including the ability to integrate VFR transits.

**Commitment to provision of access**

- 5.100. TAG Farnborough is committed to ensuring that the fundamental requirements of introducing Class D airspace are met or exceeded. This means that fair and equitable access is provided based on that airspace classification.
- 5.101. We are also committed to ensuring that our air traffic service provision (equipment and personnel), through LARS and Approach Radar, has the capability to support flights both within and through the proposed airspace, and its Class G surroundings.

**Who could contribute to reducing funnelling?**

- 5.102. The continued (and extended) provision of LARS and Approach Radar is designed to mitigate the impacts of funnelling due to this proposal by making CAS transits simple to request and quick to execute.
- 5.103. This system would work at its best if local airspace users understand it, and are willing to participate. This is why we plan to work with the GA community and also to upgrade our own internal systems and procedures.
- 5.104. We encourage pilots capable of transiting the CAS to choose to do so by contacting LARS West. Funnelling of traffic is largely proportional to the number of pilots who elect not to participate in the LARS West service and therefore mitigation relies upon positive engagement of the GA community. We have mitigated the impacts of non-communicating users by significantly reducing the lateral and vertical extents of the proposed CAS (details earlier in this section).

## **Post-Implementation Review**

- 5.105. If this proposal is approved and implemented, it is standard procedure for the airspace's operation to be analysed for at least a full year.
- 5.106. Once that analysis is complete and submitted to the CAA, they will review that analysis and decide whether any changes to the airspace or ATC arrangements are warranted in light of the conclusions they draw.
- 5.107. As per paragraph 5.95, if approval is granted, we will be held accountable by the CAA regarding provision of access to Class D CAS.

## **Conclusion**

- 5.108. The following items demonstrate how we have mitigated the concerns of safety due to funnelling/compression, and of GA access:
- a. We modified the airspace volumes based on consultation feedback and analysis of typical GA altitudes in the vicinity;
  - b. We made statements regarding expectation of GA transits;
  - c. We plan a programme of GA engagement so transits become routine.

## 6. Environmental Impacts

- 6.1. The sponsor of an airspace change is regulated by the CAA, which tests each proposal against their guidance on the application of the airspace change process (Ref 2) and its own Government guidance (Ref 1) with respect to environmental impacts. This proposal complies with the guidance.

### Overall population likely to be affected

- 6.2. Figure 20 summarises the net population<sup>5</sup> over-flown by current flight-paths, and the net population that would be over-flown by the proposed flight-paths, if this proposal was implemented.

Departures	Current pop'n over-flown	Proposed pop'n over-flown	Change in population (net difference)	Change in population (% reduction)
Up to 4,000ft	362,687	21,996	340,691	94%
From 4,000ft-7000ft	179,457	15,212	164,245	92%
<b>All Departures up to 7,000ft</b>	<b>542,144</b>	<b>37,208</b>	<b>504,936</b>	<b>93%</b>

Arrivals	Current pop'n over-flown	Proposed pop'n over-flown	Change in population (net difference)	Change in population (% reduction)
From 4,000ft to the runway	576,113	377,885	198,228	34%
From 7,000ft-4,000ft	493,308	435,123	58,185	12%
<b>All Arrivals up to 7,000ft</b>	<b>1,069,421</b>	<b>813,008</b>	<b>256,413</b>	<b>24%</b>

Combined over-flights (taking into account where departures and arrivals over-fly the same place)	Current pop'n over-flown	Proposed pop'n over-flown	Change in population (net difference)	Change in population (% reduction)
Up to 4,000ft	577,046	377,885	199,161	35%
From 4,000ft-7,000ft	493,308	437,487	55,821	11%
<b>All over-flights up to 7,000ft</b>	<b>1,070,354</b>	<b>815,372</b>	<b>254,982</b>	<b>24%</b>

**Figure 20 Population summaries:  
Departures (top), Arrivals (middle), Combined area (lower)**

- 6.3. Fewer people would be over-flown due to this proposal. This means that those fewer people would be over-flown more often, because the flight-paths would concentrate more, rather than today's somewhat dispersed pattern.
- 6.4. The difference between the current and proposed numbers is not intended to imply that all areas benefit from this proposal - some areas would, others would not. It is intended to show that, as a simple net calculation, fewer people would be over-flown by the flight-paths described in this proposal than are currently over-flown. See Appendix E for a full description of the population count method.
- 6.5. Where changes could be made to departure routes to minimise the population directly over-flown at low altitude, we did so based on the feedback we received where this was possible.

### Balancing Local Noise Impacts with Fuel Use and CO<sub>2</sub> Emissions

- 6.6. In the consultation material Part A Section 10 (Ref 3) we wrote that we need to balance local noise impacts and flight efficiency. Department for Transport Guidelines (Ref 1) recommend that below 4,000ft the environmental priority is to minimise the noise impact of aircraft.

<sup>5</sup> Population data based on information supplied by CACI for 2012.

- 6.7. Airspace changes have the potential to improve the efficiency of the UK route network, reducing the fuel burned and the CO<sub>2</sub> emitted per flight.
- 6.8. However, one option for managing local noise impact is to avoid flying over populated areas by making aircraft fly around them. As described in Section 4 the routes have been designed to avoid major population centres, and as many villages as possible.
- 6.9. We originally estimated that our most common aircraft types would use up to 44kg of extra fuel on the longest routes, and that the largest types could use up to 130kg extra fuel. This would translate to an overall estimated increase of 1,400 tonnes CO<sub>2</sub> in 2015 rising to 1,700 tonnes in 2019, for our most likely traffic forecast.
- 6.10. We wrote that some of the routes would be similar in length, making no change to fuel use for those flights. We wrote that we expect this to be a conservative overestimate due to the modelling assumptions. We also wrote that our calculations could not take full account of flights disrupted by unknown aircraft.
- 6.11. From a fuel/CO<sub>2</sub> modelling point of view, the modifications made to the SIDs and STARs did not significantly change the length of the modelled flights. Therefore the proposal presented here is likely to have broadly similar fuel/CO<sub>2</sub> figures to the original consultation material (Ref 3), re-stated in paragraph 6.9 above.

## Noise, Tranquillity, Visual Perception

### Examples of noise and visual perception

- 6.12. The air traffic control organisation NATS has a library of video clips on its [website](#). These give an illustration of the appearance and sound of a variety of aircraft types at various altitudes.
- 6.13. The following links are clickable when viewed onscreen with an internet-connected computer. They are broadly illustrative of the largest aircraft types using the airport.
- a. [Descending Airbus A319 at 3,500ft \(64.1dBA\) click to open](#)
  - b. [Climbing Boeing 737-800 at 2,800ft \(70.9dBA\) click to open](#)
- 6.14. Search online for 'NATS aircraft noise videos' for more examples of different types.
- Note a. NATS has no executive jet clips (smaller and quieter than these examples).
- Note b. Most types listed in the NATS webpage do not (and cannot) use our airport.
- Note c. These clips are not intended to be scientific and depend on the sound/volume settings of the computer used to view them. Most have background noise, to provide some context. For best viewing quality, change the resolution to HD (using the cog symbol to change settings)

### Towns and villages

- 6.15. Concentrating flights along fewer, narrower flight-paths is in line with Government guidance (Ref 1). The narrower routes we propose have been designed to avoid major population centres, and as many villages as possible.
- 6.16. Farnborough traffic would concentrate in some areas, but those flights would be more likely to be higher than today. This means that some areas would be over-flown more often, others less, and some would not notice any significant change.
- 6.17. Each route segment described in Section 4 explains the modified impacts our flights would have on local towns and villages.

### Nationally designated areas

- 6.18. Places designated as National Parks and Areas of Outstanding Natural Beauty are valued by many for their tranquillity. It is rarely possible to avoid over-flight of these places entirely, however we sought to minimise the impacts our proposal would have on them up to 7,000ft, as per Chapter 8 of the Government guidance (Ref 1).
- 6.19. Each route segment described in Section 4 explains the modified impacts our flights would have on National Parks and Areas of Outstanding Natural Beauty.

## Useful references

- 6.20. Appendix B: Forecasts of numbers of flights
- Appendix D: Noise measurement methods
- Appendix E: Population count methodology

## Local air quality

- 6.21. Government guidance on airspace change (Ref 1) states that, due to the effects of mixing and dispersion, emissions from aircraft above 1,000ft are unlikely to have a significant impact on local air quality.
- 6.22. The only change below 1,000ft in our proposal is the immediate left turn after take-off from Runway 24.
- 6.23. That turn, which is designed to occur when the aircraft passes 750ft, is specifically to turn away from the populated area of Church Crookham and towards the unpopulated Army training ground. Aircraft may well reach or exceed that altitude within the boundary of the airport itself.
- 6.24. We consider that this turn away from populated areas, combined with the altitude of the change, would have no noticeable impact on local air quality. There are no air quality management areas (AQMA) in the vicinity of the airport that could be affected by this proposal.

## Impact on flora and fauna

- 6.25. The CAA's process guidance (Ref 2) states that  
*It is considered unlikely that airspace changes will have a direct impact on animals, livestock and biodiversity. However, Change Sponsors should remain alert to the possibility and may be required to include these topics in their environmental assessment.*
- 6.26. We have no reason to believe flora and fauna would be adversely affected due to this proposal.

## 7. Themes and Issues: Justification

This section shows our responses to feedback received regarding justification. As per Feedback Report Part A (Ref 4) it is divided into sub-themes.

- 7.1. Justification/Negative (general)
- 7.2. Justification/Negative (proportionality)
  - a. airspace volumes used by other airports;
  - b. numbers of flights at other airports;
  - c. numbers of passengers using other airports;
  - d. the small number of passengers per flight;
  - e. passengers who were perceived as VIPs;
  - f. forecast growth is not substantiated;
  - g. excessive impact on other airspace users;
  - h. scale of 'airspace grab'; and
  - i. other general statements in the context of proportionality.

### **TAG Farnborough's response:**

See Section 3 for the Justifications and Objectives of this proposal.

### **Comparisons**

The comparison of airspace volumes used by other airports such as Gatwick and that proposed by TAG Farnborough was not valid due to not being like-for-like. For example the Gatwick comparison did not include large parts of the London Terminal Manoeuvring Area (LTMA) almost exclusively reserved for Gatwick's use. These volumes are Class A, the most restrictive classification.

The justification for airspace change needs to consider many factors. While comparisons of numbers of flights and passengers have some relevance, these need to be balanced amongst many other criteria.

### **Complexity**

In the case of Farnborough the overall complexity of the operation is the primary factor. It is important to differentiate between complexity and traffic levels – they are not necessarily linked.

Air traffic controllers can safely handle many aircraft where the traffic environment is not complex. Conversely, an extremely complex environment can exist with very few aircraft on frequency. The number of radio transmissions broadcast rarely reveals the full extent of behind-the-scenes activity by controllers.

This complexity, which happens daily in the vicinity of TAG Farnborough Airport, is one of the main drivers for proposing this change.

## Disruption

In the two year period from May 2013 to May 2015, more than 250 disruption events were considered by ATC staff to be 'significant':

- Arriving flights had to be broken off final approach, and/or had to be delayed in the air then repositioned once unknown or conflicting aircraft had moved away.
- Departures had to be delayed on the runway waiting for unknown or conflicting aircraft to move clear of the departure track, or had to be given non-standard (noisier) departure tracks to avoid them.

There were dozens of each type of event, with many individual 'events' affecting multiple aircraft.

A much larger number of disruption events actually occurred, but they were considered 'normal' levels of disruption. These 'normal' levels of disruption would not be considered acceptable by an airport operating within controlled airspace. For example, in the same two-year period there were more than 900 instances where non-standard departures had to be issued.

When such an event happens the complexity of the controllers' task increases, as does overall noise and fuel consumption. A delay is the safest solution to these complex scenarios – ATC anticipates the events as much as possible, and does not let them develop into something unsafe. These events were caused by complex GA situations including flights that were either unknown or could not accept temporary restrictions.

Now that the numbers of flights per year permitted at our airport can increase under the Government's 2011 planning decision, this would only get more complex and the likelihood of further delays or noisier tracks would increase. This complexity would be reduced by a CAS-based proposal.

The complexity also causes disruption of, and inconvenience to, GA activity. From an aviation technical point of view, within Class D CAS it is possible to safely reduce the minimum separation distances between IFR and VFR flights to less than that recommended during the provision of a Class G Deconfliction Service between the same IFR and VFR flights. In essence, the 'stronger' class of airspace actually allows for a safe reduction in separation.

## Forecasts

At the time of preparing the consultation, the latest available full-year data was from 2012 which we used as the base year. We are required by the airspace change process to report on the expected effects of the proposal at the year of implementation and for a future year. For this proposal we reported on 2015 and 2019 forecasts. Each year had a pair of forecasts - 'most likely' and 'high forecast'.

We are expecting our growth to be in the order of the 'most likely' figures. For 2015 we are on target to meet our 'most likely' forecast. The 'high forecast' matched the maximum allowable traffic under our 2011 planning permission<sup>6</sup>, 50,000 movements. The 'high' figures were included to ensure we presented the theoretical maximum local impacts in the consultation, and to ensure the airspace design is capable of safely handling that amount of traffic during tests and simulations (including busy summer levels of GA/S&RA traffic transiting the proposed airspace). If we had presented the 'most likely' figures only, we would not have tested the design adequately.

Some stakeholders assumed that the 'high' figures are expected immediately, should we acquire approval. They indicated that this was not likely and that we were trying to overstate our case. We agree that the 'high' figures are not likely to be achieved (but were included for the reasons above), and contend that the 'most likely' figures remain a reasonable forecast for our airport. Please see Appendix B: Forecasts of Numbers of Flights.

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<sup>6</sup> [www.rushmoor.gov.uk/article/2564/Farnborough-airports-planning-history](http://www.rushmoor.gov.uk/article/2564/Farnborough-airports-planning-history)

### **Access to airspace for other users**

GA access to this airspace is the key to the efficiency improvements for all airspace users in the vicinity - our justification is inextricably linked to its provision as far as possible (see paragraphs 5.63-5.104). This also provides reassurance that the numbers of all airspace users (TAG, GA, MoD and others) could grow safely and efficiently. We received comments and requests from aviation stakeholders giving specific ideas on where they would be most impacted. We held significant negotiations with the London Terminal Control team at NATS regarding integration of both operations and have been able to reduce the proposed areas of CAS compared to the original design.

### **Other**

If no specific details were supplied about the precise nature of the objection, then we are not able to respond. See Section 4 for a description of the proposed flight-path changes, aimed at local residents, and Section 5 for details aimed at an aviation technical audience.

## 8. Themes and Issues: General Aviation (GA) Impact

This section shows our responses to feedback received regarding GA impact. As per Feedback Report Part A (Ref 4) it is divided into sub-themes.

- 8.1. GA Impact/Negative (general, powered)
  - a. Powered-flight pilot training;
  - b. Recreational powered flight;
  - c. Aerodromes primarily involved in powered flight; and
  - d. Ballooning.
- 8.2. GA Impact/Negative (glider)
  - a. Gliders in general;
  - b. Specific gliding clubs or groups; and
  - c. Aerodromes primarily involved in gliding

### **TAG Farnborough's response:**

A high volume of comments and suggestions were received, leading to the creation of these themes. We wrote Section 5 of this document in response. It is aimed at an aviation technical audience and explains the modifications made to the airspace design due to this feedback.

For a non-aviation-technical description of the proposed flight-path changes please see Section 4.

## 9. Themes and Issues: Safety Impact

Safety is TAG's first priority.

Safety applies to all airspace users, whether they are aircraft using our airport, those using the cost-free London-wide 'LARS' radar services provided from our control tower (see paragraphs 5.63-5.104), or to those flying in the vicinity of the airport.

We would not attempt to introduce a proposal that we believe to be less safe than today.

UK aviation safety is regulated by the CAA's Safety and Airspace Regulation Group (SARG).

SARG would not approve the establishment of new airspace, routes or procedures that do not meet or exceed current safety standards, or anything that leads to an overall detriment to aviation safety.

This section shows our responses to feedback received regarding safety. As per Feedback Report Part A (Ref 4), it is divided into sub-themes.

- 9.1. Safety/Negative (general, collision risk)
  - a. General safety concerns, no specific statement given
  - b. Increased risk of collision due to the proposal; and
  - c. Increased risk of air miss or airprox due to the proposal
  - d. Pilot or ATC workload
  - e. Danger to people on the ground
- 9.2. Safety/Negative (lateral funnelling)
  - a. Forcing into a smaller area or corridor;
  - b. Overcrowding;
  - c. Reduced width or narrowing of gap; and
  - d. Choke or pinch points or similar phrase where the context is lateral.
- 9.3. Safety/Negative (vertical restriction)
  - a. Airspace base too low;
  - b. Concern regarding terrain clearance;
  - c. Compliance with Rule 5 of the Air Navigation Order;
  - d. Headroom; and
  - e. Crushed, squashed, squeezed or similar phrase where the context is vertical.

### **TAG Farnborough's response:**

While the current Farnborough operation within Class G airspace is managed in accordance with the highest safety standards, TAG Farnborough Airport is committed to continually identifying ways to advance those safety standards.

### **Current airspace type**

The current classification permits any airspace user (from large fast aircraft to gliders, balloons and microlights) to operate anywhere in the near vicinity or overhead our airport *without* speaking to our air traffic controllers.

It is not unusual for a single unknown aircraft to legitimately operate close to the final approaches for significant periods of time. This effectively prevents landings or take-offs, because we must ensure the safety of *both* aircraft – see page B50 for examples covering May 2013 to May 2015.

### **Proposed airspace type**

An objective of this proposed airspace change is to create a new, known operating environment with elements of controlled airspace, which would offer all airspace users predictability and consistency of operation. Creating a known air traffic control environment would assist the airport in catering for an increasing number of air transport movements and

do so in a way which benefits efficiency and safety for many airspace users, and reduces the overall noise impact on local residents.

**Predictable and systemised**

From a TAG Farnborough point of view, pilot and ATC workload would be improved under this proposal because the airspace management would be more systemised and predictable than today's arrangements.

**Minimising the impact on GA**

From a GA/S&RA point of view we understand that changing CAS boundaries can mean a change in the pre-planning and in-flight workload for a pilot. This is unavoidable for any new CAS proposal. We have minimised the impact on GA as much as possible – see Section 5 of this report which is aimed at an aviation technical audience, and explains the modifications made to the airspace design due to this feedback. That section explains how perceived impacts due to funnelling and compression have been mitigated. For a non-aviation-technical description of the proposed flight-path changes please see Section 4.

**ATC staffing of radar services**

We plan to increase our ATC staff in order to increase flexibility and coordination, and we remain committed to maintaining LARS in the vicinity of Farnborough regardless of the outcome of this proposal.

We also expect to offer airspace transits routinely to GA upon request, should we receive approval to implement.

**Other**

If no specific details were supplied about the precise nature of an objection, then we are not able to respond.

## 10. Themes and Issues: Airspace or Route Design

This section shows our responses to feedback received regarding airspace or route design. As per Feedback Report Part A (Ref 4) it is divided into sub-themes.

- 10.1. Airspace or Route Design/Design suggestion
  - a. The extent of a specific airspace volume, described by number as per the consultation charts, for example CTA8;
  - b. Classification of an airspace volume such as Class D;
  - c. Conceptual suggestions such as the use of RMZ and/or TMZ;
  - d. Discussion of an alternate design put forward by another organisation;
  - e. Visual reference points; and
  - f. Complexity of the proposed airspace, such as difficulty with visual navigation.
- 10.2. Airspace or Route Design/Wait for LAMP<sup>7</sup>
  - a. Waiting to join LAMP in general, or a particular phase.
  - b. Integration of TAG Farnborough routes with another airport or another route system.
  - c. Rationalising the LTMA.
- 10.3. Airspace or Route Design/Impact of Standardised European Rules of the AIR (SERA)
  - a. General impact of SERA
  - b. Impact of change in VMC<sup>8</sup> due to SERA
  - c. EASA, SES, SESAR or other reference to European aviation legislation to which the UK is bound
- 10.4. Departure route or arrival route suggestions

### TAG Farnborough's response:

A high volume of comments and suggestions were received, leading to the creation of these themes. We wrote Section 5 of this document in response to specific design challenges. It is aimed at an aviation technical audience and explains the modifications made to the airspace design due to this feedback.

For a non-aviation-technical description of the proposed flight-path changes please see Section 4.

### NATS LAMP

Since 2011 we have been in regular contact with the NATS LAMP team regarding our proposal. The timing of these projects is regularly discussed and coordinated. Part of this proposal was aligned with NATS' LAMP Phase 1A (expected to be implemented early 2016) and has been transferred to NATS accordingly (see Section 2).

NATS' LAMP is phased, due to the complexity of the airspace in southeast England. Phase 2 is not expected until the turn of the decade.

### Common arrival routes

As described in the Consultation Material Ref 3 Part E (Figure E2 on page E13 and paragraph 4.28 on page E16, Ref 3), the flight plan route for TAG Farnborough arrivals from the southeast would partially follow the same route as Southampton and Bournemouth arrivals from that direction. These flight plan routes would split at the south coast, with traffic for the latter airports continuing west and Farnborough traffic turning north. Partial integration of TAG Farnborough routes with other airports or route systems would, therefore, be achieved via this proposal as originally described in the Consultation Material Part E (Ref 3).

<sup>7</sup> London Airspace Management Programme managed by NATS

<sup>8</sup> Visual Meteorological Criteria

### **Far-reaching airspace changes**

Rationalising the entire LTMA is outside the scope of this proposal. We have made changes to our original airspace design specifically in order to make proposed CAS bases and boundaries easier to align with existing LTMA bases of the same altitude, thus allowing for easier definitions and charting. NATS' LAMP may conduct a 'tidying' exercise as part of their implementation in due course.

### **Standardised European Rules of the Air SERA**

See Section 5 paragraphs 5.59-5.60 which discuss the impacts of SERA.

## 11. Themes and Issues: Environmental Impacts

This section shows our responses to feedback received regarding environmental impacts. As per Feedback Report Part A (Ref 4) it is divided into sub-themes.

- 11.1. Noise
  - a. Regardless of source of that noise (TAG Farnborough flights, GA, RAF)
- 11.2. Fuel or emissions
  - a. Greenhouse gas emissions (from any type of flight)
  - b. CO<sub>2</sub> (due to any type of flight)
  - c. Fuel consumption (of any type of flight)
  - d. Global warming, carbon footprint or similar phrase in context
- 11.3. Local air quality
  - a. Pollution
  - b. Fuel, fumes, odours
  - c. Other air quality phrase in context
- 11.4. Tranquillity
  - a. Includes connections with National Parks and Areas of Outstanding Natural Beauty
- 11.5. Quality of life
  - a. General issues not otherwise covered, including visual intrusion or contrails
  - b. Effects on mood or personality of people over-flown

### TAG Farnborough's response:

Comments and issues were raised regarding these impacts from all sources. The source relevant to this consultation is TAG Farnborough aircraft, with changes to RAF Odiham's operation, with GA/S&RA aircraft also causing concern.

Under this proposal, there would be a significant reduction in the number of people over-flown at low altitudes – see Section 6.

See Section 4 for more details of the revised design, including specific consideration of tranquil areas such as National Parks and Areas of Outstanding Natural Beauty.

### Combinations of theoretical worst-case scenarios

Some stakeholders combined the theoretical worst case events from the original consultation material (Ref 3) and publicised them to other stakeholders, who then inferred that this would become the norm. We received many responses commenting that flights would be lower and noisier more often. That inference is erroneous.

### Higher for longer

Our flights would be more likely to be higher for longer compared to today, and the number of flights is expected to be the 'most likely' forecast. This was stated in several places throughout the Consultation Material, for example Part B paras 4.6-4.8 (Ref 3).

See Section 4 for the changes we made to our original design in more detail, including changes made using feedback from local authorities and nearby villages. On balance we believe the changes we made based on the feedback we received significantly mitigate noise concerns raised over the original design.

### RAF Odiham

Another noise source relevant to this consultation is that from the originally-proposed change to RAF Odiham's operation (in particular the Boeing CH-47 Chinook, described in the Consultation Material Part B (Ref 3) as the 'western dashed blue area'). This area has now been removed from our proposal, and is specifically discussed in Section 4 from paragraphs 4.59-4.64.

### **Light aircraft (GA) noise**

A common perception was that GA/S&RA aircraft would create more noise due to displacement, funnelling and lowering caused by the revised airspace boundaries.

Displacement and funnelling by noise-generating GA flights would be much less likely to occur under this modified proposal. We are encouraging these pilots to fly their normal routes as much as possible, and to contact us for airspace crossing clearance which we expect to provide quickly and routinely as per their request.

Analysis has shown<sup>9</sup> that most noise-generating GA flights might expect to fly about 100ft lower (down from 2,500ft to 2,400ft). The difference in noise due to this small drop would be difficult to discern.

GA noise could not be accurately defined in the original consultation material because the routes and altitudes of GA/S&RA flights are not easily predictable. This included GA use of a sliver of existing CAS described in the Consultation Material Part B (Ref 3) as the 'northern dashed blue area', where it was possible to predict a degree of impact. This area is specifically discussed in Section 4 paragraphs 4.53-4.57.

### **Fuel and CO<sub>2</sub>, air quality and tranquillity**

Fuel consumption and greenhouse gas emissions are specifically discussed in Section 6, as is local air quality, tranquillity and other environmental impacts.

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<sup>9</sup> See paragraphs 5.83-5.87 on page B44

## 12. Themes and Issues: Economic Impact

This section shows our responses to feedback received regarding environmental impacts. As per Feedback Report Part A (Ref 4) it is divided into sub-themes.

### 12.1. Negative

- a. Loss of revenue (tourism)
- b. Loss of revenue (aviation-related business)
- c. Property value
- d. Compensation in general, or discussion of financial loss
- e. Bankruptcy, go out of business, loss of jobs or similar phrase

### **TAG Farnborough's response:**

#### **Impact on tourism**

Some stakeholders were concerned that the proposal would discourage leisure visitors from areas where their business was located. This was mainly due to perceived environmental impacts (such as noise) from lower-flying aircraft making their area less attractive. See Section 6 which explains how our flights would be higher for longer compared to today, reducing the likely noise impact.

Government guidance regarding concentration vs dispersal is also discussed in Section 6. Also, Section 11 summarises the impacts due to RAF Odiham flights, and funnelling/lowering of GA/S&RA.

#### **Impact on flying or gliding**

Some stakeholders were concerned that the proposal would reduce the numbers of people flying or gliding. This was mainly due to the perception that access would be denied to the proposed CAS; that gliders could not make return trips between popular sites due to lowering of the bases; and that the revised CAS boundaries would make visual navigation prohibitively complex.

Section 5 details the modifications made in response to these comments, in particular with reference to Lasham Gliding Society (LGS) and Southdown Gliding Club at Parham (SDGC). We believe this significantly-modified proposal would not result in the closure or severe curtailment of their gliding activities, as originally claimed in their consultation responses.

#### **Property value**

Concerns regarding property values often preceded requests for compensation. These concerns were generally based on the presumption of increased over-flight leading to the increased environmental impact of noise, and that this would cause a subsequent change in property value. Sections 6 and 11 explain how we have considered responses with respect to environmental matters. Fewer people would be over-flown at low altitudes, thus reducing the overall environmental impacts due to noise.

As stated in the Consultation Material (Ref 3) Part A paragraph 10.12 Noise Management Method A, we acknowledge that fewer people would have a higher proportion of noise because there would be fewer flight-paths for the same number of aircraft to follow. Neither the Government guidance (Ref 1) nor CAA process (Ref 2) require forms of compensation due to changed noise impacts such as those consulted upon here.

#### **ATC Lasham airliner maintenance**

A number of comments highlighted the potential vulnerability of ATC Lasham Ltd, the commercial airliner maintenance business based at Lasham aerodrome.

TAG Farnborough have, since 2003, provided support to ATC Lasham Ltd through the provision of radar services, facilitating the arrival and departure of their customer's aircraft. This enables their business to operate as it does today (see also paragraph 5.20). This proposal would have no economic impact on ATC Lasham Ltd.

## 13. Themes and Issues: Consultation Process

This section shows our responses to feedback received regarding consultation process. As per Feedback Report Part A (Ref 4) it is divided into sub-themes.

- 13.1. Negative (accessibility, questionnaire)  
Discussion of the documentation or website, presentation and wording, including:
  - a. Length and complexity
  - b. Leading questions
  - c. One-sided point of view
  - d. Accusations of deliberate obfuscation or equivocation; and
  - e. Accusations of inadequate information preventing a proper response.
- 13.2. Negative (general, publicity)  
General challenges to the process due to:
  - a. Changes made to material during the consultation period
  - b. Inadequate publicity
  - c. Inadequate time to respond
  - d. Calls to cancel or restart the proposal due to fundamental flaws; and
  - e. Conflict of interest, lack of impartiality, unfairness or similar phrase in context
- 13.3. Negative (website problems)  
Issues raised by the inability to submit a response, including:
  - a. The website technical fault
  - b. Other inability to submit an answer
  - c. Submission occurred but uncertainty that the response had been received; and
  - d. Website fault means restart the consultation or cancel it

### **TAG Farnborough's response:**

Airspace design is a complicated and technical subject. This proposal comprised many elements, each with its own impacts. Proposers of airspace changes are required to present information on all the potential impacts to stakeholders.

To omit potential impacts from the consultation in an attempt to simplify it would leave the consultation open to criticism that it was not a complete representation.

### **Duty to describe all potential impacts**

It is acknowledged that stakeholders have a range of prior knowledge, from those experienced in aviation matters through to those who are newly exposed to the subject. The Consultation Material (Ref 3) was split into Parts to enable stakeholders to focus on their specific area of interest. It worked through the environmental impacts from first principles, and explained how air traffic control worked in those areas, allowing those without relevant experience to build an understanding that would enable a considered response.

Given the complexity of the proposal, this inevitably led to a sizeable consultation document.

Whilst this required an investment in time to fully understand, we contend that we had a duty to ensure that all potential impacts were fully described - only then could we be sure stakeholders had the opportunity to understand and respond to specific issues that may affect them.

## **'Leading' questions**

Accusations of 'leading' questions were made by some respondents. The questions were designed to elicit feedback on specific elements of the proposal and did not limit that feedback. The online questionnaire had three increasing 'levels' of submission depending on how much detail the respondent wished to supply:

- A comments box was attached to each question, for short amplifying statements;
- An additional, larger, comments box was at the end of each section's questionnaire (for longer statements);
- It was possible to upload files or documents at the end of each section's questionnaire (for large, detailed submissions).

The CAA reviewed the consultation material including the questionnaire in advance of the consultation's launch.

## **Breadth of publicity**

The efficacy of the consultation has been borne out by the volume of responses, as per the Executive Summary at the beginning of this report, and as fully detailed in Feedback Report Part A (Ref 4).

- We wrote to the organisations listed in the consultation material (Ref 3 Part F Appendix C).
- We made direct contact with local organisations including Director-level briefings with Government ministers, MPs, the Ministry of Defence, unitary authorities/councils, airports, and GA/S&RA groups. Due to the large area under consultation it was expected that the relevant organisations, particularly councils, would cascade the information to their sub-organisations and departments they considered would be affected.
- Our team held 13 briefings in village halls and 7 in local flying clubs.
- Our website received over 83,000 page views.
- Other stakeholders also promoted awareness through their own organisations' websites.
- The Farnborough Aerodrome Consultative Committee (FACC) was fully engaged, involved and informed and is considered the main 'local residents' stakeholder group.
- Local TV and radio news items were broadcast.
- Local press also printed news items and included them on their websites.

We believe that this level of publicity was more than adequate for potentially affected parties to become aware of the consultation, to evaluate the impacts the proposal could have on them, and for them to make their representations to us.

## **Consultation period**

The standard period for consultation is twelve weeks as per the CAA process guidance (Ref 2). We originally planned for a longer period of twelve weeks and five days (Monday 3rd February to Friday 2nd May 2014). Subsequently this was extended by a further nine days following the website's technical fault (see below), to Monday 12th May 2014. The total consultation period was therefore fourteen weeks.

CAA SARG was aware of, and agreed with, the original consultation period prior to launch, and also agreed with the remedial-action extension due to the fault.

As we complied with CAA SARG CAP725 at all times, we disagree with comments that the consultation process failed.

## **Website technical fault**

Feedback Report Part A (Ref 4) provided full details of the website technical fault, confirmation emails, duplicate responses, the corrigenda and the supplementary chart and FAQs.

Appendix F contains a copy of this text extracted from Feedback Report Part A for ease of reference in this report.

## **14. Outside the Scope of Consultation**

- 14.1. Feedback Report Part A paras 4.18-4.19 on page A18 (Ref 4) explained that we were seeking feedback about the possible impact on stakeholders due to this proposal, and that we do not seek feedback on other topics.
- 14.2. Para 4.20 of the Feedback Report Part A (Ref 4) listed examples of such topics, and para 4.21 explained what would happen should we receive responses referring to those topics.
- 14.3. Each analysis section of the Feedback Report Part A (Ref 4) provides the number of responses containing 'out of scope' comments.

## 15. Conclusions and next steps

- 15.1. In light of consultation feedback, we made changes to the proposal.
- 15.2. This document, Feedback Report Part B, details those changes, and also provides our responses to the themes and issues raised in the consultation.
- 15.3. This is the formal public notification of the revised routes and airspace that TAG Farnborough intends to apply for.
- 15.4. TAG Farnborough will now submit an Airspace Change Proposal to the CAA in order to formally request these changes.

### What is an Airspace Change Proposal (ACP)?

- 15.5. An ACP is a package of technical documents containing commercially sensitive data and a complete record of all consultation responses, including personal information such as the names<sup>10</sup> and addresses of stakeholders.
- 15.6. The regulator is required to avoid breaking data protection rules and to preserve commercial confidentiality. The ACP package is required by the CAA as part of their CAP725 process. It is not a 'document' as such, and is not suitable for publishing.
- 15.7. The integrity and independence of the regulator provides assurance that the ACP will be assessed robustly.

### What happens now?

- 15.8. Any further feedback should be provided directly to the CAA. The airspace change guidance provided by the CAA states that:

In the event that a representative organisation wishes to present new evidence or data, for consideration prior to their decision on the proposal, it must be submitted, in writing, to the following address:

**TAG Farnborough ACP**  
**Group Director Safety and Airspace Regulatory Group**  
**CAA House**  
**45-59 Kingsway**  
**London**  
**WC2B 6TE**

- 15.9. The CAA will consider the proposal against the requirements laid out in the guidance (Refs 1 and 2). We expect this assessment to take until late 2015 to complete.
- 15.10. The Director of the CAA's Safety and Airspace Regulation Group (SARG) is the 'decision maker' for all ACPs.
- 15.11. Subject to CAA approval, implementation is planned for late 2016.

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<sup>10</sup> Stakeholders who stated they do not wish their names to be passed to the CAA have had their names replaced with code numbers. The CAA will not have the decode.

## Appendix A: References

**1. Department for Transport Guidance to the Civil Aviation Authority on Environmental Objectives relating to the exercise of its Air Navigation Functions**

Search online for the above phrase  
*DfT, Jan 2014*

**2. CAP725 CAA Guidance on the Application of the Airspace Change Process**

Search online for the above phrase  
*CAA, Mar 2007*

**3. TAG Farnborough Consultation Material Parts A-F**

Part A: Introduction and overview  
Part B: Proposed changes below 4,000ft in the vicinity of Farnborough Airport  
Part C: Proposed changes between 4,000ft and 7,000ft further away from Farnborough  
Part D: Removed from this proposal, transferred to NATS LAMP  
Part E: Aviation technical information  
Part F: Appendices

Search online for 'farnborough airspace consultation' or use the following link:  
[www.Consultation.TAGFarnborough.com](http://www.Consultation.TAGFarnborough.com)  
*TAG Farnborough, Feb-May 2014*

**4. TAG Farnborough Feedback Report Part A (Full Version)**

Details as per Ref 3.  
*TAG Farnborough, Aug 2014*

**5. NATS LAMP South Coast Proposal - Feedback Report**

Search online for 'nats lamp south coast' or use the following link: [www.nats.aero/lamp-south-coast](http://www.nats.aero/lamp-south-coast)  
*NATS, Feb 2015*

**6. NATS library of aircraft noise videos**

Search online for 'nats aircraft noise videos' or use the following link:  
[www.nats.aero/environment/aircraft-noise/](http://www.nats.aero/environment/aircraft-noise/)  
*NATS, Feb 2015*

**7. Class G Airspace Modelling Feasibility Study**

Search online for the above term, or use the following link:  
<http://tinyurl.com/pd72qky>  
*CAA/Airspace & Safety Initiative via QinetiQ, Sep 2011*

**TAG Farnborough is not responsible for the content or security of websites that are not directly maintained by us**

## Appendix B: Forecasts of Numbers of Flights

We forecast the following average<sup>11</sup> numbers of aircraft to use each route:

<b>Overall Total of TAG Farnborough Aircraft Movements (All departures plus all arrivals - Figure 1)</b>	<b>2015 most likely forecast</b>	<b>2019 most likely forecast</b>
Annual	27,000	32,000
Average per hour Weekday	5.8	6.9
Average per hour Weekend	3.6	4.3
<b>Runway 06 departures up to 5,000ft (Figure 4)</b>		
Annual	2,700	3,200
Average per hour Weekday	0.58	0.69
Average per hour Weekend	0.36	0.43
<b>Runway 24 departures up to 5,000ft (Figure 5)</b>		
Annual	10,800	12,800
Average per hour Weekday	2.34	2.77
Average per hour Weekend	1.46	1.73
<b>85% of Departures from 5,000ft to 7,000ft (Figure 6)</b>		
Annual	11,475	13,600
Average per hour Weekday	2.49	2.95
Average per hour Weekend	1.55	1.83
<b>15% of Departures from 5,000ft to 7,000ft (Figure 6)</b>		
Annual	2,025	2,400
Average per hour Weekday	0.44	0.52
Average per hour Weekend	0.27	0.32
<b>Arrivals from the south 7,000ft to 4,000ft (Figure 8)</b>		
Annual	6,075	7,200
Average per hour Weekday	1.32	1.56
Average per hour Weekend	0.82	0.97
<b>Arrivals to Runway 06 from the north (Figure 9)</b>		
Annual	1,485	1,760
Average per hour Weekday	0.32	0.38
Average per hour Weekend	0.20	0.24
<b>Arrivals to Runway 06 from the south (Figure 9)</b>		
Annual	1,215	1,440
Average per hour Weekday	0.26	0.31
Average per hour Weekend	0.16	0.19
<b>Arrivals to Runway 24 from the north (Figure 10)</b>		
Annual	5,940	7,040
Average per hour Weekday	1.29	1.52
Average per hour Weekend	0.80	0.95
<b>Arrivals to Runway 24 from the south (Figure 10)</b>		
Annual	4,860	5,760
Average per hour Weekday	1.05	1.25
Average per hour Weekend	0.66	0.78

<sup>11</sup> Hourly numbers given in these tables are averages. Like any airport, there would be busy periods where flights per hour will be higher than average, likewise there would be quiet periods where there might be few flights, or none at all. These averages were calculated based on Farnborough being open 253 weekdays for 15 hours, and 110 weekend/Bank Holiday days for 12 hours, with two days closed (Dec 25th and 26th).

## Appendix C: Aviation Charts

The following three pages show:

- Figure 21     SIDs (light blue Opt 25, dark blue Opt 34)  
                  STARs (light orange Opt 25, mostly over-drawn by dark orange Opt 34)
- Figure 22     Consultation Airspace (Option 25)
- Figure 23     Post-Consultation Airspace (Option 34)

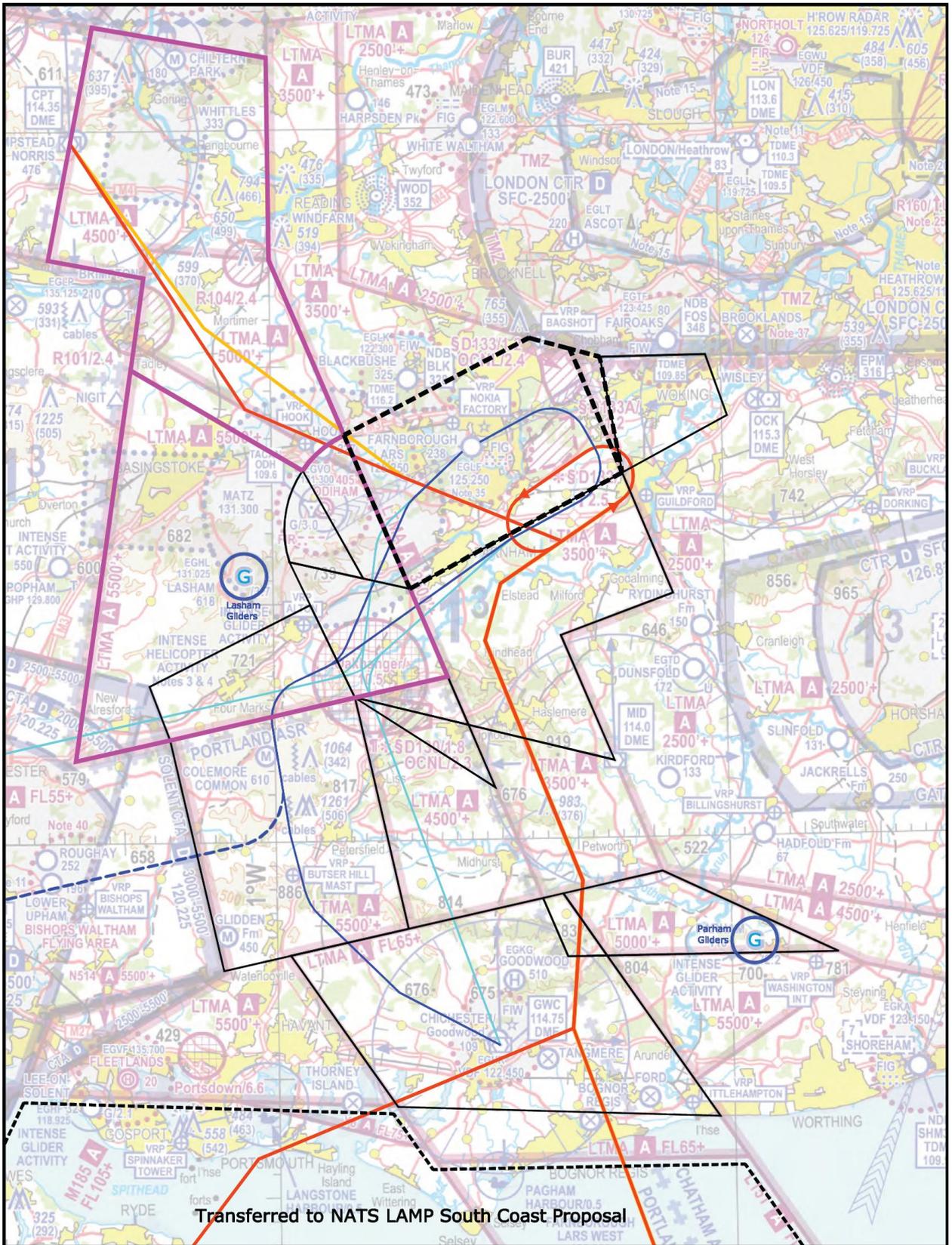


Figure 21 SIDs (light blue Opt 25, dark blue Opt 34)  
 STARs (light orange Opt 25, mostly over-drawn by dark orange Opt 34)



Figure 22 Consultation Airspace (Option 25)



Figure 23 Post-Consultation Airspace (Option 34)

## Appendix D: Noise measurement methods

There are three main types of noise measurement used in airspace changes, known as  $L_{max}$ ,  $L_{eq}$  and SEL.

### Measurement $L_{max}$

$L_{max}$  gives the peak noise level of a single event. Departure and arrival noise levels were provided in the original consultation material, by aircraft category. They are repeated here for completeness.

Height above ground – Departures	Peak noise impact of most common aircraft types Executive Jets (75% of Farnborough flights)	Peak noise impact of noisiest aircraft types Boeing 737 or Airbus 320 (10% of Farnborough flights)
Up to 2,000ft	75-92 dBA	75-93 dBA
2,000ft-3,000ft	69-75 dBA	70-75 dBA
3,000ft-4,000ft	64-69 dBA	66-70 dBA
4,000ft-5,000ft	61-64 dBA	63-66 dBA
5,000ft-6,000ft	57-61 dBA	60-63 dBA
6,000ft-7,000ft	56-57 dBA	59-60 dBA
7,000ft and above	Up to 56 dBA	Up to 59 dBA

Height above ground - Arrivals		
Up to 2,000ft	66-87 dBA	69-87 dBA
2,000ft-3,000ft	60-66 dBA	64-69 dBA
3,000ft-4,000ft	57-60 dBA	61-64 dBA
4,000ft-5,000ft	Up to 57 dBA	59-61 dBA
5,000ft-6,000ft	55 dBA or below	57-59 dBA
6,000ft-7,000ft	55 dBA or below	55-57 dBA
7,000ft and above	55 dBA or below	55 dBA or below

**Figure 24 Typical noise levels ( $L_{max}$  dBA) for departures (top) and arrivals (above)**

To add context to these numbers we supplied this table of equivalent sounds<sup>12</sup>.

Example sound	Noise level $L_{max}$ dBA
Chainsaw, 1m distance	110 dBA
Disco, 1m from speaker	100 dBA
Diesel truck pass-by, 10m distance	90 dBA
Kerbside of busy road, 5m distance	80 dBA
Vacuum cleaner, 1m distance	70 dBA
Conversational speech, 1m away	60 dBA
Quiet office	50 dBA
Room in quiet suburban area	40 dBA

**Figure 25 Example sounds for comparison**

<sup>12</sup> Based substantially on [www.sengpielaudio.com/TableOfSoundPressureLevels.htm](http://www.sengpielaudio.com/TableOfSoundPressureLevels.htm)

### **Measurement $L_{eq}$**

$L_{eq}$  is an average of many single noise events over a period of time (usually 16 hours from 7am to 11pm), meaning 'equivalent continuous sound level'.

It would usually be shown as contour lines on a map, denoting different values. The smallest contour would be the greatest average noise nearest to the runway, with larger contours showing decreasing average noise further away from the runway.

The UK government has decided that 57 dBA  $L_{eq}$  16 hours is the point above which significant annoyance occurs to the local community.

The CAA's noise consultants assessed that changes to Farnborough's 57dB  $L_{eq}$  contour due to this proposal would be outside any populated areas, because a changed 57db  $L_{eq}$  contour would extend only a short way into the MoD training ground to the immediate southwest of the airport, using conservative assumptions.

Therefore no  $L_{eq}$  contours were presented in the consultation.

### **Measurement SEL**

Sound Exposure Level (SEL) footprints are required only where night-time flights operate.

The standard opening hours of Farnborough airport mean that SEL footprints are not required.

We are not permitted to open outside these hours by our planning permission.

### **More information**

The CAA and NATS have useful web pages regarding aircraft noise.

Search the internet using the term 'CAA aviation noise' or 'NATS aircraft noise'.

## Appendix E: Population count methodology

Section 6 summarises the population likely to be affected by over-flight by aircraft departing from, or arriving to, TAG Farnborough Airport.

The following pages contain maps showing the outlines of shapes used for 'current' and 'proposed' over-flight.

The population figures within each area are derived from census data provided by CACI.

Each dot on the map is a single postcode, and each postcode has a population associated with it.

### Current

The areas used for current population numbers are as per the original consultation material (Ref 3).

The extent of over-flight is shown by the black dashed outlines on the flight density plots, which are in each part of the original consultation material.

The outline shapes for each runway have been merged into larger shapes defining the over-flight extent by 'departures, both runways, up to 4,000ft', 'arrivals, from 7,000ft-4,000ft' and other easily-understandable scenarios.

### Proposed

The 'proposed' population numbers have been derived in a similar way to the 'current' numbers.

We predict that 24% fewer people would be over-flown due to arrivals under this proposal, below 7,000ft.

We predict a somewhat narrower arrival dispersion, keeping flights slightly higher for longer, based on the proposed STAR routes, possible alternate tracks controllers might need to use, and simulation data.

We predict that 93% fewer people would be over-flown due to departures under this proposal, below 7,000ft.

We predict much less dispersion, as improved track-keeping will keep flights on the designated departures routes, that themselves have been routed to avoid as much population as possible. This improved track-keeping over sparsely-populated areas is combined with quick climbs, both from the runway to 4,000ft and from 4,000ft-7,000ft.

We used the shape of a typical Noise Preferential Routeing 'corridor', which is 1.5km either side of the centreline of the departure route (total width 3km).

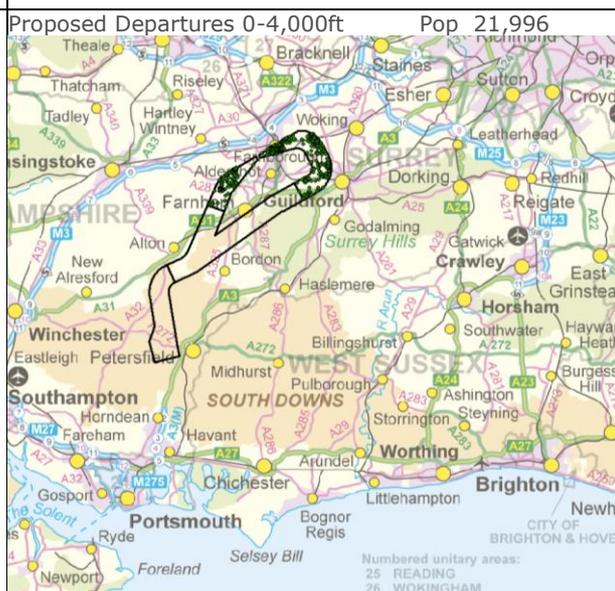
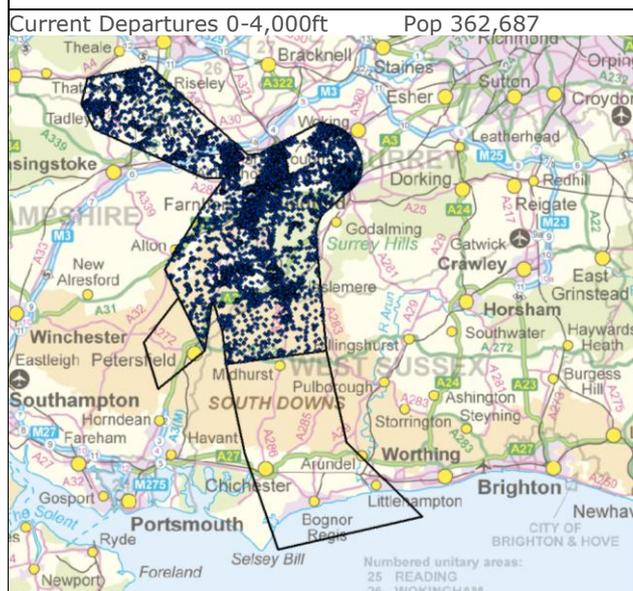
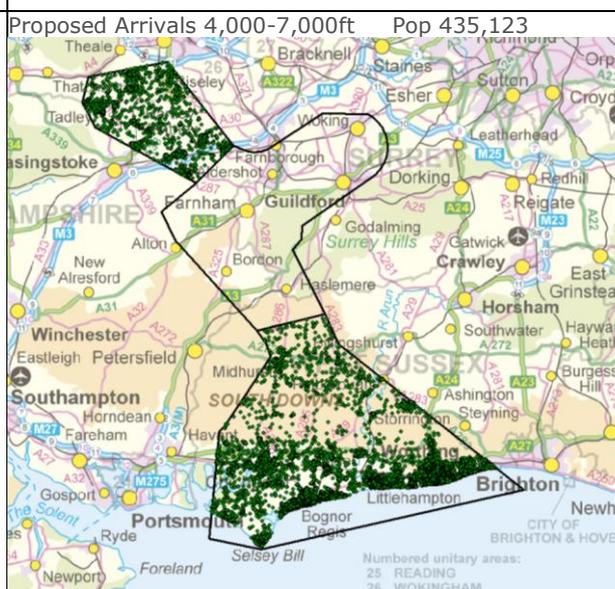
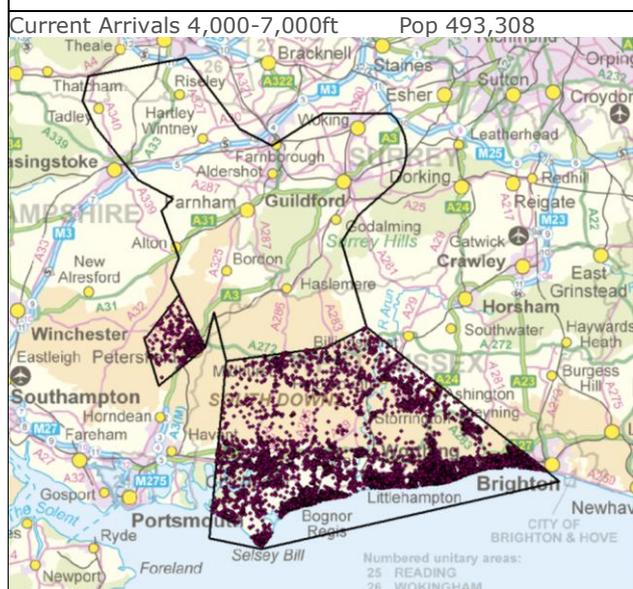
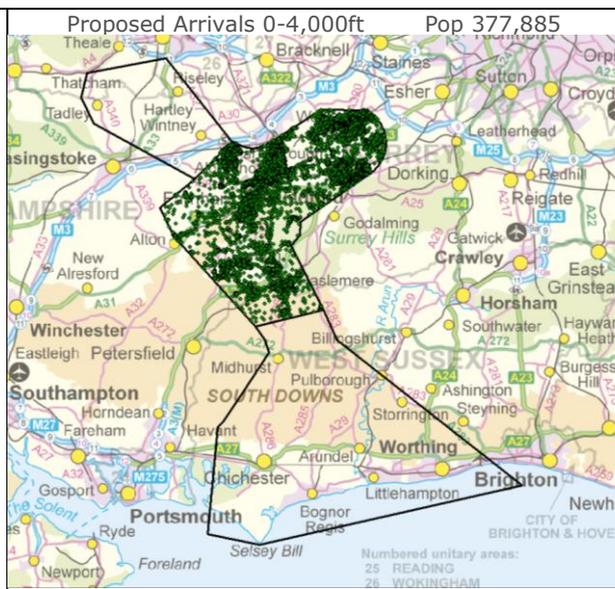
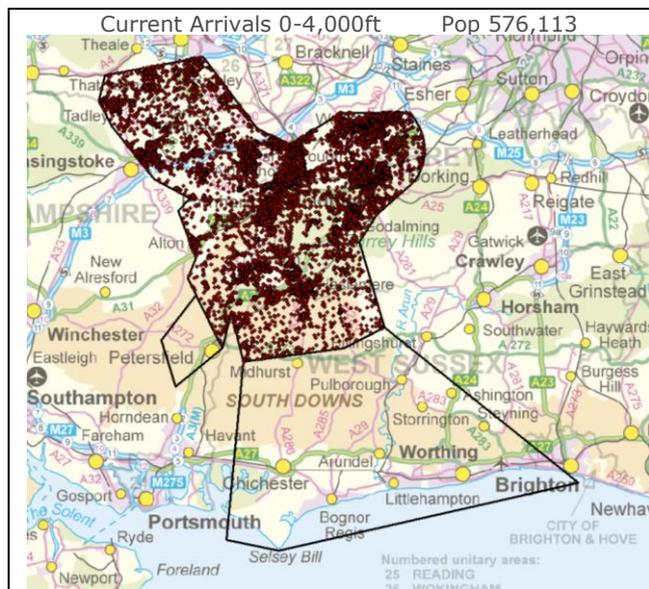
We expect that departure route centreline to be used most of the time.

### Other population information

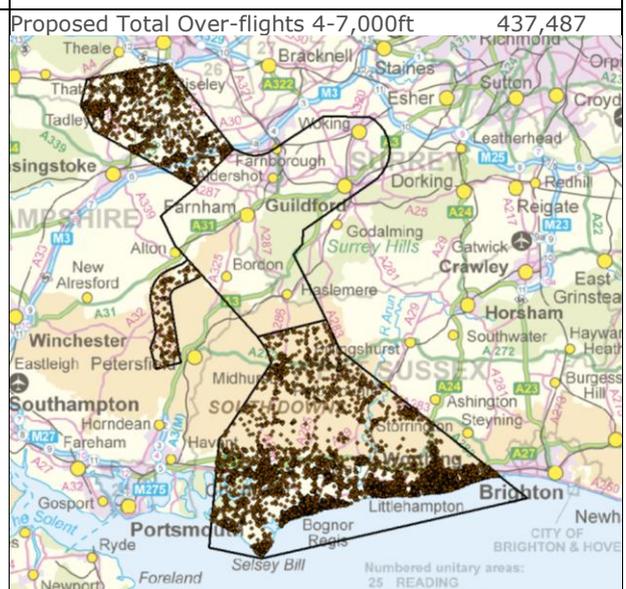
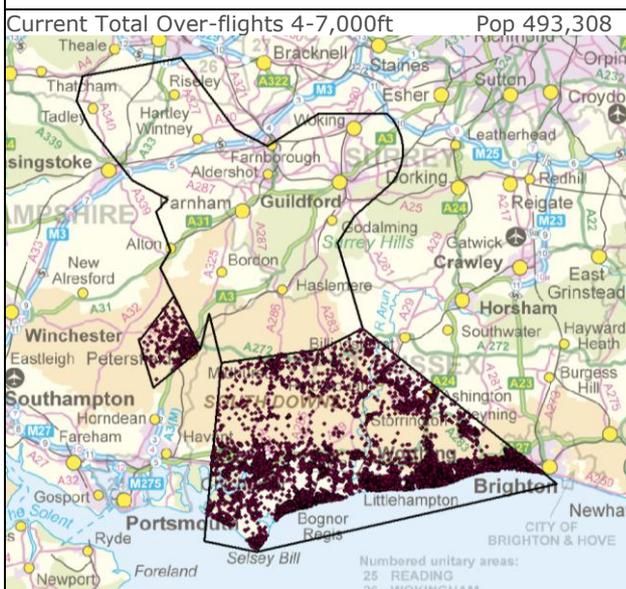
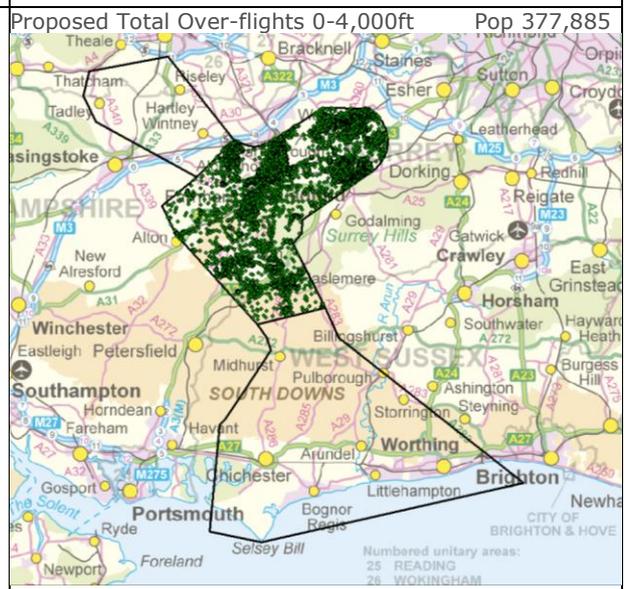
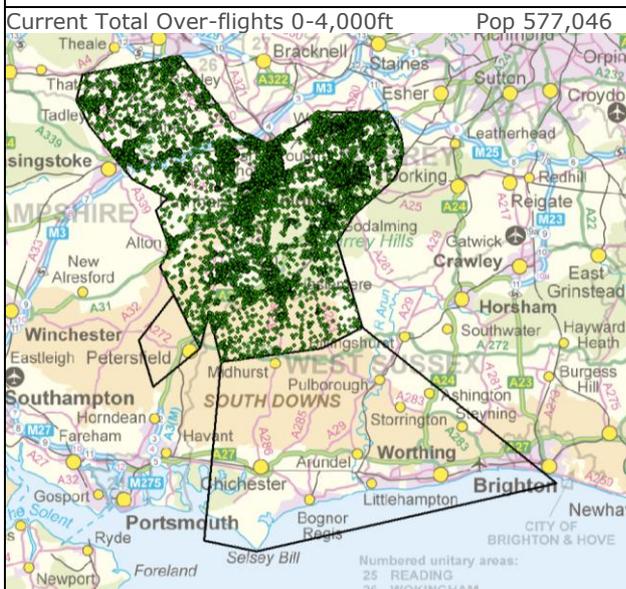
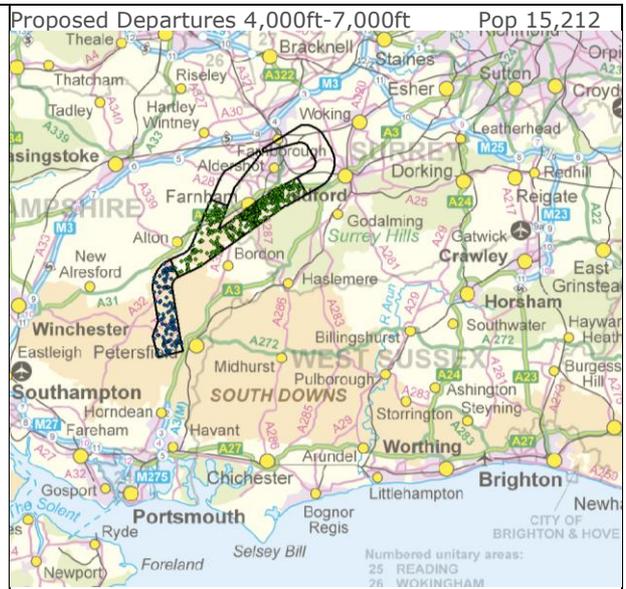
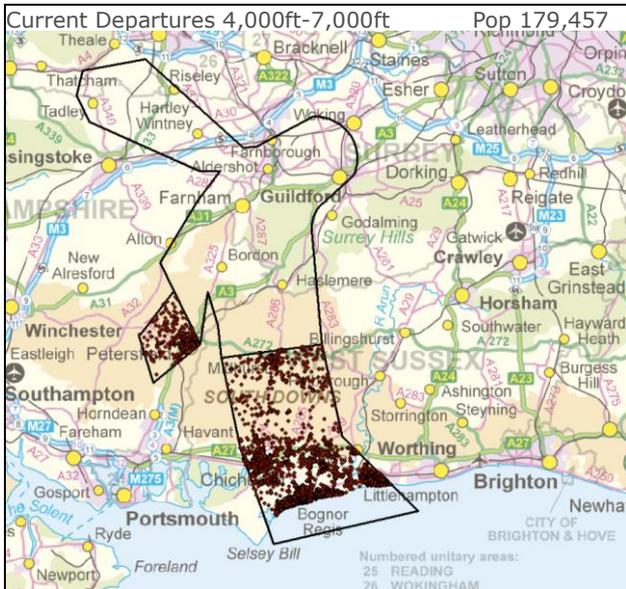
Areas over-flown above 7,000ft are not population-counted.

Arrivals from the north would be generally higher under this proposal. The areas themselves would be unchanged.

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## Appendix F: Extracts from Feedback Report Part A

Feedback Report Part A (Ref 4) provided full details of the website technical fault, confirmation emails, duplicate responses, the corrigenda, the supplementary chart and the FAQs.

Below is a copy of this text extracted from Feedback Report Part A.

### ***The technical fault***

- 1.8 *A technical fault with the online form hosted by the website occurred on Friday 11th April. Full service was restored on Wednesday 16th April and the online form subsequently operated correctly until consultation closed.*
- 1.9 *Responses submitted in this five day period failed to record.*
- 1.10 *The CAA was notified and advice sought. It was agreed that announcing an extension of nine days would mitigate the effect of this fault.  
This announcement:*
  - a. *allowed more time for those directly affected to resubmit their original lost response;*
  - b. *allowed more time for other stakeholders to submit a new response, who might otherwise not; and*
  - c. *created publicity, thus highlighting the consultation itself leading to a greater likelihood of a resubmission or of acquiring more responses.*
- 1.11 *A subsequent investigation by the website designers concluded that 127 attempted submissions were likely to have failed.*
- 1.12 *At least thirteen stakeholders successfully resubmitted their response. This is known because some of the comments state they were resubmissions by those affected. Therefore the maximum number of failed submissions can be assumed to be 127 minus 13, i.e. 114.*
- 1.13 *We believe the actual missing number to be smaller than 114 because resubmissions cannot be accurately identified unless the stakeholder specifically says so. Technical efforts were made to reconcile the recorded IP addresses of the lost submissions with subsequent submissions. This analysis did indicate a number of matches. However, IP matching is not sufficiently robust to say definitively that they indicate a resubmission by particular individuals or organisations.*
- 1.14 *Given the publicity generated in relation to the technical failure by both ourselves and many stakeholder organisations, we believe it is reasonable to assume that a number of lost submissions were subsequently re-submitted, but we have stated the worst-case of 114 here.*
- 1.15 *We informed the CAA as soon as we became aware of the fault, we proposed remedial action, executed that remedial action and prevented recurrence of the failure. These actions were performed with the full awareness of both the CAA Regulatory Case Officer and the CAA Consultation Coordinator.*
- 1.16 *Therefore, even though there was a technical fault, we have complied with the consultation process under CAA guidance. Consultation is about attaining or confirming views and opinions about the impact of a particular proposal. In total over 13,000 comments were received, which provided a wealth of useful data about these impacts, and will be used to influence the final proposal design.*

**Confirmation emails not received by stakeholders outside the failure period**

- 1.17 *The online form functioned correctly before and after the failure period. This was double-checked and confirmed by the website hosting company, which subsequently made additional daily checks.*
- 1.18 *Some stakeholders made duplicate responses, including comments that they failed to receive confirmation emails (outside the failure period).*
- 1.19 *During the analysis of responses, it was clear that some email addresses entered by the stakeholder contained typographical errors. For example, the misspelling of domain names such as 'gmail', 'hotmail', 'yahoo' and others. Sometimes part of the email address syntax was missing or mistyped, such as the '@' symbol or the '.co.uk' element.*
- 1.20 *Occasionally it was noted by our analysts that an adjacent key on a QWERTY keyboard may have been accidentally struck, for example john.smit**gh**@email.address.*
- 1.21 *If a stakeholder made a submission but supplied an incorrect email address:*
  - a. *The submission was received by us (and was analysed)*
  - b. *The confirmation email was automatically sent to the non-existent or incorrect email address*
  - c. *The stakeholder would be unaware that their response has indeed been received, as they would not get a confirmation response to their intended email address*
  - d. *The stakeholder could interpret the lack of confirmation email as a failure of the online form, rather than the result of an incorrect address input*
- 1.22 *Whilst this situation is unfortunate, TAG Farnborough Airport cannot accept responsibility for errors made by the stakeholder when completing the online form. No attempt has been made to 'guess' what the correct email address(es) might be for these responses.*

**Duplicate responses**

- 1.23 *The website did not restrict the number of times an individual stakeholder could respond to the consultation. Sometimes the same stakeholder supplied more than one response containing additional comments, or an uploaded file. Where that response was clearly identical or extremely similar (e.g. copy/ paste between text boxes, or where uploaded document/s contained the same text as comments submitted by the same stakeholder via other means), the duplicate flagged response was removed from the analysis.*
- 1.24 *Where an additional response was submitted by the same stakeholder, but the text was not identical or not similar, it was analysed as a separate response and was not classed as a duplicate.*
- 1.25 *Where it was noticed that a stakeholder supplied an identical or extremely similar response to another stakeholder, it was analysed as a separate response and was not classed as a duplicate.*

**Corrigenda**

- 1.26 *Two typographical errors were found in the consultation material during the consultation period. Each error resulted in the described impact being under-stated for two very localised geographical areas, one in Part B, one in Part C.*
- 1.27 *Immediately these errors were discovered we notified the CAA and proposed remedial action. We notified all the original stakeholders identified from the consultation launch (as listed in Part F). We also specifically notified the one parish council that was affected. The consultation material was updated and a corrigenda notice placed on the website.*

1.28 *The CAA accepted our remedial action and was content that no further action was required to comply with CAP725 consultation process.*

**Supplementary chart, and FAQs**

- 1.29 *During consultation, some responses suggested that some of the aviation VFR charts in Part E were complex to interpret.*
- 1.30 *In order to assist, we supplied an additional VFR chart with different boundary markings to offer an alternative view of the airspace volumes. Our intent was that the original charts and the supplementary chart could then be considered jointly. From these, an aviation stakeholder would find it easier to understand the potential impacts and to provide a response.*
- 1.31 *During consultation, the FAQs page was added to, from time to time. This page did not provide new information, it merely highlighted particular information already provided in the main consultation material. The CAA was aware of this supplementary information and supported its promulgation.*

**End of report**