Airspace Change Proposal

Appendix M

Heathrow SID Gradient

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1. Introduction and Summary

1.1. This document is sponsored by TAG Farnborough Airport (TAG) in agreement with Heathrow Airport Ltd (HAL).

1.2. This proposal is deliberately designed to achieve technical separation between certain Heathrow SIDs and Farnborough's (LF) proposed CAS and routes, *without* those Heathrow (LL) departures changing engine thrust settings.

1.3. The vast majority of LL departures meet or exceed the required minimum gradient of 5.5% proposed in this document.

1.4. The very few that do not, would be coordinated through LF's CAS (if granted) without delay or disbenefit.

1.5. Therefore there would be no change to environmental impact.

2. Justification and objectives

2.1. TAG's justifications (see Section 2 of main Farnborough ACP) apply because the TAG proposal would be enabled by this proposal.

2.2. The objective of this document is to provide technical assurance that certain Heathrow SIDs will climb above the proposed TAG CAS/routes without any adverse impact to environmental considerations (noise / fuel consumption / CO_2 emissions).

3. Current airspace description

3.1. The current SIDs to be changed are GOGSI/GASGU (formerly SAM) and MID. AIP chart extracts are copied on the pages below, taken from AIP AIRAC07/2015 dated 25 June 2015.

3.2. On each chart, Note 6 requires the operator to inform ATC prior to departure if the flight is unable to maintain the minimum climb gradient or attain SID altitudes.

3.3. This is a technical change without operational impact to the vast majority of aircraft using the SIDs. Traffic figures are summarised in Figure 1 below, however extremely few would need to take notice of Note 6.

Ac_Type	MID					SAM					Grand Total
	09L	09R	27L	27R	Total	09L	09R	27L	27R	Total	
A306	1	40	20	26	87						87
A310		4	2		6			1	1	2	8
A318		5			5						5
A319	4	3462	1291	1250	6007	1	506	574	575	1656	7663
A320	2	4590	1766	1709	8067		1261	1491	1506	4258	12325
A321	2	1180	488	470	2140		665	733	769	2167	4307
A332		147	80	70	297	3	79	127	127	336	633
A333		11	6	8	25		33	104	82	219	244
A342			1		1				1	1	2
A343		124	50	49	223		40	42	38	120	343
A345		22	7	11	40		8	5	1	14	54
A346	10	242	117	88	457		38	48	46	132	589
A388		88	42	35	165				3	3	168
B733			1		1						1
B734							2	4		6	6
B736		1		1	2						2
B737				2	2		25	29	26	80	82
B738		46	29	20	95		112	128	136	376	471
B744	2	570	218	209	999	2	187	294	260	743	1742
B748		10	4	5	19						19
B74S		1			1				1	1	2
B752		1	4	1	6		16	35	27	78	84
B762				1	1			2		2	3
B763	4	271	96	81	452		287	397	359	1043	1495
B764							5	41	37	83	83
B772	14	304	139	87	544	5	152	263	209	629	1173
B77L		35	19	8	62			8	5	13	75
B77W		121	48	51	220	1	229	291	302	823	1043
B788		33	17	11	61		8	15	12	35	96
B789								4	6	10	10
BE20			1		1						1
BE40				2	2						2
C25B		1			1						1
C550		1			1						1
C56X								1		1	1
C680									1	1	1
CL30		1			1		1			1	2
CL60			2	1	3						3
CRJ2				1	1			1		1	2
E135								1		1	1
E190			1		1						1
F2TH		1		1	2			2		2	4
F900		1		1	2			1		1	3
FA7X		1			1						1
GLEX			1		1						1
GLF4		1	2		3			1		1	4
GLF5				2	2						2
GLF6			1		1						1
H25B		2	1	1	4			1		1	5
LJ60				2	2						2
MD83								4	3	7	7
RJ1H		13	6	9	28						28
RJ85		4			4						4
Total	39	11334	4460	4213	20046	12	3654	4648	4533	12847	32893

Figure 1 All flights/types using Heathrow SAM/MID SIDs in 2014

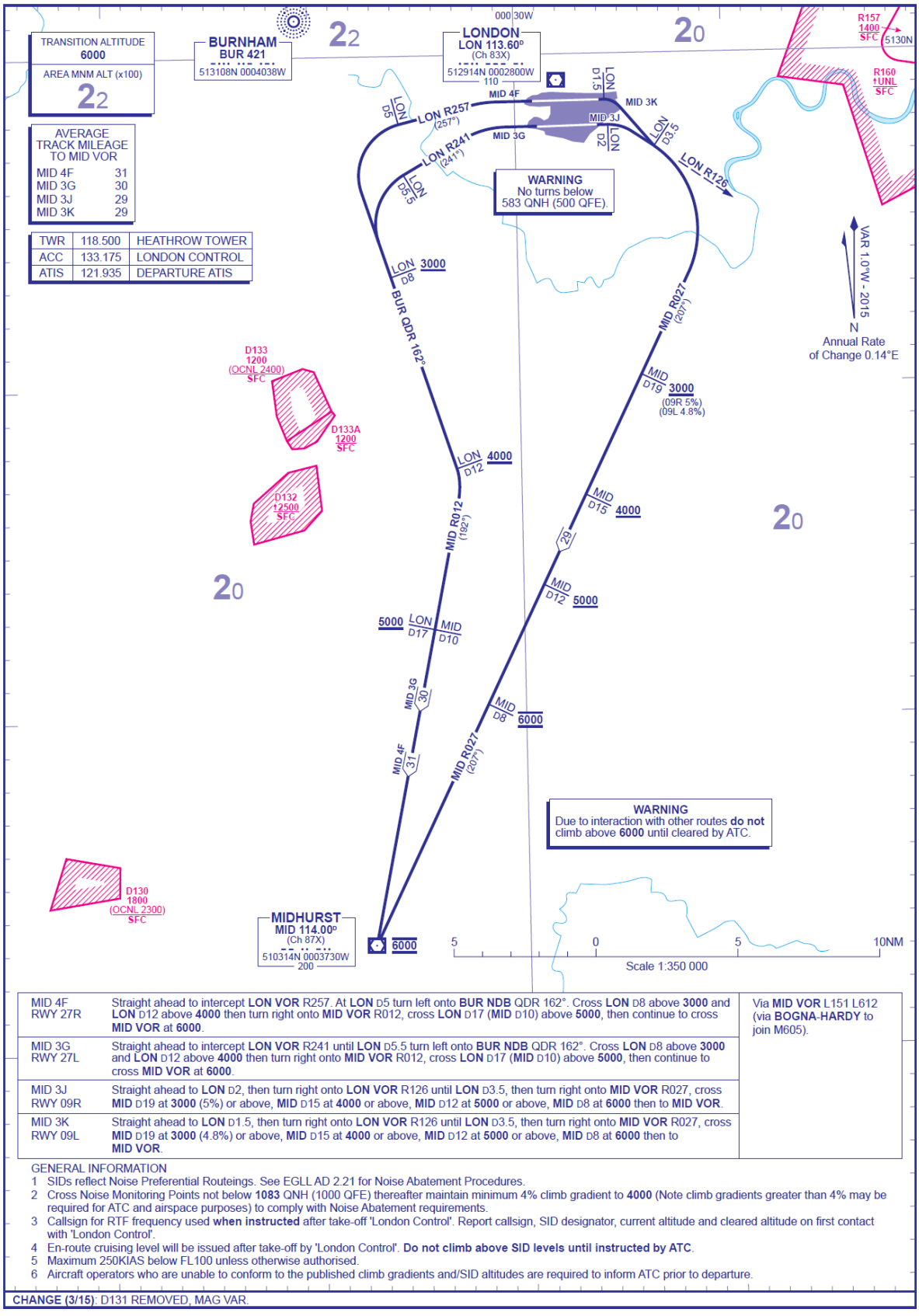
3.4. There are no operational efficiency, complexity, delays or choke points associated with this sub-proposal.

3.5. There are no environmental issues associated with this sub-proposal.

STANDARD DEPARTURE CHART - INSTRUMENT (SID) - ICAO

DISTANCES IN NAUTICAL MILES
BEARINGS, TRACKS AND RADIALS ARE MAGNETIC
ALTITUDES AND ELEVATIONS ARE IN FEET

LONDON HEATHROW
MIDHURST 4F 3G 3J 3K



MID 4F RWY 27R	Straight ahead to intercept **LON VOR** R257. At **LON** D5 turn left onto **BUR NDB** QDR 162°. Cross **LON** D8 above **3000** and **LON** D12 above **4000** then turn right onto **MID VOR** R012, cross **LON** D17 (**MID** D10) above **5000**, then continue to cross **MID VOR** at **6000**.
MID 3G RWY 27L	Straight ahead to intercept **LON VOR** R241 until **LON** D5.5 turn left onto **BUR NDB** QDR 162°. Cross **LON** D8 above **3000** and **LON** D12 above **4000** then turn right onto **MID VOR** R012, cross **LON** D17 (**MID** D10) above **5000**, then continue to cross **MID VOR** at **6000**.
MID 3J RWY 09R	Straight ahead to **LON** D2, then turn right onto **LON VOR** R126 until **LON** D3.5, then turn right onto **MID VOR** R027, cross **MID** D19 at **3000** (5%) or above, **MID** D15 at **4000** or above, **MID** D12 at **5000** or above, **MID** D8 at **6000** then to **MID VOR**.
MID 3K RWY 09L	Straight ahead to **LON** D1.5, then turn right onto **LON VOR** R126 until **LON** D3.5, then turn right onto **MID VOR** R027, cross **MID** D19 at **3000** (4.8%) or above, **MID** D15 at **4000** or above, **MID** D12 at **5000** or above, **MID** D8 at **6000** then to **MID VOR**.

Via **MID VOR** L151 L612 (via **BOGNA-HARDY** to join M605).

GENERAL INFORMATION
1 SIDs reflect Noise Preferential Routeings. See EGLL AD 2.21 for Noise Abatement Procedures.
2 Cross Noise Monitoring Points not below **1083** QNH (1000 QFE) thereafter maintain minimum 4% climb gradient to **4000** (Note climb gradients greater than 4% may be required for ATC and airspace purposes) to comply with Noise Abatement requirements.
3 Callsign for RTF frequency used **when instructed** after take-off 'London Control'. Report callsign, SID designator, current altitude and cleared altitude on first contact with 'London Control'.
4 En-route cruising level will be issued after take-off by 'London Control'. **Do not climb above SID levels until instructed by ATC.**
5 Maximum 250KIAS below FL100 unless otherwise authorised.
6 Aircraft operators who are unable to conform to the published climb gradients and/SID altitudes are required to inform ATC prior to departure.

CHANGE (3/15): D131 REMOVED, MAG VAR.

Figure 2 Heathrow MID SIDs

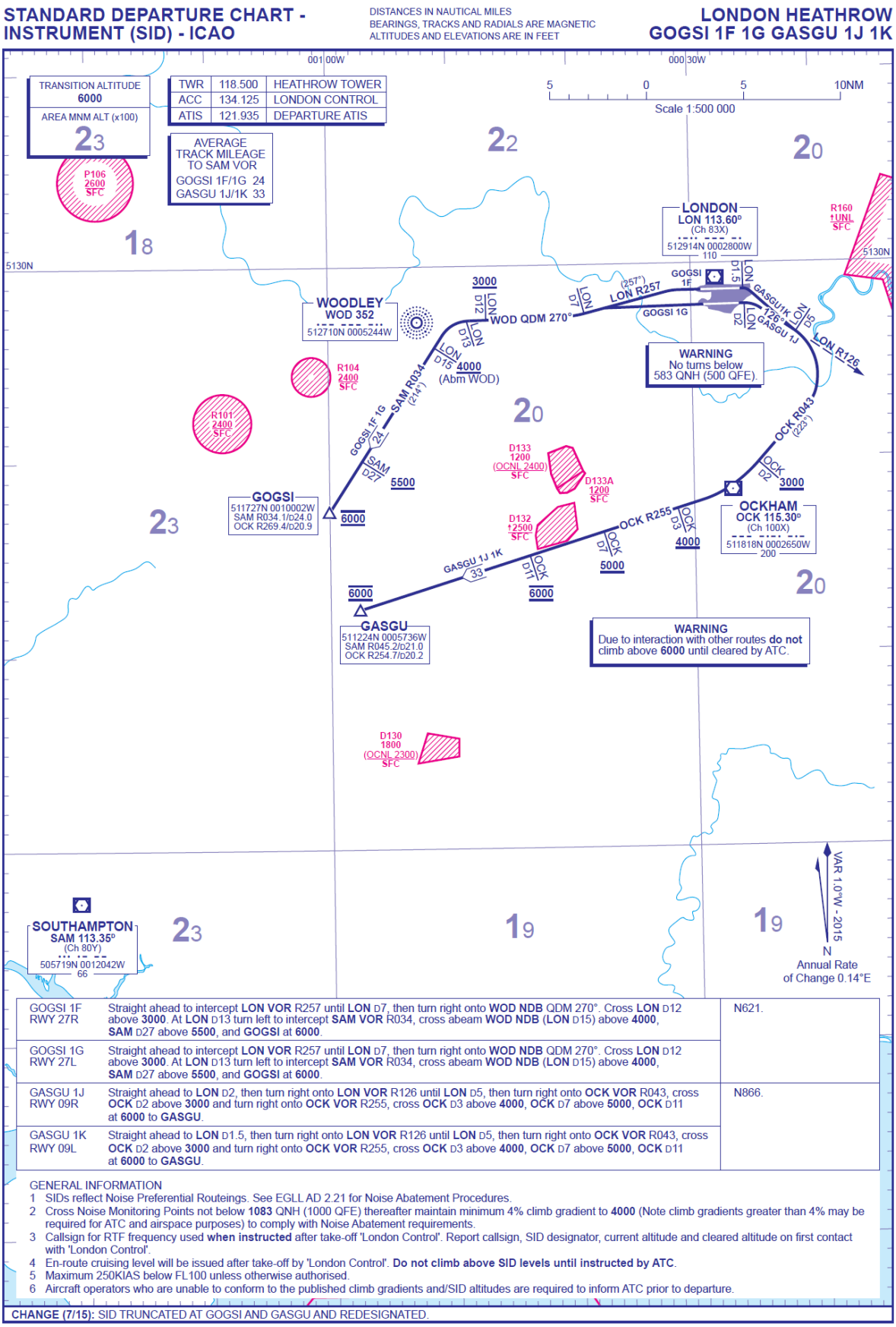


Figure 3 Heathrow GOGSI/GASGU SIDs (formerly SAM, recently truncated)

4. Proposed airspace description

4.1. There would be no change to the lateral tracks, end points or altitudes, proportion of LL flights, or aircraft types using these LL SIDs due to this proposal. LL deps would always get priority over LF traffic should there be a potential confliction.

4.2. Revised 'at/above' points within the vertical profile of the LL SIDs would ensure 3nm/1,000ft separation where these LL SIDs cross the LF RMA.

4.3. The steepest climb gradient for these 'above' points would not exceed 5.5% for any leg/ segment of any SID. 5.5% is routinely exceeded by the vast majority of relevant LL deps on these SIDs (see Section 5).

4.4. Flights from all operators are already required to notify ATC if they are likely to underperform the SID gradient (as per SID Note 6 on all LL SIDs). This Note 6 requirement would continue, and would act as the 'trigger' for coordination between LL ATC/LTC and LF ATC.

4.5. Draft 'Note 6' coordination protocol:

a. Notification of the slow climb *should* come in advance, from the pilot on stand or during taxi, as part of cockpit departure checks and calculations. It would be acceptable for the pilot to inform ATC once airborne, as soon as the underperformance becomes known.

b. Upon such notification, LL ATC or LTC (whomever receives the info first) would inform LF ATC (development of electronic notification would be progressed as part of the implementation package, presuming a successful outcome).

c. LF ATC would ensure that any potential confliction is resolved in favour of the LL departure, with LF's traffic taking any delay or vector.

d. LL and LF ATC will effect coordination of the LL dep through LF CAS (assuming approval granted). The LL dep would remain on LTC frequency and the entire coordination would be "invisible" to the pilot from the moment he/she told ATC about the potential slow climb.

e. In the *very* unlikely event that an *un-warned* potential conflict occurs, LF and LTC radar-monitor all flights at all times, and coordination would be effected tactically (with LF traffic making way for LL dep).

f. There would also be a priority telephone line between LTC and LF, and an alarm tool is to be developed at LF Approach Radar, highlighting instances where LL deps are below a gated altitude.

g. Any relevant LL slow climber would trigger these coordination actions, preferably in good time using SID Note 6, otherwise dynamically/tactically as part of the day job of an ATCO.

h. There is not expected to be a workload issue for LTC, beyond agreeing the coordination (which would essentially be "LL dep carries on unchanged, LF traffic is vectored or delayed"). The workload (vectoring, delaying) for the LF controller is considered to be relatively minor and fully acceptable.

4.6. It is considered that this protocol would be used only occasionally (see Section 5 for evidence). As legacy slow-climbing aircraft types on long-haul routes are removed from service, this coordination protocol would be triggered even less often.

4.7. The gradients and restrictions in the following charts are required for separation purposes (see Appendix C Section 4). Opportunities may arise for Heathrow SID truncations at the 6,000ft points. The charts here are relevant only to the Farnborough separation requirements.

4.8. NATS and/or Heathrow Airport Ltd may wish to progress SID truncations at the same time as the AIP amendment for this Farnborough proposal is submitted. If so, Farnborough would support submission of such an updated AIP amendment with the proposed truncation in place, provided the minimum restrictions specified for airspace separation purposes remain, and that NATS and/or HAL provide the associated data, paperwork, reserved 5LNCs and charting relevant to the truncation.

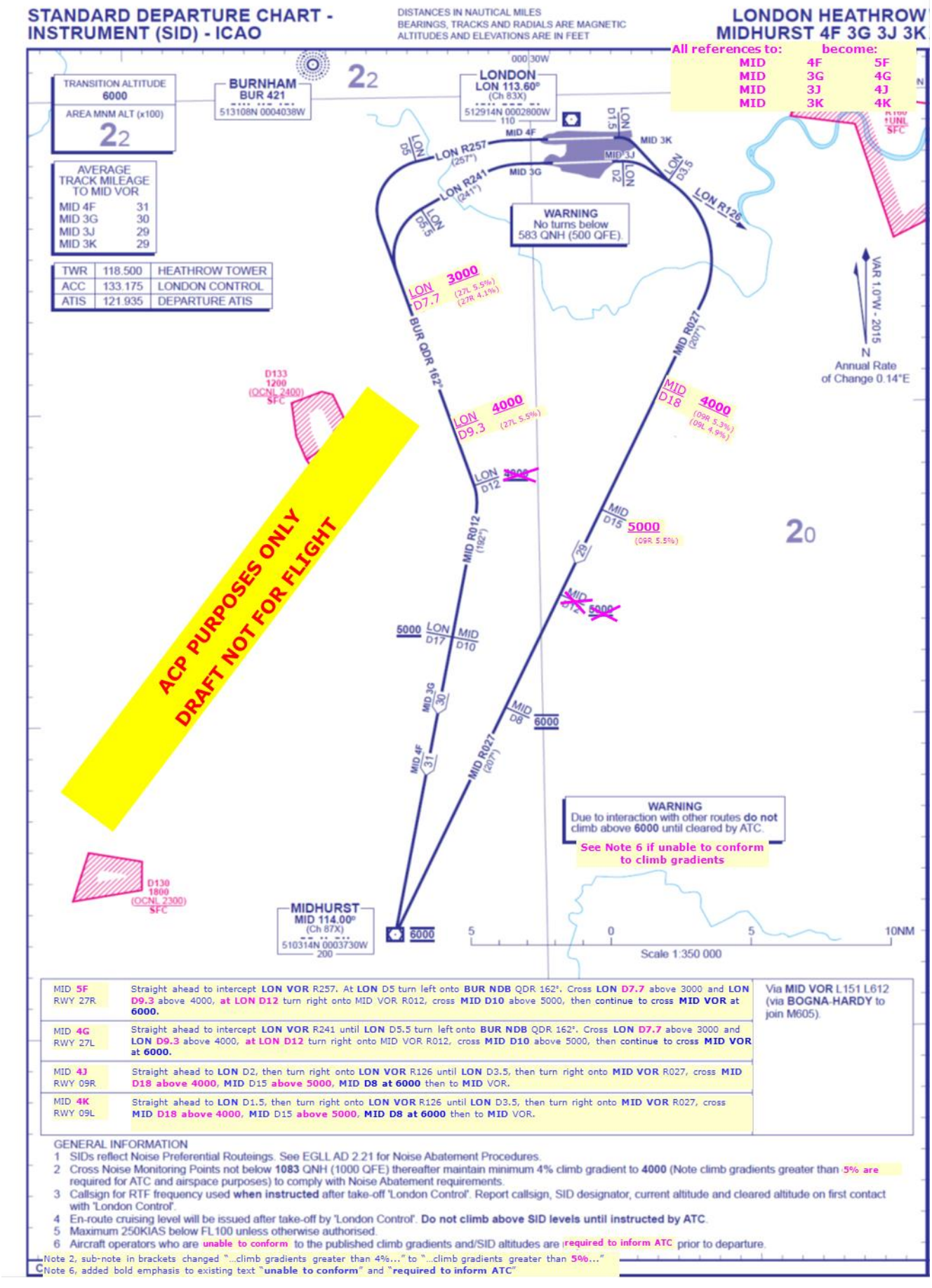


Figure 4 Draft MID SID AIP plate

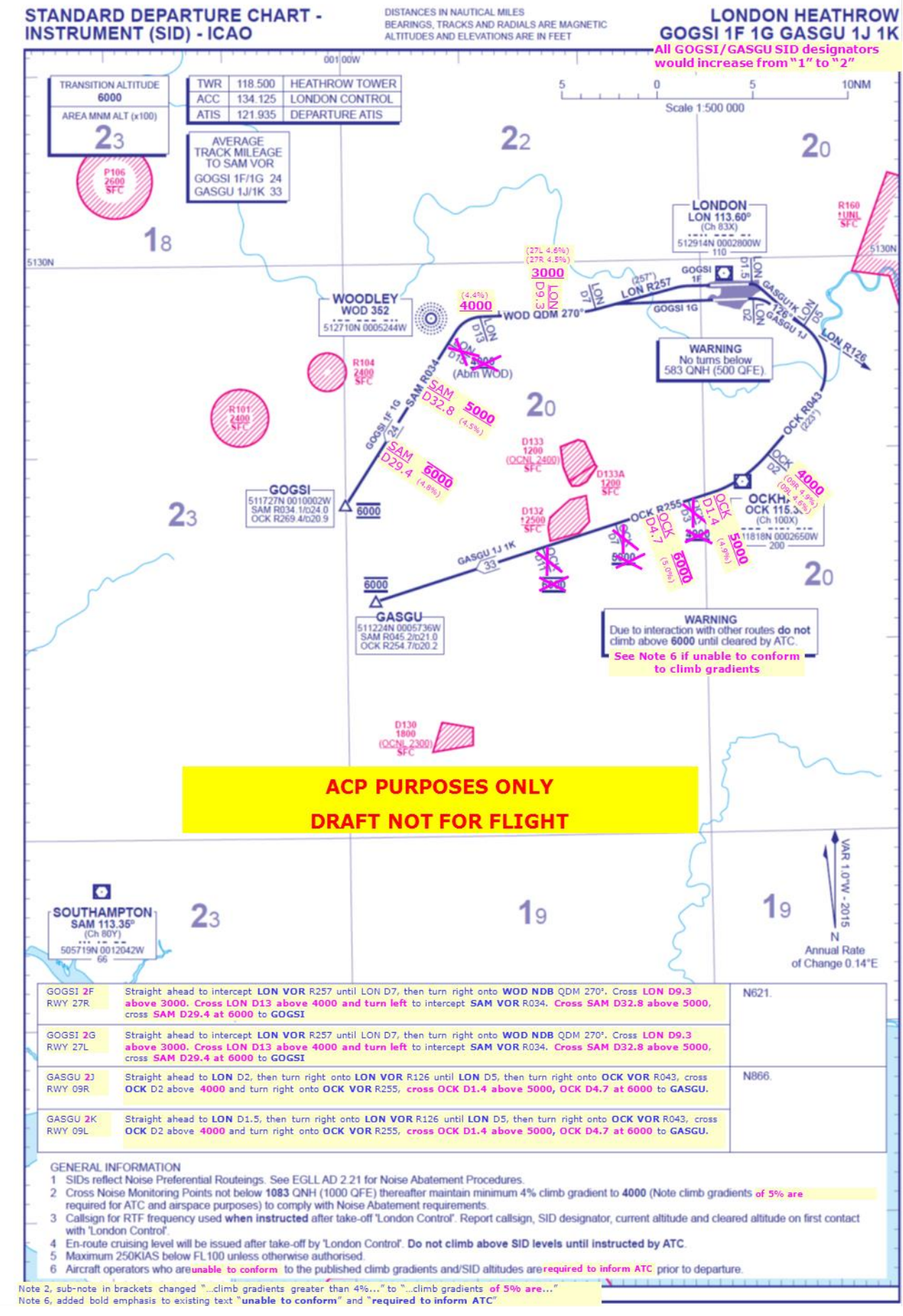


Figure 5 Draft GOGSI/GASGU SID AIP plate

5. Impacts and consultation

Units Affected by the Proposal

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

5.2. The proposal is sponsored by TAG Farnborough Airport with no objection by HAL or LTC.

Safety Issues/Analysis

5.3. 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. These simulations included the steeper LL SID gradients.

5.4. In addition, the coordination protocol in Section 4 describes situations where slow LL climbers are pre-notified, and also where this might occur un-warned without notice.

Military Implications & Consultation

5.5. No impact

General Aviation Airspace Users Impact & Consultation

5.6. No impact

Commercial Air Transport Impact & Consultation

5.7. **Heathrow Airport Ltd** do not object to this proposal due to the lack of impact it is expected to have on its operators.

5.8. **British Airways** would prefer there to be no change, but ultimately do not object to this proposal:

I think, in summary, we would not say we support the proposals - we would rather there was no change from today. However, we would probably raise no objections.

XXXXXXXXXXX, Flight Operations, British Airways

Their original response (attached above right) contains a concern about potential changes to engine settings. This was discussed verbally and became agreed that no engine settings need change, however it seems that this discussion was not recorded.

XXXXXXXXXXX

5.9. **Virgin Atlantic Airways** responded with no objection:

VIR agrees that the effect on flight operations should be minimal (especially with regard to our take-off and climb-out SOPs being unaffected). Therefore in line with the above comments [see full email for details], VIR does not object to the proposed SID gradient increase.

XXXXXXXXXXX Flight Technical & Regulatory Affairs, Virgin Atlantic Airways

Environmental Assessment: CO_2, noise, tranquillity, local air quality, visual intrusion

5.10. Examples of typical Heathrow departures (two weeks' data from June 2014, mixed easterly/westerly) show that the altitudes achieved were similar to, or exceed, the required restrictions in Figures 4 and 5.

5.11. This means that current engine settings would not need to change in order to achieve these restrictions.

5.12. Also, no change to lateral tracks would occur due to this proposal.

5.13. There would be no change to aircraft type mix due to this proposal.

5.14. Therefore no changes to CO_2, noise, tranquillity, local air quality, or visual intrusion are expected due to this proposal.

5.15. There would be no change to impacts on flora/fauna/biodiversity due to this proposal.

5.16. The radar data sample includes trial Midhurst SIDs ("DOKEN") for 27L/R that do not reflect the current operation, nor that of this proposal. As a consequence there is no data for westerly Midhurst SIDs from either Runway 27L or 27R, which reflect the actual operation as normally flown.

5.17. To overcome this missing data, we make the argument that the proposed 27L MID SID has a similar track length to the proposed 09R MID SID, from the common 1,000ft aal noise point up to the proposed 4,000ft restriction (16.4km vs 16.7km, less than 2% shorter).

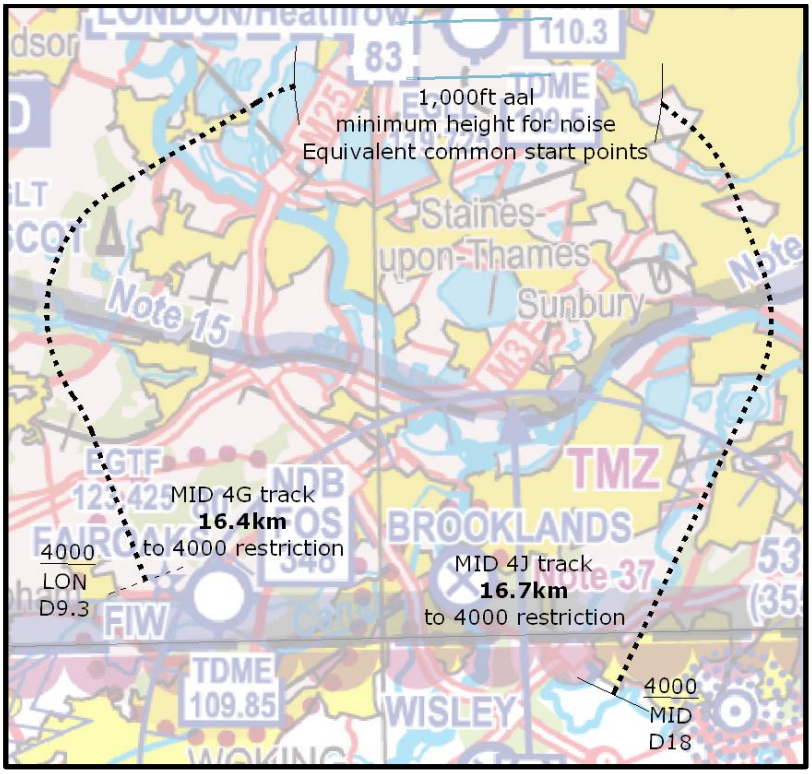
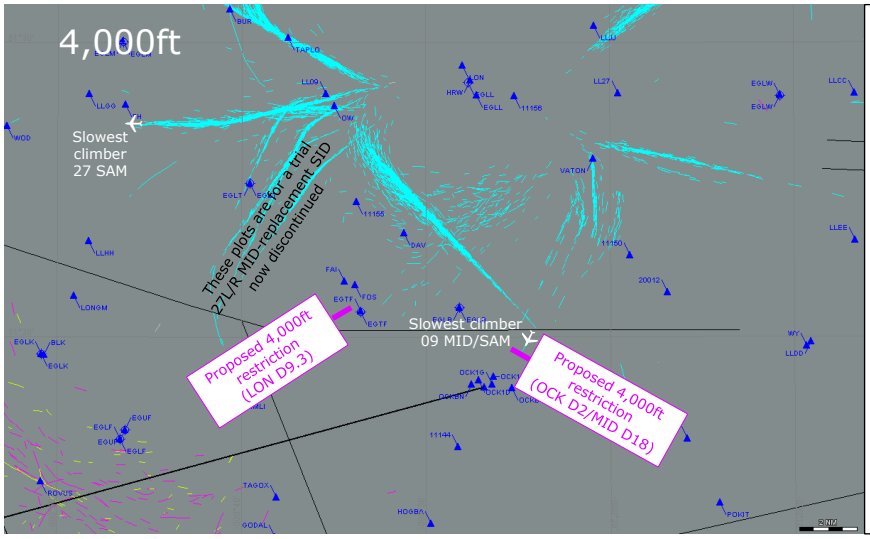


Figure 6 Equivalent track lengths to 4,000ft

5.18. Therefore the slowest climb performance of flights on the 09 MID along its 16.7km track length to 4,000ft, would be comparable to the equivalent slowest climb performance of the 27 MID along its 16.4km track length.

5.19. This means that the relationship of the slowest climber on the 09 MID to its proposed restriction, would be comparable to the relationship the slowest climber on the 27 MID has to its proposed restriction.

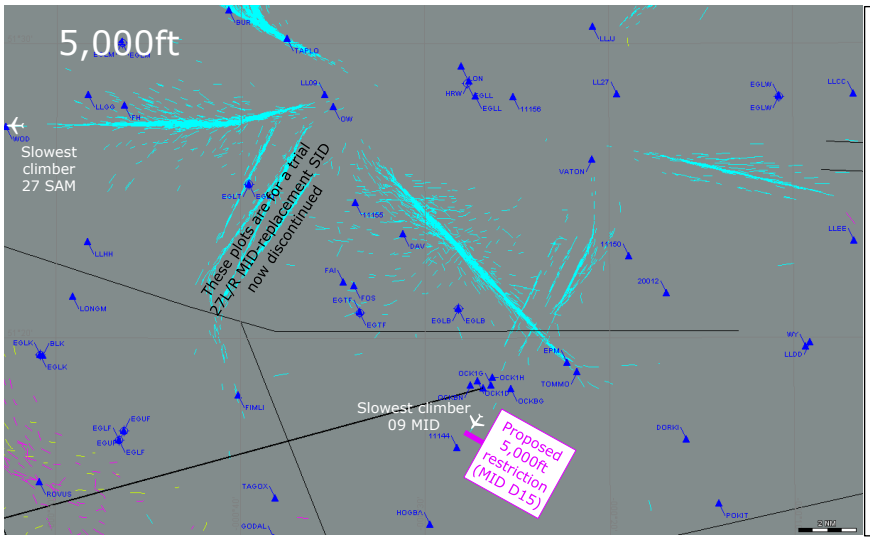


Lowest 09 MID/SAM achieves 4,000ft at approx. OCK D2 or MID D18 similar to proposed profile.

Comparably, the lowest 27 MID would likely be at approx. LON D9.3 as the track length to this point is similar to the 09 MID.

Lowest 27 SAM achieves 4,000ft well before WOD, exceeding proposed profile.

Note these are LOWEST in sample.

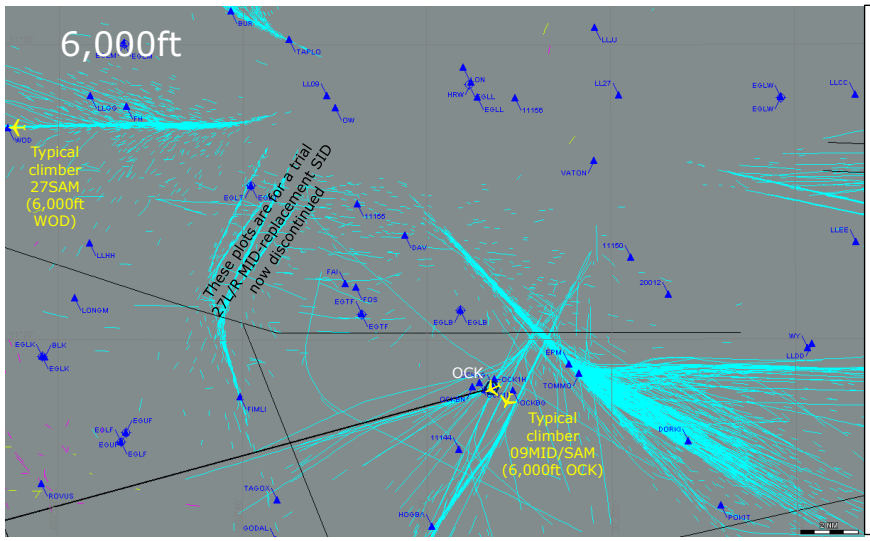


Lowest 09 MID/SAM achieves 5,000ft at approx. MID D15, similar to proposed profile.

The 5,000ft restriction for 27 MID is unchanged from today, and not shown here.

Lowest 27 SAM achieves 5,000ft before WOD, exceeding proposed profile.

Note these are LOWEST in sample.



Typically, departures on these routes already achieve 6,000ft in advance of the proposed profiles in Figures 4 and 5.

Figure 7 Heathrow departures radar data samples 4,000ft/5,000ft/6,000ft

Economic Valuation of Environmental Impact

5.20. No change of environmental impacts, therefore not applicable.

6. Analysis of options

Do nothing

6.1. The vast majority of LL departures on these SIDs would continue to exceed the gradient required for the Farnborough proposal to 'work'.

6.2. However, separation would not be assured between aircraft on the LL SID and the Farnborough CAS/routes.

6.3. Therefore this option is discounted.

Use steeper-than-6% climb gradients

6.4. Advice from HAL, BAW and VIR is that steeper gradients may require changes in engine thrust settings in some of the fleet.

6.5. Separation would be assured between aircraft on the LL SID and the Farnborough CAS/routes.

6.6. This proposal is specifically designed to avoid changes in engine thrust settings because that would cause additional environmental impacts on local residents, and cost impacts to operators in terms of fuel and engine wear.

6.7. Therefore this option is discounted.

Use 5.5% as the single steepest gradient for any part of these SIDs

6.8. Advice from HAL, BAW and VIR is that this would be acceptable without requiring changes to current engine thrust settings.

6.9. Separation would be assured between aircraft on the LL SID and the Farnborough CAS/routes.

6.10. Therefore this option is being progressed.

Conclusion

We believe the evidence supplied in this document presents a compelling case for change, in support of TAG Farnborough's CAS proposal.