Farnborough Airport

Airspace Change Proposal

Issue 1.0 3rd July 2015

Issue	Month/ Year	Changes in this issue
Issue 1	July 2015	Initial issue submitted to CAA SARG.

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Appendices

1. Introduction

This Airspace Change Proposal (ACP) is sponsored by TAG Farnborough Airport. It sets out proposals for airspace and route changes in the vicinity of TAG Farnborough Airport.

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

The proposed changes were developed to:

1. Improve the overall efficiency of the airspace for all users
2. Increase safety
3. Reduce environmental impact by reducing over-flight of populated areas at low altitude where possible.

2. Justification

Justification & Objectives

Our justifications for this proposal are 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.

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.

Benefits Summary

Environment – People over-flown:
The proposed changes will significantly reduce the number of people over-flown by aircraft operating from/to TAG Farnborough Airport. Due to the accurate track-keeping of aircraft following RNAV routes, it has been possible to design departure routes which reduce over-flight of populated areas. Where changes could be made to departures to minimise the population over-flown at low altitude, we did so based on the feedback we received during consultation, where it was possible.
Of the people over-flown currently by aircraft operating from/to Farnborough airport, if the proposed change is implemented:
Below 4,000ft
- **94% fewer people** (a reduction of 340,000) would be over-flown by departing Farnborough aircraft
- **34% fewer people** (a reduction of 198,000) would be over-flown by arriving Farnborough aircraft

Between 4,000ft and 7,000ft
- **92% fewer people** (a reduction of 164,000) would be over-flown by departing Farnborough aircraft
- **12% fewer people** (a reduction of 58,000) would be over-flown by arriving Farnborough aircraft

Access to airspace:
The proposed concept of operations (airspace, routes and procedures) relies upon Farnborough ATC 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 Class D controlled 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 currently flight-paths are not very efficient or predictable and are often extremely complex.
The more consistent and predictable the routes are, 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 **Guildford, Aldershot and Farnham**. 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 Appendix K, Feedback Report Part B, page B17 for details).
Runway 24 departures below 5,000ft	Designed to avoid direct over-flight of **Church Crookham, Fleet, Ewshot, Crondall, Farnham, and Alton**. 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 Appendix K, Feedback Report Part B, page B19 for details).
Departures from both runways 5,000ft-7,000ft.	Designed to avoid centres of population **Alton, Bordon, Liphook, Four Marks, Ropley and New Alresford** 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 Appendix K, Feedback Report Part B, page B21 for details).
Arrivals to both runways from south between 7,000ft-4,000ft	Arrivals would typically be **between 600ft and 1,000ft higher** than the current equivalent arrival, during the descent to 4,000ft. (See Appendix K, Feedback Report Part B, page B25 for details).
Runway 06 arrivals from north and south below 4,000ft	Arrivals would typically be **between 600ft and 1,000ft higher** than the current equivalent arrival until nearing final approach where standard approach altitudes would be flown. (See Appendix K, Feedback Report Part B, page B27 for details).
Runway 24 arrivals from north and south below 4,000ft	Arrivals would typically be **between 600ft and 1,000ft higher** than the current equivalent arrival until nearing final approach where standard approach altitudes would be flown. (See Appendix K, Feedback Report Part B, page B29 for details).

3. Current Airspace Description

The operation of the current airspace is described in Appendix K, Consultation document Part A, Section 8. Further detail is given for flights below 4000ft in Part B, Section 2; and for flights from 4000ft to 7000ft in Part C section 2.

Traffic Figures

The number of flights on each route are given in Appendix K, Feedback Report Part B, Page B67.

Operational Efficiency, Complexity, Delays & Choke Points

The current day ATC operation in the vicinity of Farnborough is described in Appendix K, Consultation document Part A, page A28. This describes how complexity impacts the Operational Efficiency, and causes delays.

The impact of choke points and funnelling is discussed in Appendix K, Consultation Part E, Page E23.

Appendix L provides an example list of disruption events that cause operational inefficiency, complexity and delay.

Environmental Issues

The lack of predictable routes (arrivals or departures) causes flights to cover a wide area at relatively low altitudes.

This proposal seeks to reduce the number of people regularly overflown at low altitudes.

Aircraft Type	Total	%
C56X	197	10.0%
CL60	154	7.8%
H25B	154	7.8%
GLF5	126	6.4%
F2TH	121	6.2%
BE20	101	5.1%
GLEX	97	4.9%
GLF4	87	4.4%
F900	86	4.4%
E135	78	4.0%
FA7X	76	3.9%
LJ45	66	3.4%
B462	64	3.3%
LJ60	43	2.2%
C25A	39	2.0%
C510	34	1.7%
GL5T	32	1.6%
C680	28	1.4%
A319	27	1.4%
GALX	27	1.4%
C25B	23	1.2%
C550	23	1.2%
C750	23	1.2%
B737	21	1.1%
B738	21	1.1%
CL30	21	1.1%
LJ40	20	1.0%
CRJ2	16	0.8%
E55P	16	0.8%
E145	14	0.7%
PRM1	14	0.7%
PC12	13	0.7%
JS41	12	0.6%
E50P	11	0.6%
BE40	10	0.5%
FA50	9	0.5%
P180	8	0.4%
A318	7	0.4%
A320	6	0.3%
ASTR	6	0.3%
C525	5	0.3%
H25C	5	0.3%
B734	4	0.2%
BE30	4	0.2%
BE9L	2	0.1%
C130	2	0.1%
C441	2	0.1%
C551	2	0.1%
C560	2	0.1%
C650	2	0.1%
LJ55	2	0.1%
RJ85	2	0.1%
C295	1	0.1%
E190	1	0.1%

80%

90%

Aircraft Types

Table 1 shows the composition of the aircraft mix at Farnborough.

95% of Farnborough's flights are corporate aircraft, comprising small business jets and turbo-props. The mid-sized airliner types (coloured orange) account for 4.4% of total movements.

Aircraft types are colour coded as follows

C56X Corporate Jet/Turboprop

A319 Mid-size airliner

Traffic sample - Sept 2012

Figures are for total movements (i.e. landing then take-off = 2 movements)

Table 1 TAG Farnborough Airport, Aircraft types (1 month)

4. Proposed Airspace Description

A complementary master map is supplied as a separate PDF to this proposal.

The design and operation of the proposed airspace is described in Appendix O – Airspace Concept of Operations. The procedures are detailed in Appendix H – PDG Package (note that the preferred draft designation here may be different to PDG working designations).

Figure 1 below shows the proposed airspace.

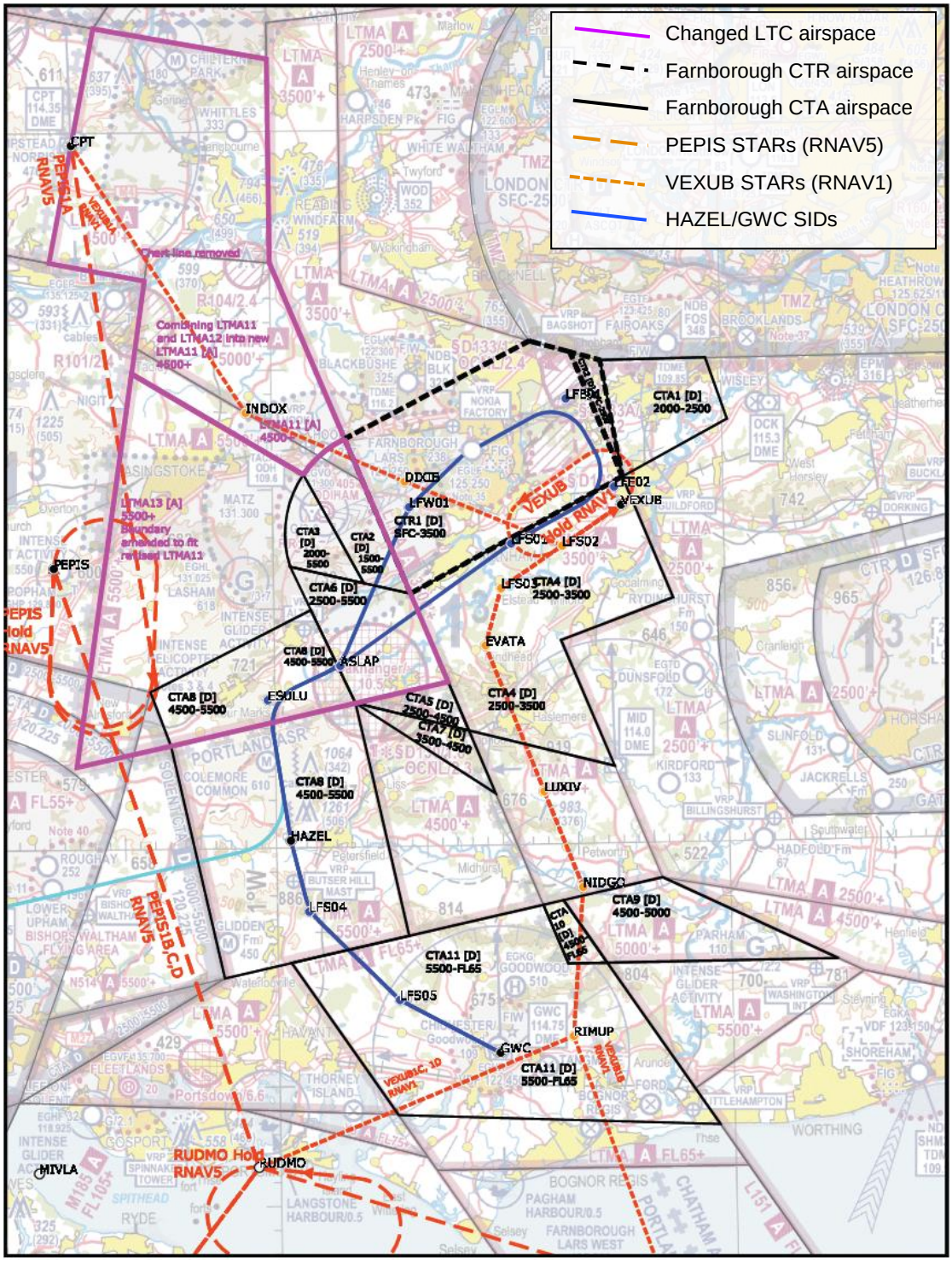


Figure 1. Overview of proposed airspace

5. Impacts & Consultation

Units Affected by the Proposal

This proposal affects TAG Farnborough Airport, NATS London Terminal Control, London Heathrow Airport and Southampton Airport.

The proposal is sponsored by TAG Farnborough Airport and supported by the other airports and LTC[1].

Safety Issues/Analysis

The proposed airspace, SIDs and STARs and link routes have been simulated in real time simulations for validation and safety assurance of the proposed ATC operations. For full detail of this please see Appendix D (Simulation Report).

The proposed airspace, SIDs, STARs, holds, MAPs and RTF procedures have been validated in flight simulators for three aircraft types for flyability validation and safety assurance. For full detail of this please see Appendix G (Flyability Validation Report).

Safety analysis and discussions are provided in Appendix B.

Military Implications & Consultation

The UK MOD has been extensively involved in the development of the proposed changes.

Excerpt from DAATM-SO2 email:

> *"The MOD has no objection to this ACP, with the caveat that the policy change to allow Military Terminal controllers (ie. RAF Odiham) to operate within another Units CTA/CTR (ie. Farnborough) is integral to this approval and to the ACP's success…"*
>
> *Lisa Mullineux*
>
> *Sqn Ldr| SO2 Airspace 1| DAATM | CAA House | 45-59 Kingsway | London | WC2B 6TE*

For full response see Appendix J zip file, under DAATM/NTMAC26-MoD-DAATM-to-EGLF

General Aviation Airspace Users Impact & Consultation

See Appendix K Consultation Feedback Report Part B, sections 5 and 8.

Commercial Air Transport Impact & Consultation

See Appendix K Consultation Feedback Report Part A, section 12.

[1] LTC have no objection subject to development of the detail of local interface procedures, the development of which is part of the implementation work package.

CO_2 Environmental Analysis Impact & Consultation

See Appendix F for fuel/CO_2 discussion.

See also Appendix K Consultation Feedback Report Part B, sections 6 and 11.

Local Environmental Impacts & Consultation

See Appendix F for local air quality discussion.

See also Appendix K Consultation Feedback Report Part B, sections 6 and 11 for discussion of noise/tranquillity.

Economic Valuation of Environmental Impact

NATS is not aware of any established methodology that is widely accepted as providing a complete and robust economic valuation of the environmental impacts of changes to airspace structure. Furthermore, NATS will not base the case for change on an economic valuation of environmental impact and therefore does not propose to attempt to provide or develop such analysis for this ACP.

See also Appendix K Consultation Feedback Report Part B, section 12.

6. Analysis of Options

Do Nothing

The predicted increase in TAG Farnborough movements would not be supported in the current uncontrolled airspace infrastructure, for all users of the airspace. Increased traffic movements without improvements in the airspace would also impact safety. This is discussed in detail in Appendix B under confidential password-protected PDFs.

The current environment would not support an efficient, predictable operation, so doing nothing was discounted.

Use airspace structures that are not CAS

Avoiding the establishment of CAS was looked at extensively, and options were considered using a combination of Transponder Mandatory Zones (TMZ) and Radio Mandatory Zones (RMZ) without establishing CAS.

In such an environment with forecast Farnborough traffic levels, a TMZ/RMZ combination would still not provide adequate predictability and controllability. This design concept was rejected, but elements of RMZ were retained in the consulted-upon design. Subsequent redesign due to consultation feedback (see Option 34) removed the requirement for an RMZ in that area. Therefore RMZ/TMZ structures were discounted.

Options 1-12

Initial designs attempted to manage air traffic near to Farnborough. Connectivity to the main air route network remained undeveloped. Option 12 had routes for arriving and departing aircraft remaining largely as today. This option received challenge from stakeholders involved in GA activity due to the amount of required CAS required northwest of Farnborough.

Because of the lack of connectivity to the network, this option was discounted.

Options 13-17

Option 17 attempted to deliver network connectivity, by means of two laterally separated routes from the south (one for arrivals, one for departures), and a 'split' route to/from the north. The split route would be bi-directional, but achieve lateral separation between an arrival and a departure, by means of timed departure release.

The required CAS north of Farnborough was reduced. However, this option received challenge from stakeholders involved in gliding activity at Lasham, due to the relatively low base of CAS areas in the normal areas for glider operations (3,500ft).

After further discussions with LTC Swanwick, the proposed network connectivity was also rejected, as complexity in the Compton VOR area had not been addressed.

This option was therefore not developed further.

Options 18-24

Alternate routing options were explored, balancing the requirements for CAS against GA requirements and challenges. Option 24 was formally put through an ATC simulation involving many controllers from the relevant ATC agencies. From this simulation, operational issues were encountered that needed addressing.

Option 25 - the Change as Originally Consulted Upon

Option 24 was refined and the simulation issues addressed. The version presented in the original consultation was Option 25.

Options 26-30

Options 26 to 30 saw the design taken through various iterations to arrive at Option 31; the option which was simulated.

Option 31 – Redesign post-consultation to be simulated

Following feedback from consultation the airspace design (option 25) was modified extensively in order to:

- minimize noise impacts,
- mitigate impacts on GA and S&RA operations
- minimize impact on RAF Odiham
- Minimize environmental impact of CO_2 emissions, local air quality and tranquillity
- This was simulated with the SARG Case Officer as an observer (Feb 2015).

Option 32-33 – Post-sim modifications

One specific region in the vicinity of Parham (Southdown Gliding Club site) was further analysed and discussed at length

- The Class D CTA south of Parham (known in Option 25 as CTA13) could be removed from the system without significant penalty, therefore it was decided to do so to mitigate the impacts on Parham Southdown Gliding Club.
- The Class D CTA directly overhead Parham (known in Option 25 as CTA12) is only 500ft thick directly below Class A LTMA14 and has the same footprint. It was considered that providing reliable safe VFR access to this thin Class D slice would be extremely unlikely. Consideration was given to proposing Class A so that LTMA14 would be the same base as LTMA20 and could be combined, reducing charting lines. This was rejected. If SARG or NATS carried out an LTMA tidying exercise at some future point, and if it was shown that this Class D volume was unable to be used in practice, TAG Farnborough would not object to that CTA being subsumed into LTMA as described above.

This removal of one CTA and retention of another (both near Parham) became Option 34.

Option 34 - Airspace Changes as Proposed Herein

The redesign work culminated in "Option 34" which is the design as proposed in this ACP. This design will optimize the performance of the airspace for all users, whilst minimizing noise impacts on the areas surrounding the airport.

Further detail of the design options considered is provided in Appendix K Consultation Document Part E sections 7 and 8.

7. Airspace Description Requirement

CAP 725, Appendix A Paragraph 5, provides a list of requirements for a proposed airspace description. These are listed below:

	CAA CAP725, Appendix A paragraph 5 Requirement. "The proposal should provide a full description of the proposed change including the following:"	**Description for this Proposal**
a	The type of route or structure; e.g. Airway, UAR, Conditional Route, Advisory Route, CTR, SIDs/STARs, Holding Patterns, etc;	See Appendix O – Airspace ConOps For PDG SID/STAR charts & coding tables see Appendix H.
b	The hours of operation of the airspace and any seasonal variations;	Weekdays 0700–2200 local time Weekends/public holidays 0800-2000 local time Closed December 25th & 26th
c	Interaction with domestic and international en-route structures, TMAs or CTAs with an explanation of how connectivity is to be achieved. Connectivity to aerodromes not connected to CAS should be covered;	See Appendix O – Airspace ConOps For PDG SID/STAR charts & coding tables see Appendix H.
d	Airspace buffer requirements (if any);	See Appendix O – Airspace ConOps
e	Supporting information on traffic data including statistics and forecasts for the various categories of aircraft movements (Passenger, Freight, Test and Training, Aero Club, Other) and Terminal Passenger numbers;	See Appendix K Feedback Report Part B page B67
f	Analysis of the impact of the traffic mix on complexity and workload of operations;	The mix of aircraft types using Farnborough Airport (small Turbo-prop, small business jet, mid-sized airliner corporate jet) does not in itself cause complexity. The complexity is due to the uncontrolled airspace through which aircraft have to fly, and the profusion of unknown traffic (see Appendix B, Safety Discussion)
g	Evidence of relevant draft Letters of Agreement, including any arising out of consultation and/or Airspace Management requirements;	See Appendix I – Draft LoAs
h	Evidence that the Airspace Design is compliant with ICAO Standards and Recommended Practices (SARPs) and any other UK Policy or filed differences, and UK policy on the Flexible Use of Airspace (or evidence of mitigation where it is not);	See Appendix H – PDG package

i	The proposed airspace classification with justification for that classification;	The proposed EGLF CAS class is D. The small additional area of LTC airspace is proposed as Class A. Justification for Class D is provided in Appendix K, Consultation Document Part E, page E6 to E7. Justification for the small additional volume of Class A in the LTMA is provided in Appendix K Feedback Report Part B page B38-B40 paras 5.37-5.48.
j	Demonstration of commitment to provide airspace users equitable access to the airspace as per the classification and where necessary indicate resources to be applied or a commitment to provide them in-line with forecast traffic growth. 'Management by exclusion' would not be acceptable;	Class D used by EGLF. The airspace will be available for GA transits on request (this will be encouraged). See Appendix K, Feedback Report Part B, Section 5 (pages B33-B46)
k	Details of and justification for any delegation of ATS.	See Appendix O – Airspace ConOps

8. Operational Impact

CAA CAP725, Appendix A Paragraph 7, provides a list of requirements for operational impact. These are listed below:

	CAA CAP725, Appendix A paragraph 7 requirements. "An analysis of the impact of the change on all airspace users, airfields and traffic levels must be provided, and include an outline concept of operations describing how operations within the new airspace will be managed. Specifically, consideration should be given to:"	**Evidence of Compliance/Proposed Mitigation**
a	Impact on IFR General Air Traffic and Operational Air Traffic or on VFR General Aviation (GA) traffic flow in or through the area;	IFR GAT and all OAT: See Appendix O – Airspace ConOps VFR GA: See Appendix K, Feedback Report part B section 5, and Appendix O – Airspace ConOps pg31.
b	Impact on VFR operations (including VFR Routes where applicable);	See Appendix K, Feedback Report part B section 5, and Appendix O, Concept of Operations pg26-30.
c	Consequential effects on procedures and capacity, i.e. on SIDS, STARS, and/or holding patterns. Details of existing or planned routes and holds;	New SIDs STARs and holds detailed in Appendix H- PDG package
d	Impact on aerodromes and other specific activities within or adjacent to the proposed airspace;	Impact on Odiham, Blackbushe, Fairoaks, Lasham, Gatwick & Heathrow detailed in Appendix K, Feedback Report part B section 5 and Appendix O, ConOps.
e	Any flight planning restrictions and/or route requirements.	See Appendix O, ConOps pgs 7-8 (arrivals) pgs 12-13 (departures)

9. Supporting Infrastructure & Resources

CAA CAP725, Appendix A Paragraph 6, provides a list of requirements for supporting infrastructure/resources. These are listed below:

	CAA CAP725, Appendix A Paragraph 6, general Requirements	**Evidence of Compliance/Proposed Mitigation**
a	Evidence to support RNAV and conventional navigation as appropriate with details of planned availability and contingency procedures.	Appendix A (CNS coverage) Section 3 details navigational aid coverage in the proposed airspace. Provision of RNAV 1 capability from UK based navigational aids is sufficient to satisfy the navigation performance requirements of the proposed new procedures based on DME/DME for RNAV1, and DME/DME or VOR/DME for RNAV5.
b	Evidence to support primary and secondary surveillance radar (SSR) with details of planned availability and contingency procedures.	See Appendix A (CNS coverage) Section 1
c	Evidence of communications infrastructure including R/T coverage, with availability and contingency procedures.	See Appendix A (CNS coverage) Section 2
d	The effects of failure of equipment, procedures and/or personnel with respect to the overall management of the airspace must be considered.	Equipment: See Appendix A (CNS coverage). Levels of equipment redundancy are indicated on the coverage plots by colour. The impacts of other equipment, procedure or personnel failure would be managed tactically at the time and investigated post-event as appropriate, followed by remedial action.
e	The Proposal must provide effective responses to the failure modes that will enable the functions associated with airspace to be carried out including details of navigation aid coverage, unit personnel levels, separation standards and the design of the airspace in respect of existing international standards or guidance material.	See Appendix A (CNS coverage) for navigation aid coverage See Appendix C for containment and separation, standards, and Appendix O ConOps for general separation background. For unit personnel levels, staffing will be increased by one, and staffing contingency will be as per current day ops.
f	A clear statement on SSR code assignment requirements is also required.	Proposed SSR codes are listed in Appendix O, ConOps page 6.
g	Evidence of sufficient numbers of suitably qualified staff required to provide air traffic services following the implementation of a change.	The proposed routes would be contained within airspace managed by Farnborough and Swanwick LTC ATC. Farnborough ATC intend to increase staffing by at least one, and commits to examining the allocation of existing staff with respect to LARS sectors. No change to staffing requirements at LTC due to this proposal.

10. Airspace & Infrastructure Requirements

CAA CAP725, Appendix A Paragraphs 11-14, provides a list of requirements for airspace and infrastructure. These are listed below:

	CAA CAP725, Appendix A paragraph 11: General Requirements	**Evidence of Compliance/Proposed Mitigation**
a	The airspace structure must be of sufficient dimensions with regard to expected aircraft navigation performance and manoeuvrability to fully contain horizontal and vertical flight activity in both radar and non-radar environments;.	The airspace dimensions are sufficient to fully contain horizontal and vertical flight activity in both radar and non-radar environments. See Appendix H (Procedure Design). Note EGLF is a radar environment.
b	Where an additional airspace structure is required for radar control purposes, the dimensions shall be such that radar control manoeuvres can be contained within the structure, allowing a safety buffer. This safety buffer shall be in accordance with agreed parameters as set down in DAP Policy Statement 'Safety Buffer Policy for Airspace Design Purposes Segregated Airspace';	None required – local danger areas D132 and D133 are live firing, and as such do not require buffers according to CAA Policy Statement "Special Use Airspace - Safety Buffer Policy For Airspace Design Purposes" 14 Aug 2014 (which superseded the CAP725 requirement).
c	The Air Traffic Management (ATM) system must be adequate to ensure that prescribed separation can be maintained between aircraft within the airspace structure and safe management of interfaces with other airspace structures;	Separations within the proposed airspace will be radar monitored and managed by ATC. Management of interfaces with other airspace structures will also be the responsibility of LTC and Farnborough ATC.
d	Air Traffic Control (ATC) procedures are to ensure required separation between traffic inside a new airspace structure and traffic within existing adjacent or other new airspace structures;	See Appendix C Containment and Separation, and Appendix O (Concept of Operations).
e	Within the constraints of safety and efficiency, the airspace classification should permit access to as many classes of user as practicable;	Class D CTR and CTA except for a small Class A extension to LTMA See Appendix K Feedback Report Part B Section 5 and Appendix O (Concept of Operations).
f	There must be assurance, as far as practicable, against unauthorised incursions. This is usually done through the classification and promulgation.	Details of the airspace changes associated with this proposal will be published two AIRAC cycles in advance. A programme of outreach to engage the GA fraternity in how to request lawful transit is planned. LARS and CAIT will be used to monitor traffic and mitigate any incursions.
g	Pilots shall be notified of any failure of navigational facilities and of any suitable alternative facilities available and the method of identifying failure and notification should	Failure of navigational facilities will be promulgated by NOTAM and ATC will provide navigational assistance using radar when necessary.

	be specified;	

h	The notification of the implementation of new airspace structures or withdrawal of redundant airspace structures shall be adequate to allow interested parties sufficient time to comply with user requirements. This is normally done through the AIRAC cycle;	Changes will be published via the normal AIRAC cycles. Two AIRAC cycles' notice will be given.
i	There must be sufficient R/T coverage to support the ATM system within the totality of proposed controlled airspace.	R/T coverage within the proposed airspace is well proven. R/T coverage plots are provided in Appendix A section 2.
j	If the new structure lies close to another airspace structure or overlaps an associated airspace structure, the need for operating agreements shall be considered;	See Appendix O (Concept of Operations).
k	Should there be any other aviation activity (low flying, gliding, parachuting, microlight site, etc.) in the vicinity of the new airspace structure and no suitable operating agreements or ATC Procedures can be devised, the Change Sponsor shall act to resolve any conflicting interests;	If such a conflict occurs then we will act appropriately, and may also seek CAA guidance

	CAA CAP725, Appendix A paragraph 12: ATS Route Requirements	**Evidence of Compliance/Proposed Mitigation**
a	There must be sufficient accurate navigational guidance based on in-line VOR/DME or NDB or by approved RNAV derived sources, to contain the aircraft within the route to the published RNP value in accordance with ICAO/EuroControl Standards;	The proposed SIDs and STARs would be contained within airspace where the CNS infrastructure is well proven and appropriate contingency procedures already exist. See Appendix A section 3 for plots demonstrating suitable Nav coverage to assure RNAV1 & RNAV5 capability.
b	Where ATS routes adjoin Terminal Airspace there shall be suitable link routes as necessary for the ATM task;	The proposed procedures connect to the en-route airway structure as per Appendix O (ConOps)
c	All new routes should be designed to accommodate P-RNAV navigational requirements.	Proposed SIDs are RNAV1. Non RNAV1 equipped departures will be vectored (see Appendix K, Consultation feedback report part B para 4.14). Proposed VEXUB STARs are RNAV1. Proposed PEPIS STARs are RNAV5. (This gives non-RNAV1 equipped aircraft a route in).

	CAA CAP725, Appendix A paragraph 13: Terminal Airspace Requirements	Evidence of Compliance/Proposed Mitigation
a	The airspace structure shall be of sufficient dimensions to contain appropriate procedures, holding patterns and their associated protected areas;	See Appendix C (CAS containment), Appendix H (Procedure Design) and Appendix O (Concept of Operations).
b	There shall be effective integration of departure and arrival routes associated with the airspace structure and linking to designated runways and published IAPs;	See Appendix H (Procedure Design) and Appendix O (Concept of Operations).
c	Where possible, there shall be suitable linking routes between the proposed terminal airspace and existing en-route airspace structure;	See Appendix H (Procedure Design) and Appendix O (Concept of Operations) pages 7-8 and 12-13
d	The airspace structure shall be designed to ensure that adequate and appropriate terrain clearance can be readily applied within and adjacent to the proposed airspace;	All procedures and routes are compliant with PANS Ops standards, See Appendix H (Procedure Design).
e	Suitable arrangements for the control of all classes of aircraft (including transits) operating within or adjacent to the airspace in question, in all meteorological conditions and under all flight rules, shall be in place or will be put into effect by Change Sponsors upon implementation of the change in question (if these do not already exist);.	See Appendix O (Concept of Operations).
f	Change Sponsors shall ensure that sufficient VRPs are established within or adjacent to the subject airspace to facilitate the effective integration of VFR arrivals, departures and transits of the airspace with IFR traffic;	Additional VRPs are being progressed separately from this ACP and will be very useful regardless of the outcome of this ACP.
g	There shall be suitable availability of radar control facilities;	No change to extant availability
h	Change Sponsors shall, upon implementation of any airspace change, devise the means of gathering (if these do not already exist) and of maintaining statistics on the number of aircraft transiting the airspace in question. Similarly, Change Sponsors shall maintain records on the numbers of aircraft refused permission to transit the airspace in question, and the reasons why. Change Sponsors should note that such records would enable ATS Managers to plan staffing requirements necessary to effectively manage the airspace under their control;	A log of transits requested and whether granted or refused will be maintained.
i	All new procedures should, wherever possible, incorporate Continuous Descent Approach (CDA) profiles after aircraft leave the holding facility associated with that procedure.	Where possible CDA would be applied.

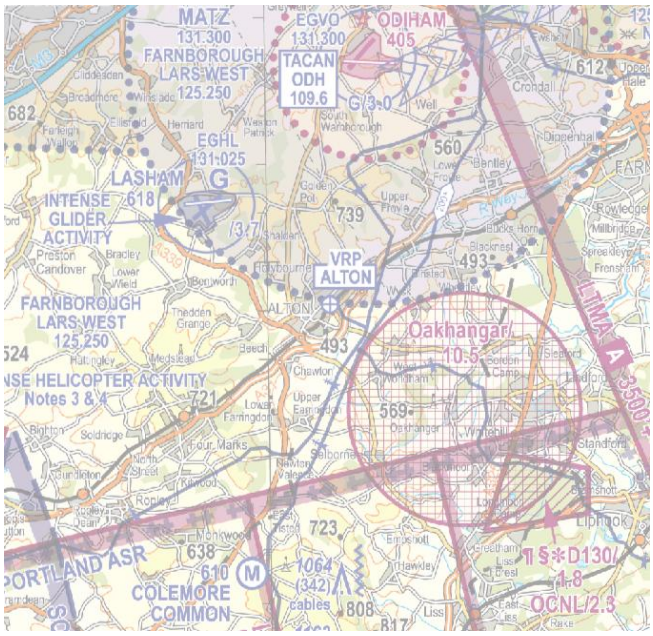
CAA CAP725, Appendix A paragraph 14: Off Route Airspace Requirements	Evidence of Compliance/Proposed Mitigation

One change is requested to be considered by SARG, concerning Oakhanger HIRTA, west of Bordon, Hants.

In civilian VFR charts it is notified as a circle. GA tend to avoid it even though it is not an exclusion area, merely a warning to VFR pilots about potential high energy radio waves. This avoidance could cause unnecessary funnelling.

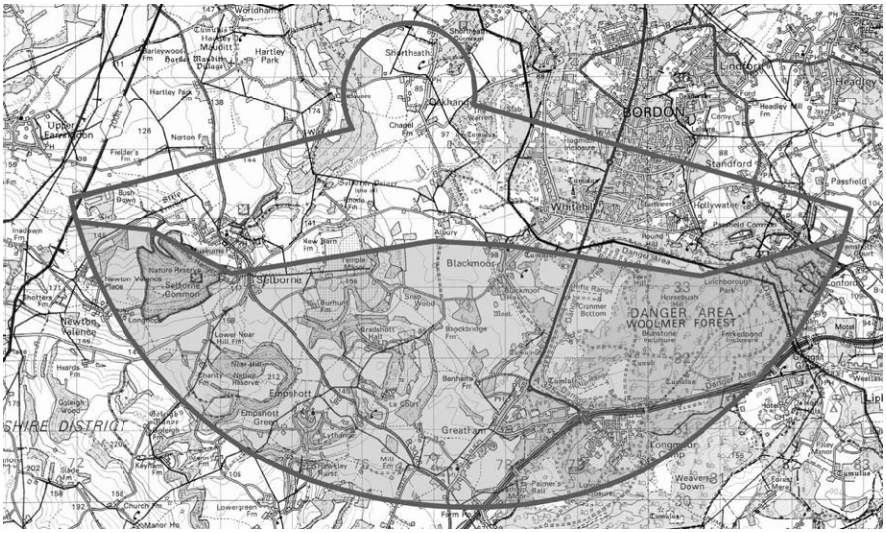
Military aircraft use charts showing less than a semicircle.

If the civilian charts could be redrawn to match the military charts, it would likely mitigate potential funnelling due to the unnecessary avoidance of the northern semicircle, and a "gap" would appear on the VFR map between Oakhanger and Odiham's MATZ.



Civilian 250K VFR chart (above, SE of Odiham MATZ).
Note the misspelling of "Oakhanger" on this VFR 250K chart
(the equivalent VFR 500K chart is correct,
and the AIP entry at ENR 5.3 is also correct)

Military Flying Order chart (below)



11. Environmental Requirements

This section details the required elements of an Environmental Assessment for the Phase 2 ACP development, based upon CAP 725 Appendix B.

The requirements in this section are grouped by the degree of compliance expected from airspace change sponsors. In following this guidance:

- **Must** – change sponsors are to meet the requirements in full when this term is used.
- **Should** – change sponsors are to meet these requirements unless there is sufficient reason which must be agreed in writing with the DAP case officer and the circumstances recorded in the formal airspace change documentation.
- **May** – change sponsors decide whether this guidance is appropriate to the circumstances of the airspace change.

	Requirement		CAP725 Ref.	CAP725 Page	How met
1	In order to ensure that the various areas for environmental assessment by DAP are addressed, Change Sponsors should submit the documentation with the following clearly defined sections: Description of the airspace change (refer to 28 – 33); Traffic forecasts (refer to 34 – 38); An assessment of the effects on noise (refer to Sections 4 and 5); An assessment of the change in fuel burn/CO2 (refer to Section 6); An assessment of the effect on local air quality (refer to Section 7); and An economic valuation of environmental impact, if appropriate (refer to Section 9).	General	Para 2	B-1	Airspace description see Appendix O Concept of Operations Traffic figures see Appendix K Feedback Report Part B page B67 Noise impact see Appendix K, Feedback report Part B sections 4, 6, 11 and pages B72-B73. Fuel/CO_2 & local air quality See Appendix F. Economic valuation of environmental impact, see this ACP section 5.
2	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.	General	Para 18	B-4	We have no reason to believe that flora and fauna will be adversely affected by this proposal.
3	Environmental assessment should set out the base case or current situation so that changes can be clearly identified.	General	Para 19	B-4	Environmental analysis uses a base case of current day operations. See Appendix F.
4	Environmental assessment should follow the Basic Principles listed in CAP 725.	General	Para 20	B-4	The basic principles have been followed. See this ACP Section 5
5	A technical document containing a comprehensive and complete description of the airspace change including the environmental impact will be required and must be produced for all airspace changes.	General	Para 25	B-6	See this ACP Sections 4 & 5.
6	It may be appropriate for Change Sponsors to produce a more general description of the airspace change and the rationale for its proposal in an easy-to-read style for public consumption. If such an additional separate document is produced, it must contain details of the environmental impact of the proposal.	General	Para 25	B-6	See Appendix K, Consultation document and Feedback report part B.

	Requirement		CAP725 Ref.	CAP725 Page	How met
7	The environmental assessment must include a high quality paper diagram of the airspace change in its entirety as well as supplementary diagrams illustrating different parts of the change. This diagram must show the extent of the airspace change in relation to known geographical features and centres of population	Airspace Design	Para 28	B-7	See complementary chart PDF associated with this ACP, suitable for A3 printing or can be zoomed in onscreen.
8	The proposal should consider and assess more than one option, then demonstrate why the selected option meets safety and operational requirements and will generate an overall environmental benefit or, if not, why it is being proposed.	Airspace Design	Para 29	B-7	See this ACP Section 6
9	The Change Sponsor must provide DAP with a complete set of coordinates describing the proposed change in electronic format using World Geodetic System 1984 (WGS 84). In addition, the Sponsor must supply these locations in the form of Ordnance Survey (OS) national grid coordinates.	Airspace Design	Para 30	B-7	See Appendix E AIP Coordinate Validation spreadsheet suitable for Darren Warwick's checking.
10	This electronic version must provide a full description of the horizontal and vertical extent of the zones and areas contained within the airspace change. It must also include coordinates in both WGS 84 and OS national grid formats that define the centre lines of routes including airways, standard instrument departures (SID), standard arrival routes (STAR), noise preferential routes (NPR) or any other arrangement that has the effect of concentrating traffic over a particular geographical area.	Airspace Design	Para 30	B-7	See complementary ACP master map PDF in conjunction with Appendix E Coordinate Validation spreadsheet. The design and operation of the proposed airspace is described in Appendix O - Concept of Operations . The procedures are detailed in Appendix H - Procedure Design.
11	Change Sponsors should provide indications of the likely lateral dispersion of traffic about the centre line of each route. This should take the form of a statistical measure of variation such as the standard deviation of lateral distance from the centre line for given distances along track in circumstances where the dispersion is variable.	Airspace Design	Para 31	B-7	Data of RNAV track-keeping conformance from a study of procedures trialled at Gatwick Airport indicates that aircraft navigating using RNAV1 had an average track deviation from the simulated track, of 0.1nm, and 95% were within 0.2nm (a sample of 594 aircraft, on 2 SIDs). Hence likely lateral dispersal from the centre-line of the RNAV1 routes is expected to be than 0.2nm or less, with a 95% confidence interval.

12	Sponsors may supply the outputs from simulation to demonstrate the lateral dispersion of traffic within the proposed airspace change or bring forward evidence based on actual performance on a similar kind of route. It may be appropriate for Sponsors to explain different aspects of dispersion e.g. dispersion within NPRs when following a departure routeing and when vectoring – where the aircraft will go and their likely frequency	Airspace Design	Para 31	B-7	See Appendix D, Simulation Plots
13	Change Sponsors must provide a description of the vertical distribution of traffic in airways, SIDs, STARs, NPRs and other arrangements that have the effect of concentrating traffic over a particular geographical area	Airspace Design	Para 32	B-7	See vertical profiles given in Appendix K, Feedback Report Part B (Figs 4-6 use example climb profiles, figs 8-10 use shading to illustrate descent rate)
14	For departing traffic, sponsors should produce profiles of the most frequent type(s) of aircraft operating within the airspace. They should show vertical profiles for the maximum, typical and minimum climb rates achievable by those aircraft.	Airspace Design	Para 32	B-7	See typical vertical profiles given in Appendix K, Feedback Report Part B (Figs 4-6)
15	A vertical profile for the slowest climbing aircraft likely to use the airspace should also be produced.	Airspace Design	Para 32	B-8	The slowest climbing aircraft will follow the profiles given in Appendix K, Feedback Report Part B (Figs 4-6)
16	All profiles should be shown graphically and the underlying data provided in a spread sheet with all planning assumptions clearly documented.	Airspace Design	Para 32	B-8	n/a. Climbs are capped by overlying airspace/routes.
17	Change Sponsors should explain how consideration of CDA and LPLD is taken into account within their proposals	Airspace Design	Para 33	B-8	Implementation of RNAV arrivals will give pilots improved predictability and hence improve capability to execute CDAs with more accuracy.
18	In planning changes to airspace arrangements, sponsors may have conducted real and/or fast time simulations of air traffic for a number of options.	Traffic Forecasts	Para 34	B-8	See Appendix D, Simulation Report and Plots.
19	Change Sponsors must include traffic forecasts in their environmental assessment.	Traffic Forecasts	Para 35	B-8	See Appendix K, Feedback Report Part B, page B67
20	Information on air traffic must include the current level of traffic using the present airspace arrangement and a forecast. The forecast will need to indicate the traffic growth on the different routes contained within the airspace change volume.	Traffic Forecasts	Para 35	B-8	See Appendix K, Feedback Report Part B, page B67
21	The sources used for the forecast must be documented.	Traffic Forecasts	Para 35	B-8	Forecasts in Appendix K, feedback report were based on TAG forecast "most likely" growth scenario. In line with master plan and planning permission granted in 2011 by Secretary of State.

22	Typically, forecasts should be for five years from the planned implementation date of the airspace change. There may be good reasons for varying this – for example, to use data that has already been made available to the general public at planning inquiries, in airport master plans or other business plans	Traffic Forecasts	Para 36	B-8	Forecast figures were given for 2019 since this accords with the traffic forecasts outlined by the planning permission restrictions.
23	It may also be appropriate to provide forecasts further into the future than five years: examples are extensive airspace changes or where traffic is forecast to grow slowly in the five-year period but faster thereafter.	Traffic Forecasts	Para 36	B-8	n/a
24	It may be appropriate for Change Sponsors to outline the key factors [affecting traffic forecasts] and their likely impact. In these circumstances, Sponsors should consider generating a range of forecasts based on several scenarios that reflect those uncertainties – this would help prevent iterations in the assessment process.	Traffic Forecasts	Para 37	B-8	A range of forecasts has not been produced. The justification for change is not sensitive to the degree to which traffic grows (all the benefits and impacts increase or decrease proportionately).
25	Traffic forecasts should contain not only numbers but also types of aircraft. Change Sponsors should provide this information by runway (for arrivals/departures) and/or by route with information on vertical distribution by height/altitude/flight level as appropriate.	Traffic Forecasts	Para 38	B-9	The mix of aircraft types is not expected to change within the forecast period.
26	Types of aircraft may be given by aircraft type/engine fit using ICAO type designators. If this is not a straightforward exercise, then designation by the UK Aircraft Noise Contour Model (ANCON) types or by seat size categories would be acceptable	Traffic Forecasts	Para 38	B-9	See section 3. Type mix is given by ICAO type designators.
27	Change Sponsors must produce Leq, 16 hours noise exposure contours for airports where the proposed option entails changes to departure and arrival routes for traffic below 4,000 feet agl based on the published minimum departure and arrival gradients. Under these circumstances, at least three sets of contours must be produced: Current situation – these may already be available as part of the airport's regular environmental reporting or as part of the airport master plan; Situation immediately following the airspace change; and Situation after traffic has increased under the new arrangements (typically five years after implementation although this should be discussed with the DAP Project Leader).	Noise	Para 44	B-11	Leq16 Not applicable. See Appendix K, Feedback Report Part B, page B73.

28	The contours should be produced using either the UK Aircraft Noise Contour Model (ANCON) or the US Integrated Noise Model (INM) but ANCON must be used when it is currently in use at the airport for other purposes.	Noise	Para 46	B-12	Not applicable
29	Terrain adjustments should be included in the calculation process (i.e. the height of the air routes relative to the ground are accounted for).	Noise	Para 47	B-12	Not applicable
30	Contours must be portrayed from 57 dBA Leq, 16 hours at 3 dB intervals.	Noise	Para 48	B-12	Not applicable
31	Contours should not be produced at levels below 54 dBA Leq, 16 hours because this corresponds to generally low disturbance to most people.	Noise	Para 48	B-12	Not applicable
32	Change Sponsors may include the 54 dBA Leq, 16 hours contour as a sensitivity analysis but this level has no particular relevance in policy making.	Noise	Para 48	B-12	Not applicable
33	A table should be produced showing the following data for each 3 dB contour interval: Area (km2); and Population (thousands) – rounded to the nearest hundred.	Noise	Para 49	B-12	Not applicable
34	It is sometimes useful to include the number of households within each contour, especially if issues of mitigation and compensation are relevant: This table should show cumulative totals for areas/populations/households. For example, the population for 57 dBA will include residents living in all higher contours. The source and date of population data used should be noted adjacent to the table. Population data should be based on the latest available national census as a minimum but more recent updated population data is preferred. The areas calculated should be cumulative and specify total area within each contour including that within the airport perimeter.	Noise	Para 50	B-12	Not applicable

35	Contours for assessment should be provided to DAP in both of the following formats: Electronic files in the form of a comma delimited ASC2 text file containing three fields as an ordered set (i.e. coordinates should be in the order that describes the closed curve) defining the contours in Ordnance Survey National Grid in metres: Field Name Units 1 Level dB 2 Easting six figure easting OS national grid reference (metres) 3 Northing six figure northing OS national grid reference (metres) Paper version overlaid on a good quality 1:50 000 Ordnance Survey map. However, it may be more appropriate to present contours on 1:25 000 or 1:10 000 Ordnance Survey maps.	Noise	Para 51	B-13	Not applicable
36	Contours for a general audience may be provided overlaid on a more convenient map (e.g. an ordinary road map with a more suitable scale for publication in documents). The underlying map and contours should be sufficiently clear for an affected resident to be able to identify the extent of the contours in relation to their home and other geographical features. Hence, the underlying map must show key geographical features, e.g. street, rail lines and rivers.	Noise	Para 53	B-13	Not applicable
37	SEL footprints must be used when the proposed airspace includes changes to the distribution of flights at night below 7,000 feet agl and within 25 km of a runway. Night is defined here as the period between 2300 and 0700 local time. If the noisiest and most frequent night operations are different, then footprints should be calculated for both of them. A separate footprint for each of these types should be calculated for each arrival and departure route. If SEL footprints are provided, they should be calculated at both 90 dBA SEL and 80 dBA SEL.	Noise	Para 56	B-13	Not applicable. (EGLF closed at night.)
38	SEL footprints may be used when the airspace change is relevant to daytime only operations. If SEL footprints are provided, they should be calculated at both 90 dBA SEL and 80 dBA SEL.	Noise	Para 56	B-14	Not applicable

39	SEL footprints for assessment should be provided to DAP in both of the following formats: Electronic files in the form of a comma delimited ASC2 text file containing three fields as an ordered set (i.e. coordinates should be in the order that describes the closed curve) defining the footprints in Ordnance Survey National Grid in metres: Field Field Name Units 1 Level (dB) 2 Easting six figure easting OS national grid reference (metres) 3 Northing six figure northing OS national grid reference (metres) Paper version overlaid on a good quality 1:50 000 Ordnance Survey map. However, it may be more appropriate to present footprints on 1:25 000 or 1:10 000 Ordnance Survey maps.	Noise	Para 57	B-14	Not applicable
40	SEL footprints for a general audience may be provided overlaid on a more convenient map (e.g. an ordinary road map with a more suitable scale for publication in documents). The underlying map and footprints should be sufficiently clear for an affected resident to identify the extent of the footprints in relation to their home or other geographical features. Hence, this underlying map must show key geographical features, e.g. streets, rail lines and rivers. Calculations should include terrain adjustments as described in the section on Leq contours	Noise	Para 58	B-14	Not applicable
41	Change Sponsors may use the percentage highly annoyed measure in the assessment of options in terminal airspace to supplement Leq. If they choose to use this method, then the guidance on population data for noise exposure contours set out should be followed. Sponsors should use the expression and associated results in calculating the number of those highly annoyed. If they wish to use a variant method, then this would need to be supported by appropriate research references.	Noise	Para 65	B-15	Not applicable
42	Change Sponsors may use the LDEN metric but, if they choose to do so, they must still produce the standard Leq, 16 hours contours as previously described. If airspace change sponsors wish to use the LDEN metric they must do so in a way that is compliant with the technical aspects of the Directive and any supplementary instructions issued by DEFRA. Sponsors should note the requirement for noise levels to be calculated as received at 4 metres above ground level. In particular, the guidance on how contours are to be portrayed, as described in the section dealing with Leq contours applies. Calculations should include terrain adjustments as described in the section on Leq contours. An exception regarding LDEN contours is the production of a table showing numerical data on area, population and households which should be presented by band (e.g. 55 dBA to 60 dBA) rather than cumulatively as for UK Leq contours (e.g. >55 dBA). Change Sponsors should make it clear where areas/counts are by band or cumulative.	Noise	Para 67 & 69 & 70	B-15 & B-16	Not applicable
43	Change Sponsors may use the LNight metric within their environmental assessment and consultation. If they do so, SEL footprints must also be produced. Calculations should include terrain adjustments as described in the section on Leq contours.	Noise	Para 73	B-16	Not applicable

44	Change Sponsors may use difference contours if it is considered that redistribution of noise impact is a potentially important issue.	Noise	Para 78	B-17	Not applicable
45	Change Sponsors may use PEI as a supplementary assessment metric.	Noise	Para 85	B-19	Not applicable
46	Change Sponsors may use the AIE metric as a supplementary assessment metric. If the sponsor uses PEI as a supplementary metric then AIE should also be calculated as both metrics are complementary.	Noise	Para 87	B-19	Not applicable
47	Change Sponsors may vary the information displayed in Operations Diagrams providing that the diagram is a fair and accurate representation of the situation portrayed.	Noise	Para 88	B-20	Not applicable
48	Change Sponsors may use maximum sound levels (Lmax) in presenting aircraft noise footprints for public consumption if they think that this would be helpful. This does not replace the obligation to comply with the requirement to produce sound exposure level (SEL) footprints, where applicable.	Noise	Para 95	B-21	L_{max} noise levels given in Appendix K, Consultation Documents Parts B-D and also in Appendix K Feedback Report Part B, page B72.
49	Change Sponsors may produce diagrams portraying maximum sound event levels (Lmax) for specific aircraft types at a number of locations at ground level beneath the airspace under consideration. This may be helpful in describing the impact on individuals. It is usual to include a table showing the sound levels of typical phenomenon e.g. a motor vehicle travelling at 30 mph at a distance of 50 metres.	Noise	Para 96	B-21	Table of L_{max} levels for aircraft at different altitudes can be correlated with the flight profiles given in Appendix K, Feedback Report Part B, Fig 4-10
50	Change Sponsors must demonstrate how the design and operation of airspace will impact on emissions. The kinds of questions that need to be answered by the sponsor are: Are there options which reduce fuel burn in the vertical dimension, particularly when fuel burn is high e.g. initial climb? Are there options that produce more direct routeing of aircraft, so that fuel burn is minimised? Are there arrangements that ensure that aircraft in cruise operate at their most fuel-efficient altitude, possibly with step-climbs or cruise climbs?	Climate Change	Para 102	B-22	Prioritised reducing over-flight of local populated areas where possible, at the expense of fuel consumption. See Appendix F and Appendix K Consultation Feedback Report Part B, sections 6 and 11.
51	Change Sponsors should estimate the total annual fuel burn/mass of carbon dioxide in metric tonnes emitted for the current situation, the situation immediately following the airspace change and the situation after traffic has increased under the new arrangements – typically five years after implementation. Sponsors should produce estimates for each airspace option considered.	Climate Change	Para 106	B-23	See Appendix F.
52	Change Sponsors should provide the input data for their calculations including any modelling assumptions made. They should state details of the aircraft performance model used including the version numbers of software employed.	Climate Change	Para 107	B-23	See Appendix F. Aircraft performance data used: BADA 3.10

53	Where the need to provide additional airspace capacity, reduce delays or mitigate other environmental impact results in an increase in the total annual fuel burn/ mass of carbon dioxide in metric tonnes between the current situation and the situation following the airspace change, Sponsors should provide justification.	Climate Change	Para 108	B-23	See Appendix F. The priority below 4000ft agl is to reduce noise impact. Longer routes have been created due to prioritising avoidance of over-flight of populated areas below 4000ft agl. The assumptions used in this calculation are conservative (worst case), hence in reality it is expected that the increase in fuel burn (534 tonnes p.a.) will be less than this figure.
54	Change Sponsors must produce information on local air quality only where there is the possibility of pollutants breaching legal limits following the implementation of an airspace change. The requirement for local air quality modelling will be determined on a case by case basis as discussed with the DAP Project Leader and ERCD. This discussion will include recommendations of the appropriate local air quality model to be used. Concentrations should be portrayed in microgrammes per cubic metre (µg.m-3). They should include concentrations from all sources whether related to aviation and the airport or not. Three sets of concentration contours should be produced: Current situation – these may already be available as part of the airport's regular environmental reporting or as part of the airport master plan; Situation immediately following the airspace change; and Situation after traffic has increased under the new arrangements – typically five years after implementation although this should be discussed with the DAP Project Leader.	Local Air Quality	Para 115	B-25	The single change that takes place below 1,000ft is designed to specifically avoid populated areas. There are no AQMAs in the area below 1,000ft where the change would occur. See Appendix F.
55	Contours for assessment should be provided to DAP in similar formats to those used for noise exposure contours. Where Change Sponsors are required to produce concentration contours they should also produce a table showing the following data for concentrations at 10 µ.m-3 intervals: Area (km^2); and Population (thousands) – rounded to the nearest hundred.	Local Air Quality	Para 116	B-25	Not Applicable
56	The source and date of population data used should be noted adjacent to the table. Population data should be based on the latest available national census as a minimum but more recent updated population data is preferred.	Local Air Quality	Para 117	B-25	Not Applicable

57	Change Sponsors may wish to conduct an economic appraisal of the environmental impact of the airspace change, assessing the economic benefits generated by the change. If undertaken, this should be conducted in accordance with the guidance from HM Treasury in the Green Book (HM Treasury, 2003). If Change Sponsors include a calculation of NPV then they must show financial discount rates, cash flows and their timings and any other assumptions employed. The discount rate must include that recommended in the Green Book currently set at 3.5%. Additionally, other discount rates may be used in a sensitivity analysis or because they are representative of realistic commercial considerations	Economic Valuation	Para 124 & 126	B-27	No such appraisal has been undertaken. See section 5.