Airspace Change Proposal

Appendix C

CAS Containment and Separation Arguments

INDOX area (arrivals from the northwest)

ASLAP area (85% of departures)

Farnborough SIDs vs slow-climbing Heathrow and Gatwick departures

3nm/1,000ft Procedural Separation, 3nm Radar Separation

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This document describes and discusses four specific subjects arising within the Farnborough Airspace Change Proposal, and relevant safety arguments applicable.

1. Containment in the vicinity of INDOX

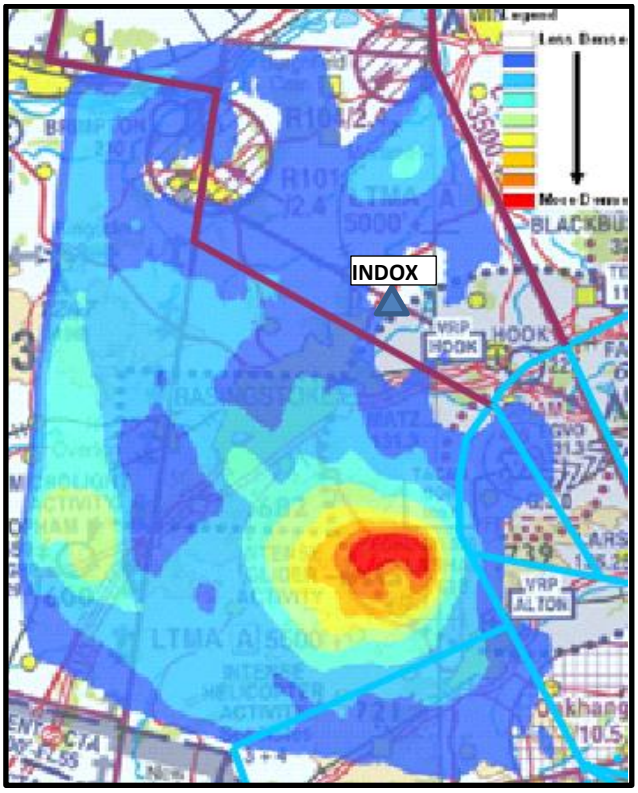

Figure 1 Proposed point INDOX on the STAR from the NW, and primary radar returns

1.1. Currently aircraft arriving at Farnborough from the CPT direction are descended out of CAS and the final portion of the flight is via class G airspace. In the vicinity of the descent out of Controlled Airspace there are significant General Aviation activities, particularly a high density of gliding activity.

1.2. The map above illustrates the density of radar returns of primary traffic. This analysis covers the time period 7-13 and 21-27 Sept 2014 (14 days in total).

1.3. The intense activity to the southwestern region of RAF Odiham encapsulates the Lasham gliding activity.

1.4. The project investigated powered flights in the area of proposed change. Powered aircraft generally operate at lower altitudes (90%+ are not above 3,000ft).

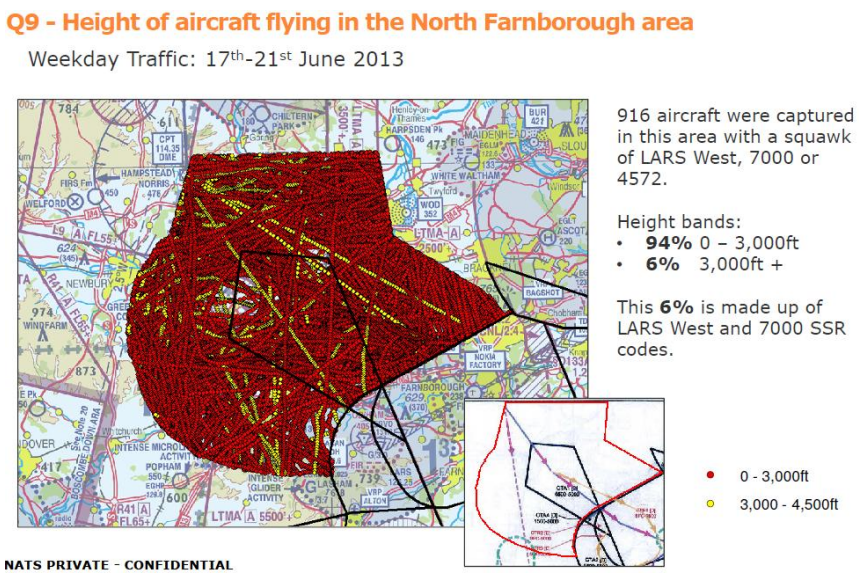

Figure 2 SSR altitude analysis in the area

1.5. To balance the needs of the General Aviation community versus the need to protect Farnborough inbound aircraft, the following has been proposed.

Figure 3 Minimal CAS request

1.6. To provide predictability and support systemisation of TC airspace, RNAV1 STARs have been designed into the ACP. On the above chart extract, the proposed RNAV1 arrival STAR form the northwest is shown in Orange, via INDOX and DIXIB.

1.7. The purple airspace line shows the proposed airspace with a base of 4,500ft (this lowers existing airspace by 500ft in the majority of the sector), which achieves containment for the route of 1nm if the aircraft on the CPT – INDOX – DIXIB route was below 5,500ft.

1.8. This airspace and the RNAV1 route is adjacent to the existing Heathrow RMA for Easterly operations. The route is in the optimum position to minimise overall impact on Heathrow and reduce airspace required to protect the operation balanced against the needs of the GA community especially gliding operations.

1.9. It should be noted that there have been no reported infringements of this Class A airspace in its current format.

1.10. Given the requirements of the GA community for airspace, the containment offered by 1nm is sufficient in the opinion of the ATC team with the following equipment and procedures available:

a. Radar monitoring of aircraft by TC SW and Farnborough as part of normal Radar scanning.

b. AIP and STAR plate warnings of reduced CAS containment

c. Airspace Infringement warning system

d. Large scale publication VFR map

e. Training package for Farnborough controllers to include the impact of gliders operating to the edge of CAS

f. Training package for TC SW controllers to include the impact of gliders operating to the edge of CAS

g. Appropriate publicity and discussion with the gliding community safety teams

h. The airspace is classified as Class A to remove charting complexity

i. The majority of powered traffic is operating below 3,000’ therefore not interacting with the proposed airspace.

j. OCATS on NERL RDP (NODE-L)

1.11. The majority of cross country gliders operate with moving map technology (see https://members.gliding.co.uk/airspace/) and the BGA have provided assurance that they are very competent operating in the vicinity of but remaining clear of CAS.

1.12. The map below shows Heathrow Runway 09 arrival tracks recorded during a period of easterly operations over a nine day period, with the proposed Farnborough Airspace within the chart area overlaid.

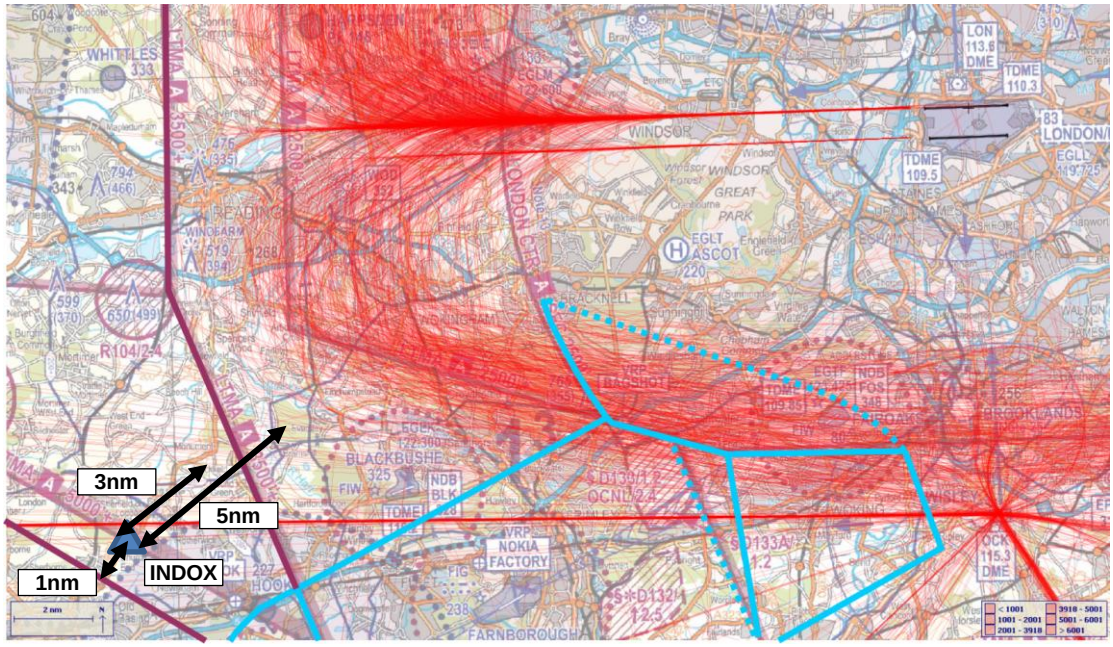

Figure 4 Heathrow easterly arrivals

1.13. This shows that the extent of Heathrow easterly arrivals being vectored downwind/base leg within their RMA is extremely unlikely to be a factor.

2. Containment in the vicinity of ASLAP

2.1. Aircraft climbing on the proposed SIDs will be climbing to 5,000ft initially. The majority of aircraft (85%) would be greater than 3nm from the edge of CAS, between ASLAP and ESULU because they would already have been cleared to FL70 or higher, and would have reached or exceeded 5,500ft (i.e. out of the smaller CTA, into the larger LTMA) before reaching ASLAP.

2.2. The remaining 15% of aircraft would be between 5,000ft climbing FL70 more slowly, due to Heathrow or Gatwick departures above. This minority would be 2.58nm from the edge of CAS between ASLAP and ESULU.

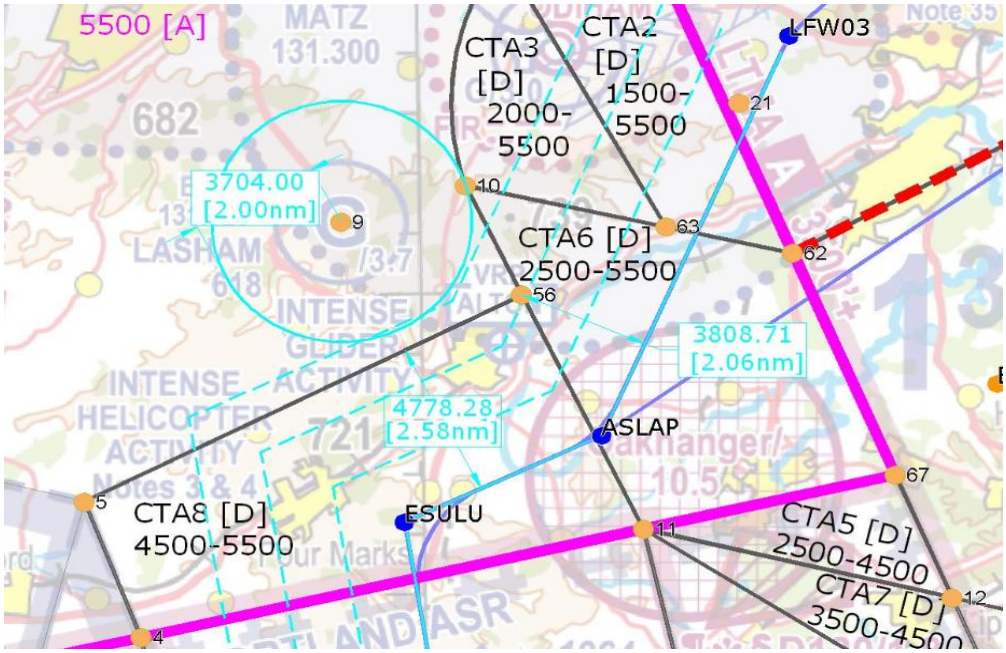

Figure 5 Containment around SIDs in vicinity of ASLAP

2.3. A balance has been struck between the requirement to protect aeroplanes versus the requirements of the GA community in providing a tolerably safe operating environment.

2.4. The same rationale has been applied to the area between LFW03 and ASLAP where the nominal SID centreline is 2.06nm from the edge of CAS. The majority of aircraft (85%) would be at or above 5,000ft at the narrowest distance between the centreline and CAS boundary.

2.5. Given the requirements of the GA community for airspace, the containment offered by 2.06nm/2.58nm is sufficient in the opinion of the ATC team with the following equipment and procedures available:

a. Radar monitoring of aircraft by Farnborough as part of normal Radar scanning.

b. AIP and STAR plate warnings of reduced CAS containment

c. Airspace Infringement warning system

d. Large scale publication VFR map

e. Training package for Farnborough controllers to include the impact of gliders operating to the edge of CAS

f. Training package for TC SW controllers to include the impact of gliders operating to the edge of CAS

g. Appropriate publicity and discussion with the gliding community safety teams

h. The majority of powered traffic is operating below 3000’ therefore not interacting with the proposed airspace.

i. OCATS on NERL RDP (NODE-L)

3. Farnborough SIDs vs slow-climbing Heathrow and Gatwick departures

3.1. In order to reduce coordination between Farnborough and TC SW Farnborough controllers will climb departures to appropriate levels within the LTMA in compliance with MATS Part 2 procedures.

3.2. Flight Progress Strips for relevant Heathrow and Gatwick departures will be provided to the Farnborough controller.

3.3. Farnborough will Radar Monitor track compliance and vertical climb profile of all Farnborough departures.

3.4. Radar Display tools will display alerts for any Heathrow traffic not climbing as per the revised SID gradient required by the MID/GASGU/GOGSI SIDs. Action would be taken by Farnborough controllers as appropriate.

3.5. In the event that a Gatwick is unable to climb above 5,000ft, resulting in entry of Farnborough CAS, this will be coordinated by TC SW.

3.6. Subject to the above, prior to issuing a climb to a level above 3,000ft, Farnborough will apply the procedures in MATS Part 1 and:-

a. Assess the position of all relevant Gatwick and Heathrow traffic;

b. Farnborough can issue the climb without coordination with TC SW provided that:-

- CCDS and Priority lines to TC SW are serviceable.
- The Radar Display Tool system must be serviceable.
- Mode Charlie of all relevant assessed aircraft indicates 400ft above the planned climb to altitude, and continuing in that direction.

3.7. It should be noted that Mode Sierra is usually available at both units, which will provide additional information to increase the situational awareness of the controllers rather than a dependency for provision of separation.

3.8. Where 10nm lateral separation exists and the Farnborough aircraft has a filed flight plan speed of 250kts or greater, Farnborough controllers may climb without coordination.

4. 3nm/1,000ft Procedural Separation, 3nm Radar Separation

4.1. Due to the proximity of Heathrow and Gatwick airports, the airspace available is limited. The proposed airspace and RMAs have been designed to fit around existing airspace with the least possible impact to both airports.

4.2. Farnborough ATC proposed that informal guidance was sought from CAA SARG to establish whether design separation of 3nm and 1,000ft is appropriate. This section complements Section 3 above. 3nm lateral radar separation is discussed in Appendix A (CNS).

4.3. This section contains the results of that guidance, and includes mitigations and supporting data. In the following text/charts, the SID designation number would increase by one under Appendix M (e.g. MID3G shown here would become MID4G when the new restrictions are introduced). The SAM SIDs have changed name to GASGU and GOGSI due to recent truncation - the tracks and distances are otherwise identical.

4.4. It would be acceptable to CAA SARG for EGLF to design airspace that provides procedural separation of **3nm and 1,000ft** from aircraft departing on a Heathrow SID (RNAV or conventional), and an aircraft making an approach to EGLF either being radar monitored or vectored.

4.5. This 3nm and 1,000ft procedural separation is subject to all of the following:

a. In an LTMA environment at 6,000ft or below with LTC and EGLF having a serviceable approach radar capable of separation standards of 3nm available to the unit respectively

b. CCDS is serviceable at Farnborough

c. A priority line is available between appropriate LTC sectors and EGLF and between EGLF and EGLL TWR

d. Any LL SID modification of a SID that would impinge upon LF Airspace undertaken is designed to provide 'not below' restrictions as appropriate to deliver continuous climb and at least 3nm and 1,000ft separation procedurally

e. Any aircraft commander that cannot make the SID profile gradient is instructed to inform LL ATC on first contact via AIP notification including if this occurs when airborne. If a commander notifies ATC then a suitable mechanism is identified and employed for making this notification available in a timely fashion to EGLF enabling the aircraft to become known traffic.

f. Farnborough operates with notification of relevant Heathrow departures through the receipt of relevant flight progress strips.

g. An appropriate automatic alarm tool is commissioned and made available to EGLF Approach to provide a warning in a timely manner if a LL aircraft is flown below a certain gated level

h. Farnborough aircraft operating IFR will remain at least one nautical mile inside the boundaries of CAS.

4.6. The items above are considered as follows:

a. Already exists at LTC, with LF's radar authorised for 3nm deconfliction distance. Presuming approval, when CAS is established the authorisation would convert to 3nm separation standard (see Appendix A for CNS).

b. CCDS is already operational at Farnborough.

c. LF-LTC priority lines exist. LF-LL TWR priority lines are planned for implementation, along with a missed approach alarm.

d. See Appendix M (LL SID Gradient), and the following paragraphs for a full discussion.

e. See Appendix M (LL SID Gradient) for evidence that the vast majority of Heathrow departures significantly outperform the proposed 5.5% minimum gradient, and also for

evidence that Heathrow SID AIP plates would have the standard 'Note 6' warning re: pilots contacting ATC if under-performance is predicted.

f. Provision of relevant flight progress strips is part of the implementation plan.

g. Such a system will be investigated as part of the implementation plan.

h. This will be the case.

Current CAS/OCAS 'separation'

4.7. Currently, CAS/OCAS 'separation' is deemed because (for example) a Heathrow flight may be passing 3,000ft following the correct SID 'at/above' points, with a Farnborough flight at 2,400ft, vertically 'separated' by 600ft due to being 100ft below the LTMA base of 2,500ft.

4.8. There is no 5nm/1,000ft requirement between CAS and OCAS flights.

4.9. OCAS traffic may operate right up to the very edge of CAS.

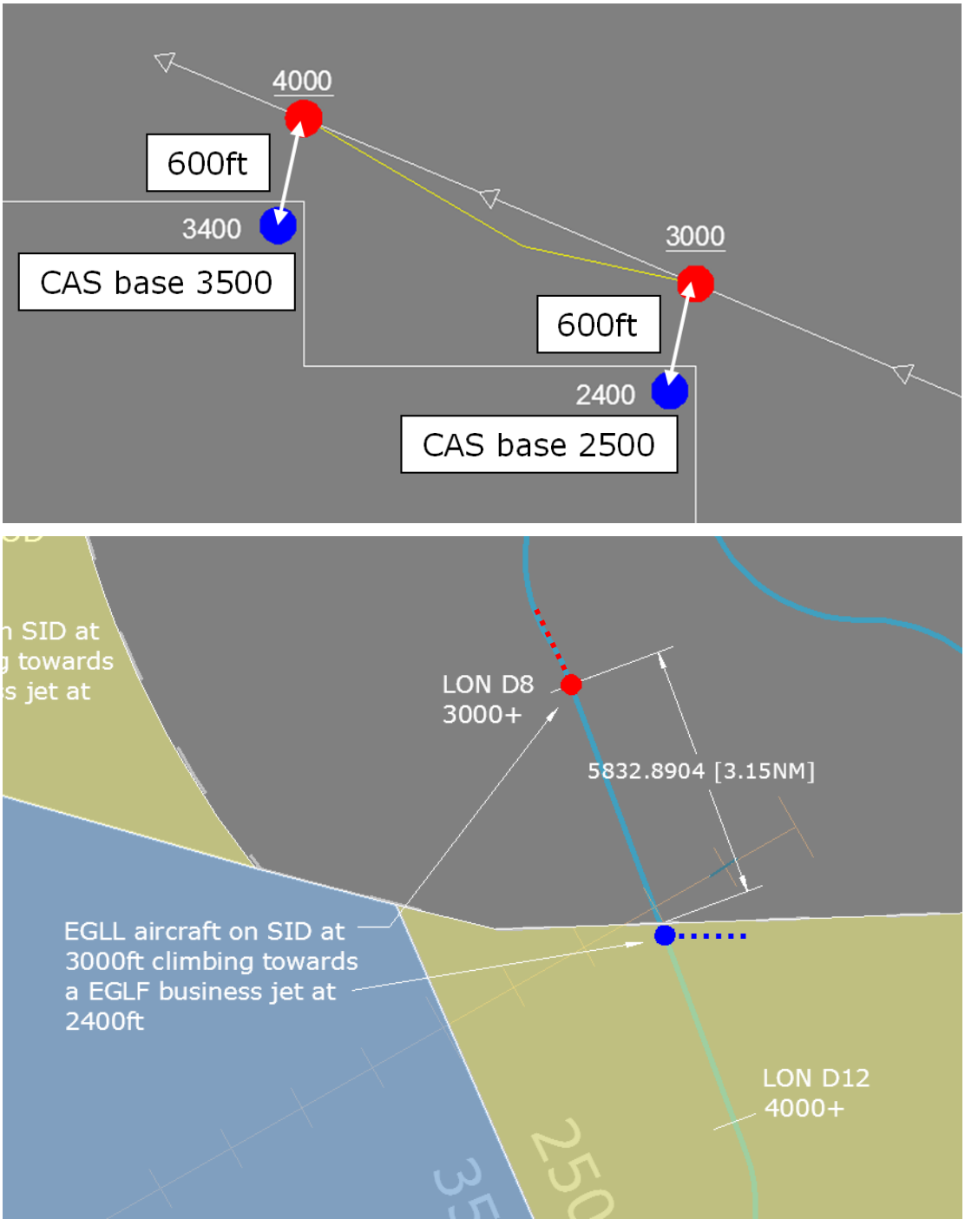

Figure 6 CAS/OCAS separation scenarios

Proposed Easterly Operations

4.10. The easterly Farnborough RMA and proposed easterly Heathrow SIDs are shown below.

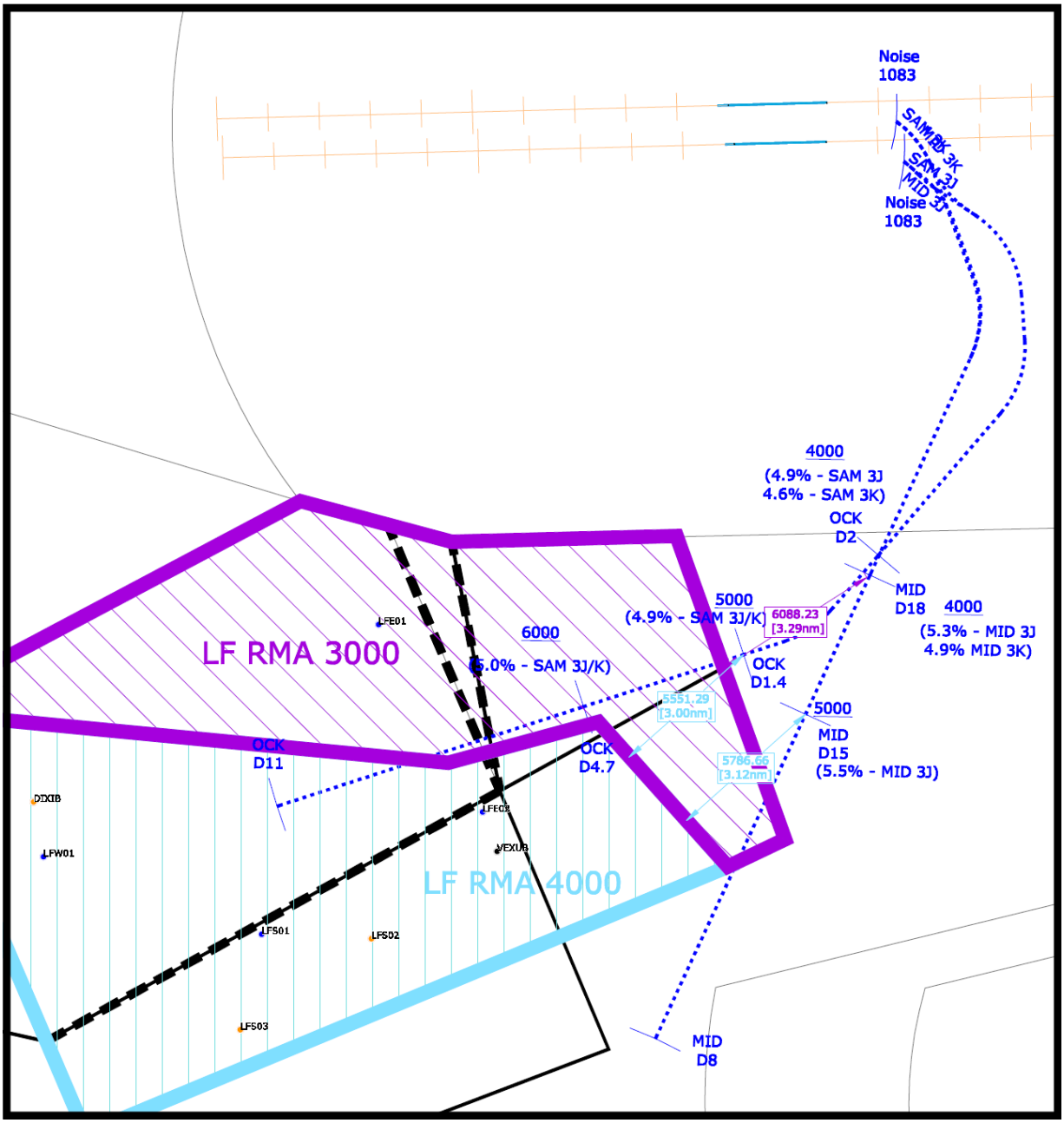

Figure 7 Farnborough Easterly RMA and Heathrow proposed SID gradients

4.11. To meet the combined '3nm and 1,000ft' criterion for Farnborough flights within the light blue 4,000ft RMA, Heathrow MID and GASGU (SAM) departures would need to be at/above 5,000ft at least 3nm from the eastern edge.

a. For the MID3J SID the 5,000ft point is 3.1nm from the edge of the blue area.

b. For the SAM3J (GASGU1J) SID the 5,000ft point is 3.0nm from the edge of the blue area.

4.12. To meet the combined '3nm and 1,000ft' criterion for Farnborough flights within the purple 3,000ft RMA, Heathrow MID and GASGU (SAM) departures would need to be at/above 4,000ft at least 3nm from the eastern edge.

a. For the MID3J SID the 4,000ft point is 3.3nm from the edge of the purple area.

b. For the SAM3J (GASGU1J) SID the 4,000ft point is further east than the MID3J point.

Proposed Westerly Operations

4.13. The westerly Farnborough RMAs and proposed westerly Heathrow SIDs are shown below.

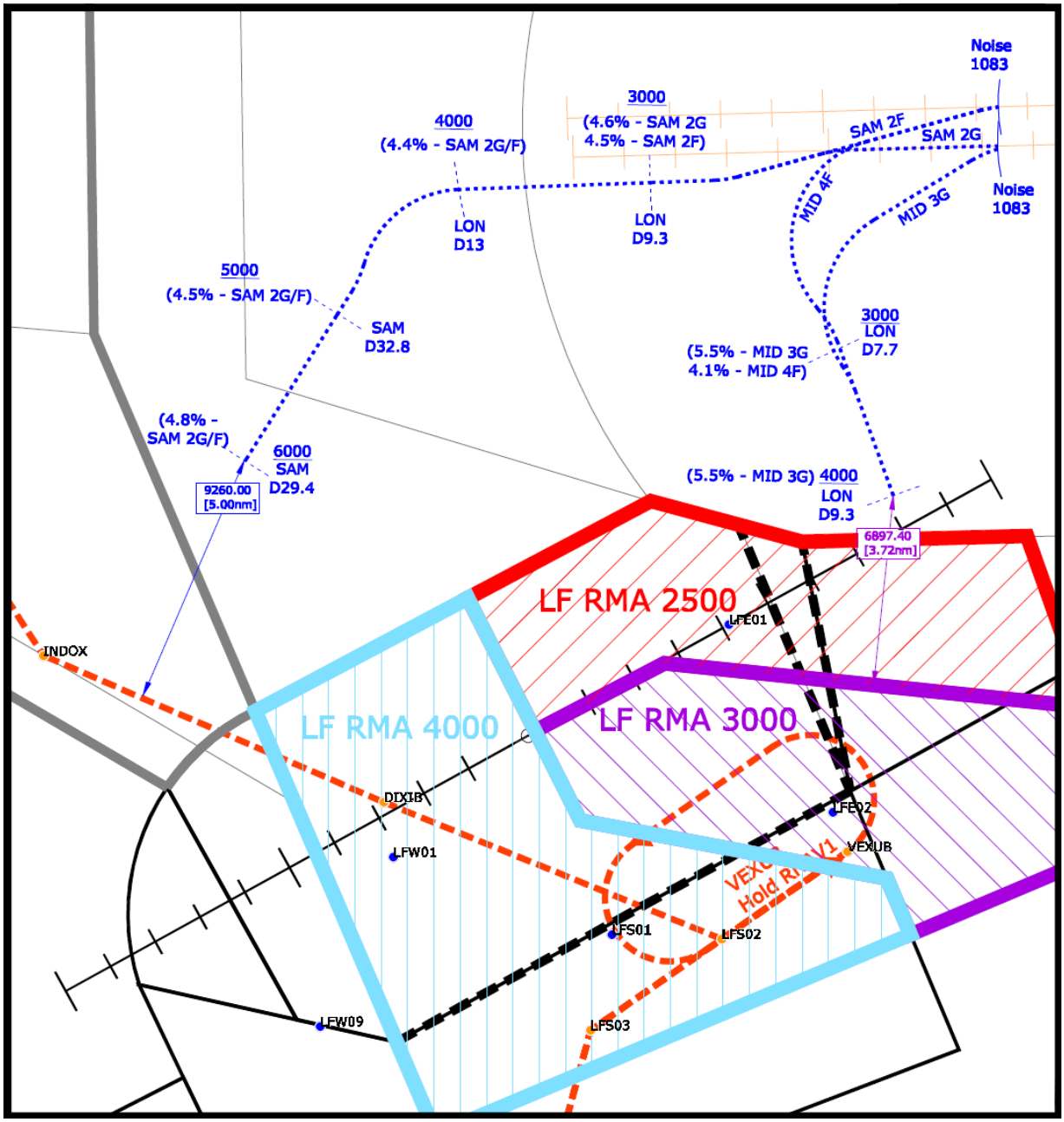

Figure 8 Farnborough Westerly RMA and Heathrow proposed SID gradients

4.14. To meet the combined '3nm and 1,000ft' criterion for Farnborough flights within the purple 3,000ft RMA, Heathrow MID departures would need to be at/above 4,000ft at least 3nm from the eastern edge.

4.15. The 4,000ft point is 3.7nm from the edge of the purple area.

SAM (GOGSI) SID vs VEXUB1A STAR

4.16. The GOGSI SID crosses the VEXUB1A RNAV1 STAR between points INDOX and DIXIB on that STAR. It is expected that many Farnborough arrivals will be radar vectored by LTC, however this scenario presumes that most are left on their own lateral navigation along the STAR centreline.

4.17. The lowest any Farnborough arrival can be, in the INDOX area, is 5,000ft (the CAS base would become 4,500ft under this proposal). The arrival is likely to be higher in reality, with LTC resolving conflictions with Heathrow departures to give climb to the Heathrow, before transfer to LF ATC.

4.18. To meet the combined '3nm and 1,000ft' criterion for Farnborough flights at 5,000ft on the STAR near INDOX, Heathrow SAM (GOGSI) departures would need to be at/above 6,000ft at least 3nm from the STAR centreline (marked in dashed orange in the chart below).

4.19. The 6,000ft point is 5.0nm from the STAR centreline.

a. In the unlikely event that an RNAV1 arrival at 5,000ft is 1nm north of centreline, and a Heathrow SAM (GOGSI) flight is 6,000ft at the SID restriction point, separation would be 4nm and 1,000ft.

b. In the unlikely event that an RNAV1 arrival at 5,000ft is 1nm north of centreline, and a Heathrow flight *does not* reach/exceed 6,000ft until 1nm *after* the restriction point, separation would be 3nm and 1,000ft.

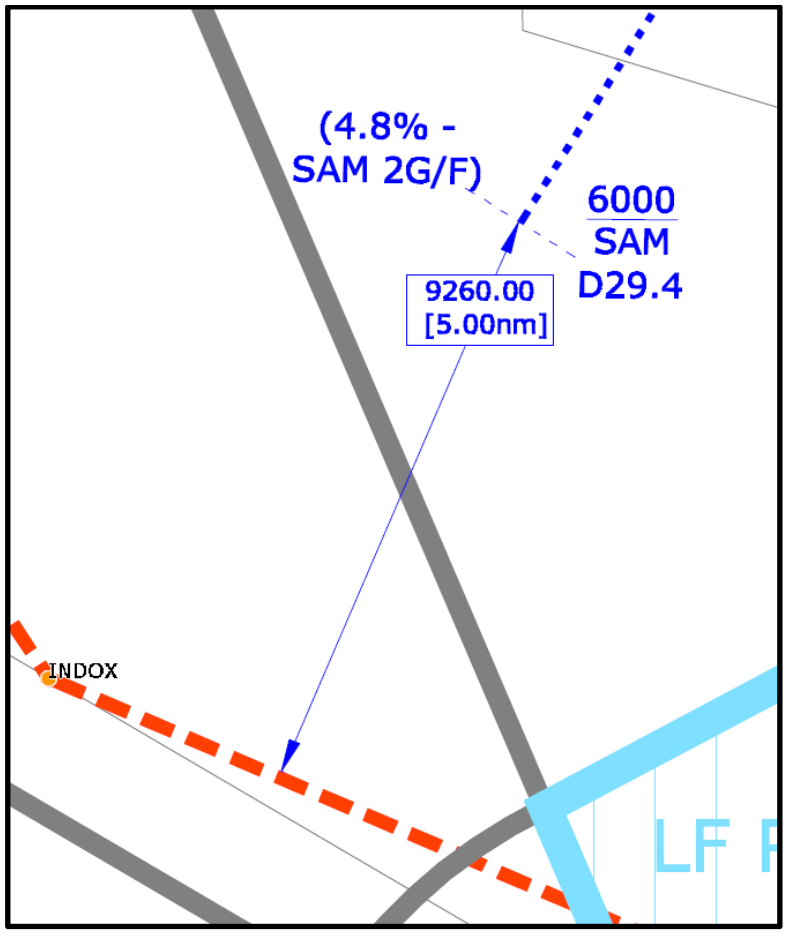

Figure 9 LF VEXUB1A STAR (orange) vs LL SAM (GOGSI) SID

The 2,500ft RMA: LL MID3G SID vs LF Runway 24 ILS Intercepts

4.20. Due to the alignment of the Farnborough final approach track to Runway 24 and its intercept altitude, it is not possible to meet all the conditions for 3nm *and* 1,000ft procedural separation with Heathrow MID SIDs.

4.21. Under this proposal, the CAS/OCAS environment described in paras 4.7-4.9 would become fully-CAS, subject to 3nm lateral radar separation minima at all times instead of 'CAS/OCAS deemed'.

4.22. These flights would be radar monitored by LF Approach. The radar alarm from item 4.5.g (to be developed) would already have alerted LF Approach if the Heathrow flight remained low for that long, and LF ATC will ensure radar separation is maintained, if necessary by using priority coordination with the LTC controller via the priority line.

Separation for Farnborough departures against Heathrow and Gatwick

4.23. This is discussed in Section 3 above, and in Appendix O Airspace ConOps page 15.

5. Conclusion

5.1. The need to minimise the impact on other airspace users means that the volumes of CAS required are relatively small. The need to minimise impact on Heathrow departures means the proposed Heathrow SID climb gradient is as shallow as possible given the requirement to safely separate from Farnborough traffic.

5.2. It is essential to consider CAS containment where routes approach the boundary, and essential to consider separation requirements in an area where airspace and route options are very limited.

5.3. These four areas were the ones where containment or separation required particular consideration.

5.4. The four sections above show that:

a. CAS containment is acceptable under the conditions stated;

b. Separation is achievable between Farnborough departures and Heathrow or Gatwick departures;

c. The procedural separation standard of 3nm and 1,000ft is achievable to the maximum extent possible within this design. Where procedural separation is not possible, standard radar separation of at least 3nm would be achieved.

5.5. If approved, this proposal represents a significant improvement in airspace management and safety in the region.