YOUR LONDON AIRPORT Gatwick

Redesign of Gatwick Route 4 RNAV SIDs

Design Principle Evaluation (Submission 2)

CAA Ref: ACP-2018-86

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1 Introduction

1.1 Background

London Gatwick Airport is the UK's second largest airport and prior to COVID-19, was handling over 100k metric tons of cargo and 46 million passengers annually. Destinations serviced by Gatwick Airport include other UK regions, Europe, Canada, the Americas, Africa and the Far East.

Route 4 is a set of Standard Instrument Departure (SID) routes for aircraft taking off in a westerly direction from Runway 26 and then turning approximately 180°, through north, to track in an easterly direction just to the south of Reigate and Redhill in Surrey.

The introduction of RNAV SIDs (Area Navigation Standard Instrument Departure) for Route 4 has been subject to regulatory and legal challenge since its original approval in 2013, when the CAA approved, and GAL implemented, RNAV procedures on all nine Gatwick Airport departure routes. In 2015, the CAA conducted a Post Implementation Review (PIR) (CAP 1912) and approved most of the routes for continued use but found that Route 4 had not delivered the objective of the airspace change. This required the route to be modified. This work was completed, and GAL submitted an amended Route 4 proposal which was ratified by the CAA.

Subsequently, the community group 'Plane Justice' sought a judicial review to challenge the CAA's PIR decision. Following a further detailed investigation, the CAA asked the court to quash their previous decision. As a result, Route 4 RNAV SIDs assumed a temporary status.

So far, we have introduced the story, this shall be expanded upon and further explained (in Section 4 of this document), including how, in 2020, the temporary RNAV SIDs were withdrawn.4

1.2 Progress to 'Define' Gateway (Stage 1)

The purpose of this project is to submit a new application for RNAV-1 performance-based navigation (PBN) SID procedures for Route 4 departures at Gatwick Airport, under the guidance and requirements of the CAA's Airspace Change Process, CAP 1616. This project commenced in late 2018, with a CAA Assessment Meeting held on 24 January 2019. Significantly, this airspace change is not connected with any previous airspace changes, but seeks to ensure that affected stakeholders are provided with ample opportunities to engage with, and input into, the process, as described within CAP 1616.

The purpose of the Assessment Meeting was to discuss the submitted Statement of Need (19 December 2018) and for the CAA to confirm the airspace change process was the correct way of reaching the desired outcome stated in the Statement of Need.

The objectives of this Airspace Change Proposal (ACP) are to design and implement new RNAV SIDs for Route 4 that:

- Improve further, where practicable, aircraft and passenger safety.
- Limit and seek to reduce, where possible, the environmental impact on local communities in the vicinity of the Route 4 SIDs.

- Enable further improvements in safety and noise reduction through the application of more efficient FASI-South[1] operating procedures and opportunities.
- Provide long term predictability of flight paths.

In order to develop the design principles, GAL engaged with a group of aviation and non-aviation stakeholders to ascertain their views using questionnaires and through a series of three focus groups; these were all held in May 2019 (15th, 16th and 20th). The focus group presentations, subsequent feedback and a full description of how stakeholder feedback influenced the selection of the final shortlist of design principles are all published on the CAA portal. Confirmation that GAL passed the 'Define' Gateway was confirmed by the CAA and published on the portal on 27 September 2019.

Full details of the process followed can be seen in in our Design Principles Report at Stage 1B on the CAA Airspace Portal via this link: Design_Principles_Report_Issue_1.pdf

The work undertaken during Stage 1, and described above, helped to establish a final shortlist of design principles to act as the framework against which the design options have been developed. The list of final shortlisted design principles is shown in Table 1 below.

	Design Principle
1[2]	Route 4 options will be designed safely with full regulatory compliance
2	Designs should be built to facilitate dispersion below 7000ft
3	New Route 4 designs options should give due regard to the historic routings in use prior to the introduction of RNAV routes in 2012
4	Route 4 designs should seek to minimise the adverse impact of noise on previously unaffected populations and seek to reduce the total number of people overflown
5	Designs should seek to minimise the impact of noise on particularly sensitive areas
6	Route 4 designs should enable transition to a vertical profile that allows an efficient, and potentially faster, climb to higher altitudes
7	Designs that seek to provide respite should not overfly previously unaffected populations
8	Route 4 designs should not be constrained by the existing NPR to 4000ft

Table 1 - Final Shortlisted Design Principles

1.3 Progress to first 'Develop and Assess' Gateway (Stage 2)

In October 2019, Stage 2 work on options development started. This concluded with a 'Develop and Assess' Gateway on 28 February 2020, at which the CAA concluded that further clarification was required in a number of areas before GAL could progress to Stage 3. This document addresses the stated shortfalls and, alongside the Initial Options Appraisal

[1] FASI-South is the umbrella name for the programme to modernise the airspace structure and route network in Southern England. The programme is a collaborative initiative between 17 airports, and NATS as the UK's en route air navigation services provider (ANSP).
[2] Besides safety, the other design principles have no relative priority.

(IOA), will serve as a Submission 2 for the next agreed 'Develop and Assess' Gateway on 29 July 2022. Full details of the work completed prior to and following the unsuccessful February Gateway are detailed below in Section 3.

1.4 Document Structure

This document is the Design Principles Evaluation (DPE) which will be submitted with, or before, the Initial Options Appraisal as formal submissions that provide the evidence required by the CAA for its 'Develop and Assess' Gateway.

This DPE has been structured as follows:

- **Section 1** – Introductory section; brief description of progress to date.
- **Section 2** – GAL's interpretation of the Stage 2 'Develop and Assess' Gateway requirements.
- **Section 3** – Describes how GAL engaged with its local stakeholders to develop and refine its design options for the first 'Develop and Assess' Gateway.
- **Section 4** – Provides detail on the first 'Develop and Assess' Gateway outcome, further engagement and changes made for the second submission.
- **Section 5** – Design Principle Evaluation, showing how options have responded to the design principles separately developed through earlier engagement activity, and fully described in the Stage 1 'Define' Gateway submissions (September 2019).
- **Section 6** – Design option evaluation against the technical criteria detailed in CAP 1616, Appendix F.

2 CAP 1616 Stage 2 Requirements

2.1 Introduction

This section firstly details the specific requirements of Stage 2 as defined in CAP 1616. It then describes the additional work required to achieve a successful 'Develop and Assess' Gateway, as highlighted by the CAA during the 3 March 2020 Gateway debrief (available on the CAA portal). Section 3 fully describes how the Stage 2 requirements have been addressed by GAL and includes detail to demonstrate how GAL has responded to the identified shortcomings following the first unsuccessful Gateway.

2.2 Stage 2 Process Requirements

Stage 2 of the CAP 1616 process is broadly divided into Step 2A, Options Development and Step 2B, Options Appraisal. The detailed requirements for each step are summarised below.

2.2.1 Step 2A

Step 2A is the Options development process that requires the sponsor to develop a comprehensive[3] list of options that address the Statement of Need and align with the design principles developed at Stage 1. These options are tested with the same group of stakeholders who assisted with the development of design principles. The culmination of this Step is the production of a DPE (this document Section 5). Sponsors are to ensure that the option identified as the preferred option (subsequently at Step 2B) must be compliant with the technical criteria set out in the standardised format in Appendix F to CAP 1616.

In order to satisfy the CAA, the change sponsor must have identified all the viable options and evaluated those options in a fair and consistent manner against the design principles. The sponsor must actively seek stakeholder agreement that the assessment of each option against the design principles has been completed in line with the process requirements. The sponsor must also detail how any stakeholder feedback has influenced decision making during this first Step of the Stage 2 process.

2.2.2 Step 2B

Step 2B is the Options Appraisal process that requires an "Initial" appraisal (IOA) of each of the viable options against defined criteria[4]. As a minimum, the appraisal must include qualitative assessments of the different options. Each option must be considered against the 'do minimum[5],' scenario in order to understand the impacts. At a later stage of the ACP, the "Full" Options appraisal should include quantified metrics against each option. At this stage, the sponsor is required to complete safety assessments and use TAG to quantify the health impacts of noise for each option assessment.

The IOA must include a high-level objective and detail the assessment criteria. It must commence with the comprehensive list of viable options that must include a 'do nothing/minimum' option which can be used as the baseline for the analysis. The baseline should be fully described, include an indicator of the likely noise impacts and a high-level assessment of costs and benefits. It should also include criteria for assessing the list of

[3] In earlier documentation the term 'long list' preceded the use of 'comprehensive list'.
[4] CAP 1616 Table E2 provides a guide to the approach expected by the CAA.
[5] In GALs case, 'do nothing' is not an option, a replication of the conventional SID is the Do Minimum Option, that will also serve as the baseline against which all the future options are compared.

options and apply these to develop a shortlist of options. The sponsor is required to give an indication of the preferred option.

2.2.3 Engagement Requirements

Throughout the process described above, the sponsor is required to engage with its stakeholder community (both aviation and non-aviation) and to demonstrate how engagement has influenced the final proposal. The key requirement is to demonstrate that the process has been followed and a two-way conversation has been established with the stakeholder community. The CAA will require evidence that demonstrates the sponsor has complied with the 'we asked, you said, we did' approach throughout the CAP 1616 process.

2.3 Stage 2 Additional First Gateway Requirements

At the unsuccessful first 'Develop &Assess' Gateway, a number of issues were highlighted by the CAA. To address these issues for the next Gateway, GAL will:

- Demonstrate that a consistent approach was adopted in relation to stakeholder engagement.
- More accurately describe in the DPE how its design options have responded to the design principles.
- Describe the steps taken to identify and produce an acceptable 'do nothing' option.

These shortcomings have been addressed in the following sections of this document in accordance with CAA guidance provided during a Gateway debrief held on 3 February 2020 (minutes of this meeting can be found on the CAA portal).

3 Options Development (D&A Gateway 1)

3.1 Introduction

This section describes the process followed to develop the Comprehensive list of all options and how these were reduced to the Comprehensive list of viable options, describing the supporting stakeholder engagement activities and highlighting how stakeholders have influenced the Steps of the process.

Please note, this Section (section 3) only describes the process followed for the first Develop & Assess Gateway (commenced in 2019 and Gateway held in March 2020). This Gateway failed, and Section 4 describes process followed to the second Gateway (commenced in 2020 and Gateway to be held May 2022).

For the purposes of the design principles assessment, and specifically with reference to Design Principle 3, *New Route 4 designs options should give due regard to the historic routings in use prior to the introduction of RNAV routes in 2012*, the term 'historic route' refers to the Route 4 Conventional SIDs in place between December 1999 and 2013 prior to the introduction of the RNAV-1 SIDs in November 2013. An exchange between the CAA and GAL on this topic is recorded on the CAA portal. This exchange shows how, apart from this ongoing consideration, the current (2018) ACP should be considered in isolation from any earlier discussion on previous conventional routing. However, as described in the following paragraphs GAL remains eager to ensure that the concerns of its local stakeholders are appropriately addressed, wherever this is possible, and at all future stages of this CAP 1616 (2018) ACP.

3.2 Engagement Approach

Throughout the current stage of the process, as well as during later consultation, transparency will remain the overarching principle adopted by GAL when progressing this airspace change. Consequently, the aim of our engagement activity is to ensure that GAL develops a good understanding of what is important to our key stakeholder and what they perceive the impact of any change will be.

At the commencement of this 2018 ACP, GAL developed its internal stakeholder engagement plan. The general approach for this ACP, as demonstrated during the earlier development of design principles, is always to ensure a high degree of transparency and two-way engagement with all relevant stakeholders. This includes those local communities who are potentially most likely to be affected by this change. In developing the stakeholder list, GAL included representation from those communities under the current flight paths, as well as those who had previously expressed an interest in our airspace projects through their individual community groups. Our stakeholder groupings include representation from the airlines as well as the wider aviation industry, councils and public officials, environmental groups and campaign groups. Representation was sought from communities within seven district and borough councils that could potentially be affected by this ACP. These boroughs fall within Kent, Surrey and West Sussex. In addition, we identified three town and 14 parish councils that could potentially be affected. The potentially affected area also includes the Surrey Hills Area of Outstanding Natural Beauty (AONB). A full list of the organisations and groups that we invited to participate in the earlier development of design principles for this ACP are recorded in Design Principles Report dated 13 September 2019 and published on the CAA portal.

3.3 Stakeholder Events (Gateway 1)

This paragraph describes the engagement activity undertaken to date, all of which is relevant to the development of the lists of options further described in paragraphs below. In line with our general approach described in paragraph 3.2 above, very early on in the process we considered where it would be necessary to hold formal events with our identified stakeholders. The point at which these events were scheduled is compliant with the CAP 1616 requirement. However, at every step of the process GAL has been willing to engage as necessary with the local communities where further clarification is required.

3.3.1 Stage 1 Focus Groups

During Stage 1, three focus groups were arranged to capture as many stakeholders in the conversation as was possible. These were held on 15, 16 and 20 May 2019. A standardised presentation was used at all events to ensure all stakeholders were provided with the same and most up to date information on operations along Route 4, and on the requirements of the CAP 1616 process. The methodology for design principles development was explained and responses requested through questionnaires available at the event and also provided after the event.

Significantly, all stakeholders were advised during the briefings that responses did not need to be limited to the exact questions specified on each response proforma; GAL confirmed that free-text responses through any medium would be recorded and actioned where this was appropriate. The following paragraph was included in the document providing instructions on how to respond (as published on the CAA portal).

> *'Please do not feel constrained in your response to any question. If you wish to highlight any other relevant local constraints or issues, then Gatwick Airport would welcome any feedback you choose to contribute that will support the development of our Design Principles. Your responses may be operational or environmental in nature but should be those you feel are most important to you or your represented community.'*

The slide deck used for this presentation was published on the CAA portal on 13 September 2019.

Feedback from the focus group discussions and questionnaires sent after the events were used to generate a long list of potential design principles. GAL then reviewed the long list and provided evidence to show why some of the principles captured in the long list could not be taken forward. The remaining shortlist of design principles was shared stakeholders in order to ask for their views once again on the remaining design principles. A further round of analysis was conducted once all responses were received to reduce the shortlist of 17 items to a final (unprioritized) list of 8 design principles against which options could be designed at Stage 2 of the process. Details of the above process were provided within the Design Principles Report, now published on CAA Portal on 13 September 2019; this report also contains the full list of stakeholders engaged.

3.3.2 Stage 2 Focus Group 1

Stage 2 involves the development of design options that have been constructed to align as closely as possible with the developed design principles. At the earlier Stage 1 focus groups the CAP 1616 process was fully explained to stakeholders, including the requirement to continue the conversation at Stage 3 when developing options. At this stage of the process 2 focus groups were organised and again held in a hotel at Gatwick Airport. The focus groups were held on 30 October 2019 and 21 November 2019, and each event was scheduled for 4 hours with refreshments provided for attendees.

The first event provided an update on objectives and progress to date and included a reminder of the process requirements for Stage 2. However, it introduced a focus on the design parameters rather than on tracks over the ground in order to seek stakeholder agreement that the approach to design being taken was the appropriate methodology, given the constraints also briefed. Stakeholders were informed that the methodology would serve as the basis for a more detailed level of design that would be introduced at the second workshop. The reduction of the Comprehensive List to a list of viable options is covered in more detail in para 3.4 below, but was fully explained during the first focus group and comments invited after the event, alongside any more specific questionnaires sent out for completion. Full details of stakeholder attendance and comments are provided in the redacted Minutes for this event published on the CAA portal.

3.3.3 Stage 2 Focus Group 2

The second event was split into two sessions. The first session first provided a recap of the last session and progress before then, reminding all attendees of the proposed routes presented in the first focus group, but this time presented on maps rather than just as envelopes. The second session presented the design options on large A1 scale ordnance survey maps positioned across the room in stations. The maps contained an overview of the various options, the local Areas of Outstanding Natural Beauty (AONB), local towns, churches, schools etc. and allowed our stakeholders to highlight on these maps their own places of interest and to bring those to the attention of the GAL Airspace team. Alongside these maps, an Ordnance Survey (OS) map with acetate overlays was provided. This depicted all the various options so that stakeholders could make comparisons between the tracks of each option. A suitable expert was available at each map station to answer questions and describe the route. Feedback forms were provided at each station for individuals to either complete on site, or to return after the event. Comments were again requested in any format to the Gatwick Route 4 email address; the point was made that these should not be constrained to the specific questions detailed on the forms. Again, full details of stakeholder attendance and comments received at each event are provided in the redacted Minutes for this event published on the CAA portal.

3.4 Options – Comprehensive List

The comprehensive list of design options was developed for the first 'Develop & Assess' Gateway, and to align with the design principles as closely as possible. CAA guidance at this stage required GAL to consider "all possible options". In accordance with stakeholder comments received during the design principles workshops, the comprehensive list was developed for further consideration with stakeholders during the first options development workshop; all identified stakeholders were again offered the opportunity to take part in this workshop and the attendance and Minutes of the meeting were uploaded to the CAA portal. It should be noted that presentation of draft options for stakeholder consideration was progressed as described here because it is a far more efficient way of focusing conversations. GAL had to balance the requirement for developing an efficient process against the risk that its motives for presenting a list could be mis-construed; on balance, it was felt that focussing conversations, whilst remaining open to stakeholder suggestions and ideas, was both transparent and compliant with the CAP 1616 requirements. At every step of the process, GAL are keen to ensure that its stakeholders have every opportunity to influence the final outcome following the broader formal consultation at Stage 3.

The comprehensive list of options presented and discussed during the Stage 2 first focus group is shown in Table 2 below.

OPTION	OPTION DESCRIPTION	FEATURE
A	Wraparound south after take-off	• Conflict with Route 9 • Runway approach centreline crossing
B	Extension west on centreline after take-off (no turn below 4000ft)	• Conflict with Route 1 • Significant constraints of departure flows - delays • Increase in noise impact on extended centreline
C	Track further north after take-off	• Gatwick airport airspace constraints • Interaction with Heathrow • Increasing levels of residential housing
D	Offset departure north (22° turn immediately on departure)	• Aircraft would have to track southeast following the turn to re-intercept the outbound track • Increase in track miles • Gatwick airport airspace constraints
E	Offset departure south (22° turn immediately on departure)	• Increase in track miles • New areas of population would be overflown • Respite not supported during initial engagement • Gatwick airport airspace constraints
0	Fly-by Fly-by LAM2X	• Current temporary status of Route 4 (as flown in 2018/20)
1	Fly-by Fly-by LAM1X	• Turn by KKW04 not below 2500ft
2	Fly-over Fly-by	• As per LAM2X but DIRECT SUNAV and no southerly track adjustment
3	Fly-by KKE09 & Fly-by KKE11	• Fly-by fly-by at multiple waypoints for dispersion
4	Fly-over Fly-by	• Multiple turn points with dispersion in the turn
5	Fly-by Fly-by	• Similar track across the ground as Option 3 but with a lower speed with a turn common to Option 4 above
6	Fly-over Fly-by	• Multiple turn points plus apparent dispersion in the turn
7	Constant Radius to fix	• Concentrated

Table 2 - Comprehensive List of Options[6]

6 An explanation of Fly-by/Fly-over way points can be found at Appendix A1.

During the workshop there was a good deal of discussion on options A to E, during which GAL explained that these options could be supported by the airport but would not make the comprehensive list of viable options for the next stage unless supported by stakeholders. Option A was a draft design departing to the south, but in order to do so it would generate a conflict with traffic on Route 9 as well as a potential conflict with traffic on arrival routes; for this reason, such an option could not be considered within the scope of this project, but was an option that would need to be considered as part of the FASI-S Gatwick ACP. Option B was a potential extension to the west after take-off with a restriction on any turn below 4,000ft. This could have provided some respite, but would cause a safety conflict with Route 1, 7 and 8 which would additionally constrain the departure flow and potentially generate significant delays. It would also generate significant levels of additional noise on the departure lane, for those currently affected by other departure routes. Option C was an attempt to shift the levels of noise further north; however, doing so would generate additional conflicts with London Heathrow (LHR) and other traffic to the north. On the assumption that altitude would also be constrained below the LHR traffic, then additional levels of noise would be added to the Surrey Hills AONB, to those already affected by other airports and to those in more densely populated areas. Option D, a small turn north after take-off would require a larger south-easterly correction to regain the outbound track and would probably have a greater impact in the Dorking area than was currently the case, as well as an interception of the outbound track that would be closer to the western margins of Doversgreen and Reigate than is currently the case; for these reasons this option was discounted early on. It would also add track miles and would extend significantly beyond the agreed airport airspace constraints. Option E was a similar proposition to Option D, but this time offset to the south of the extended runway centreline. As already discounted, an option to turn south was also not deemed operationally feasible for the reasons stated under Option A above. There would also be an increase in track miles and new areas overflown at this stage. It would also require larger adjustments necessary as described and more than likely have an impact on areas to the South that were unaffected. As respite was not fully supported at earlier stages of the process this was also considered an unviable option.

At the workshop and within the stakeholder feedback, there was no significant dissent raised against the logic of the arguments to discount Options A-E. Most attendees understood, if not accepted, the constraints within which it was necessary to conduct this ACP.

The comprehensive list of options taken forward and supported by some or all stakeholders can be seen in Section 3.5 below.

3.5 Options – Comprehensive List Taken Forward

The comprehensive list of viable design options that were taken forward to the first D&A Gateway are shown in Table 3 below. At this stage of the process, it should be noted that these options are more fully described in the document entitled Gatwick Route 4 Redesign of RNAV SIDs (Options Development Step 2A) dated 12 February 2020, and available on the CAA portal. This is not the final list that will be taken forward for the second D&A Gateway. The final list for the second Gateway submission, and against which this DPE exercise has been updated, are detailed in Section 4 (and in Table 4 therein), which includes a description of the additional stakeholder event held in support of GAL's second Gateway submission.

Option	Procedure	Basic Description	Action taken
0	Fly-over Fly-by LAM 2X	Fly over fly by at LAM2X, as per current flown	Taken forward to Stage 2B
1	Fly-by Fly-by LAM1X	Turn by KKW04 not below 2500ft	Taken forward to Stage 2B
2	Fly-over Fly-by	As per LAM2X but DIRECT SUNAV and no southerly track adjustment	Taken forward to Stage 2B
3	Fly-by Fly-by (Apparent Dispersion Late in Turn)	Fly-by Fly-by at multiple waypoints for dispersion	Taken forward to Stage 2B
4	Fly-over Fly-by (Multiple Initial Turn Points)	Multiple turn points with dispersion in the turn	Taken forward to Stage 2B
5	Fly-by Fly-by (Lower Speed Vs Option 1)	Similar track across the ground as Option 1 but with a lower speed	Taken forward to Stage 2B
6	Fly-over Fly-by (Multiple Initial and Turn Points)	Multiple turn points with apparent dispersion in the turn	Taken forward to Stage 2B
7	Constant Radius to Fix (Tracks Concentrated)	Concentrated	Taken forward to Stage 2B

Table 3 - Summary of Comprehensive List of Viable Options

3.6 Options – Comprehensive List Graphics

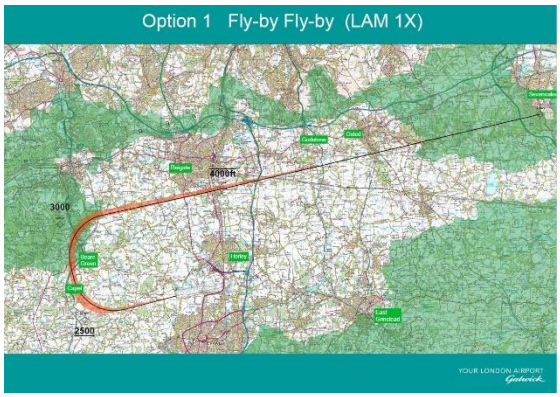
The Comprehensive List of 8 viable options in total reflect the list at the time of the first D&A Gateway. Each of these are shown below against an Ordnance Survey 1:50,000 background map, as presented in the focus groups discussed earlier (paras 3.3.2 and 3.3.3). The nominal tracks are shown alongside an area shaded in orange; this represents the anticipated variation in overflight tracks, given the proposed procedure design methodology[7] used in the design of each option.

[7] Path Terminator ARINC 424 - ARINC 424 is a worldwide Standard for the navigation system database used by aircraft flight management systems to fly between waypoints in the proximity of airports.

3.6.1 Option 0

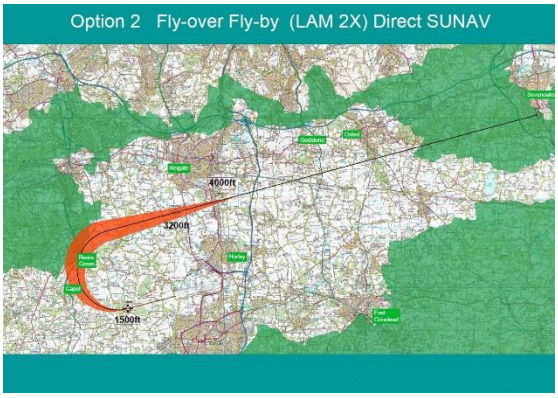
This is the currently flown LAM 2X Standard Instrument Departure (SID) as published in the UK AIP 2016. Following an initial fly-over waypoint (not below 1500ft max 220 KIAS) aircraft fly the turn using a Course to Fix Path Terminator that results in a degree of dispersion during the turn. For airspace, Way Point KKE09 is flown not below 3200ft and KKE11 not above 4000ft. The speed restriction of 220 KIAS is raised to 250 KIAS at WP KKE 11. Aircraft adjust track at KKE15 by 3° before routing to SUNAV at 5000ft.

3.6.2 Option 1



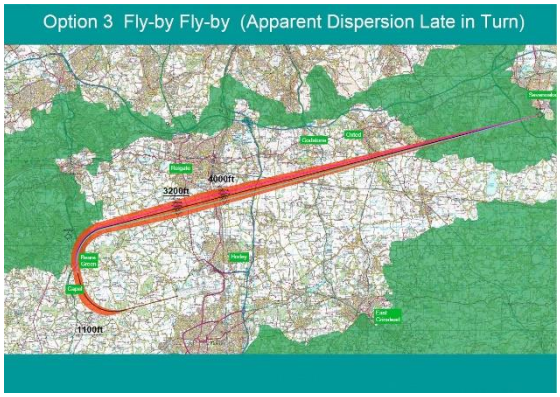
This was the previously published LAM 1X SID and was previously published in the UKAIP 2013. Aircraft fly straight ahead and make the first turn at KKW04 not below 2500ft. Two 90° turns at the fly-by waypoints KKW04 and KKN06 result in aircraft tracking 079° (True) following the turn. The turn is coded Track to Fix which results in a relatively small degree of dispersion in the turn. Aircraft must be below 4000ft at WP KKE14 where the speed restriction of 220 KIAS is raised to 250 KIAS. Aircraft remain on track 079° (True) to SUNAV at 5000ft.

3.6.3 Option 2



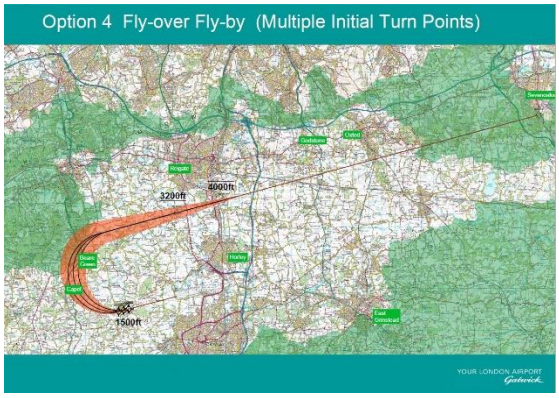
This option uses the same turn as described in Option 0, however, the track adjustment at KKE15 is removed and waypoint NEW 11 is placed on the course that aircraft would nominally roll out of the turn. WP NEW09 maintains the requirement for aircraft to be above 3200ft at a point abeam the original KKE09 and NEW 11 maintains the restriction of aircraft not climbing 4000ft at the point abeam KKE11. NEW11 lifts the speed restriction from 220 KIAS to 250 KIAS.

3.6.4 Option 3



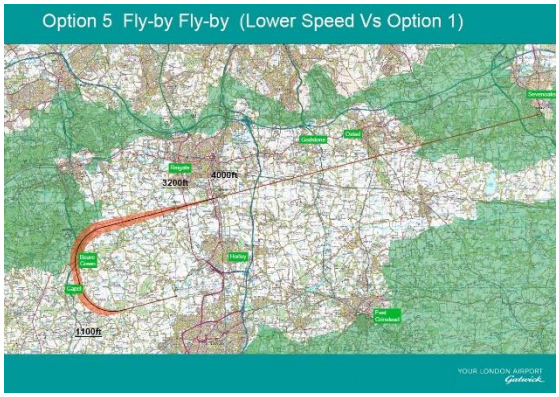
Aircraft fly straight ahead to KKXX01 and turn not below 1100ft. KKXX02 is the second of two 90° turns with a speed limit of 200 KIAS. Three waypoints are placed abeam each other at a distance of 278m with the intention of providing a degree of managed track dispersion. KKE 09 A, B and C provide different termination points for the paths following the turn although all are coded Course to Fix. This results in three courses being flown to different waypoints and these discreet paths are maintained to three waypoints KKE11 A, B C where the speed restriction of 220 KIAS is lifted to 250 KIAS and the three paths are coded Course to Fix to SUNAV at 5000ft resulting in a gradual narrowing of the apparent dispersion.

3.6.5 Option 4



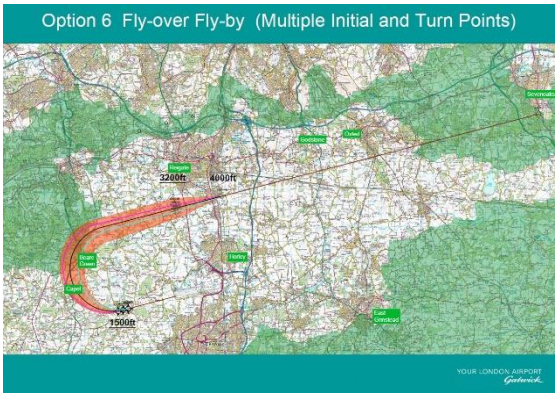
Option 4 utilises three initial turning points placed sequentially 400m apart. These waypoints are coded to ensure aircraft do not turn below 1500ft with the intention that there will be planned dispersion in the turn. The turn is designed to be flown with Course to Fix Path Terminators. Following the turn WP NEW09 maintains the requirement for aircraft to be above 3200ft at a point abeam the original KKE09 and NEW 11 maintains the restriction of aircraft not climbing 4000ft at the point abeam KKE11. NEW11 lifts the speed restriction from 220 KIAS to 250 KIAS.

3.6.6 Option 5



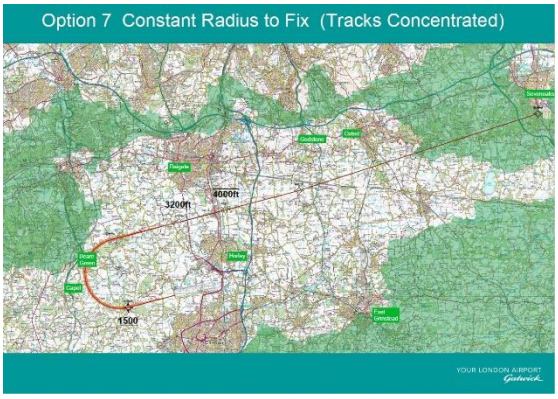
Option 5 uses the same methodology as option 1 which incorporates two 90° turns at fly-by waypoints followed by a direct track to SUNAV at 5000ft. The speed is reduced in the turn to 200 KIAS and this results in the waypoints being placed closer together, as a result the turn is completed to the south of that designed in Option 1. The 200 KIAS restriction is lifted to 250 KIAS at NEW12 creating a point of acceleration.

3.6.7 Option 6



This option is an amalgam of Options 3 and 4 and is expected to result in a degree of track dispersion in, and following, the turn. Option 6 brings the paths to a common waypoint at KK11A and from there a concentrated track of traffic to SUNAV at 5000ft utilising a Track to Fix Path Terminator, unlike the Course to Fix used in Option 3 which leads to a more gradual concentrating of the tracks closer to SUNAV.

3.6.8 Option 7



This option utilises a Constant Radius to Fix Path Terminator that will produce a concentrated track over the ground. KKW02 is coded as the first waypoint to ensure aircraft do not turn below 1500ft. Following the turn KKE09 and KKE11 fulfil the same function as described in Option 0 along with the track adjustment at KKE15 to SUNAV at 5000ft. Due the degree of concentration this the design will need further work ahead of the public consultation to more accurately depict a track over the ground that will minimise the numbers of peoples newly overflown. The indicative swathe depicted above and presented to key stakeholders demonstrated the level to which traffic is expected to be concentrated on such a design.

3.7 Stakeholder Feedback

This paragraph summarises the key stakeholder concerns at the time of the first Gateway. A good deal of skepticism is apparent regarding the CAP 1616 process itself. Concerns remain over whether or not the ACP is being constrained or not by the NPR and there is clear disagreement about what a “historic 2012” route means, and what it should mean. This is a key factor that influences individual groups’ perceptions of how each presented option gives due regard to historic routing, or not. Many support a full consultation across the whole area which is not aligned to this stage of the CAP 1616 process, but will come at Stage 3; this is not soon enough for many. There is a clear divide between those who would like some of the noise exported to those who have not experienced it before, rather than providing some dispersal amongst those currently affected. Similarly, there is a clear divide between those who would like the NPR changed and those who would like it to remain where it is. There is a concern that dispersal may force more noise on those already experiencing this impact due to Route 3. A more detailed assessment of comments will be included as part of the Design Engagement Document. It should be remembered that at the time of the original work, the CAA was open to considering a final route that did not track down the centerline of the published NPR swathe, as described in CAP 1912.

Subsequent to the stakeholder engagement about the NPR, described in Appendix A2, the sponsor received clarification from the CAA that: "the CAA can confirm that the Route 4 Noise preferential Route (NPR) as described in the currently promulgated UK AIP EGKK AD 2.21 Noise Abatement Procedures…….is correct. Other communications suggesting that there is another source of definitive information regarding the NPR are incorrect."

4 Options Development (D&A Gateway 2)

4.1 Introduction

This section describes the outcome of the first D&A Gateway and discusses other factors that have slowed progress with this project since the CAA decision. These included the definition of the baseline and how this was further complicated in May 2020 by the publication of CAP 1912, the CAA's final decision on whether the 2016 RNAV-1 SID had achieved its objective. In parallel with this, the impact of COVID-19 had two key impacts. Firstly, government guidance on limiting movement and interaction had a detrimental effect on project progress. Secondly, a slow recovery across the aviation industry in general, and specifically at Gatwick Airport, had an impact that needed careful consideration for subsequent stages of the CAP 1616 process.

4.2 Gateway Outcome

On 3 March 2020, the CAA published its findings on the outcome of the 28 February 2020 D&A Gateway. The findings concluded that:

- The sponsor did not demonstrate to the CAA's satisfaction that a consistent approach was adopted in relation to stakeholder engagement.
- The Change Sponsor has failed to produce to the CAA's satisfaction, a design principles evaluation showing how its design options have responded to the design principles.
- In considering the comprehensive list of options and the baseline, the sponsor has failed to adequately produce a 'do nothing' option.

The reaction to this outcome is further described in the paragraphs below in support of the second submission for the D&A Gateway.

4.3 CAP 1912 Impact

In May 2020, CAP 1912 concluded that the 2016 RNAV-1 SID had not achieved its objective of providing a satisfactory replication of the Route 4 conventional SIDs, more specifically on the eastbound leg. The temporary RNAV SID was to be de-notified from the AIP, leaving only conventional procedures on Route 4. This action also had the impact of removing the baseline for this 2018 ACP which was defined as Option 0 (LAM 2X) as shown at para 3.6.1 above.

4.4 Second Baseline

As stated in para 4.3 above, in Q2 2021 work began to redefine the baseline and the do-nothing option. This task was further complicated because there was no historical data associated with the new Route 4 conventional procedures introduced following the CAP 1912 decision. It was recognised at this stage that it would take some time to build a historical level of track data in support of future environmental analysis.

As CAP 1616 stipulates the level of track data that needs to support an environmental assessment at Stage 3 (Consultation), it was necessary at this stage (Stage 2) to ensure that the selection of a baseline would not be compromised again further in the process. A methodology was agreed that would allow recent traffic data flying the conventional

routing to be used to establish a mean track which could then be populated with representative 2019 levels of traffic data to model the environmental impact associated with the baseline. Notably, the impact of COVID-19 on traffic levels and the ability of ERCD to provide meaningful analysis of those reduced traffic levels throughout the London TMA resulted in different destination sets and track over the ground patterns (due to increased opportunity for vectoring), this meant that the overall pattern was not representative compared to a 'steady state' operation for Gatwick Airport. Therefore, the sponsor proposed a methodology for capturing a traffic sample from the new conventional baseline which ERCD used as the nominal track, then they took the 2019 traffic volume and modelled it down that new conventional baseline.

Further consideration was also necessary of the effect of the UK programme for the rationalisation of the Doppler Very High Frequency Omni-Directional Range (DVOR) navigational infrastructure. A number or airports across the UK will be impacted by the de-commissioning of these ground-based navigation aids, towards the end of 2022. Confirmation was sought from the CAA (and given) that the introduction of RNAV substitution - in accordance with CAP 1781 *DVOR / DME / NDB Rationalisation: Guidance for the use of RNAV Substitution* - to temporarily replace the procedures flown along the new conventional track would align well enough to ensure that the baseline was not compromised at a later stage in the process.

The CAA agreed with the methodology proposed by GAL and that the new 2021 conventional procedure is an appropriate baseline to use for the ongoing assessments. A new procedure annotated 'Baseline' was therefore included in the Comprehensive List of options. The Option 0 design option remains a viable alternative in its own right at this stage of the process. Consequently, it remained as an option and was presented as such in the event described immediately below (para 4.5). At this stage also, an additional Option 7 was introduced to replace the Option 7 design previously included. When this constant radius to fix design was originally introduced stakeholders were informed this specific design was, at that stage, a draft to demonstrate what could be expected using such a design tool; this new version represents a fully designable option.

4.5 Stage 2 Focus Group 3 and 4

Following the main pandemic lockdowns, GAL took a view that its stakeholders should be engaged once again. GAL felt the long period that had passed and the detail of the changes and discussions that had taken place over the intervening period, should be fully described to its stakeholders. Once again GAL wished to request and receive any feedback on the current course of action and recent decisions, in order to better inform preparations for the second D&A Gateway.

Preparation for these events began in late 2021 and the events were staged on 1st and 2nd of February 2022, using Microsoft Teams. The presentations included a full update on the current status of the ACP as well as a good deal of detail on the activities that had taken place since the last 21 November 2019 focus group, as described in the previous paragraphs of this section. A reminder was provided about the state of the options following the last focus group and presented to the CAA for the first D&A Gateway. In particular, the addition of the new baseline (described in para 4.4) was explained in the context of the D&A Gateway debrief and the requirement to give due regard to the historic 2012 routing.

During the process where specific key feedback was required, a feedback form was produced. As it was the first time the final Option 7 was presented, comment on this replacement option was requested on a form. However, as with all earlier events, GAL have specifically invited participants to provide feedback in any form and on any matter of

particular concern. From the responses received following this focus group and the earlier events, the range of feedback provided suggests this message was received as intended.

4.6 Stakeholder Feedback

One key concern following a review of the feedback from this event suggested the graphic representing the baseline still appeared to be too far south and should be moved north to align with the 2012 (and 2021) conventional procedure. Option 0, the do minimum baseline, now represents this, but the Option 0 presented at this stage is still a viable option and has been changed to Option 8 for the DPE assessment below. For detailed stakeholder feedback please see the Design Engagement Document as part of this submission.

4.7 Changes Actioned

For clarity, Table 4 below shows how the option numbering has changed at key project stages as this process has evolved. It also shows what was explained and engaged upon at the Focus Groups (1&2) in Nov 2019, the subsequent Focus Groups (3&4) in Feb 2022 and the current status in Jul 2022. This should make it easier to understand the changes that have been made in response to stakeholder feedback to date. Larger maps showing each option are provided at Appendix A2.

Option	Focus Groups 1&2 Nov 2019	Focus Groups 3&4 Feb 2022	Current Status Jul 22
Baseline		Current 2021 Conventional	Current 2021 Conventional Baseline
0	Fly-over Fly-by LAM 2X	Fly-over Fly-by LAM 2X (now Option 8 – Jul 22)	Current 2021 Conventional 6M,6V RNAV Replication Do Minimum Baseline[8]
1	Fly-by Fly-by LAM1X Turn by KKW04 not below 2500ft	Fly-by Fly-by LAM1X Turn by KKW04 not below 2500ft	Fly-by Fly-by LAM1X Turn by KKW04 not below 2500ft
2	Fly-over Fly-by (LAM 2X) Direct SUNAV As per LAM2X but DIRECT SUNAV and no southerly track adjustment	Fly-over Fly-by (LAM 2X) Direct SUNAV As per LAM2X but DIRECT SUNAV and no southerly track adjustment	Fly-over Fly-by (LAM 2X) Direct SUNAV As per LAM2X but DIRECT SUNAV and no southerly track adjustment
3	Fly-by Fly-by (Apparent Dispersion Late in Turn) Fly-by, Fly-by at multiple waypoints for dispersion	Fly-by Fly-by (Apparent Dispersion Late in Turn) Fly-by, Fly-by at multiple waypoints for dispersion	Fly-by Fly-by (Apparent Dispersion Late in Turn) Fly-by, Fly-by at multiple waypoints for dispersion
4	Fly-over Fly-by (Multiple Initial Turn Points) Multiple turn points with dispersion in the turn	Fly-over Fly-by (Multiple Initial Turn Points) Multiple turn points with dispersion in the turn	Fly-over Fly-by (Multiple Initial Turn Points) Multiple turn points with dispersion in the turn
5	Fly-by Fly-by (Lower Speed Vs Option 1)	Fly-by Fly-by (Lower Speed Vs Option 1)	Fly-by Fly-by (Lower Speed Vs Option 1)

[8] Do nothing is not an option, a replication of the conventional SID is the Do Minimum Option, that will also serve as the baseline against which all the future options are compared, projected forward to the point of implementation and at implementation plus ten years. A single comparison will be made between the Baseline and 0, but it is anticipated that there will be no differences.

Option	Focus Groups 1&2 Nov 2019	Focus Groups 3&4 Feb 2022	Current Status Jul 22
	2 x 90° turns, similar track across the ground as Option 1 but with a lower speed	2 x 90° turns, similar track across the ground as Option 1 but with a lower speed	2 x 90° turns, similar track across the ground as Option 1 but with a lower speed
6	Fly-over Fly-by (Multiple Initial and Turn Points) Multiple turn points with apparent dispersion in the turn	Fly-over Fly-by (Multiple Initial and Turn Points) Multiple turn points with apparent dispersion in the turn	Fly-over Fly-by (Multiple Initial and Turn Points) Multiple turn points with apparent dispersion in the turn
7	Constant Radius to Fix (Tracks Concentrated) 'draft'	New Constant Radius to Fix (Tracks Concentrated) 'final'	New Constant Radius to Fix (Tracks Concentrated) 'final'
8			Fly-over Fly-by (Was LAM 2X)

Table 4 - Options Status throughout Process

5 Design Principle Evaluation (DPE) for Gateway 2

5.1 Introduction

The assessments in this section have been completed taking into account two things: Firstly, how well the intended design toolset used to build each option had resulted in a design that was as compliant as possible with the maximum number of design principles developed at Stage 1. Secondly, the stakeholder responses and discussion during the 2 sets of focus groups and any comment subsequently received on how well these designs matched the intended criteria. It should be understood that not all feedback received covered every design principle against every option. However, this assessment has been made by those attending all of the events, and with full sight of all of the very helpful stakeholder feedback. As was described earlier, GAL is keen to ensure that its stakeholders have an opportunity to help shape these Stage 2 assessments before we move to a more formal and full consultation on the Short List of options that result from the IOA that should be read alongside this document at the next Stage 2 D&A Gateway.

5.2 Evaluation of the Options against the Design Principles

Each option has been assessed against each of the design principles shown in Table 1 in paragraph 1.2 above. Table 6 below defines the criteria used in conducting the evaluation of each component parameter. Table 6 provides a quick look summary showing the assessment of each design principle against each option.

Evaluation	Met	Partial	Not Met
Each design option was assessed against each design principle, taking account of intended design parameters and the most recent stakeholder comments during and after the Stage 2 focus groups	Indicates that the specified option is judged to be **compliant** with or has no impact on the relevant design principle; no stakeholder adverse comment	Indicates that the specified option is **not fully compliant** with the relevant design principle, but mitigation is possible through agreed operating procedures or agreements; no or minor adverse stakeholder comment	Indicates that the specified option is **not compliant** with the relevant design principle and that there will be no possible plans available to mitigate the issue; with or without adverse stakeholder comment

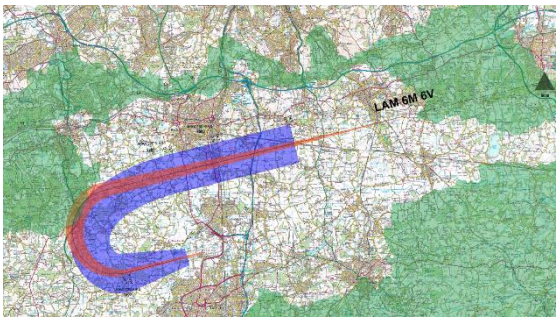
Table 5 - Definitions Supporting DPE Assessments

5.3 Evaluation of the Options against the Accept/Reject Criteria

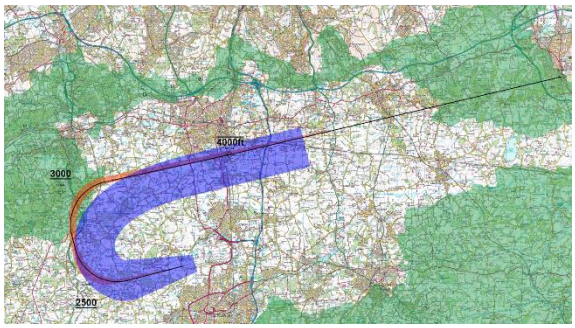
In order for each option to be assessed as accepted for further appraisal, the Sponsor requires that an option must meet, or partially meet, both DP1 and DP6. If an option does not meet, or partially meet, either of these DPs then it shall be rejected.

	Option 0	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8
DP 1 - Route 4 options will be designed safely with full regulatory compliance									
DP 2 - Options should be designed to facilitate dispersion below 7000 ft									
DP 3 - New Route 4 design options should give due regard to the historic routings in use prior to the introduction of RNAV routes in 2012									
DP 4 - Route 4 designs should seek to minimise the adverse impact of noise on previously unaffected populations and seek to reduce the total number of people overflown									
DP 5 - Designs should seek to minimise the impact of noise on particularly sensitive areas									
DP 6 - Route 4 designs should enable transition to a vertical profile that allows an efficient, and potentially faster, climb to higher altitudes									
DP 7 - Designs that seek to provide respite should not overfly previously unaffected populations									
DP 8 - Route 4 designs should not be constrained by the existing NPR to 4000ft									

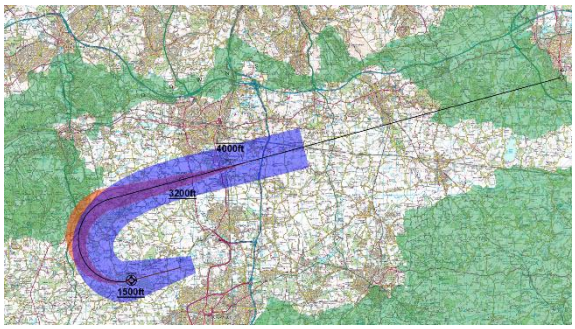
Table 6 - Design Principle Evaluation against Options

Design Principle Evaluation			**OPTION NO: 0**
Option Name: Current Conventional 6M, 6V – RNAV Replication			ACCEPT
Description of Option: The current situation is included as an option for comparative purposes. Option 0 is to provide RNAV Replication for the current Conventional 6M, 6V under CAA CAP1781. This is the Do Minimum Baseline.			
Design Principle 1: Route 4 options will be designed safely with full regulatory compliance.		PARTIAL	MET
Summary of Qualitative Assessment: CAP 1781 could permit the use of coding that is not fully PANS OPS compliant.			
Design Principle 2: Designs should be built to facilitate dispersion below 7000 ft.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: This design does fully facilitate dispersion below 7000ft, it has a course to fix turn which allows dispersion around the turn but not on the easterly track. The 6M 6V Procedure has good dispersion in the turn and it is reasonable to assume that the coding used by the operators will continue to do so under CAP1781.			
Design Principle 3: New Route 4 design options should give due regard to the historic routings in use prior to the introduction of RNAV routes in 2012.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: This particular design was introduced following the denotification of the 2016 RNAV and the CAP 1781 substitution for the Route 4 conventional procedures.			
Design Principle 4: Route 4 designs should seek to minimise the adverse impact of noise on previously unaffected populations and seek to reduce the total number of people overflown.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: This particular design was introduced following the 'historic routing' for which it should therefore be green; but as with all dispersed designs it does not seek to minimise the number of people newly overflown.			
Design Principle 5: Designs should seek to minimise the impact of noise on particularly sensitive areas.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: This design minimises the impact of noise on particularly sensitive areas and only slightly overflies a portion of the AONB, so we believe this meets this DP.			
Design Principle 6: Route 4 designs should enable transition to a vertical profile that allows an efficient, and potentially faster, climb to higher altitudes.	NOT MET	PARTIAL	MET

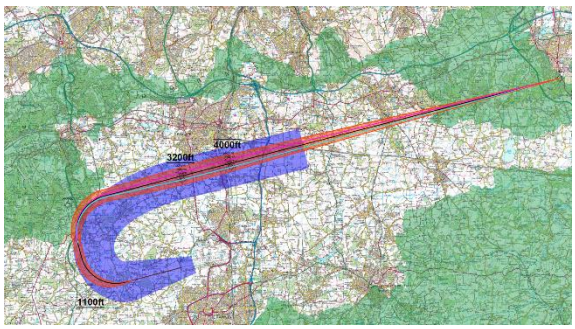
Summary of Qualitative Assessment: With the modernisation of airspace, through FASI-S, it is expected that the future air traffic situation will allow departing traffic to be issued a clearance to climb above the designed altitude limits. Until that time, departing traffic will be issued a clearance to climb initially to not above 4000ft. Further climb to not above 7000ft will be issued, where the air traffic situation allows as soon as is practicable.			
Design Principle 7: Designs that seek to provide respite should not overfly previously unaffected populations.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: Not applicable as none of these options were designed to provide any respite in accordance with the wishes of the stakeholders engaged during CAP 1616 Step 1A/B.			
Design Principle 8: Route 4 designs should not be constrained by the existing NPR to 4000ft.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: This procedure was designed to conform with the published NPR.			

Design Principle Evaluation			**OPTION NO: 1**
Option Name: Fly-by Fly-by LAM1X			ACCEPT
Description of Option: This SID was previously published in the UK AIP between 14 November 2013 – 25 May 2016. Two 90° turns. Climb straight ahead on RW heading for 4nm climbing not below 2500ft. Turn right heading 347.5° for 4.1nm. Turn right heading 079.7° T for 6.9nm climbing not above 4000ft. Then route direct SUNAV not above 5000ft.			
Design Principle 1: Route 4 options will be designed safely with full regulatory compliance.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: The procedure has been designed to meet acceptable levels of flight safety by ensuring all tracks are designed to PANS-OPS criteria.			
Design Principle 2: Designs should be built to facilitate dispersion below 7000 ft.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: The procedure will not facilitate dispersion below 7000ft.			
Design Principle 3: New Route 4 design options should give due regard to the historic routings in use prior to the introduction of RNAV routes in 2012.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: While this design does not specifically take the historic routings into consideration it does track further to the north on its easterly track akin to the historic routing.			
Design Principle 4: Route 4 designs should seek to minimise the adverse impact of noise on previously unaffected populations and seek to reduce the total number of people overflown.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: This design moves the track closer to Reigate which is currently unaffected.			
Design Principle 5: Designs should seek to minimise the impact of noise on particularly sensitive areas.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: This design reduces the swathe of the traffic to minimise the impact on the AONB, as far as is practicable; however, the track is further north and closer to Reigate.			

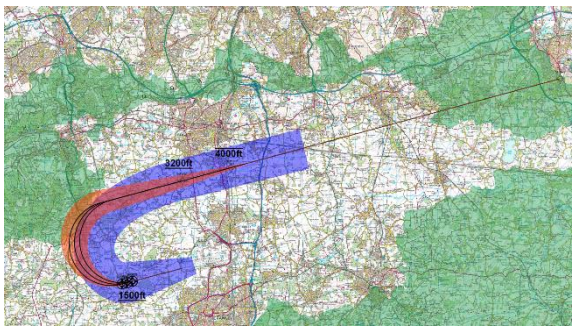
Design Principle 6: Route 4 designs should enable transition to a vertical profile that allows an efficient, and potentially faster, climb to higher altitudes.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: With the modernisation of airspace, through FASI-S, it is expected that the future air traffic situation will allow departing traffic to be issued a clearance to climb above the designed altitude limits. Until that time, departing traffic will be issued a clearance to climb initially to not above 4000ft. Further climb to not above 7000ft will be issued, where the air traffic situation allows as soon as is practicable.			
Design Principle 7: Designs that seek to provide respite should not overfly previously unaffected populations.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: Not applicable as none of these options were designed to provide any respite in accordance with the wishes of the stakeholders engaged during CAP 1616 Step 1A/B			
Design Principle 8: Route 4 designs should not be constrained by the existing NPR to 4000ft.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: This design is not constrained by the existing NPR to 4000ft.			

Design Principle Evaluation			**OPTION NO: 2**
Option Name: Fly-over Fly-by (LAM 2X) Direct SUNAV			ACCEPT
Description of Option: Climb straight ahead for 2nm not below 1500ft. Turn right heading 077.1⁰ T climbing not above 3200 ft. Continue heading and climb not above 4000ft then route direct to SUNAV.			
Design Principle 1: Route 4 options will be designed safely with full regulatory compliance.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: The procedure has been designed to meet acceptable levels of flight safety by ensuring all tracks are designed to PANS-OPS criteria. However, mitigation may be required to ensure safe separation for simultaneous participating aircraft on Route 4.			
Design Principle 2: Designs should be built to facilitate dispersion below 7000 ft.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: The procedure has been designed to introduce dispersion below 7000ft in the turn but concentrates traffic on the easterly leg.			
Design Principle 3: New Route 4 design options should give due regard to the historic routings in use prior to the introduction of RNAV routes in 2012.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: This route is designed with due regard for the historic routings in use prior to the introduction of RNAV routes in 2012. The term 'historic route' refers to the Route 4 Conventional Standard Instrument Departures (SIDs) in place between December 1999 and November 2013, prior to the introduction of the RNAV-1 SIDs in 2013. This option flies direct to SUNAV following the turn.			
Design Principle 4: Route 4 designs should seek to minimise the adverse impact of noise on previously unaffected populations and seek to reduce the total number of people overflown.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: This design was introduced to closer reflect the traffic dispersion prior to the introduction of the 2012 P-RNAV. Following the turn aircraft will route direct to SUNAV and will not correct onto the existing NPR which may impact previously unaffected population.			
Design Principle 5: Designs should seek to minimise the impact of noise on particularly sensitive areas.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: This design minimises the impact of noise on particularly sensitive areas but does overfly a portion of the AONB, so we believe it only partially meets this DP.			

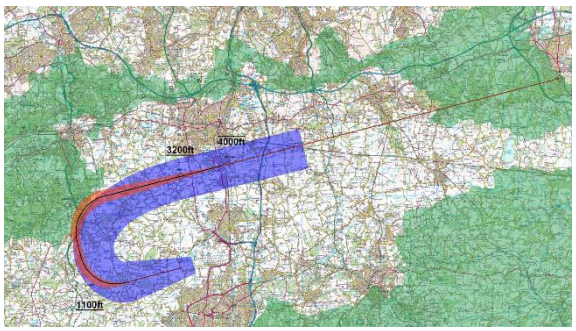
Design Principle 6: Route 4 designs should enable transition to a vertical profile that allows an efficient, and potentially faster, climb to higher altitudes.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: With the modernisation of airspace, through FASI-S, it is expected that the future air traffic situation will allow departing traffic to be given clearance to climb above the designed altitude limits. Until that time, departing traffic will be issued a clearance to climb initially to not above 4000ft. Further climb to not above 7000ft will be issued, where the air traffic situation allows as soon as is practicable.			
Design Principle 7: Designs that seek to provide respite should not overfly previously unaffected populations.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: Not applicable as none of these options were designed to provide any respite in accordance with the wishes of the stakeholders engaged during CAP 1616 Step 1A/B.			
Design Principle 8: Route 4 designs should not be constrained by the existing NPR to 4000ft.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: This design is not constrained by the existing NPR to 4000ft.			

Design Principle Evaluation			**OPTION NO: 3**
Option Name: Fly-by Fly-by (Apparent Dispersion Late in Turn)			ACCEPT
Description of Option: Climb straight ahead for 3.8nm not below 1100ft. Turn right to track 347.5⁰ T for 3.5nm. Turn right to track 077.6⁰ T for 4.7nm climbing to not below 3200ft. Maintain track 077.6⁰ T for 2nm climbing not above 4000ft then route direct SUNAV.			
Design Principle 1: Route 4 options will be designed safely with full regulatory compliance.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: The procedure has been designed to meet acceptable levels of flight safety by ensuring all tracks are designed to PANS-OPS criteria. However, mitigation may be required to ensure safe separation for simultaneous participating aircraft on Route 4.			
Design Principle 2: Designs should be built to facilitate dispersion below 7000 ft.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: The design facilitates dispersion late in the turn and creates dispersion along the easterly track and so partially meets this DP.			
Design Principle 3: New Route 4 design options should give due regard to the historic routings in use prior to the introduction of RNAV routes in 2012.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: This route is designed with due regard for the historic (pre-2013) traffic routing. The term 'historic route' refers to the Route 4 Conventional Standard Instrument Departures (SIDs) in place between December 1999 and November 2013 prior to the introduction of the RNAV-1 SIDs in 2013.			
Design Principle 4: Route 4 designs should seek to minimise the adverse impact of noise on previously unaffected populations and seek to reduce the total number of people overflown.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: This procedure has been designed to minimise the adverse impact of noise to *some* previously unaffected populations by introducing dispersion following the turn.			
Design Principle 5: Designs should seek to minimise the impact of noise on particularly sensitive areas.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: The design will minimise the impact of noise on particularly sensitive areas.			

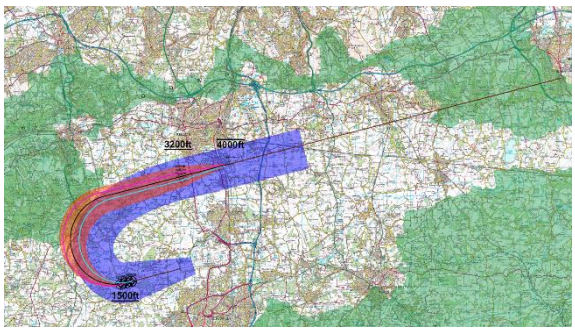
Design Principle 6: Route 4 designs should enable transition to a vertical profile that allows an efficient, and potentially faster, climb to higher altitudes.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: With the modernisation of airspace, through FASI-S, it is expected that the future air traffic situation will allow departing traffic to be issued a clearance to climb above the designed altitude limits. Until that time, departing traffic will be issued a clearance to climb initially to not above 4000ft. Further climb to not above 7000ft will be issued, where the air traffic situation allows as soon as is practicable.			
Design Principle 7: Designs that seek to provide respite should not overfly previously unaffected populations.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: Not applicable as none of these options were designed to provide any respite in accordance with the wishes of the stakeholders engaged during CAP 1616 Step 1A/B.			
Design Principle 8: Route 4 designs should not be constrained by the existing NPR to 4000ft.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: This design is not constrained by the existing NPR to 4000ft.			

Design Principle Evaluation			**OPTION NO: 4**
Option Name: Fly-over Fly-by (Multiple Initial Turn Points).			ACCEPT
Description of Option: This option utilises three initial turn points placed sequentially 400m apart. Climb straight ahead for 2nm not below 1500ft. Turn right onto course 077.1°T, not below 3200ft. Continue on track for 2nm not above 4000ft and then route direct SUNAV.			
Design Principle 1: Route 4 options will be designed safely with full regulatory compliance.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: The procedure has been designed to meet acceptable levels of flight safety by ensuring all tracks are designed to PANS-OPS criteria. However, mitigation may be required to ensure safe separation for simultaneous participating aircraft on Route 4.			
Design Principle 2: Designs should be built to facilitate dispersion below 7000 ft.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: This option has been designed to allow dispersion below 7000ft through the use of three sequential turn points positioned on the initial climb but concentrates traffic along the easterly leg.			
Design Principle 3: New Route 4 design options should give due regard to the historic routings in use prior to the introduction of RNAV routes in 2012.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: This route is designed with due regard for the historic routings in use prior to the introduction of RNAV routes in 2012. The term 'historic route' refers to the Route 4 Conventional Standard Instrument Departures (SIDs) in place between December 1999 and November 2013 prior to the introduction of the RNAV-1 SIDs in 2013.			
Design Principle 4: Route 4 designs should seek to minimise the adverse impact of noise on previously unaffected populations and seek to reduce the total number of people overflown.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: This option has been designed to minimise the adverse impact of noise on previously unaffected populations by the utilisation of dispersion in the turn, similar to the pre 2013 P-RNAV.			
Design Principle 5: Designs should seek to minimise the impact of noise on particularly sensitive areas.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: The design will minimise the impact of noise on particularly sensitive areas wherever practicable. However, due to the multiple initial turn points, areas of the AONB are newly overflown.			

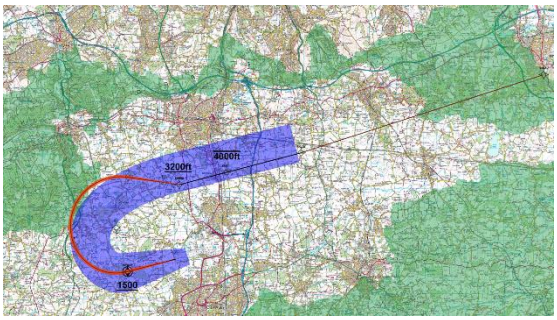
Design Principle 6: Route 4 designs should enable transition to a vertical profile that allows an efficient, and potentially faster, climb to higher altitudes.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: With the modernisation of airspace, through FASI-S, it is expected that the future air traffic situation will allow departing traffic to be issued a clearance to climb above the designed altitude limits. Until that time, departing traffic will be issued a clearance to climb initially to not above 4000ft. Further climb to not above 7000ft will be issued, where the air traffic situation allows as soon as is practicable.			
Design Principle 7: Designs that seek to provide respite should not overfly previously unaffected populations.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: Not applicable as none of these options were designed to provide any respite in accordance with the wishes of the stakeholders engaged during CAP 1616 Step 1A/B.			
Design Principle 8: Route 4 designs should not be constrained by the existing NPR to 4000ft.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: This design is not constrained by the existing NPR to 4000ft.			

Design Principle Evaluation			**OPTION NO: 5**
Option Name: Fly-by Fly-by (Lower Speed Vs Option 1)			ACCEPT
Description of Option: Using the same methodology as option1, incorporating 2 90° turns at fly-by waypoints followed by a direct track to SUNAV at 5000ft. Climb straight ahead for 3.8nm not below 1100ft. Turn right to track 347.5⁰ T for 3.5nm. Turn right to track 077.6⁰ T for 4.7nm not below 3200ft. Maintain 077.7⁰ T for 2nm, climbing to not above 4000ft and then fly direct SUNAV.			
Design Principle 1: Route 4 options will be designed safely with full regulatory compliance.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: The procedure has been designed to meet acceptable levels of flight safety by ensuring all tracks are designed to PANS-OPS criteria.			
Design Principle 2: Designs should be built to facilitate dispersion below 7000 ft.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: This procedure will not facilitate dispersion below 7000ft.			
Design Principle 3: New Route 4 design options should give due regard to the historic routings in use prior to the introduction of RNAV routes in 2012.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: This route is designed with due regard for the historic routings in use prior to the introduction of RNAV routes in 2012. The term 'historic route' refers to the Route 4 Conventional Standard Instrument Departures (SIDs) in place between December 1999 and November 2013 prior to the introduction of the RNAV-1 SIDs in 2013.			
Design Principle 4: Route 4 designs should seek to minimise the adverse impact of noise on previously unaffected populations and seek to reduce the total number of people overflown.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: This procedure has been designed in order to minimise the adverse impact of noise on previously unaffected populations by the utilisation of concentration in the turn, avoiding areas of higher population density, similar to the pre 2013 P-RNAV. It is also flown at a lower speed.			
Design Principle 5: Designs should seek to minimise the impact of noise on particularly sensitive areas.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: As this design is flown at a lower speed and therefore has a tighter turn it will minimise the impact of noise on particularly sensitive areas in comparison to option 1			

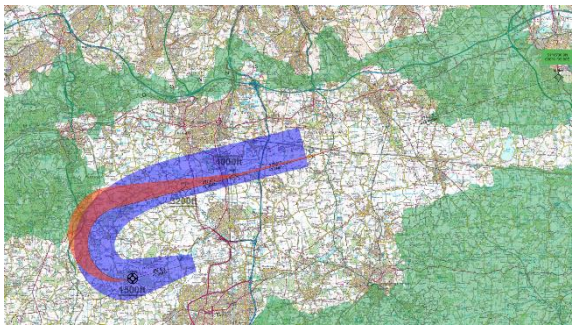
Design Principle 6: Route 4 designs should enable transition to a vertical profile that allows an efficient, and potentially faster, climb to higher altitudes.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: With the modernisation of airspace, through FASI-S, it is expected that the future air traffic situation will allow departing traffic to be issued a clearance to climb above the designed altitude limits. Until that time, departing traffic will be issued a clearance to climb initially to not above 4000ft. Further climb to not above 7000ft will be issued, where the air traffic situation allows as soon as is practicable.			
Design Principle 7: Designs that seek to provide respite should not overfly previously unaffected populations.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: Not applicable as none of these options were designed to provide any respite in accordance with the wishes of the stakeholders engaged during CAP 1616 Step 1A/B.			
Design Principle 8: Route 4 designs should not be constrained by the existing NPR to 4000ft.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: This design is not constrained by the existing NPR to 4000ft.			

Design Principle Evaluation			**OPTION NO: 6**
Option Name: Fly-over Fly-by (Multiple Initial and Turn Points.			ACCEPT
Description of Option: This is an amalgamation of options 3 and 4 resulting in systemised dispersion in, and following, the turn. The multiple courses, that comprise the design, described below are designed specifically to create dispersion. Climb straight ahead for 2nm not below 1500ft. Turn right on to course 078.^{0}T, 077.5^{0}T, 077.7^{0}T (these are the multiple turn points) climbing to not below 3200ft. Continue climb to not above 4000ft and then fly direct SUNAV.			
(Design Principle 1: Route 4 options will be designed safely with full regulatory compliance.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: The procedure has been designed to meet acceptable levels of flight safety by ensuring all tracks are designed to PANS-OPS criteria. However, mitigation may be required to ensure safe separation for simultaneous participating aircraft on Route 4.			
Design Principle 2: Designs should be built to facilitate dispersion below 7000 ft.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: The procedure has been designed using multiple tracks to create dispersion below 7000ft but concentrates traffic on the easterly leg.			
Design Principle 3: New Route 4 design options should give due regard to the historic routings in use prior to the introduction of RNAV routes in 2012.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: This route is designed with due regard for the historic routings in use prior to the introduction of RNAV routes in 2012. The term 'historic route' refers to the Route 4 Conventional Standard Instrument Departures (SIDs) in place between December 1999 and November 2013 prior to the introduction of the RNAV-1 SIDs in 2013.			
Design Principle 4: Route 4 designs should seek to minimise the adverse impact of noise on previously unaffected populations and seek to reduce the total number of people overflown.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: This procedure has been designed to create wider dispersion during the first turn and moves the track closer to Reigate which is likely to impact populations currently unaffected.			

Design Principle 5: Designs should seek to minimise the impact of noise on particularly sensitive areas.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: Due to the degree of dispersion this design will have a noise impact within the AONB.			
Design Principle 6: Route 4 designs should enable transition to a vertical profile that allows an efficient, and potentially faster, climb to higher altitudes.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: With the modernisation of airspace, through FASI-S, it is expected that the future air traffic situation will allow departing traffic to be issued a clearance to climb above the designed altitude limits. Until that time, departing traffic will be issued a clearance to climb initially to not above 4000ft. Further climb to not above 7000ft will be issued, where the air traffic situation allows as soon as is practicable.			
Design Principle 7: Designs that seek to provide respite should not overfly previously unaffected populations in accordance with the wishes of the stakeholders engaged during CAP 1616 Step 1A/B.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: Not applicable as none of these options were designed to provide any respite.			
Design Principle 8: Route 4 designs should not be constrained by the existing NPR to 4000ft.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: This design is not constrained by the existing NPR to 4000ft.			

Design Principle Evaluation			**OPTION NO: 7**
Option Name: Constant Radius to Fix (Tracks Concentrated)			ACCEPT
Description of Option: This can be expected to produce concentrated tracks throughout the turn. Climb straight ahead on Runway heading for 2nm climbing not below 1500ft. At KKW02 Fly constant radius fixed on Waypoint (TBN) to Waypoint (End Fix). Route via KKE09, KKE11 and KKE15 to SUNAV not above 5000ft.			
Design Principle 1: Route 4 options will be designed safely with full regulatory compliance.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: The procedure has been designed to meet acceptable levels of flight safety by ensuring all tracks are designed to PANS-OPS criteria.			
Design Principle 2: Designs should be built to facilitate dispersion below 7000 ft.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: This design does not facilitate dispersion below 7000ft. It has been designed as constant radius to fix which, by design, concentrates aircraft tracks.			
Design Principle 3: New Route 4 design options should give due regard to the historic routings in use prior to the introduction of RNAV routes in 2012.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: This route is designed to conform with the NPR and thus does not track very close to, or with the dispersion in the first turn that was evident with the historic traffic routing. The term 'historic route' refers to the Route 4 Conventional Standard Instrument Departures (SIDs) in place between December 1999 and November 2013 prior to the introduction of the RNAV-1 SIDs in 2013.			
Design Principle 4: Route 4 designs should seek to minimise the adverse impact of noise on previously unaffected populations and seek to reduce the total number of people overflown.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: This Option would result in very concentrated tracks over previously unaffected population. The total number of people overflown would be reduced as the track is very concentrated.			
Design Principle 5: Designs should seek to minimise the impact of noise on particularly sensitive areas.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: The proposed track would fly over the AONB, however it would be very concentrated. This could be seen as an advantage or disadvantage in relation to AONB overflight, the area affected would be smaller however the noise levels in such areas, higher.			
Design Principle 6: Route 4 designs should enable transition to a vertical profile that allows an efficient, and potentially faster, climb to higher altitudes.	NOT MET	PARTIAL	MET

Summary of Qualitative Assessment: With the modernisation of airspace, through FASI-S, it is expected that the future air traffic situation will allow departing traffic to be issued a clearance to climb above the designed altitude limits. Until that time, departing traffic will be issued a clearance to climb initially to not above 4000ft. Further climb to not above 7000ft will be issued, where the air traffic situation allows as soon as is practicable.			
Design Principle 7: Designs that seek to provide respite should not overfly previously unaffected populations.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: Not applicable as none of these options were designed to provide any respite in accordance with the wishes of the stakeholders engaged during CAP 1616 Step 1A/B.			
Design Principle 8: Route 4 designs should not be constrained by the existing NPR to 4000ft.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: This design is not constrained by the existing NPR to 4000ft.			

Design Principle Evaluation		**OPTION NO: 8**	
Option Name: Fly-over, Fly-by (Was LAM2X)		ACCEPT	
Description of Option: Was previously Option 0 based on the temporary RNAV-1 SIDs which were in place from May 2016 to February 2021. 			
Design Principle 1: Route 4 options will be designed safely with full regulatory compliance.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: The procedure has been designed to meet acceptable levels of flight safety by ensuring all tracks are designed to PANS-OPS criteria.			
Design Principle 2: Designs should be built to facilitate dispersion below 7000 ft.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: This design does facilitate dispersion below 7000ft, it has a course to fix turn which allows dispersion around the turn but not on the easterly track.			
Design Principle 3: New Route 4 design options should give due regard to the historic routings in use prior to the introduction of RNAV routes in 2012.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: This particular design was introduced to closer reflect the traffic dispersion on the turn prior to the introduction of the 2012 P-RNAV and to correct the track so that aircraft flew along the published NPR.			
Design Principle 4: Route 4 designs should seek to minimise the adverse impact of noise on previously unaffected populations and seek to reduce the total number of people overflown.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: This design was introduced to closer reflect the traffic dispersion in the turn prior to the introduction of the 2012 P-RNAV and to correct the track so that aircraft flew along the published NPR. As with all dispersed designs it does not seek to minimise the number of people newly overflown.			
Design Principle 5: Designs should seek to minimise the impact of noise on particularly sensitive areas.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: This design minimises the impact of noise on particularly sensitive areas but does overfly a portion of the AONB, so we believe it only partially meets this DP.			
Design Principle 6: Route 4 designs should enable transition to a vertical profile that allows an efficient, and potentially faster, climb to higher altitudes.	NOT MET	PARTIAL	MET

Summary of Qualitative Assessment: With the modernisation of airspace, through FASI-S, it is expected that the future air traffic situation will allow departing traffic to be issued a clearance to climb above the designed altitude limits. Until that time, departing traffic will be issued a clearance to climb initially to not above 4000ft. Further climb to not above 7000ft will be issued, where the air traffic situation allows as soon as is practicable.			
Design Principle 7: Designs that seek to provide respite should not overfly previously unaffected populations.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: Not applicable as none of these options were designed to provide any respite in accordance with the wishes of the stakeholders engaged during CAP 1616 Step 1A/B.			
Design Principle 8: Route 4 designs should not be constrained by the existing NPR to 4000ft.	NOT MET	PARTIAL	MET
Summary of Qualitative Assessment: This procedure was designed to conform with the NPR swathe, but not to be constrained by it (see depiction above).			

6 Technical Criteria Evaluation

6.1 Introduction

The technical criteria detailed in Appendix F to CAP 1616 form the basic structure on which the change sponsor builds a formal airspace change proposal. The tables in this section show how each of the developed options complies with the technical criteria detailed in the first column of the table, identifying where plans will need to be established to resolve any issues that may arise, as follows:

Evaluation	Met	Partial	Not Met
Each design option was assessed against each of the technical criteria, taking account of intended design parameters and views of GAL's operational staff	Indicates that the specified option is judged to be **compliant** with or has no impact on the relevant technical criteria	Indicates that the specified option is **not fully compliant** with the relevant technical criteria, but mitigation is possible through agreed operating procedures/ agreements	Indicates that the specified option is **not compliant** with the relevant technical criteria and that there will be no possible plans available to mitigate the issues

Table 7 - Definitions Supporting Technical Criteria Assessments

6.2 Route 4 RNAV Standard Instrument Departures

		Option 0	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8
Operational Impact										
	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/ 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									
b	Impact on VFR operations (including VFR routes where applicable)									
c	Consequential effects on procedures and capacity, i.e. on SIDs, STARs, and/or holding patterns. Details of existing or planned routes and holds									
d	Impact on aerodromes and other specific activities within or adjacent to the proposed airspace									
e	Any flight planning restrictions and/or route requirements									

		Option 0	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8
Supporting Infrastructure/Resources										
	General Requirements	**Evidence of compliance/ mitigation**								
a	Evidence to support RNAV and conventional navigation as appropriate									
b	Evidence to support primary and secondary surveillance radar (SSR)									
c	Evidence of communications infrastructure including R/T coverage									
d	The effects of failure of equipment, procedures and/or personnel with respect to the overall management of the airspace must be considered									
e	Effective responses to the failure modes that will enable the functions associated with airspace to be carried out									
f	A clear statement on SSR code assignment requirements									
g	Evidence of sufficient numbers of suitably qualified staff required to provide air traffic services following the implementation of a change									

		Option 0	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8
Airspace and Infrastructure										
	General Requirements	**Evidence of compliance/ 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									
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.									
c	The Air Traffic Management 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									
d	Air traffic control procedures are to ensure required separation between traffic inside a new airspace structure and traffic within existing adjacent or other new airspace structures									
e	Within the constraints of safety and efficiency, the airspace classification should permit access to as many classes of user as practicable									

		Option 0	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8
f	There must be assurance, as far as practicable, against unauthorised incursions. This is usually done through the classification and promulgation									
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 be specified									
h	There must be sufficient R/T coverage to support the Air Traffic Management system within the totality of proposed controlled airspace									
i	If the new structure lies close to another airspace structure or overlaps an associated airspace structure, the need for operating agreements shall be considered									
j	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 air traffic control procedures can be devised, the change sponsor shall act to resolve any conflicting interests									
	ATS Route Requirements	**Evidence of compliance/ 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									
b	Where ATS routes adjoin terminal airspace there shall be suitable link routes as necessary for the ATM task									

		Option 0	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8
c	All new routes should be designed to accommodate P-RNAV navigational requirements									
	Terminal Airspace Requirements	**Evidence of compliance/ mitigation**								
a	The airspace structure shall be of sufficient dimensions to contain appropriate procedures, holding patterns and their associated protected areas									
b	There shall be effective integration of departure and arrival routes associated with the airspace structure and linking to designated runways and published instrument approach procedures (IAPs)									
c	Where possible, there shall be suitable linking routes between the proposed terminal airspace and existing en-route airspace structure									
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									
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 the change sponsor upon implementation of the change in question (if these do not already exist)									
f	The change sponsor shall ensure that sufficient visual reference points 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									

		Option 0	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8
g	There shall be suitable availability of radar control facilities									
h	All new procedures should, wherever possible, incorporate Continuous Descent Approach (CDA) profiles after aircraft leave the holding facility associated with that procedure									
	Off-Route Airspace Requirements	**Evidence of compliance/ mitigation**								
a	If the new structure lies close to another airspace structure or overlaps an associated airspace structure, the need for operating agreements shall be considered									
b	Should there be any other aviation activity (military low flying, gliding, parachuting, microlight site etc) in the vicinity of the new airspace structure and no suitable operating agreements or air traffic control procedures can be devised, the change sponsor shall act to resolve any conflicting interests									

			Option 0	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8
Environmental Assessment											
	Theme	**Content**	**Evidence of compliance/ mitigation**								
a	Assessment of noise impacts	Consideration of noise impacts									
b	Assessment of CO_2 emissions	Consideration of the impacts on CO_2 emissions									
c	Assessment of local air quality	Consideration of the impacts on local air quality									
d	Assessment of impacts upon tranquillity	Consideration of any impact upon tranquillity, notably on AONB or National Parks									

Table 8 - Technical Criteria Evaluation of Standard Instrument Departures.

A1 Waypoints

A1.1 Explanation of Waypoints

Some procedures are constructed of a series of waypoints designed to be flown by the automatic systems that the majority of modern aircraft use for navigation. A waypoint is defined positionally by its Latitude and Longitude, and generally will not necessarily represent a physical feature on the ground but will be positioned so that the routes designed can be technically flyable by the aircraft. Some waypoints describe the point at which the route integrates with the national airways structure. The aircraft navigation systems will automatically direct the aircraft according to the routing designed into the procedure.

If a waypoint is designated a 'Fly-By' waypoint, the aircraft will initially be heading in the direction of the waypoint but the aircraft will anticipate a point in space to turn, so that the aircraft ends up heading directly towards the next waypoint in sequence, as shown in Figure 1 below. Depending on the angle of turn, the aircraft may not overfly the actual waypoint at all. In addition, the actual flight path that an aircraft follows during these turns will vary slightly depending on the flight performance of each aircraft, creating a small amount of dispersion of aircraft tracks during the turn. Some of the waypoints used for the GAL procedure designs are designated as 'Fly-By' waypoints.

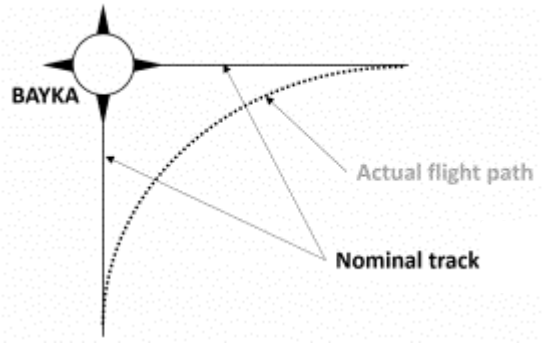


Figure 1 - Fly-By Waypoint

If a waypoint is designated a 'Fly-Over' waypoint, the aircraft navigational system will direct the aircraft to overfly the position of the waypoint prior to making the turn towards the next waypoint. The navigational system will make any heading adjustments back to the nominal track between the waypoints before directing the aircraft to the next waypoint, as shown in Figure 2 below.

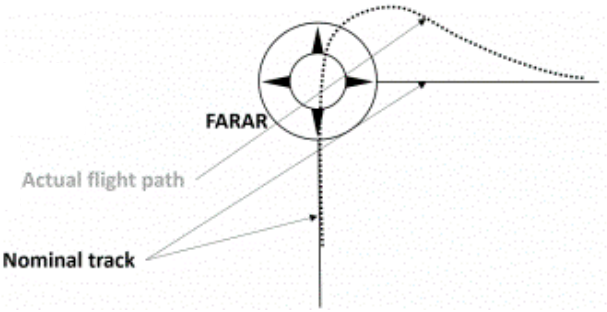


Figure 2 - Fly-Over Waypoint

A2 Design Options on Ordnance Survey Maps showing the Noise Preferential Route on Route 4

The following pages show in more detail the options against which the DPE in Section 5 has been made.

To minimise any confusion, some option numbers have changed during the process to date and to minimise confusion the changes are summarised in Table 4, para 4.7.

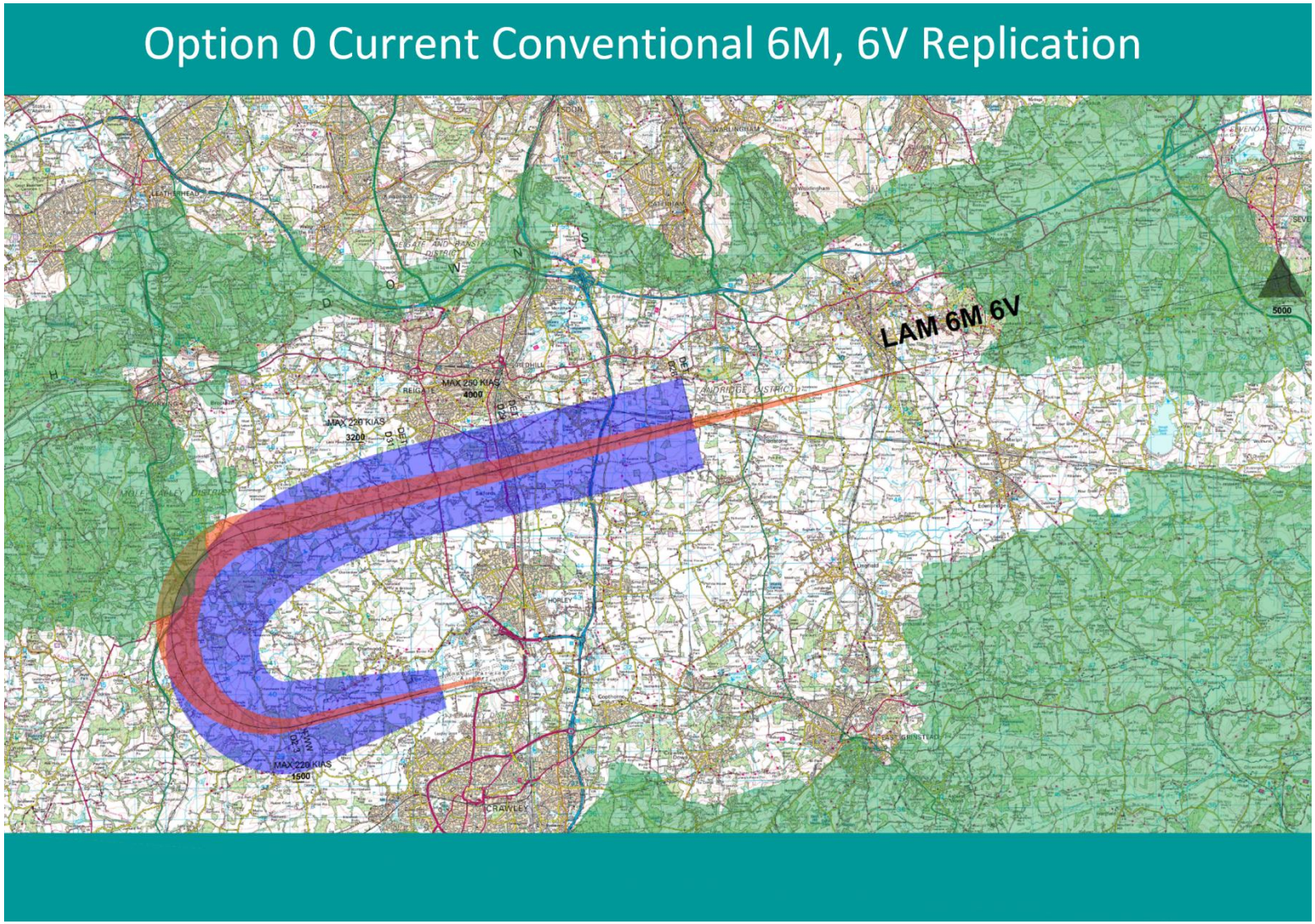
The majority of these draft design slides were used to explain the features of each design and facilitate a 2-way discussion with stakeholders who attended the focus groups. They help to understand the impact of each option and how each option has been developed to align with the design principles developed with the helpful inputs provided by GAL stakeholders.

In providing the enhanced maps to stakeholders, the sponsor helped aviation and non-aviation stakeholders to situate the routes. By doing so, a debate arose where one stakeholder group repeated an earlier assertion that GAL had incorrectly promulgated, via the Aeronautical Information Publication (AIP), the wrong NPR information. This was exacerbated by the stakeholder conflating the data promulgated separately on the Gatwick Noise and Track Keeping (NTK) System, with the data in the AIP. The sponsor raised the issue with the Department for Transport (DfT), who have primacy over the NPRs, who stated that the data published by GAL in the AIP was correct. In addition, GAL raised the issue with the CAA, with whom the stakeholders had previously corresponded, to seek clarity for all concerned.

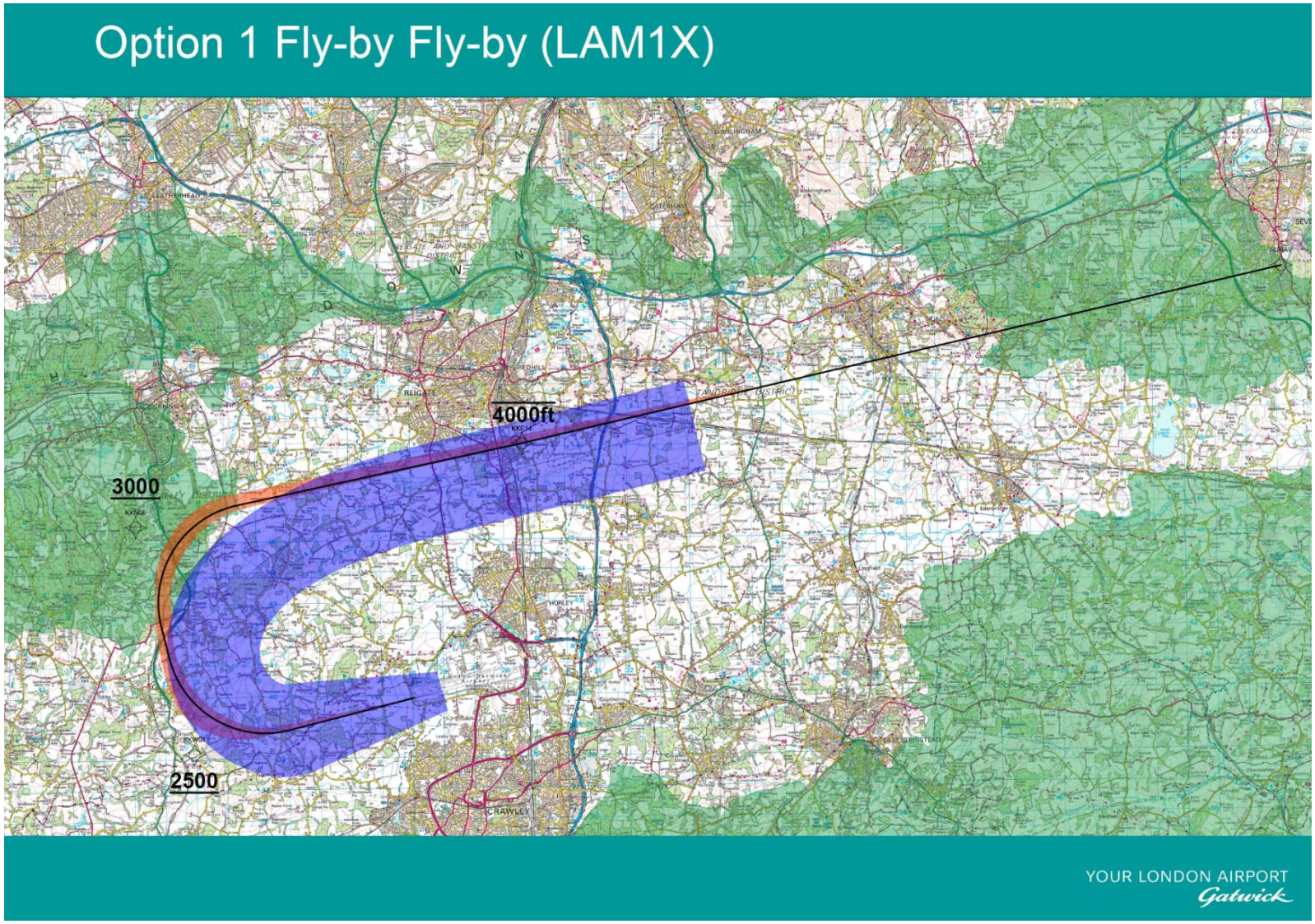
This debate has concluded when the sponsor received clarification from the CAA (28 June 2022) that: “the CAA can confirm that the Route 4 Noise preferential Route (NPR) as described in the currently promulgated UK AIP EGKK AD 2.21 Noise Abatement Procedures…….is correct. Other communications suggesting that there is another source of definitive information regarding the NPR are incorrect.”

GAL wish to highlight this as an example of the effort and hard work expended by the sponsor to provide an unambiguous picture to stakeholders. Further information regarding this stakeholder engagement can be found in the Stage 2 Design Engagement Document.

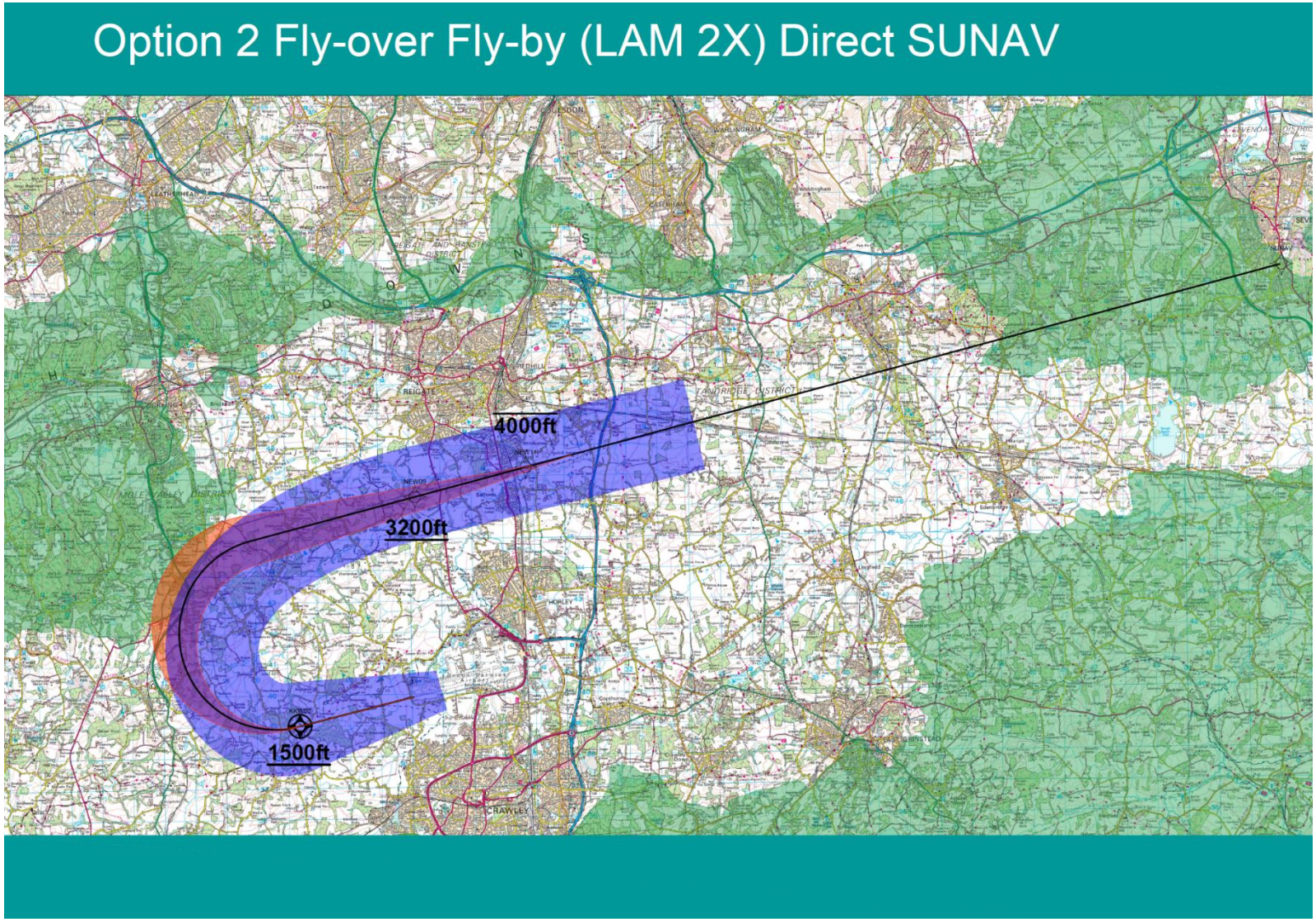
Option 0


Option 0 Current Conventional 6M, 6V Replication
LAM 6M 6V
MAX 250 KIAS
4000
MAX 220 KIAS
3200
MAX 220 KIAS
1500
REIGATE
REDHILL
HORLEY
CRAWLEY
5000

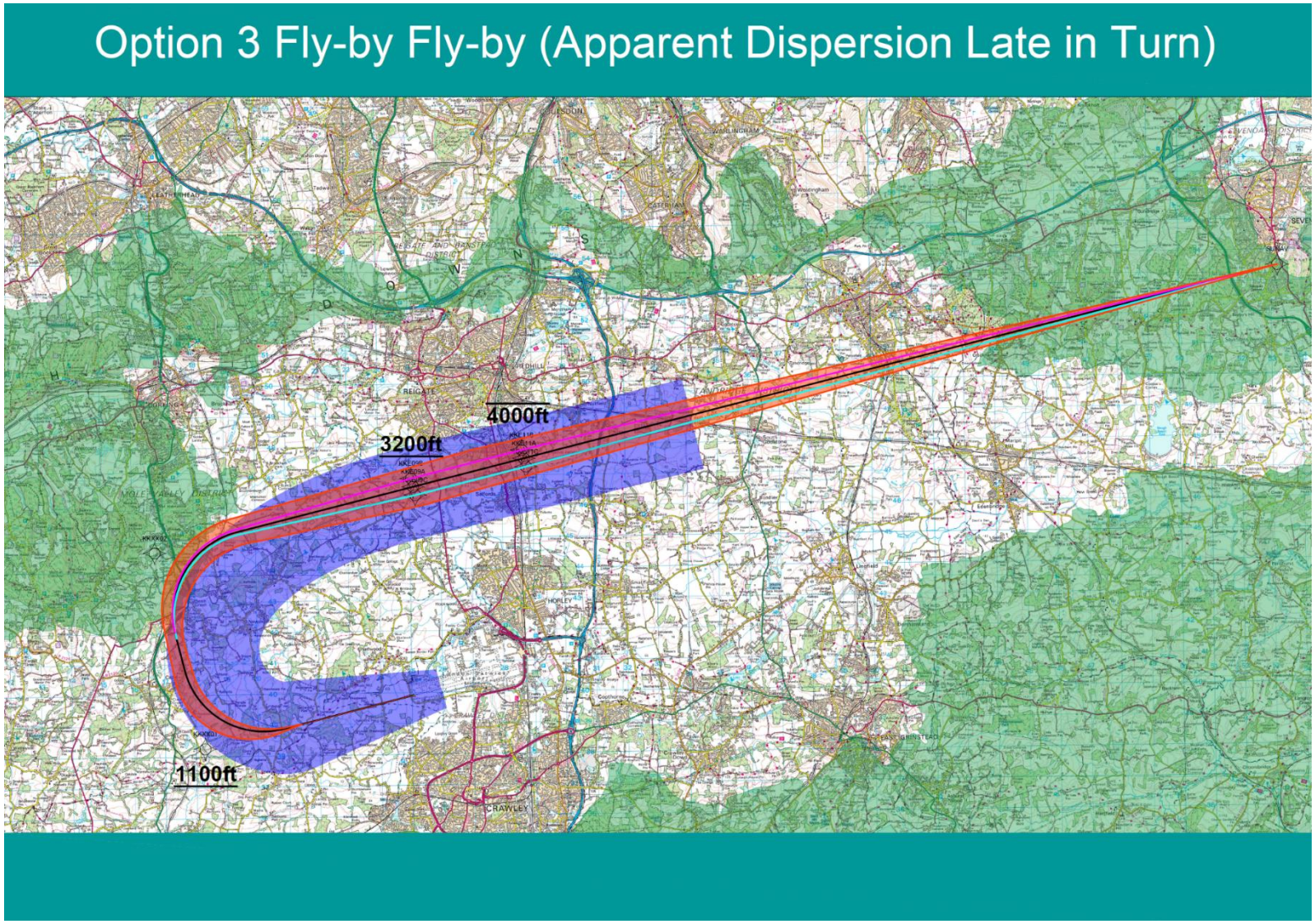
Option 1


Option 1 Fly-by Fly-by (LAM1X)
4000ft
3000
2500
YOUR LONDON AIRPORT Gatwick

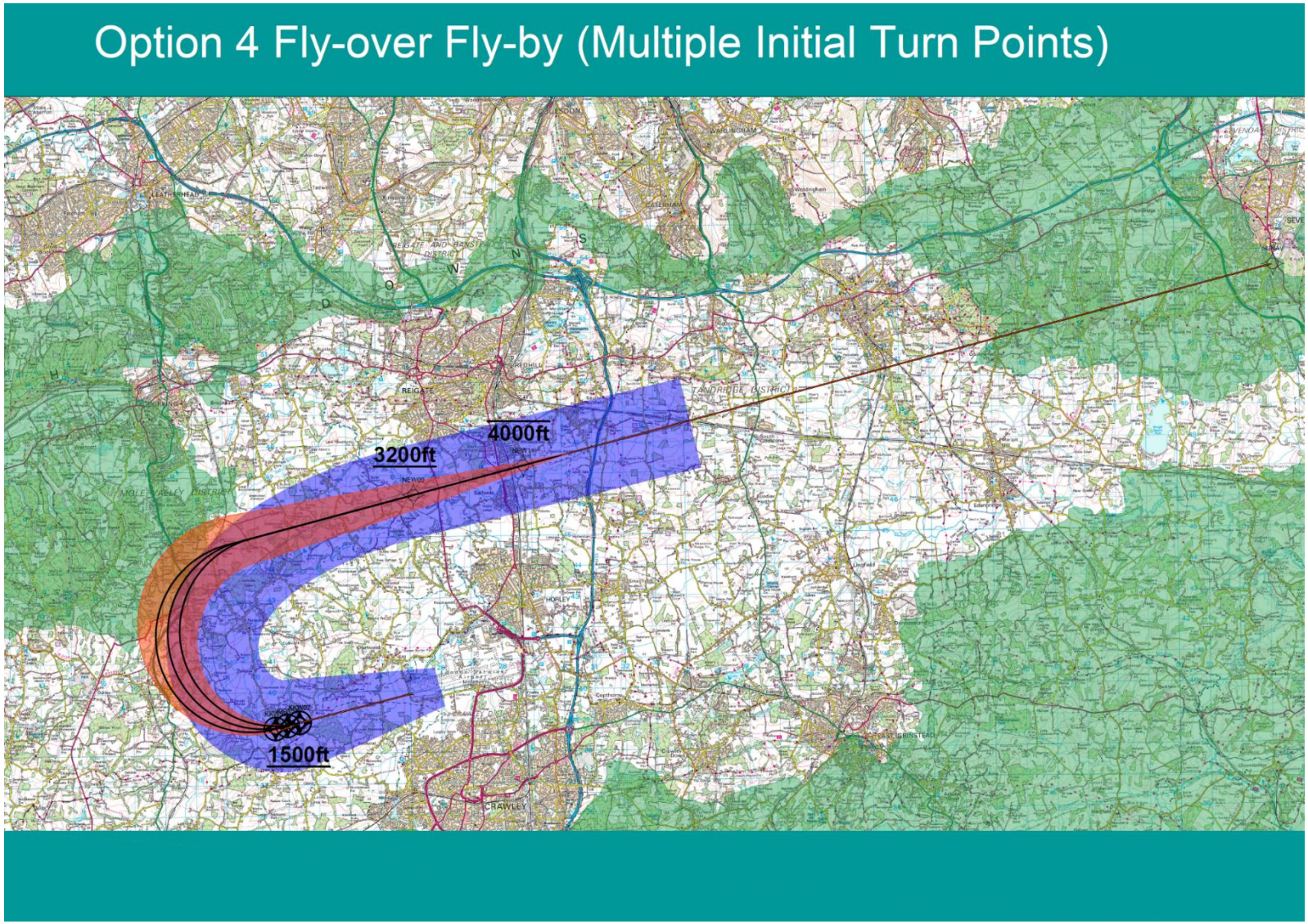
Option 2


Option 2 Fly-over Fly-by (LAM 2X) Direct SUNAV
4000ft
3200ft
1500ft

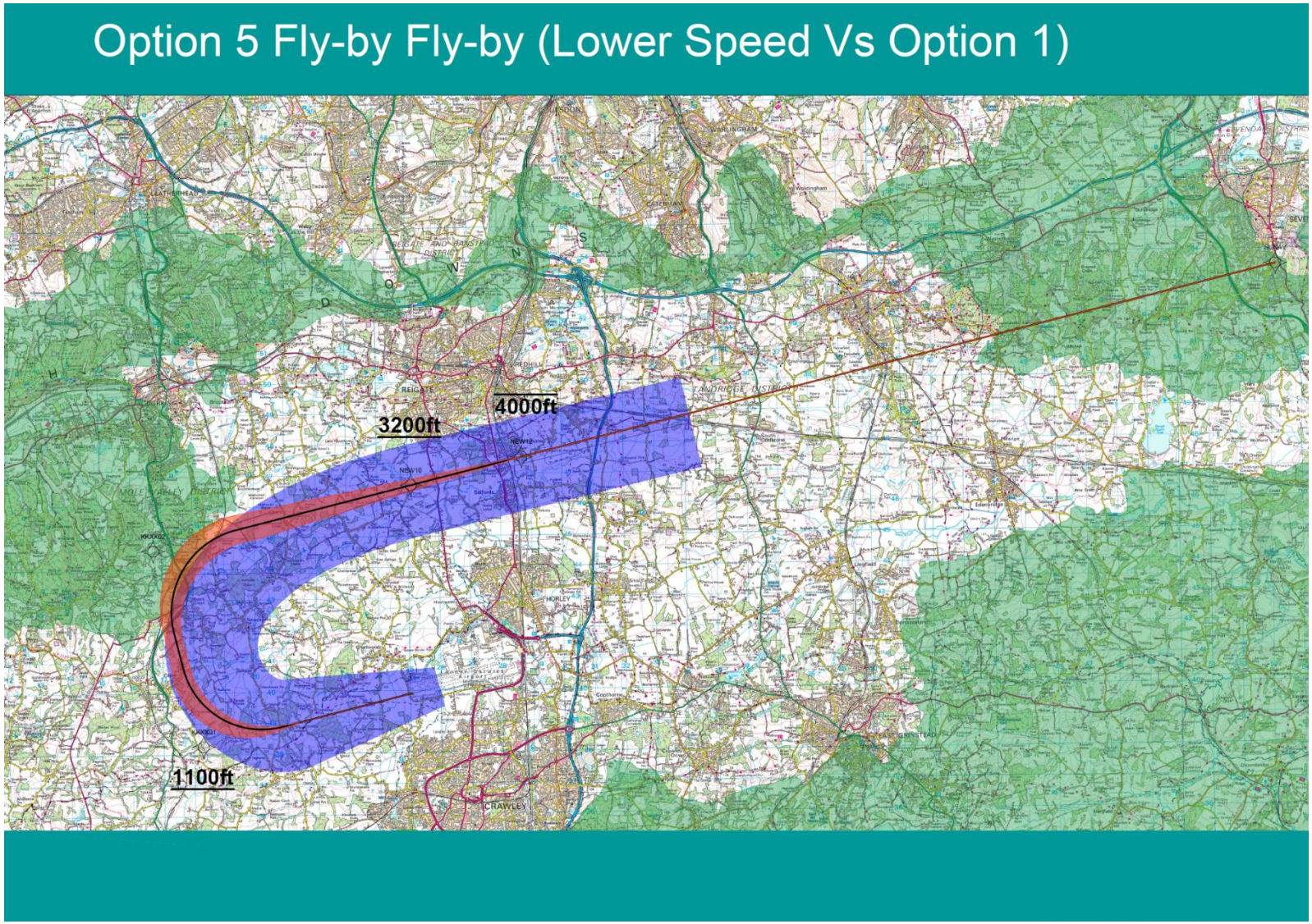
Option 3


Option 3 Fly-by Fly-by (Apparent Dispersion Late in Turn)
4000ft
3200ft
1100ft

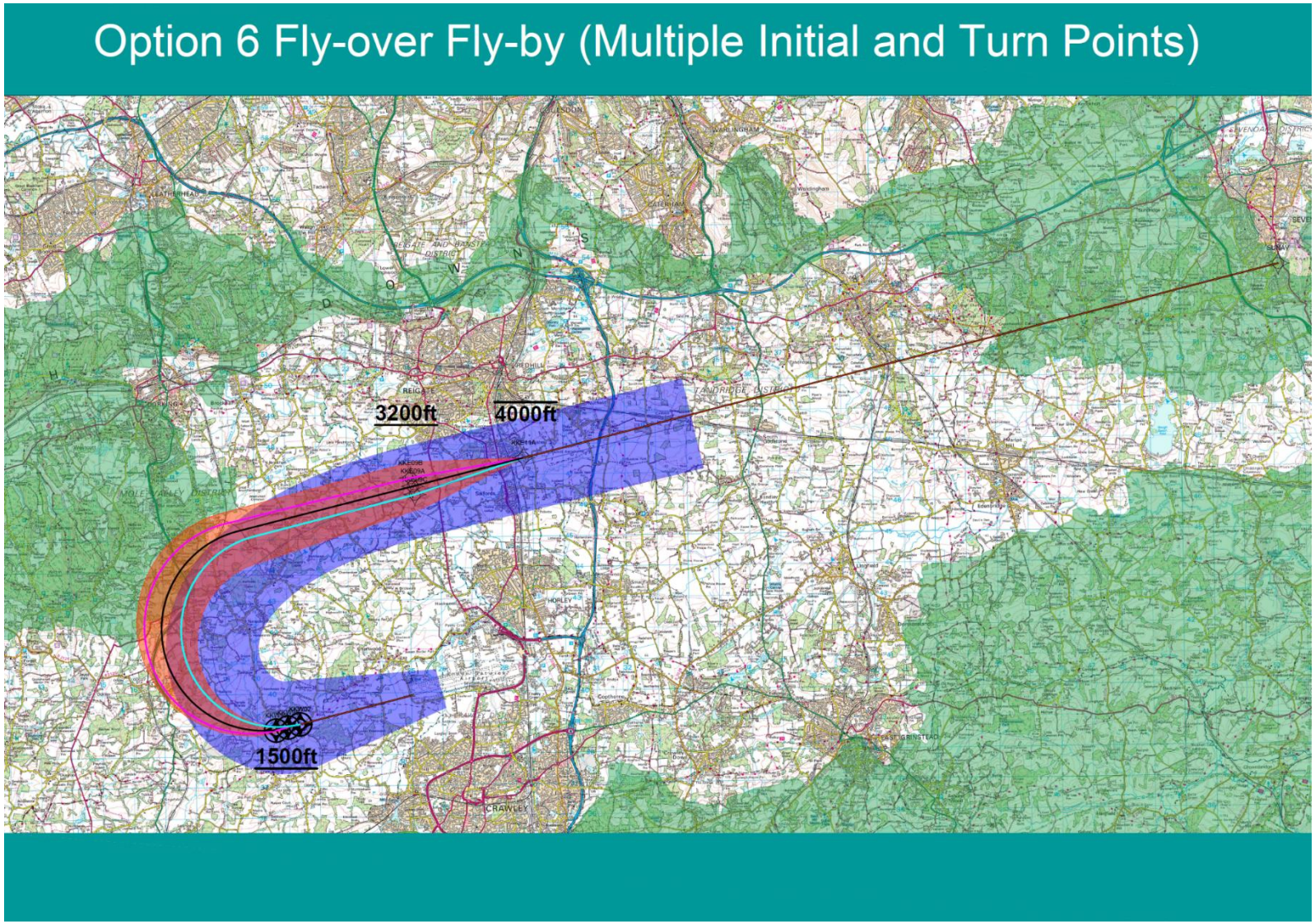
Option 4


Option 4 Fly-over Fly-by (Multiple Initial Turn Points)
4000ft
3200ft
1500ft

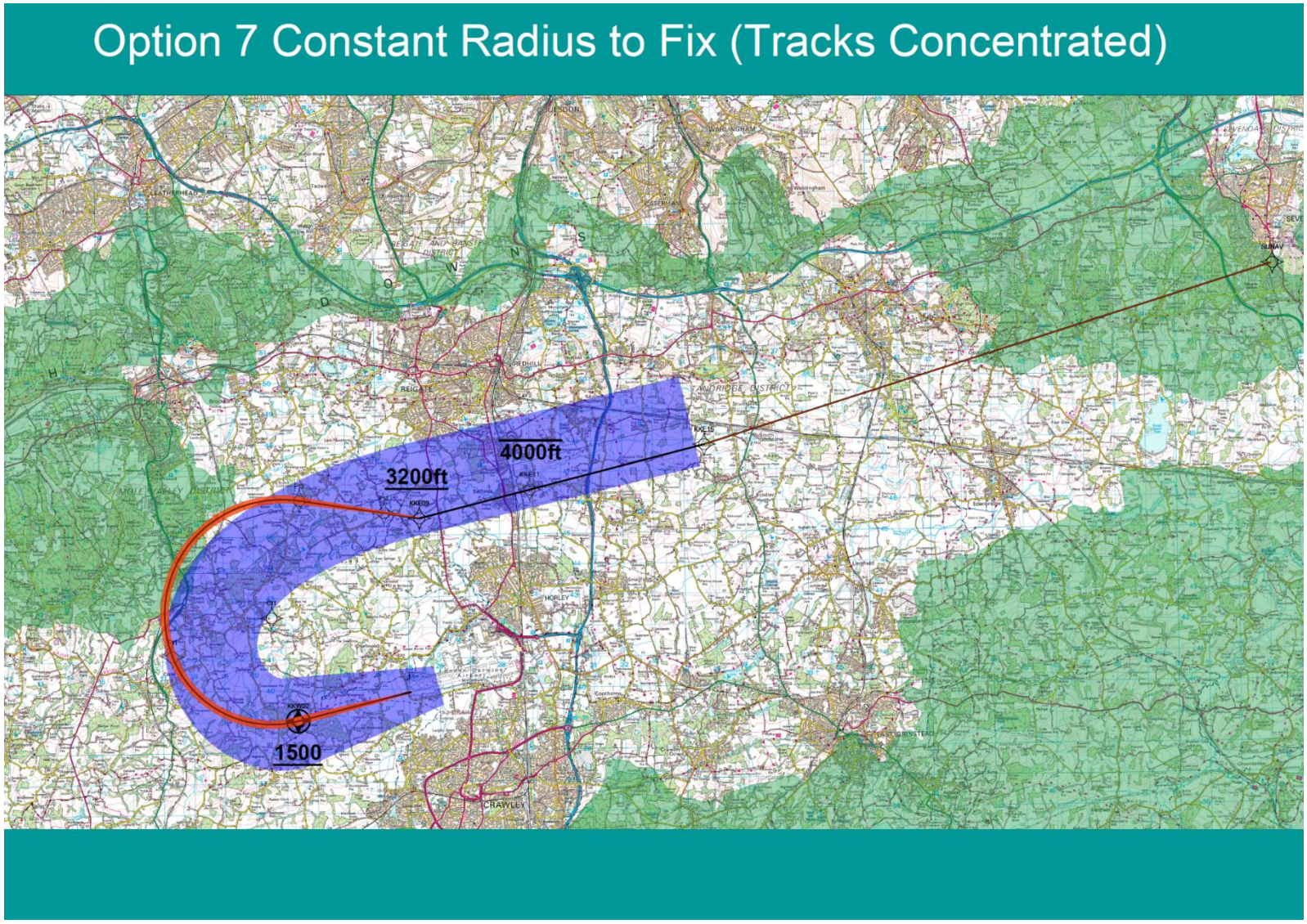
Option 5


Option 5 Fly-by Fly-by (Lower Speed Vs Option 1)
4000ft
3200ft
1100ft

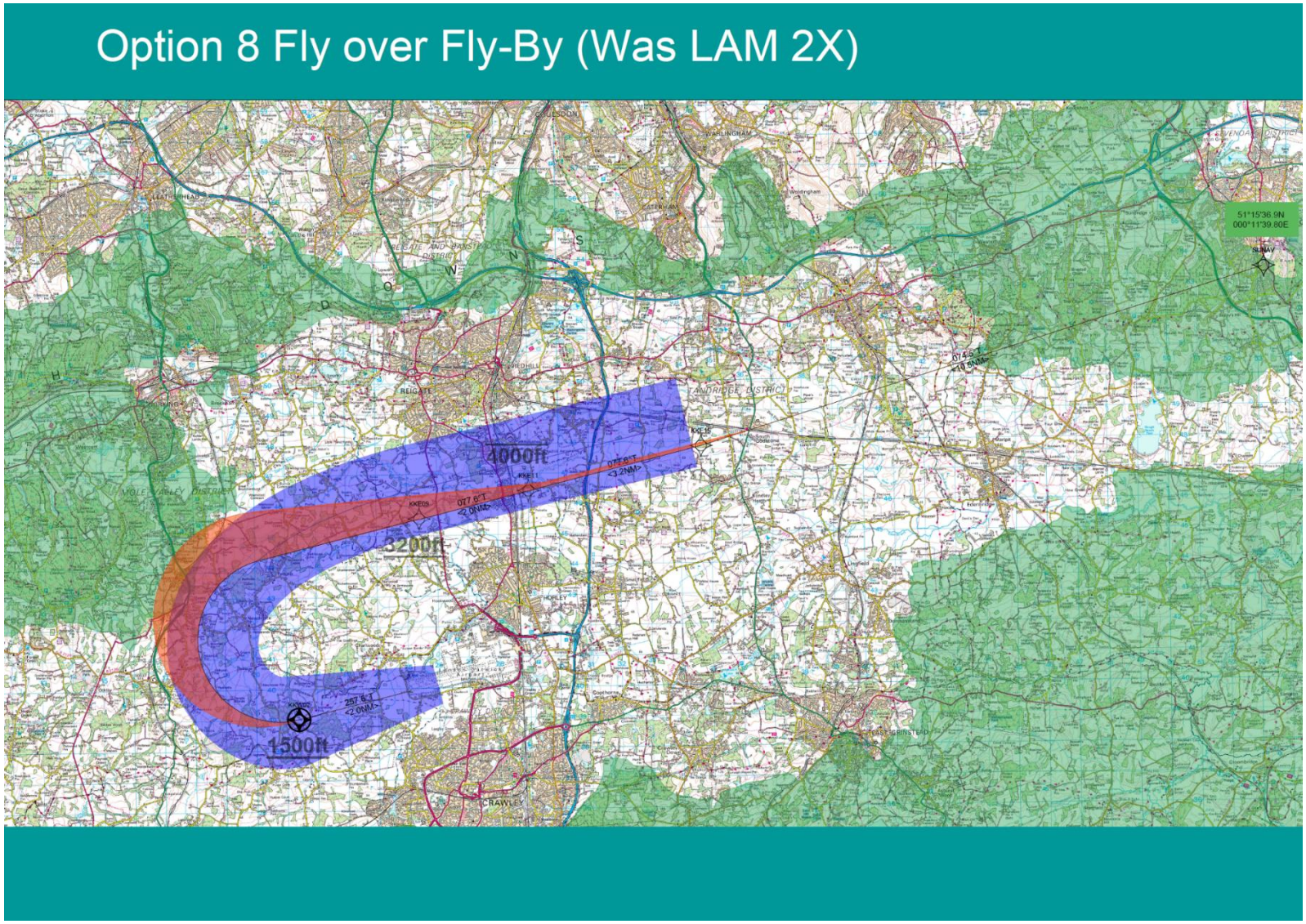
Option 6


Option 6 Fly-over Fly-by (Multiple Initial and Turn Points)
3200ft
4000ft
1500ft

Option 7


Option 7 Constant Radius to Fix (Tracks Concentrated)
4000ft
3200ft
1500
REIGATE
HORLEY
CRAWLEY

Option 8


Option 8 Fly over Fly-By (Was LAM 2X)
4000ft
3200ft
1500ft
51°15'36.9N
000°11'39.80E