West Airspace Deployment L6203

London Airspace Management Programme 2, Deployment 1.1

ACP-2017-70

Consultation Document

NATS Public

Roles

Action	Role	Date
Produced	Manager Airspace Change Compliance & Delivery Airspace and Future Operations	06/10/2021
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Drafting and Publication History

Issue	Month/Year	Changes this issue
1.0	09/2021	First Issue for public consultation.
1.1	10/2021	Flight planning examples added in section 9.

References

Ref No	Description	Hyperlinks
1	LAMP D1.1 CAA web page – progress through CAP1616	Link to portal
2	Stage 1 Statement of Need	Link to document
3	Stage 1 Assessment Meeting Minutes	Link to document
4	Stage 1 Design Principles	Link to document
5	Stage 2 Design Options and Design Principle Evaluation	Link to document
6	Stage 2 Initial Options Appraisal and Safety Assessment	Link to document
7	Stage 3 Consultation Strategy	Link to portal, please navigate to Step 3b
8	Stage 3 Full Options Appraisal	Link to portal, please navigate to Step 3b
9	Airspace change: Guidance on the regulatory process for changing the notified airspace design and planned and permanent redistribution of air traffic, and on providing airspace information CAP1616	Link to document
10	Environmental requirements technical annex CAP1616A	Link to document
11	Airspace Modernisation Strategy AMS CAP1711	Link to document
12	UK Government Department for Transport's 2017 Guidance to the CAA on its environmental objectives when carrying out its air navigation functions, and to the CAA and wider industry on airspace and noise management (abbreviated to ANG2017)	Link to document
13	Performance-based Navigation, Enhanced route spacing guidance CAP 1385	Link to document
14	UK Aeronautical Information Publication (AIP)	Link to AIP

Contents

1. Executive Summary

The London Airspace Modernisation Programme 2 Deployment 1.1 (LAMP2D1.1, abbreviated herein to LD1.1) airspace (see Figure 1 below) is critical airspace within the European and World Air Traffic Management (ATM) network. It is situated at a crossroads of east-west/north-south traffic flows between Europe and the London area, and Ireland and North America; and between the north of England and Scotland and France, Iberia and beyond. Today's Air Traffic Services (ATS) route network has evolved over time and does not fully exploit modern navigation technology. The objective of this project is to update the route network to deliver specific initiatives of the Civil Aviation Authority (CAA)'s Airspace Modernisation Strategy (AMS) using Performance Based Navigation (PBN). This will provide benefits in capacity whilst minimising environmental impacts and ensuring the recovery and continued growth of aviation is sustainable.

Modernising the ATS route network involves systemising traffic flows to allow optimal profiles to be flown, this reduces interactions between aircraft, reduces Air Traffic Control (ATC) workload and in turn enable an increase in network capacity.

Many of the airports that feed aircraft into this airspace, from beneath or from elsewhere in the UK, are planning to modernise their low-level arrival and departure routes, to ensure they can meet the need for sustainable future growth. Modernising the network would ensure their requirements can be met, and that the overlying network does not become a constraint on future growth. This airspace change is being progressed concurrently with the proposed introduction of Free Route Airspace (FRA) in the higher level airspace. Hence this consultation and that for FRA in the airspace above are linked and, if approved, it is the intention to implement both changes simultaneously.

Additionally, we have taken this opportunity to perform a thorough review of the controlled airspace required, and our operational procedures, to deliver benefit to other airspace users where possible. As a result this ACP proposes changes to controlled airspace which would result in a net release of ~88 cubic nautical miles of controlled airspace.

The project is now at the consultation stage, where we present the detail of the design options, that build on the design concepts that progressed from stage 2 and request feedback on these.

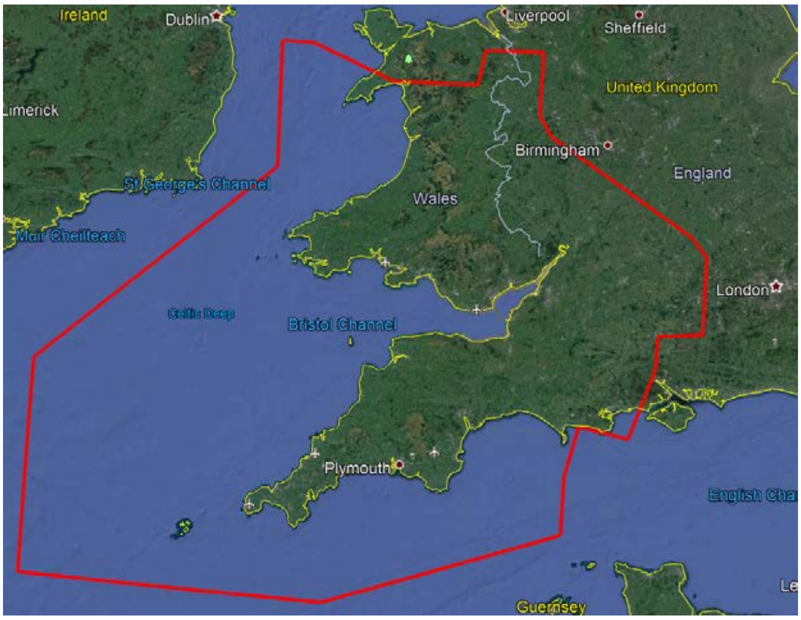

Figure 1 Airspace area covered by LAMP Deployment 1 (LD1.1)

The Statement of Need states the desired outcome is for "Optimal alignment and connectivity of the ATS route network with each airport's airspace structures, such that the network capacity should not be a significant constraint on airport capacity and environmental impacts are minimised."

Figure 1 shows the geographical extent that the proposed changes cover[1]. Along with the CAA's AMS, the proposed changes aim to support the needs of all Airspace Users and Aviation Stakeholders to ensure the changes are fit for purpose and comply with the required regulations and legislation.

[1] Note there are some high-level connecting routes which extend beyond the red outline which require re-alignment to facilitate efficient network connectivity. See section 8 for more detail.

The Design Principles (see para. 2.9 and Ref 4) which were developed with stakeholders at Stage 1, form a comprehensive list of objectives which the proposed design should aim to meet.
The changes proposed are all at or above 7,000ft hence, in accordance with Government guidance, mitigation of noise impacts to stakeholders on the ground is not prioritised (Ref 12 para 4.1d). Due to the altitude of the proposed changes, assessment of environmental impacts is limited to Greenhouse gas emissions, assessed by the 'CO_2 equivalent' (CO_2e) metric.
Previous CAP1616 stages have summarised the design options development (Refs 5-6). The design options being progressed to consultation are:

- LD1.1 Option 0 – Do nothing and maintain the current ATS route structure (baseline for comparison).
- LD1.1 Option 4 - Systemisation using PBN routes based on 5nm radar separation environment, with improved connectivity provided by direct routes, interfacing with FRA above FL305 (FL245 in S09)[2].
- LD1.1 Option 6 - Systemisation using PBN routes based on 5nm radar separation, interfacing with Free Route Airspace (FRA) above FL245.

The "do nothing" option has been discounted as it does not fully meet several design principles (see Ref 6). However, the current airspace is the baseline against which all proposed changes are measured, hence it is included for comparison purposes. There is still scope for feedback on the specific details of the design options upon which we are consulting – the removal of other options does not remove the scope for formative feedback.
The purpose of this consultation is to ensure that stakeholders who could be positively or negatively affected by these changes, are made aware of this airspace change proposal and given the opportunity to submit feedback about the designs.
Through our engagement activities undertaken so far, we have sought to ensure that:

- the correct audience is targeted in an appropriate manner and given the opportunity to respond.
- the consultation materials we produce provide stakeholders with enough detail to make an informed response.
- the duration of the consultation is appropriate.

This consultation begins on 6th Sept, and ends 29th November 2021 (12 weeks)
This consultation document and the associated response questionnaire are freely available via the CAA airspace change consultation portal at:

https://consultations.airspacechange.co.uk/nats/ld1-1

The consultation portal also includes the following useful materials:

- An interactive map (to enable the routes for each option to be viewed in more detail)
- FAQ document to give answers to frequently asked questions.
- Feedback questionnaire.
- Links to all supporting material

If the proposal is approved by the CAA, implementation of the airspace change would occur not before 23rd March 2023.
This document relates to the LD1.1 changes and provides information about two alternative options for changing the airspace. Please read the descriptions of the proposed changes from section 5 onwards and the likely impacts in section 17. You are then requested to submit your comments and feedback using the questionnaire which is provided on the CAA airspace change consultation portal.

Link to Free Route Airspace Deployment 2

This implementation is being coordinated with Free Route Airspace Deployment 2 (FRA D2) which proposes to change the airspace above the LD1.1 region to Free Route Airspace. The consultations for these two Airspace Change Proposals (ACPs) are being run simultaneously. Information on the FRA D2 (ACP-2019-12) consultation is available here.

https://consultations.airspacechange.co.uk/nats/nats-fra-d2

[2] Note: The addition of the DFL between systemised airspace and FRA (FL305 for option 4 or FL245 for Option 6) was added to the descriptions (from the Stage 2 documentation) to make the main difference between the options clearer.

2. Introduction

Today's Air Traffic Services (ATS) route network has evolved over time and does not fully exploit modern navigation technology. The scope of this project is to modernise the airspace across the west of the London Flight Information Region (FIR). This would reduce complexity in this airspace and, in turn, reduce air traffic control workload and ensure a safe and efficient operation for the future. NATS Enroute Limited (NERL) is the sponsor of this proposal.

2.1. About this Airspace

The area covered by this ACP is shown in Figure 1 and covers the southwest of England and most of Wales. The ACP proposes changes to the airspace and route structure which would change aircraft flight profiles between 7,000ft and 24,500/30,500ft (FL70-FL245/305).

The lower airspace between FL70–FL245 routinely accommodates flights arriving to and departing from several aerodromes within the area, including Cardiff, Exeter and Bristol Airports.

The airspace is also used extensively by aircraft arriving at and departing from airports outside the area, including all London airports, Liverpool, Birmingham, Manchester and Dublin. These arriving and departing aircraft would be descending from or climbing into the upper airspace (FL245 and above).

The upper airspace also accommodates flights arriving to the London FIR from the adjacent FIRs: Scottish, Irish, French (Brest) and the Channel Islands Control Zone as well as traffic departing from adjacent UK airspace, and overflights such as transatlantic flights to/from continental Europe.

In 2019, there were close to 470,000 traffic movements through this airspace. Due to the impact of the coronavirus pandemic on the aviation industry, the number of flights significantly reduced across the whole of the UK and Europe during the second and third quarters of 2020 to date. Previously, demand for air travel across the UK had been increasing faster than predicted.

The objective of this project is to update the route network to deliver specific initiatives of the Airspace Modernisation Strategy (AMS). The proposed changes seek to introduce a systemised network of ATS routes utilising Performance Based Navigation (PBN). This would enable aircraft to navigate using modern navigation capabilities and not be constrained by ground-based navigation beacons. This would provide benefits in capacity whilst minimising environmental impacts.

2.2. Why must this change happen now?

The enroute network has evolved over many years and historically has been constrained by the use of ground-based navigation beacons. Improvements in navigation technology (e.g. satellite-based navigation) have removed these constraints so it is now possible to do a complete redesign of the route network, which would deliver benefits in safety, environment and capacity. The introduction of FRA is part of an internationally coordinated programme which has dictated the deployment timescale, and this represents an opportunity to perform a complete redesign of the airspace below. Undertaking such a fundamental redesign of the airspace is considered a once-in-a-generation opportunity and would secure efficiencies and benefits for many years to come.

2.3. About this document

This consultation document explains the history, impacts and benefits of the proposal. Two complementary documents provide more details on how this consultation will be conducted and how the options were appraised:

- Stage 3 Consultation Strategy, which provides details on how we will conduct the consultation. See Ref 7.
- Stage 3 Full Options Appraisal, which provides analysis for each option in comparison to the baseline, to quantify likely benefits/impacts. See Ref 8.

![NATS logo]

2.4. Where are we in the airspace change process?

The airspace change process is summarised in the flowchart below. We are at Stage 3.

Stage 1 Define has been completed, where the need for an airspace change was established. We engaged with representatives of stakeholder groups to develop and define the design principles underpinning this proposal.

Stage 2 Develop & Assess has also been completed, where initial design concepts were developed, refined with feedback from representatives of stakeholder groups, each option evaluated against the design principles and an initial appraisal performed to illustrate the benefits and impacts of each option. This crucial stage of the process removed the least suitable potential airspace designs from further development: for example, those that were not as safe, those that were sub-optimal for environmental impacts or those not technically viable.

Supporting documentation for this proposal (including Stage 1 and Stage 2) can be found on the CAA's airspace change portal by clicking on this link.

The two design options that have progressed to the current stage are both viable and would resolve the current problem. This proposal is now at Stage 3 Consult, where stakeholders are asked for feedback on these options.

The following flowchart illustrates the airspace change process (known as CAP1616) on the left, with details of Stage 3 on the right:

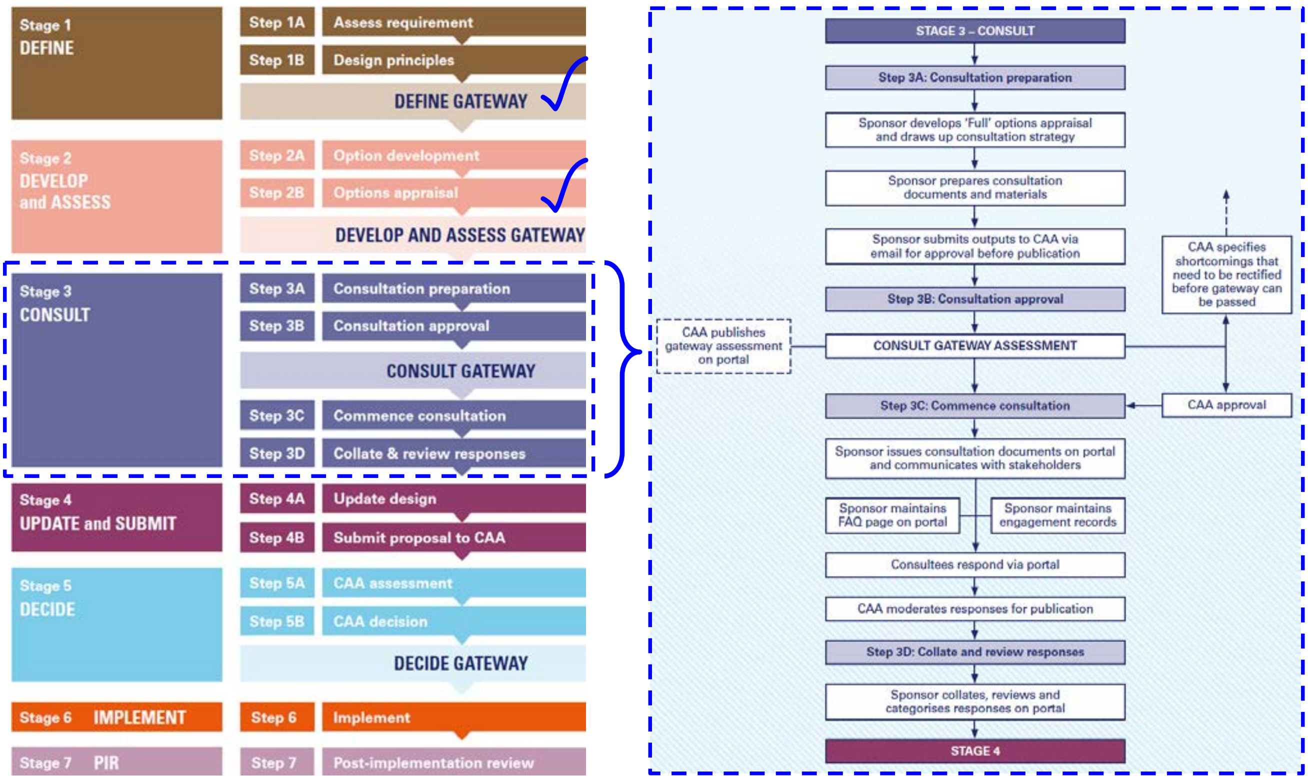

Figure 2 Airspace Change Process – Overview (left) and Stage 3 Consult (right)

2.5. Stakeholders

A stakeholder is an interested third party in an airspace change proposal. This ACP is proposing changes to routes and controlled airspace (CAS) throughout the region depicted in Figure 1 above 7,000ft (FL70)[3]. Due to the altitude of the changes proposed, the primary focus of this consultation are aviation stakeholders and this document uses common aviation technical language.

The primary stakeholder groups for this consultation are:

- Air Navigation Service Providers (ANSPs) who border the LD1.1 area
- Aircraft Operators such as airlines, freighters and executive jets
- Airports
- Ministry of Defence
- Data Houses/ Flight-planning providers
- National Air Traffic Management Advisory Committee (NATMAC) Members
- General Aviation/Sports & leisure aviation

The stakeholders proactively targeted by NATS for involvement in this consultation are listed in the Consultation Strategy (Ref 7) Appendix A. However, any other interested parties may participate in this consultation and feedback is welcomed from any individual or organisation.

This consultation is aimed at an audience of aviation stakeholders, hence some language used in this document includes commonly understood aviation terms without further explanation. A Glossary of Terms is provided in Section 20.

2.6. ACP Split and Categorisation Level

Prior to the COVID-19 pandemic this ACP was intended to be coordinated and implemented simultaneously with ACPs being sponsored by Bristol, Cardiff and Exeter Airports. At that time, discussions were held between NATS and the CAA regarding whether the LD1 ACP, proposing changes to the enroute network, would have an influence on the low-level route designs to be progressed by the airports. As this could not be ruled out, it was argued that the LD1 network ACP should be categorised as a "scaled" Level 1[4].

The impact of COVID-19 on air traffic resulted in airports pausing progress on their ACPs. However, NATS has continued with progressing the proposed changes to the ATS route network above 7,000ft due to the wider network benefits it can provide to our customers including alignment with the deployment of Free Route Airspace (FRA) in the same area. In order to allow the ACPs to progress and implement separately, the original ACP has been split to create two separate ACPs:

1. London Airspace Modernisation Programme 2 - Deployment 1.1 (Referred to as LD1.1). (THIS ACP). A network-only ACP, which will interface with the airports' existing traffic flows. (Target implementation spring 2023.) (ref ACP-2017-70 – this ACP). Design constraints associated with this ACP ensure that there is no prospect to influence the low-level route designs of the airports (below 7,000ft), hence it has been categorised as Level 2a.
2. London Airspace Modernisation Programme 2 - Deployment 1.2 (Referred to as LD1.2) (SEPARATE ACP implemented later) ACP will be used to implement any further changes that may be required by airport ACPs subsequent to LD1.1. LD1.2 will be coordinated with the airports and the output from the airports may result in further changes as part of LD1.2. For example, network connection changes for any amended or new arrival/departure routes proposed by Bristol, Cardiff, or Exeter Airports. (ref ACP-2021-

[3] See section 3.1 for explanation of Flight Level (FL)

[4] Under CAP 1616 the CAA categorises ACPs by assigning them a "Level", which in turn influences the process that is required to be followed. The Levels are primarily based on the altitude and area in which the changes occur and are defined in CAP1616 Table 2 (page 26).

050). The LD1.2 ACP will progress as a scaled Level 1 (because it may have the potential to influence lateral aircraft tracks or dispersion below 7,000ft).

These two ACPs provide additional flexibility to be able to accommodate airports' future design aspirations, and not constrain their ability to deliver appropriate noise mitigation opportunities for their local communities. To be clear, *this* consultation only concerns the LD1.1 network changes above 7,000ft.

2.7. Scope of this consultation and link with Free Route Airspace Deployment 2

This ACP specifically aims to modernise the lower airspace in the identified geographical area, by introducing PBN routes, and providing a safe and efficient interface with the airspace above and below.

The existing airspace design has evolved over many decades and has been influenced by the position of out-dated ground-based radio navigation beacons (known as VORs & NDBs). By performing a thorough clean-sheet redesign the objectives can be met (see Design Principles (Objectives) section below), with the combined airspace being more efficient, and yielding environmental benefit by enabling airline operators to reduce CO_2e emissions per flight, which in-turn would give economic benefit due to reduced operating costs.

The airspace affected starts at/above 7,000ft (FL70). The proposal seeks optimal alignment and connectivity of the ATS route network with each airport's airspace structures, such that the network capacity should not be a significant constraint on airport capacity and environmental impacts are minimised.

In order to integrate the arrivals/departures to/from Bristol, Cardiff, Exeter and Luton into the proposed systemised enroute network it may be necessary to change/truncate some existing SIDs & STARs.

The proposed solution may involve revision of the SIDs /STARs to structurally deconflict them from other traffic streams (e.g. by truncation and joining to a proposed route). No aircraft trajectories below 7,000ft would be changed as a result of the changes proposed herein[5].

It is highlighted that the overlying airspace is also being changed concurrently by the Free Route Airspace Deployment 2 ACP (FRA D2). These two ACPs cover a similar geographic region, will conduct consultation concurrently, and be implemented simultaneously. Hence the consultation strategies of these two ACPs are aligned and coordinated.

Prior to the COVID-19 pandemic the LD1.1 and FRA D2 projects were being progressed independently. As a result of the pandemic a thorough review was undertaken by NATS of these projects. This concluded that by implementing these two projects simultaneously, significant costs could be saved and benefits to the aviation industry delivered earlier. Synchronising implementation of systemised routes within this ACP with the delivery of FRA has enabled the options for LD1.1 to develop to ensure the two deployments complement each other and maximise benefit. See Section 9 for further detail.

The ACPs, which have been ongoing for several years, remain distinct, and will be evaluated as such by the regulator. The timelines have been synchronised to facilitate simultaneous implementation. The first stage of this comprises coordination of the consultations, which will be run concurrently. This will allow stakeholders to be able to evaluate and give feedback on both changes, and better understand the impact/benefit of the combined changes.

The LD1.1 ACP area borders with the airspace operated by three other air navigation service providers (ANSPs): IAA (Ireland), DSNA (France) and the Ports of Jersey (Channel Islands). NATS has engaged extensively with neighbouring ANSPs so that any inter-dependencies are known and fully considered in the design options.

[5] This proposal has been developed cognisant of the DVOR rationalisation programme and the revised SIDs/STARs do not utilise DVORs planned for withdrawal.

Subsequent LAMP Deployments covering airspace in the London Terminal Manoeuvring Area (TMA) are planned, however these will be progressed subsequently under separate ACPs.

It should be noted that the FRA area proposed by the separate FRA ACP overlies the LD1.1 area, but the boundaries are slightly different. This is necessary since the extent of the LD1.1 lower route changes and the FRA airspace are different in some areas.

FRA D2 and LD1.1 dependency FAQs

There is a separate document of FAQs available on the consultation portal. Some key ones are included here. The FRA D2 and LD1.1 ACPs are dependent and co-ordinated, they are being run in parallel, with both consultations being run concurrently. The outcome of the LD1.1 consultation will determine the Division Flight Level (DFL) between FRA D2 & LD1.1 (i.e. the level at which Free Route Airspace begins and aircraft can choose their preferred trajectory (subject to some limitations)), so this is a key dependency.

- Do both ACPs have to be implemented at the same time? Yes, in practical terms the two ACPs cannot be implemented independently. There are significant design efficiencies and cost benefits to implementing at the same time. Implementing separately would incur very significant additional costs resulting from transitional states requiring additional design, consultation, validation, safety assurance training etc. From the airspace users' perspective the impact of trying to introduce the two changes separately could potentially result in confusion & stakeholder fatigue.
    - LD1.1 cannot be implemented independent of FRA because there are no routes proposed above FL245/305 and no routes in sector 9 (see Figure 7 for location of Sector 9). Existing routes in sector 9 do not align to the route structure proposed in the LD1.1 ACP.
    - FRA D2 cannot be implemented independently of the LD1.1 ACP because the structural limitation, FRA significant points etc are based on the LD1.1 ACP design options.
- What if there is a delay to either ACP, for example the need to re-consult as a result of the outcome of the other ACP consultation? If there is a delay to either ACP that would result in delay to the other. This risk is recognised and accepted.
- Will the cumulative impacts of both ACPs be shared with stakeholders? Yes, cumulative impacts & benefits are considered (in section 17). To consider one ACP option in isolation can give apparently contradictory results, hence the combined benefits/impacts should be considered by the reader. This is essential in order to understand the impacts on the whole system and see the "bigger picture".

2.8. Alignment with the Airspace Modernisation Strategy, and other proposals

The UK Government has tasked the aviation industry to modernise airspace across the whole of the UK. The long-term strategy of the CAA and the UK Government is called the Airspace Modernisation Strategy (AMS, ref 11). The AMS identifies fifteen initiatives to modernise airspace. These include a fundamental redesign of the routes in and around the southern UK. This programme of modernisation in the southern UK is known as 'Future Airspace Strategy Implementation – South', or FASI-S. (It should be noted that this nomenclature highlighted alignment with the CAA's Future Airspace Strategy (FAS), which was the predecessor of the AMS. The FASI-S programme is fully aligned with the AMS and hence *could* similarly be described as Airspace Modernisation Strategy, Implementation – South.

More details on the AMS and FASI-S are available on the CAA website here and here respectively.

NATS, and the airports across the south, are all working on separate, but coordinated, airspace change proposals to meet these AMS objectives via FASI-S airspace change proposals. Each airport's FASI-S proposal interacts with, and has some reliance upon, the FASI-S proposals of other airports and of the NATS FASI-S ACPs related to changes to the UK's ATS route network.

The fundamental redesign of the south's ATS route network is a large programme. It involves redesigning the routes serving many airports at all altitudes in a coordinated way, using precise and flexible satellite navigation. This is expected to bring efficiencies to the ATS route network by enabling more continuous climbs and descents, while systemising the routes to keep them separated from those of neighbouring airports (see section 3.2).

The changes proposed in this consultation will interface with Bristol, Cardiff and Exeter Airports. Aircraft transiting to/from the other airports would also benefit from the proposed network improvements.

These airports are sponsoring FASI-S ACPs, intended to introduce improved low-level arrival and departure routes to each airport. As part of the Stage 2 stakeholder engagement, email responses were received from each of these airports giving feedback and stating whether progress of the LD1 ACP[6] through stage 2 would cause any issue with their own ACP. These emails were supportive of LD1 progressing, and that dependencies could be managed via ongoing engagement (for further information see ref 6 Annex C).

These airports have been engaged with on numerous occasions throughout the CAP1616 process thus far. Prior to the COVID-19 pandemic and the resulting downturn in traffic, it had been anticipated that these airports would sponsor their own ACPs to propose changes to the routes and airspace below 7,000ft close to the airports. However, the effects of the pandemic resulted in the airports having to pause their ACPs and temporarily put the planned changes on hold. NATS has continued with the proposed changes to the enroute network in order to deliver benefits more quickly.

The stakeholder engagement has ensured that the LD1.1 options are sympathetic in concept and can accommodate future aspirations of all FASI-S airports. In particular:

- The LD1.1 design would not preclude Bristol, Cardiff, Exeter or other FASI-S airports from doing further airspace change after LD1.1 implementation.
- The interfaces with Bristol, Cardiff, Exeter (and other airports) can accommodate subsequent design proposals and link any new SIDs/STARs into the proposed systemised network.
- Bristol and Cardiff have dependencies on each other due to their proximity, however they have no interdependencies with other FASI (N or S) airfields or routes at lower levels, therefore changes to other airport ACPs is highly unlikely.
- The LD1.1 design does not preclude changes being made in parts of the airspace by subsequent LAMP deployments (if this is necessary to facilitate network connectivity with airport designs these would be undertaken by LAMP deployment 1.2 ACP (LD1.2)).

2.9. Design Principles (Objectives)

The design principles were set following engagement with representative stakeholder groups as part of CAP1616 Stage 1. The design principles and their relative priorities are shown below. These were used to evaluate the design options during Stage 2 to determine which were discarded and which were progressed. (see Ref 6).

Design Principle	Category	Priority	Description
DP0	Safety	A	Is always the highest priority.
DP1	Operational	B	The airspace will enable increased operational resilience.
DP2	Economic	C	Optimise network fuel performance.
DP3	Environmental	C	Optimise CO_2e emissions per flight.
DP4	Environmental	C	Minimising of noise impacts due to LAMP influence will take place in accordance with local needs.
DP5	Technical	C	The volume of controlled airspace required for LAMP should be the minimum necessary to deliver an efficient airspace design, taking into account the needs of UK airspace users.

[6] Note this was prior to the LAMP Deployment 1 ACP being split into two ACPs (LD1.1 and LD1.2)

DP6	Technical	C	The impacts on GA and other civilian airspace users due to LAMP will be minimised.
DP7	Technical	C	The impacts on MoD users due to LAMP will be minimised.
DP8	Operational	B	Systemisation will deliver the optimal capacity and efficiency benefits
DP9	Technical	B	The main route network linking Airport procedures with the En Route phase of flight will be spaced to yield maximum safety and efficiency benefits by using an appropriate standard of PBN.
DP10	Technical	A	Accords with the CAA's published Airspace Modernisation strategy (CAP1711) and any current or future plans associated with it. (this Design Principle was added by CAA request)

Table 1 Design Principles

3. Key Technical Details

3.1. Altimetry – altitudes, heights and flight levels

Aircraft can use different vertical references when flying. "Altitude" specifically means the distance of an aircraft above mean sea level using a local or regional pressure setting; "height" specifically means the distance above the surface/terrain; "Flight Level" (FL) is a standard reference for aircraft at higher levels, in hundreds of feet, so an aircraft at FL90 is 90 x 100 = 9,000ft above the standard reference.

Controllers need to use reference settings which are common for the aircraft under their control and those adjacent, hence the use of altitudes and flight levels.

All of the changes proposed within this ACP only influence aircraft flight-paths above an altitude of 7,000ft which is above the transition altitude[7] (TA) for all airports. Above the TA aircraft fly with reference to Flight Levels, hence in this document we generally refer to flight levels (FLs) e.g. FL70 = 7,000ft.

3.2. What do we mean by systemisation?

Systemisation refers to the process of reducing the need for human intervention in the air traffic control system. This can be achieved by utilising improved navigation capabilities to develop a network of routes that are safely separated from one another so that aircraft are guaranteed to be kept apart without the need for air traffic control to intervene so often. Systemisation can reduce complexity, benefit safety and capacity. A systemised route network is characterised by the following:

- An ATS route network where climbing and descending aircraft follow a structured route system, with routing based on their departure point and/or destination.
- Route design is predicated on the use of Performance Based Navigation (PBN) which enables very accurate track conformance to routes. This allows the distance between routes to be safely minimised (e.g. parallel routes separated by ~7nm in a 5nm minimum radar separation environment, rather than the legacy spacing of 12nm).
- Systemising ATS routes should reduce the amount of tactical intervention required, by optimising the routings available within a given piece of airspace
- The allocation of traffic on routes is driven by traffic data, both historical and future, and the input from sector controllers
- Although systemisation reduces the amount of controller intervention required, there will still be instances where controllers would need to use tactical intervention (e.g. radar headings or shortcuts between waypoints) to resolve conflictions

3.3. Systemisation and separation

The proposed LD1.1 airspace would be managed by NATS Swanwick Centre ATC. Flights would be monitored by ATC with the assistance of automated track-keeping conformance monitoring and conflict detection tools. These would alert ATC if a flight deviates from its expected trajectory, or if aircraft trajectories are in conflict and hence ATC intervention is required. Optimisation of traffic flows would be achieved through the use of the Standard Route Document (SRD) which would specify the required route depending on origin and destination.

[7] The altitude at which aircraft change to using FL as the altimetry reference for maintaining vertical separation (i.e. change from the local airport pressure setting to standard pressure: 1013 hPa). This is 6000ft for the majority of UK airports though some have lower TA (see AIP ENR 1.7 - 4.1).

3.4. Introduction and Release of Controlled Airspace

Both options may require some changes to the volume of controlled airspace (CAS). A comprehensive review of existing CAS has been undertaken as part of this ACP and where possible CAS that would no longer be required could be released. This could serve to off-set in part, any new CAS that may be required. Note: the CAP1991 Airspace Classification Review being undertaken by the CAA, will be informed of the changes to CAS being proposed by the LD1.1 ACP.

The lowest level of aircraft flight path affected by this ACP is FL70. For details of the changes to controlled airspace proposed please see Section 8.

The amount of new CAS required below FL195, can be minimised by designating routes using the appropriate standard of PBN (e.g. RNAV1). (If routes are defined using PBN, the aircraft can fly them with greater accuracy, this permits routes to be positioned closer, thus requiring less CAS).

3.5. PBN equipage and route navigation specification

States are required to designate a navigational performance specification for ATS routes. The majority of the LD1.1 airspace and routes would be designated as RNAV1. There would also be a limited RNAV5 route structure to ensure connectivity for this traffic in the various traffic flows. The majority of aircraft are RNAV1 equipped (or better) as illustrated in Table 2 below (data from all flights during July 2019).

Origin	Airport	PBN Equipage >=RNAV1
EGBB	Birmingham	98.3%
EGCC	Manchester	99.1%
EGFF	Cardiff	94.9%
EGGD	Bristol	98.0%
EGGP	Liverpool	94.0%
EGGW	London Luton	97.4%
EGHI	Southampton	94.9%
EGHH	Bournemouth	94.1%
EGKB	Biggin Hill	93.3%
EGKK	London Gatwick	99.2%
EGLC	London City	98.6%
EGLF	Farnborough	96.3%
EGLL	London Heathrow	99.9%
EGNX	East Midlands	97.5%
EGSS	London Stansted	98.0%
EGTE	Exeter	93.2%
	ALL UK	94.3%

Table 2 PBN Equipage by origin (July 2019)

It should be noted that this ACP does not seek to create any RNAV1 or RNAV5 instrument flight procedures (IFPs). Where SID/STARs are required to be truncated, these modifications will be made to the extant procedures (with the consent of the airport concerned).

3.6. Special Use Airspace (SUA) - Safety Buffer Policy

The SUA Safety Buffer Policy determines the closest distance that aircraft can fly around areas of SUA (such as military Danger Areas). This also determines the minimum distance that routes can be positioned in proximity to SUA.

In support of the design of LD1.1 and FRA D2, NATS intends to seek dispensation from the buffer policy. This has been deemed necessary to enable NATS to deliver specific initiatives of the CAA's AMS (Ref 11), which are:

- maintaining and enhancing high aviation safety standards
- securing the efficient use of airspace and enabling integration
- avoiding flight delays by better managing the airspace network
- improving environmental performance by reducing emissions
- facilitating defence and security objectives

For more detail relating to the specific dispensations requested from the Buffer Policy see Appendix C.

3.7. Other Design Options Considered (but not progressed)

Full assessment of design options which were considered but not progressed is given in Ref 5 (Design Principle Evaluation and Options Appraisal).

The requirements for LD1.1 as mandated by the EU Implementing Regulation EU716/2014[8] are listed in Ref 5. The design options that were considered in Stage 2 in order to meet each of these mandated requirements are detailed in Ref 5. Combinations of these were then used to construct the options progressed for consultation (i.e. the Options as outlined in Section 6).

3.8. Delegated Air Traffic Services

Air traffic services (ATS) in the LD1.1 airspace for arrivals and departures in the vicinity of Bristol and Cardiff are delegated from NERL to Bristol and Cardiff ATC. As part of this ACP the extent of the areas of delegation may be subject to change. If there are any changes to the areas of delegation necessary, these would be agreed between NATS and the airports once the airspace proposed has been finalised.

3.9. Full options appraisal

The "Options Appraisal (Phase II – Full) including safety assessment" (Ref 8) as required by CAP1616 (Ref 9), accompanies this document and is published on the CAA portal for this airspace change.

3.10. Implementation Timetable

The *earliest* implementation of any of the changes proposed herein would be 23rd March 2023 (AIRAC 03/2023). Implementation is subject to CAA approval.

[8] EU716/2014 has been superseded by EU2021/116 (Common Project 1) within the EU. This change to the regulation occurred post-UK withdrawal from the EU and the DfT have consulted on if and how to incorporate this into UK law, at the time of writing, a decision has not been published. EU716/2014 is retained (and amended in UK domestic law) under the European Union (Withdrawal) Act 2018

4. Current Airspace (Option 0 - Baseline)

Before looking at the proposed options for this Airspace Change, it is important to understand the current airspace operation in the area. The current airspace is the Option 0 "Do nothing" baseline, against which the proposed options are evaluated. It should be noted that "Doing nothing" was discounted at the Design Principle Evaluation (Stage 2). It is useful as a baseline for comparison, however it is not considered as a viable option as it would not fulfil the aims of the AMS.

The area covered by this ACP is shown in Figure 4 and Figure 5 below. The airspace in question covers Southwest England and most of Wales.

The vertical extent of the LD1.1 airspace proposed to be changed is:

- Option 4: FL70 – FL305, (with FRA above from FL305, and FL245 in S09)
- Option 6: FL70 – FL245, (with FRA above from FL245)

This airspace routinely accommodates flights arriving to and departing from the airports of Bristol, Cardiff and Exeter Airports, as well as numerous smaller aerodromes within the area.

Additionally, the airspace is used extensively by aircraft arriving at and departing from airports outside the area, including all London airports, Birmingham, Liverpool, Manchester, East Midlands and Dublin.

These arriving and departing aircraft would be descending from or climbing into the upper airspace (FL245 and above).

The LD1.1 airspace up to FL245 is part of the London Flight Information Region (FIR). Above FL245 this airspace is part of the London Upper Flight Information Region (UIR). The LD1.1 airspace also interfaces with the following adjacent UIR/FIRs: Scottish, Irish, French (Brest) and the Channel Islands Control Zone. The traffic is comprised of aircraft arriving/departing from UK airports whether originating from airports within the lateral boundary of the LD1.1 area, or airports outside the area, and overflights such as transatlantic flights to/from continental Europe.

Currently all aircraft flight plan to fly along the published ATS route structure. The existing ATS route structure was historically based on ground-based radio navigation beacons, many of which are being withdrawn from service, due to age and redundancy.

The existing ATS route network spacing is based on old standards which required 12nm spacing between adjacent routes for them to be considered separated. The improvements to navigational accuracy mean that new routes can be safely positioned more closely to each other, which can enable more efficient utilisation of the airspace.

Modern satellite navigation now makes navigation between any points possible and there is much less reliance on ground-based navigation beacons. Using modern Performance Based Navigation (PBN) it is commonplace for air traffic control (ATC) to allow aircraft to route direct to a point (termed a 'tactical direct'), to improve efficiency as aircraft transit through UK airspace.

The use of the designated entry/exit points (termed coordination points (COPs)) at the FIR/UIR boundary, and the influence on flightpaths of some navigation beacons and the ATS route structure can be seen clearly in Figure 5. However, the regular use of tactical direct shortcuts to/from the COPs can also be discerned.

Within the extant LD1.1 airspace, traffic flows north-south on two parallel routes; N864 & N862. Traffic to/from the south joins via a COP on the Brest/Channel Islands border, traffic to/from the north joins the Manchester TMA. East-west traffic from Ireland travels on ATS route Q63 routing STU – BCN – CPT. In the southern sectors, traffic is routed on ATS route L620 or N17 (eastbound). There are no ATS routes between FL70-FL245 in the southwest portion of the airspace (Sector 9). Figure 4 (Lower Airspace) shows the ATS routes and the density distribution of flights within this airspace for a typical pre-pandemic summer week (11-18th August 2019).

Above FL245, there is a complex series of routings between COPs. The majority of traffic routes east/west from Ireland via ATS route L607, with north/southbound traffic via parallel routes UP16 & N862. Figure 5 (Upper airspace) below, shows the ATS routes and the density distribution of flights within this airspace for a typical busy pre-pandemic summer week (11-18th August 2019).

For reference, the existing UK ATS route structure is defined in detail in the following sections of the UK Aeronautical Information Publication (AIP) (Ref 14):

ENR 3.1 LOWER ATS ROUTES
ENR 3.3 AREA NAVIGATION ROUTES

Illustration of numbers of flights

In 2019 (pre-pandemic) 469,980 flights transited the LD1.1 airspace region.

The airspace usage by airline is given below.

Airline	Callsign	%
RyanAir	RYR	17.8%
easyJet	EZY	10.4%
Aer Lingus	EIN	8.6%
British Airways	BAW	8.4%
TUI Airways	TOM	4.3%
Jet2	EXS	4.1%
United Airlines	UAL	4.1%
American Airlines	AAL	4.0%
Delta Air Lines	DAL	3.5%
Virgin Atlantic	VIR	2.8%
Air France	AFR	2.7%
KLM	KLM	2.1%
Lufthansa	DLH	1.8%
Air Canada	ACA	1.6%
Swissair	SWR	1.2%
Norwegian Airlines	NRS	1.2%
Stobart Air	STK	1.0%
Air Transat	TSC	0.9%
Iberia	IBS	0.6%
Norwegian Shuttle	NAX	0.5%

Table 3 Percentage of flights by airline

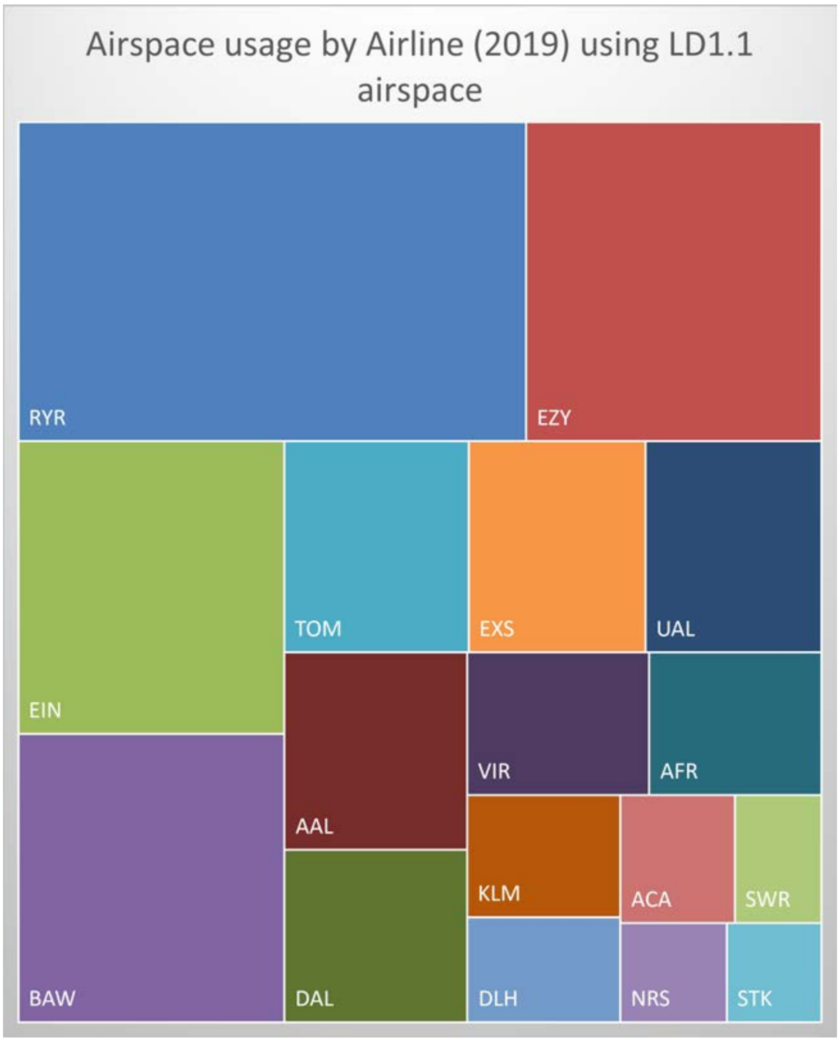

Figure 3 Airlines with greater than 1% of flights

Table 3 shows the percentage usage of the airspace for the top 20 airlines. Figure 3 illustrates the proportions of flights for those airlines having more than 1% of the total (in 2019).

Fleet Mix

The Fleet mix giving the percentage of each of the top 50 aircraft types using the airspace is given below.

Aircraft Type	Daily Count	%	Aircraft Type	Daily Count	%
B738	299	20.3%	E190	11	0.7%
A320	217	14.7%	RJ85	11	0.7%
B772	104	7.1%	MD11	9	0.6%
A319	70	4.8%	E135	8	0.5%
B763	55	3.7%	JS41	8	0.5%
B789	55	3.7%	A359	7	0.5%
B77W	53	3.6%	B737	7	0.5%
A333	50	3.4%	GLF4	7	0.5%
B788	41	2.8%	B38M	6	0.4%
DH8D	38	2.6%	GLF5	6	0.4%
A332	34	2.3%	B462	5	0.3%
B744	33	2.2%	E75L	5	0.3%
A321	30	2.0%	F2TH	5	0.3%
B752	30	2.0%	GLEX	5	0.3%
E145	25	1.7%	A346	4	0.3%
E195	22	1.5%	AT75	4	0.3%
AT76	21	1.4%	C25A	4	0.3%
E75S	19	1.3%	F900	4	0.3%
B764	18	1.2%	LJ45	4	0.3%
A388	15	1.0%	C55B	3	0.2%
B77L	14	1.0%	C68A	3	0.2%
A343	13	0.9%	CL60	3	0.2%
B748	12	0.8%	E55P	3	0.2%
BE20	12	0.8%	GL5T	3	0.2%
B733	11	0.7%	A21N	2	0.1%

Table 4 Fleet Mix - top 50 aircraft types

The fleet mix above is based on traffic from 2019 (pre-pandemic) with the following changes:

- B744 and A380 aircraft types for British Airways have been replaced with 60% B772 and 40% B788
- A318 aircraft types for British Airways were removed from our sample
- A340 aircraft types for Virgin were replaced with B789
- The sample includes FlyBe DH8D, so it is likely that the future proportion of DH8B would be reduced.

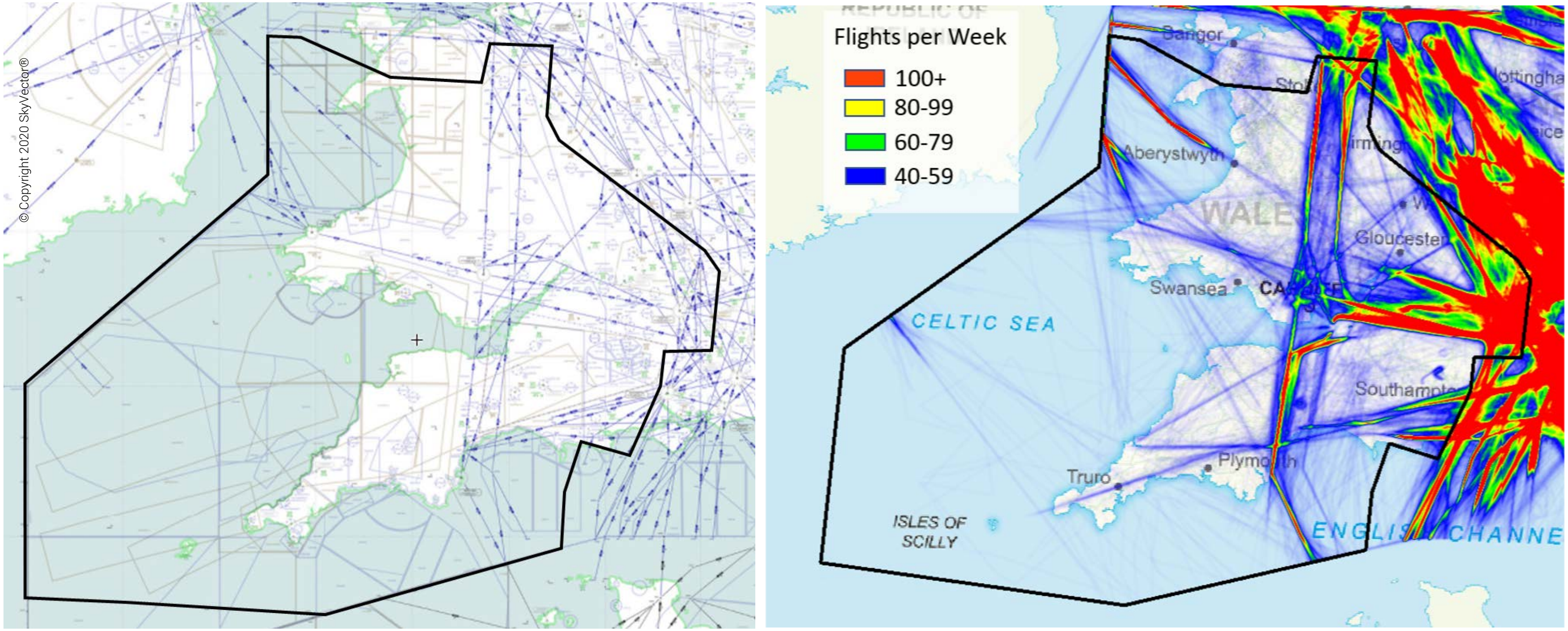

Figure 4: Lower ATS Routes (FL70 – 245) within the LD1.1 area and the density of flights (Aug 11-18 2019)

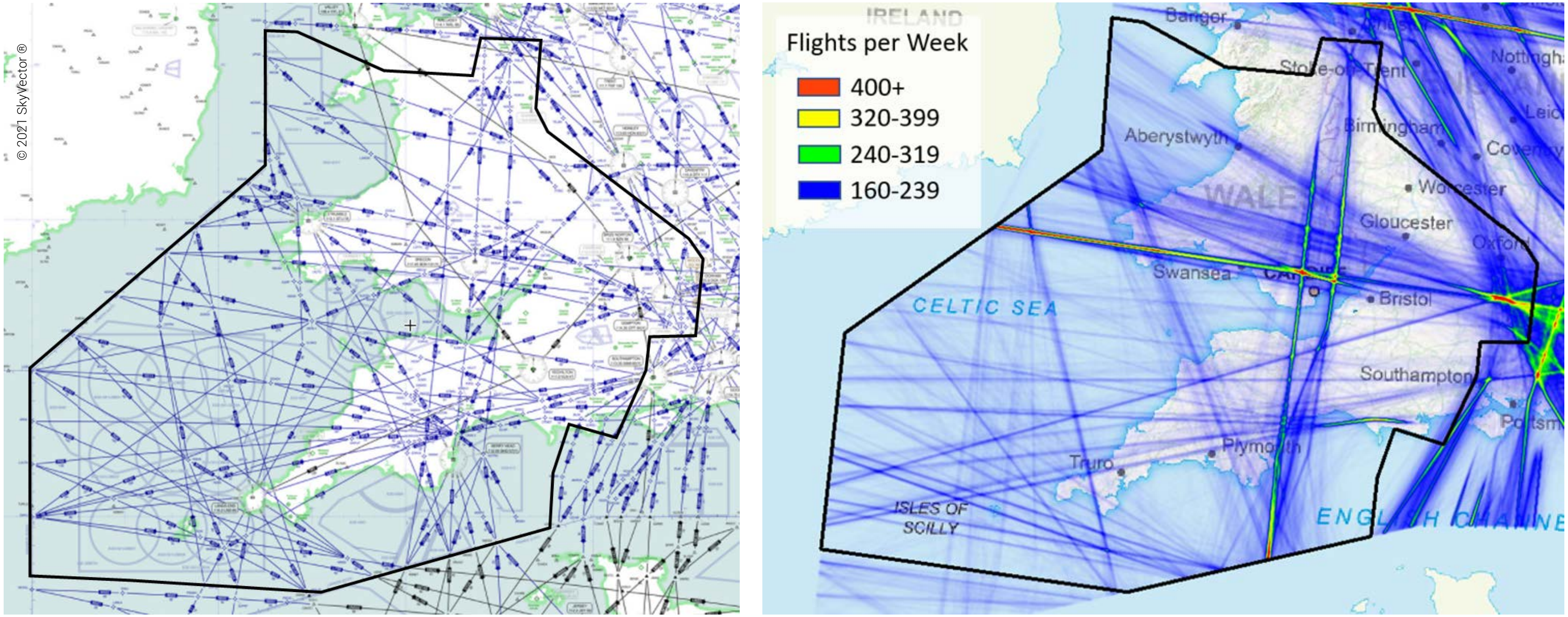

Figure 5: Upper ATS Routes (FL245 and above) within the LD1.1 area and the density of flights (Aug 11-18 2019)

Note that the colour scale in the above figure has a higher traffic threshold than for Figure 4 since this upper airspace (above FL245) is significantly busier.

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5. Airspace Design Options for Consultation

Two options, Option 4 and Option 6, have been evaluated as viable and progressed from the previous CAP 1616 stages. These are compared to the existing baseline (Option 0). There are differences between Option 4 and Option 6 where the main systemised design interacts with Airport/adjacent ANSP interfaces. These are described in detail in subsequent sections (sections 9-16). Feedback on the merits of the interface designs is also requested. The interface with the overlying FRA is conceptually the same across both options but with different division Flight Level (DFL) and is described below.

- LD1.1 Option 0 – Do nothing and maintain the current ATS route structure (baseline for comparison).
- LD1.1 Option 4 - Systemisation using PBN routes based on 5nm radar separation environment, with improved connectivity provided by direct routes, interfacing with FRA above FL305 (FL245 in S09)[9].
- LD1.1 Option 6 - Systemisation using PBN routes based on 5nm radar separation, interfacing with Free Route Airspace (FRA) above FL245.

The "do nothing" option has been discounted as it does not fully meet several design principles.

5.1. Summary of Differences between Options 4 and 6

Aspect	Option 4	Option 6 (Preferred)
Interface with FRA	FRA DFL is FL305 except in S09 where it is at FL245.	FRA DFL is FL245 across entire LD1.1 area, hence aircraft are able to commence user-preferred trajectories earlier in the flight.
Southern Interface[10] Environmental impact Fuel burn	Limited systemisation 132 Tonnes CO_2e increase p.a. (2023) 41 Tonnes fuel increase p.a. (2023)	More extensive systemisation 121 Tonnes CO_2e increase p.a. (2023) 38 Tonnes fuel increase p.a. (2023)
Western Interface[10] Environmental impact Fuel burn	Less change required to D201. Minimal portion of D201 needed to be re-defined and capped at FL145 in line with feedback received from Qinetiq during Stakeholder engagement. 156 Tonnes CO_2e reduction p.a.(2023) 49 Tonnes fuel reduction p.a. (2023)	Change required to D201. Larger portion of D201 required to be re-defined and capped at FL145. But this gives better environmental performance (reduced dis-benefit). 165 Tonnes CO_2e reduction p.a.(2023) 52 Tonnes fuel reduction p.a. (2023)
Airport interfaces[10]	No difference	
Design Concepts	Less flexibility for flight planning options from FL305	Increased flexibility for flight planning options from FL245
Complexity	Uses 3 Airspace design concepts, Systemised, Direct route and Free Route – increased complexity	Uses 2 Airspace design concepts, Systemised and Free Route – less complex.

[9] Note: The addition of the DFL between systemised airspace and FRA (FL305 for option 4 or FL245 for Option 6) was added to the descriptions (from the Stage 2 documentation) to make the main difference between the options clearer.
[10] See following interface sections

5.2. Changes to holding

The changes to holding described below are common to both Option 4 and Option 6.

Two new contingency holds are proposed as described in the table below (one of which replaces OKESI). These would be used (infrequently) when required, if there were major disruption in other parts of the network (e.g. airport/ runway closure).

Point	Inbound Course	Turn Direction	Speed Limit	Duration (Min)	Upper Limit (FL)	Lower Limit (FL)	Notes
UA19D .	97.4	RIGHT	240	1.5	190	150	replaces OKESI FL160 - FL240
UA19D	97.4	LEFT	240	1.5	250	200	
DURIN	101	RIGHT		1.5		270	

Note the proposed designs reference numerous new waypoints. The names used for these waypoints are working names and would change prior to implementation. (Approved five letter name codes will be agreed and reserved with ICAO).

The OKESI hold (currently published as FL160 - FL240), is being removed from service. The UA19D hold proposed to replace it, has a base level 1,000ft higher. A contingency enroute hold would be added to route E east of SWANY (exact position to be confirmed). DURIN shows a possible position for this hold.

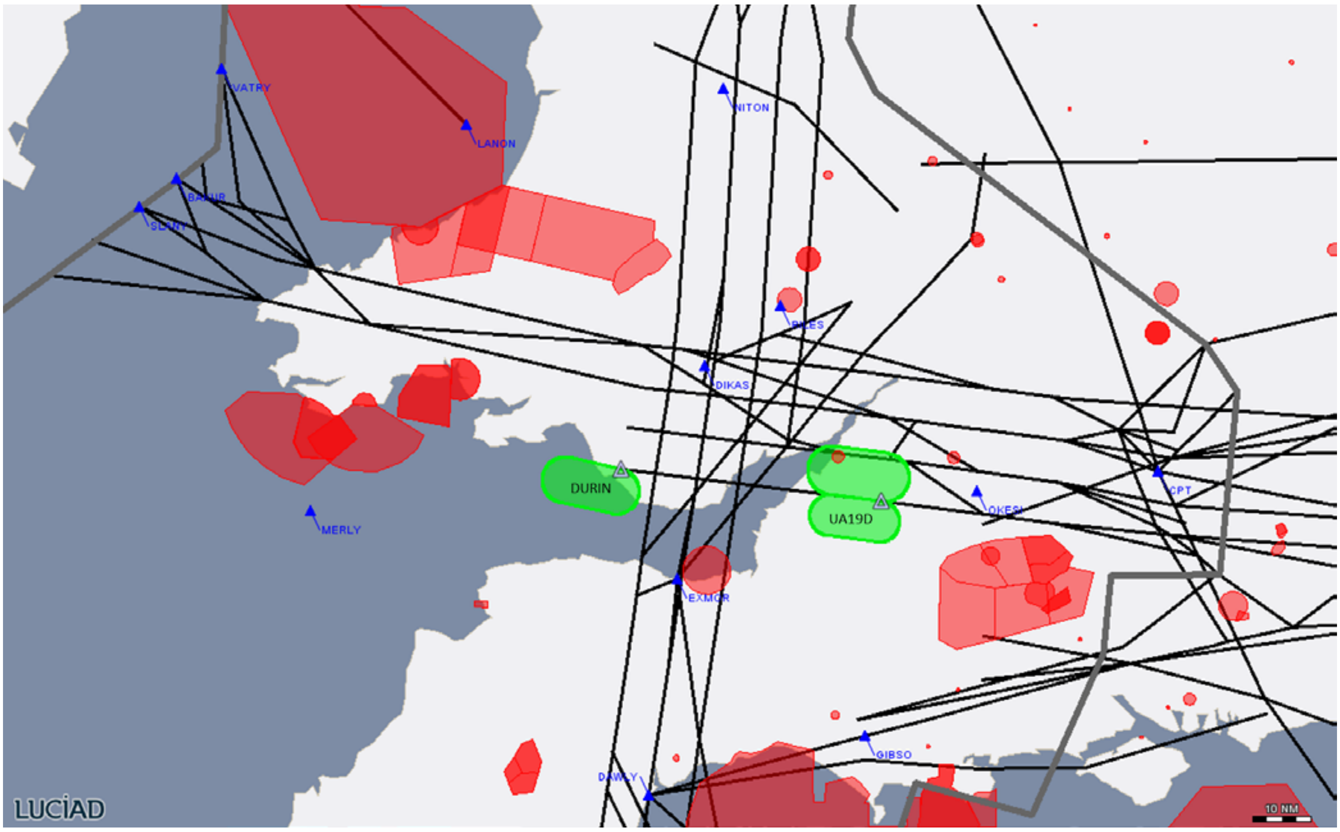

Figure 6 showing locations of proposed holds (SUA in red)

6. Option 4 Overview

The Option 4 concept is based on the fixed network of systemised PBN ATS routes up to FL245, with a network of published direct routes (DCTs), up to FL305. The principal network is formed by 4 north-south and 5 east-west flows (up to FL305). The network of DCTs creates a flexible infrastructure between FL245-305 which can be modified at relatively short notice to react to changes to airspace user requirements (e.g. SUA demand, Flexible Use Airspace (FUA), changes to Commercial Air Transport traffic flows etc). Details of the interfaces with adjoining airspace structures, SIDs and STARs for airports, and the adjacent ANSPs are given in sections 8-16 below. This network would be compatible with the current radar separation standard, keep aircraft safely separated with minimal ATC intervention and relies on the extant terminal delay absorption structures (holds). Above FL305 would be free route airspace where flight planning is not constrained by an ATS route structure.

The ATS route spacing is based on CAP1385 route separation criteria[11] assuming a 5nm radar environment. This option enables improved environmental performance by introducing the option of new published direct routings (DCTs) between FL245 and FL305 shown in purple in Figure 7). This option should provide an efficient, deconflicted network which would yield safety, capacity and environmental benefits.

Note: seven routes extend out from the eastern interface, and two routes extend north from the northern interface to provide connectivity for flights to the existing ATS route network. For further details see interface sections 14 and 15.

The review and subsequent co-ordination of the LD1.1 and FRA D2 ACPs (see section 2.7 above), identified that development of the Option 4 concept could align with the FRA concept, and maintain Option 4 as a viable option for LD1.1 using the division flight level (DFL) of FL305. This would complement, and would be coordinated with, the FRA ACP.

Specifically, Option 4 comprises a systemised PBN route network from FL70 to FL245, with a network of direct routes published in the Route Availability Document (RAD Appendix 4) between FL245-FL305 which would provide connectivity to FRA at FL305, initially replicating the systemised route structure up to FL305 (with the dependency that the FRA D2 ACP introduces FRA above FL305). In Sector 9 (see Figure 7) the systemised routes terminate at FL245 and above FL245 is FRA. In the overlying free route airspace, flights can route to any point. The inclusion of flight plannable DCTs between FL245-FL305 would enable environmental benefits.

Systemised PBN routes offer an efficient network design which would keep aircraft safe with minimal ATC intervention. The use of a 5nm separation radar environment requires no upgrade to existing radar or associated systems. DCTs are used to provide flexible flight planning options within the Option 4 design, as shown in Figure 7.

6.1. Benefits

The benefits of this option are:

- Systemised airspace
- Potential reduction in ATC complexity
- Potential reduction in controller intervention
- Design permits some offload scenarios due to SUA activity
- Provides a systemised network flow for Bristol and Cardiff arrivals and departures
- Direct routings enable enhanced environmental benefits
- 5nm radar environment does not require any changes to radar infrastructure or related systems.
- Support the AMS target (ref 11) and align with Common project 1 (EU2021/116)

6.2. Issues

The identified potential issues with this option were outlined in Stage 2 as:

- Additional Controlled airspace may be required in some areas (mitigated by release of other CAS i.e. raising base levels)
- Less aligned with the FRA concept.

[11] Supported by the High Level, High Speed Trial which provided evidence to support CAP1385 separation criteria at higher altitudes (above FL175).

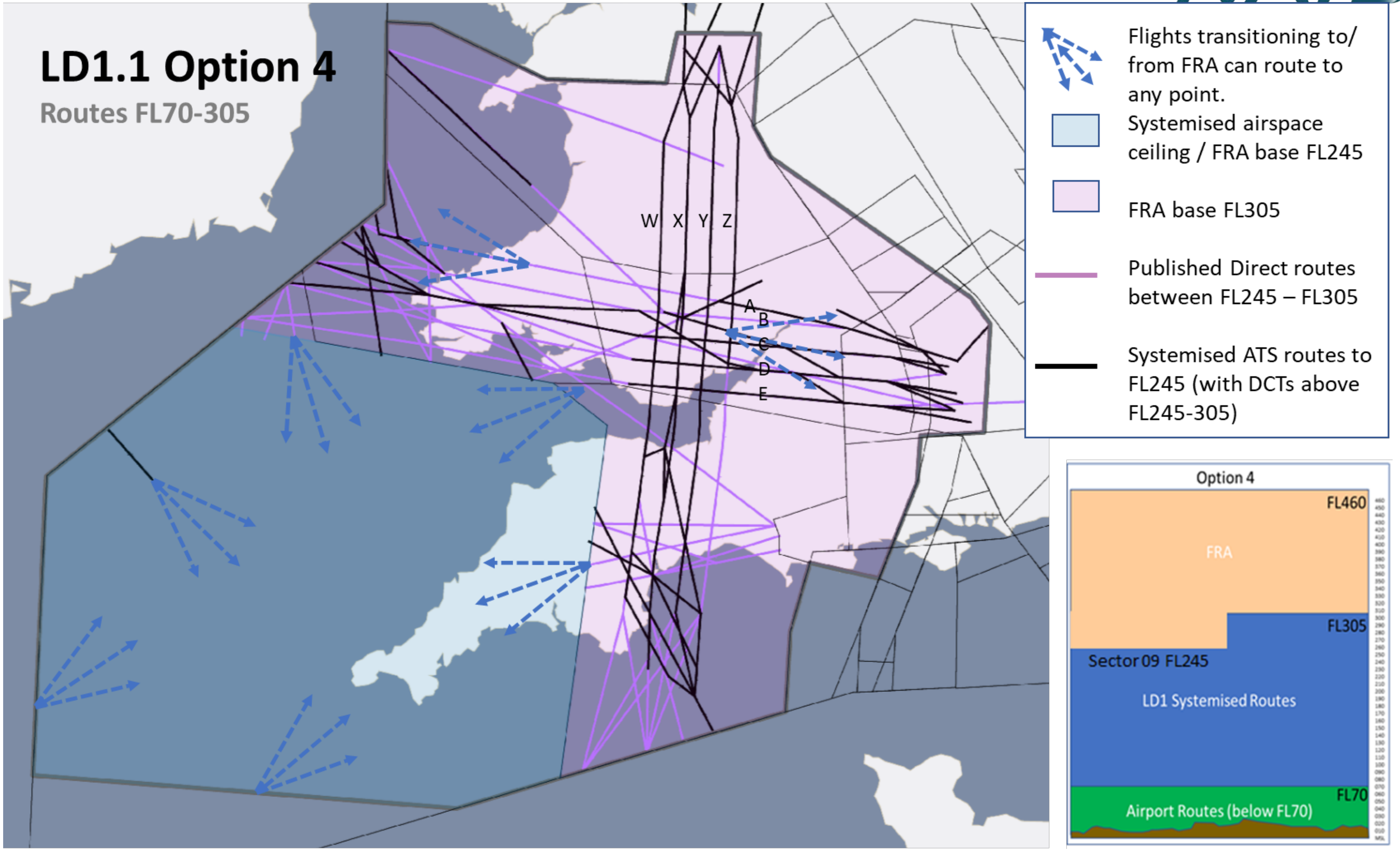

Figure 7 Option 4: Change to systemised routes FL70-305 with indicative FRA transitions

7. Option 6 (preferred) Overview

Option 6 is an evolution from Option 4, with a systemised PBN route network from FL70 to FL245. The main difference is that the division flight level (DFL) between the systemised airspace/FRA is 6,000ft lower at FL245, and this allows aircraft to begin the free-route portion of the flight earlier.

The principal network is formed by 4 north-south (routes W, X, Y, Z) and 5 east-west flows (routes A, B, C, D, E, up to FL245). Details of the interfaces with SIDs and STARs for Bristol and Cardiff airports and the adjacent ANSPs are given in sections 8-16 below. Above FL245 is free route airspace where flight planning is not constrained by an ATS route structure. This network would be compatible with the current radar separation standard and would ensure aircraft are safely separated with minimal ATC intervention and relies on the extant terminal delay absorption structures (holds).

Within volumes of airspace that today have little or no traffic operating below FL245 the majority of the Option 6 route network is formed by FRA routings (e.g. Swanwick Sector 9 which covers the south west of NATS UK airspace). Figure 8 shows an overview of the proposed LD1.1 routes. A layered pdf is provided on the consultation portal which allows stakeholders to select various layers (e.g. existing routes/proposed routes/ airport SIDs/STARs).

Note: seven routes extend out from the eastern interface, and two routes extend north from the northern interface to provide connectivity for flights to the existing ATS route network. For further details see interface sections 14 and 15.

7.1. Benefits

The benefits of this option are:

- Systemised airspace
- Potential reduction in ATC complexity
- Potential reduction in controller intervention
- Design permits some offload scenarios due to SUA activity
- Provides a systemised network flow for Bristol and Cardiff arrivals and departures
- Lower FRA enables user-preferred trajectories to be started earlier in the flight – enables operators to optimise trajectories, bringing additional environmental benefit over Option 4.
- 5nm radar environment does not require any changes to radar infrastructure or related systems.
- Supports the AMS target (ref 11) and align with the EU Pilot Common Project (EU2021/116[8]) introduction of Free Route Airspace.
- Provides increased flexibility to adapt to unforeseen circumstances such as the dramatic change in traffic volumes experienced during the COVID-19 pandemic.

NATS prefers this option over Option 4 because it has greater flexibility, is less complex, and has the potential to further improve environmental performance.

7.2. Issues

One potential issue with this option is:

- Some additional controlled airspace may be required (this is mitigated by release of other CAS i.e. raising base levels).

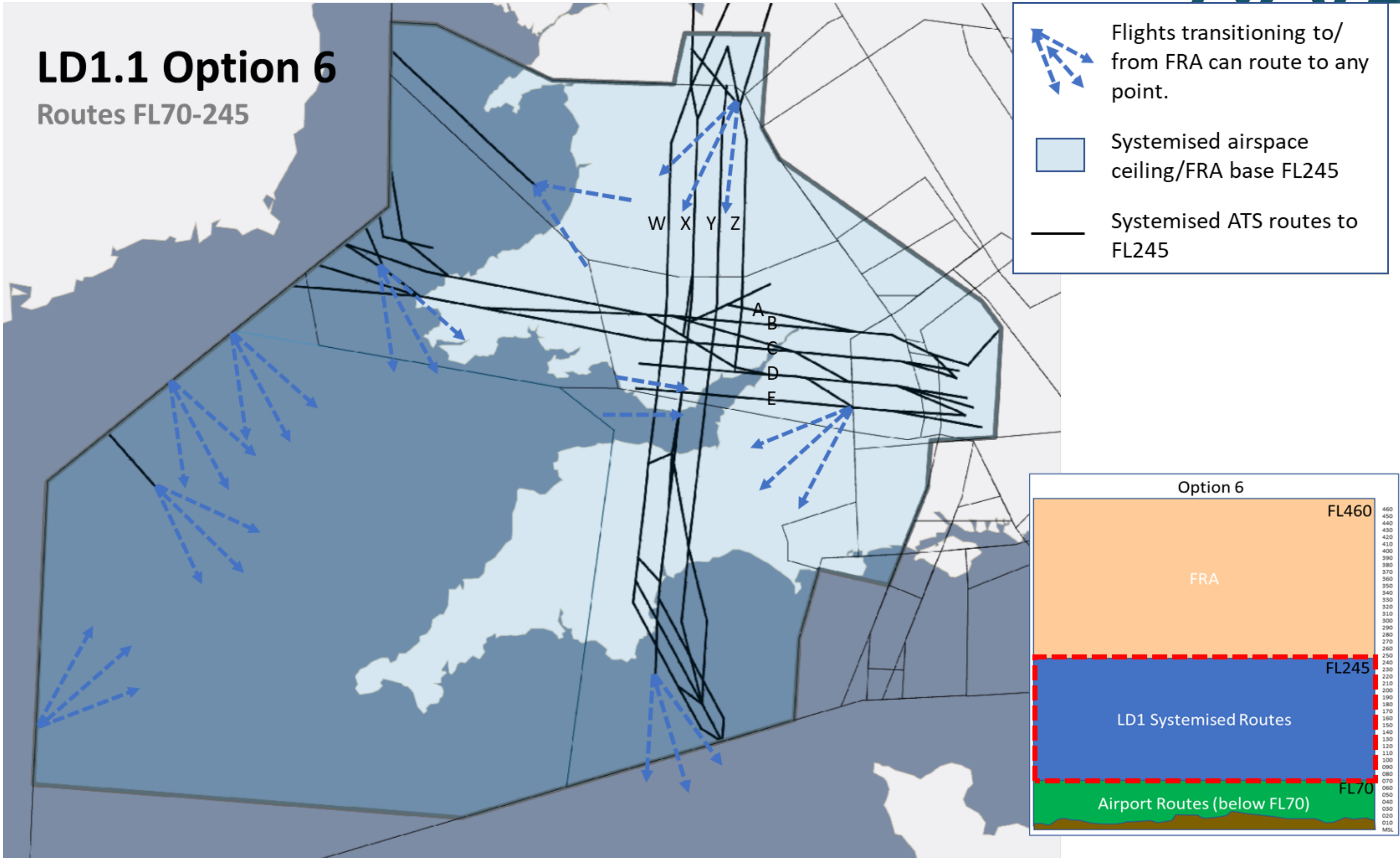

Figure 8 Option 6: Systemised routes FL70-245, with indicative FRA transitions from FL245

8. Changes to Controlled Airspace & SUA

8.1. CAS requirements

The proposed airspace designs for both options require some changes to the volume of controlled airspace (CAS) and military training areas (TRA1 & TRA2). This includes the introduction of some new areas of controlled airspace and the release of other areas (to Class G – uncontrolled airspace). Note that the CAS changes are the same for both options. Where new CAS is required, this is to facilitate the safe operation of the proposed routes. Usually this involves a lateral expansion (widening) of the airspace to accommodate more parallel systemised routes.

However, due to improvements in aircraft performance and navigational accuracy, there are many areas where the airspace bases can be raised, thus releasing airspace to be uncontrolled. On balance, the proposed CAS changes would "release" much more airspace (reclassifying to Class G), than would be "taken" (changing extant Class G to CAS). The net figure of airspace released is approximately ~88 cubic nautical miles of CAS (below FL195).

The following pages in this section describe where the airspace is proposed to change. Note that as a result of rationalisation of the airspace, numbering of the CTA regions may change, some new areas may be created and some may be merged.

The Class C airspace structures between FL195 and FL245 will be updated to include the proposed lateral extent of the lower CTAs. The West CTA etc defines the airspace between FL195 and FL245 but as all airspace above FL195 is Class C, this would not be a material change.

CAS being changed (ordered by current base level)	Summary of change	Net volume changed (nm³)	Reason
STU CTA 1 See Figure 9	Lateral increase south.	-162	Widened to give CAS containment for proposed systemised ATS route structure.
	Base raise from FL145 to FL155		Historic traffic data/ trajectory modelling/SME input for climb and descent profiles.
STU CTA 2 See Figure 9	Lateral increase south	-12	Changes to give CAS containment for proposed systemised ATS route structure.
	Base raised from FL125 to FL145		Historic traffic data/ trajectory modelling/SME input for climb profiles.
STU CTA 3 See Figure 9	lateral increase north and south.	-31	Changes to give CAS containment for proposed systemised ATS route structure.
	Raise base from FL95 to FL125,		Historic traffic data/ trajectory modelling/SME input for climb/descent profiles.
STU CTA 4 See Figure 9	Lateral increase to the north and south	+19	Changes to give CAS containment for proposed systemised ATS route structure.
	No change to base level		Historic traffic data/ trajectory modelling/SME input for climb/descent profiles.

Table 5 Proposed changes to Strumble (STU) CTA controlled airspace

CAS being changed	Summary of change	Net volume changed (nm³)	Reason
NITON CTA 6	Minor lateral increase in south-eastern corner	+ <1	Changes to give CAS containment for proposed systemised ATS route structure.
NITON CTA 7	Minor lateral increase in south-western corner	+ <1	Changes to give CAS containment for proposed systemised ATS route structure.
NITON CTA 9/10/11/12 See Figure 9	Southern portion of NITON CTA 9 adjacent to CTA 10 reduced in size laterally to the east, adjacent areas CTA 10/11/12 reduced in size laterally and base level of FL145 applied to all portions. Central Portion of NITON CTA 9 raised to FL155 and reduced in size laterally east and west, with increases laterally in the northern portion. Additional FL175 fillets added centrally on the eastern and western sides. Northern portion base level retained at FL145, lateral increase east and west.	-188	Changes to give CAS containment for proposed systemised ATS route structure. Historic traffic data/ trajectory modelling/SME input for climb/descent profiles.
NITON CTA 8 See Figure 11	Lateral extension to the east	+4	Changes to give CAS containment for proposed systemised ATS route structure.
	No change to base level		Historic traffic data/ trajectory modelling/SME input for climb profiles.

Table 6 Proposed changes to NITON CTA controlled airspace

CAS being changed	Summary of change	Net volume changed (nm³)	Reason
Cotswold CTA 13 See Figure 10	Lateral increase to the south and reduction in size of TRA002.	+23	Changes to give CAS containment for proposed systemised ATS route structure.
	Base to match adjoining CTA13 (FL105)		Historic traffic data/ trajectory modelling/SME input for climb/descent profiles.
Cotswold CTA 6 See Figure 9	Lateral increase north.	+6	Changes to give CAS containment for proposed systemised ATS route structure.
	No change to base level		Historic traffic data/ trajectory modelling/SME input for climb/descent profiles.
Cotswold CTA 9 See Figure 9	Lateral reduction in width on the west side.	-5	Changes to give CAS containment for proposed systemised ATS route structure.
	No change to base level		Historic traffic data/ trajectory modelling/SME input for climb/descent profiles.
Cotswold CTA 10 See Figure 9	Lateral reduction in width on the west side.	-7	Changes to give CAS containment for proposed systemised ATS route structure.
	Base raised from FL95 to FL105		Historic traffic data/ trajectory modelling/SME input for climb/descent profiles.
Cotswold CTA 11 See Figure 9	Lateral increase in width to the east		Changes to give CAS containment for proposed systemised ATS route structure and Cardiff STAR.
	No change to base level		Historic traffic data/ trajectory modelling/SME input for climb/descent profiles.
Cotswold CTA 7 See Figure 9	Lateral increase north.	+43	Changes to give CAS containment for proposed systemised ATS route structure.
	Base lowered to FL95.		Historic traffic data/ trajectory modelling/SME input for climb/descent profiles.
Cotswold CTA 15	Lateral reduction in size in line with Cotswold CTA 11.	-6	Segment removed to avoid overlap with revised CTA 11, changes to give CAS containment for proposed systemised ATS route structure.

Table 7 Proposed changes to Cotswold CTA controlled airspace

CAS being changed	Summary of change	Net volume changed (nm³)	Reason
New BHD CTA 7 See Figure 12	New CTA established with a base of FL75. (max width 4nm, for all the BHD areas below)	+38	Changes to give CAS containment for proposed systemised ATS route structure. Historic traffic data/ trajectory modelling/SME input for climb/descent profiles.
New BHD CTA 8 See Figure 12	New CTA established with a base of FL95.	+46	Changes to give CAS containment for proposed systemised ATS route structure. Historic traffic data/ trajectory modelling/SME input for climb/descent profiles.
New BHD CTA 9 See Figure 12	New CTA established with a base of FL105.	+82	Changes to give CAS containment for proposed systemised ATS route structure. Historic traffic data/ trajectory modelling/SME input for climb/descent profiles.
New BHD CTA 10 See Figure 12	New CTA established with a base of FL125.	+75	Changes to give CAS containment for proposed systemised ATS route structure. Historic traffic data/ trajectory modelling/SME input for climb/descent profiles.
Berry Head CTA 5 See Figure 12	Volume extended laterally to the west and east and divided laterally north/south. Base level of southern portion raised to FL105.	+8	Changes to give CAS containment for proposed systemised ATS route structure. Historic traffic data/ trajectory modelling/SME input for climb/descent profiles.

CAS being changed	Summary of change	Net volume changed (nm³)	Reason
Berry Head CTA 4 See Figure 12	Volume reduced laterally in line with amendment to BHD CTA 5.	-21	Changes to give CAS containment for proposed systemised ATS route structure.

Table 8 Proposed changes to Berry Head (BHD) CTA controlled airspace

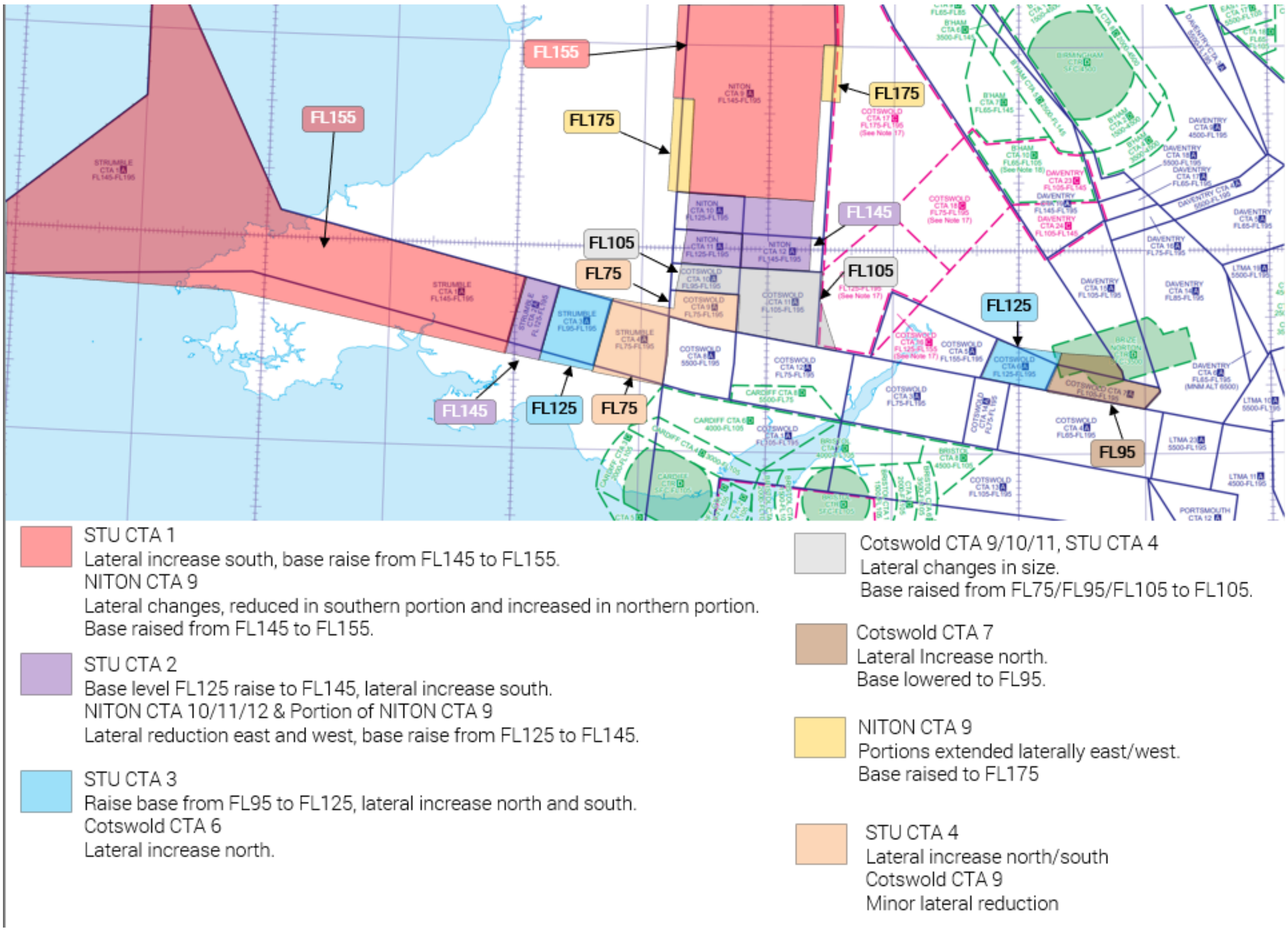

Figure 9 CAS changes in STU, NITON, Cotswold CTAs

The changes proposed to CAS in the STU, NITO and Cotswold CTAs are detailed in Figure 9 and Table 5 to Table 7. Overall, small lateral extensions to CAS are required to accommodate the systemised route structure., and widespread raising of CTA bases of CAS.

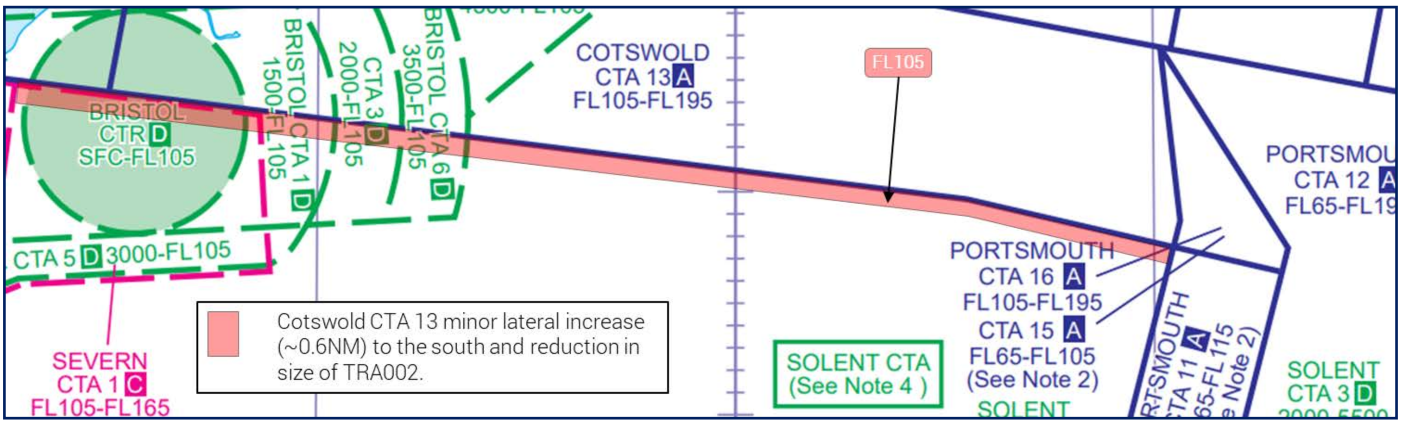

Figure 10 CAS changes: lateral increase in Cotswold CTA and reduction of TRA002

The widening of Cotswold CTA 13 by 0.6nm is required to accommodate the systemised east-west routes structure.

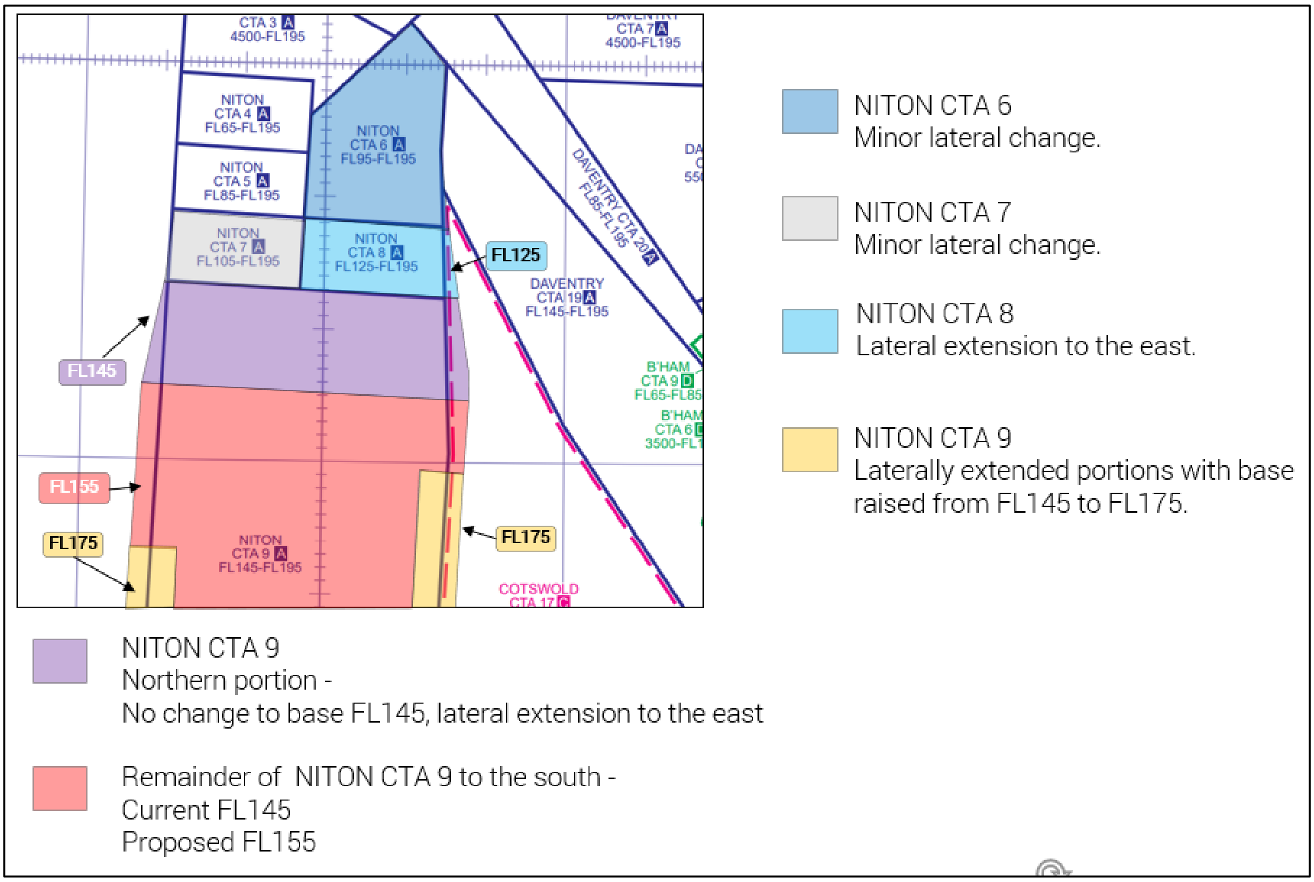

Figure 11 CAS changes: in NITON CTA

The lateral extensions proposed to the NITON CTA as shown in Figure 11 and Table 6 are required to accommodate the systemised north-south route structure.

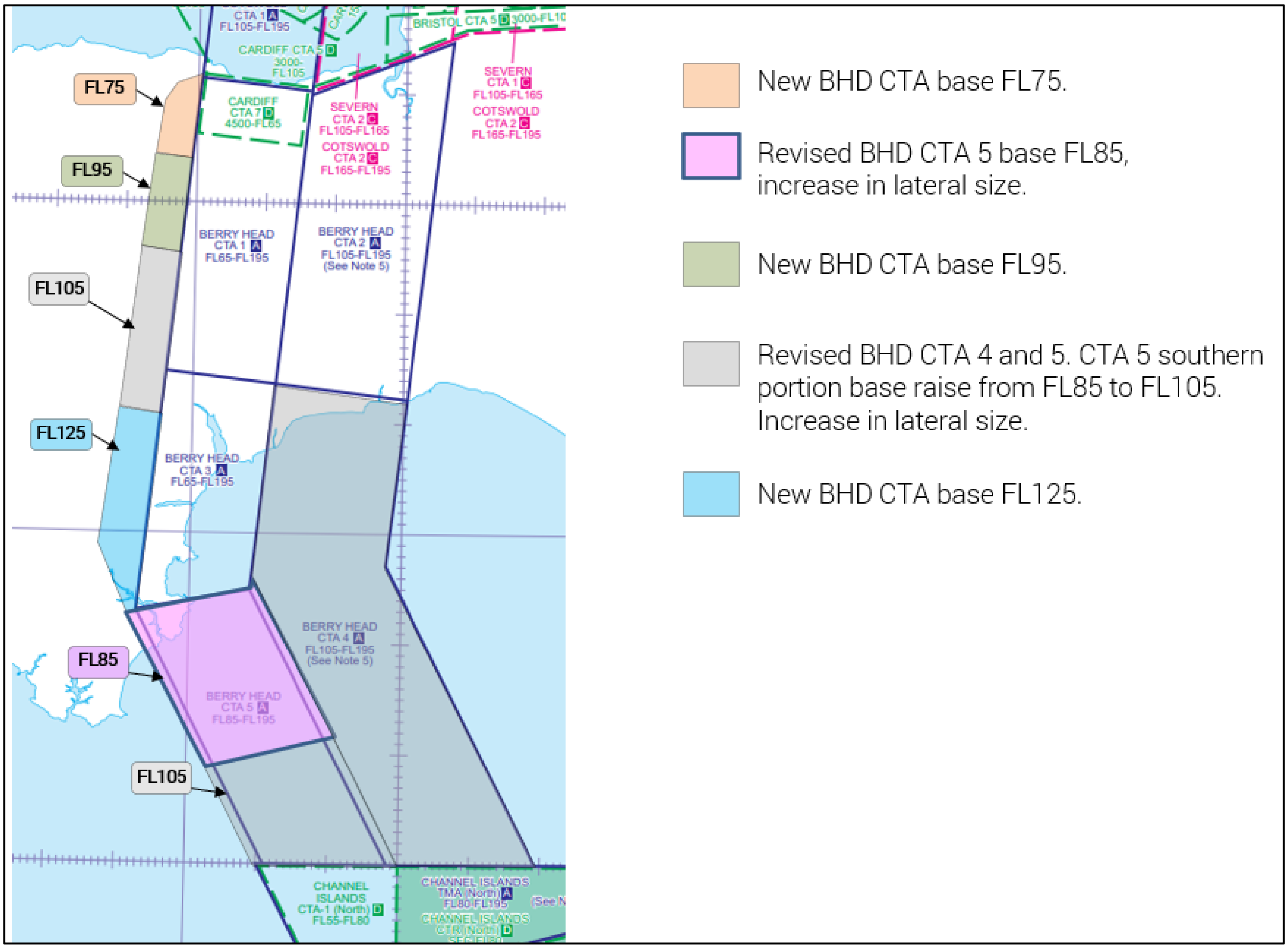

Figure 12 CAS changes: in BHD CTA

The lateral extensions proposed to the Berry Head CTA as shown in Figure 12 and as detailed in Table 8 are required to accommodate the systemised north-south route structure.

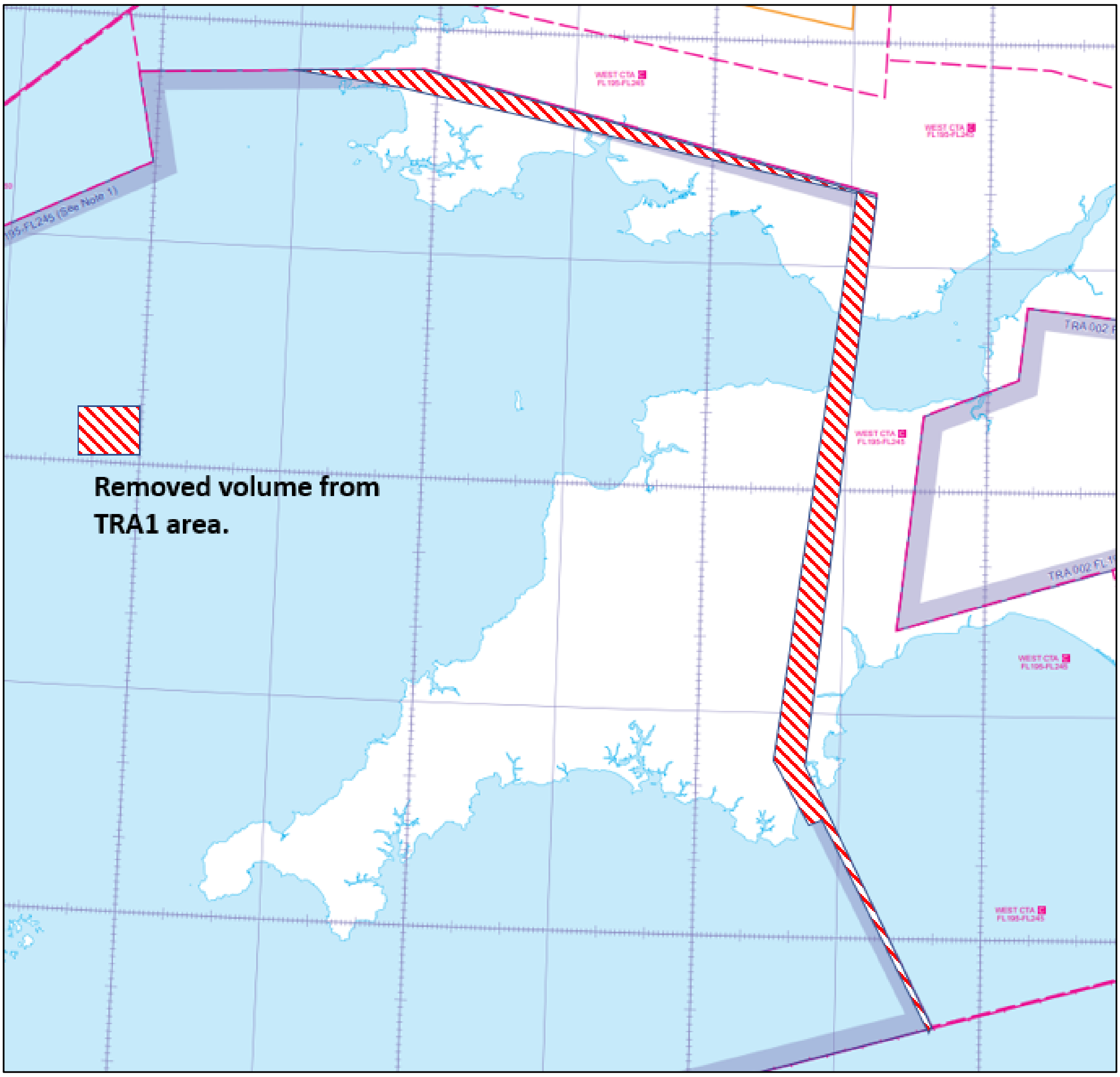

Figure 13 Proposed change to TRA1

The widening of the STU, BHD CTAs require that TRA001 is modified as shown in Figure 13 to match the proposed new boundary.

9. Interface Details

The interfaces of LD1.1 with adjoining airspace are depicted in Figure 14 below. At some of these interfaces there are differences between the Option 4 and Option 6 designs, and these are described in more detail in the following sections.

Additionally, the interface with the overlying free route airspace (FRA) is also described below, giving examples of typical flight profiles to/from example airports.

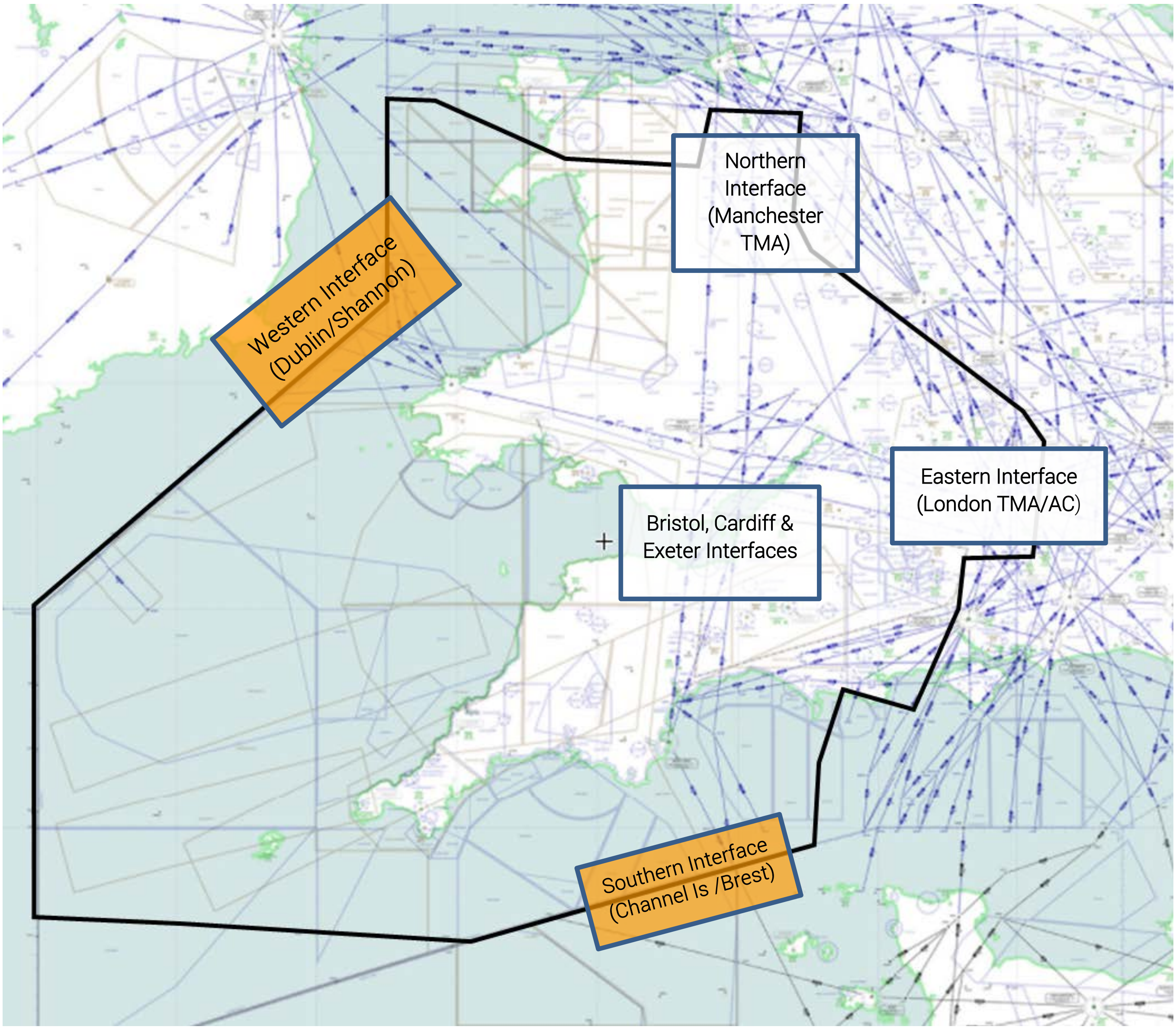

Figure 14: Location of interface options

Note that at the western and southern interfaces (orange coloured) there are differences between Option 4 & Option 6. The designs at the other interfaces are the same for both options.

9.1. FRA Interface - Arrivals

Each airport would have a defined set of FRA Arrival points for descending out of FRA to join the lower ATS route structure, or to leave controlled airspace to arrive at an airport[12]. As in today's operation, these routes may then link to STARs (where available) for the destination airport. Most existing STARs would remain unchanged, some would be truncated to allow connectivity to the proposed network (detailed in the Bristol & Cardiff airport interface sections 10 and 11), however the delivery point of traffic to the airport from all STARs would be unchanged. Each LD1.1 option maintains connectivity between the proposed new routes and existing STARs, and this is described in the interface descriptions below. The FRA Arrival points would be used for flight planning to determine where aircraft would transition from FRA to the systemised route structure below. ATC will endeavour to ensure that the descent profile is optimised and adjust the FRA exit point accordingly to account for aircraft performance and weather considerations.

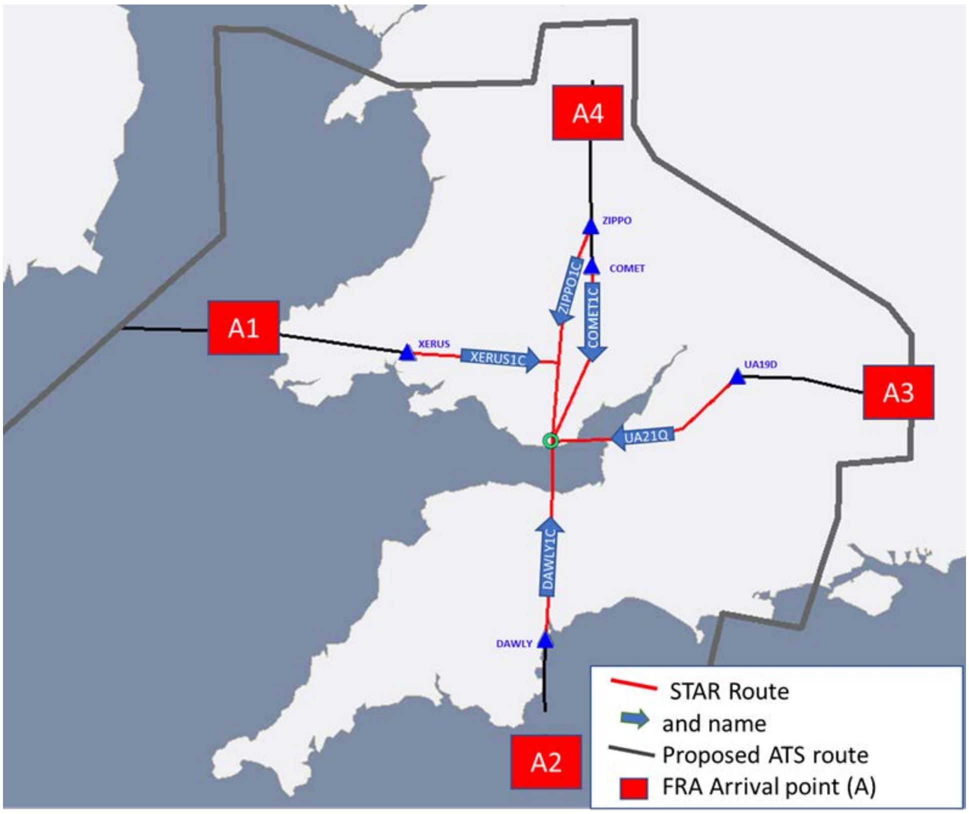

Figure 15 Indicative examples of arrivals to Cardiff

The LD1.1 deployment area affects arrivals for the Severn Group, with the primary airports being Bristol, Cardiff & Exeter, and also connectivity with other airports listed in Appendix A.

Figure 15 shows an indicative example of the proposed arrival structure using Cardiff Airport as the example (Cardiff chosen as the example since arrivals to Cardiff from all directions would have to transition through the LD1.1 airspace).

FRA arrival points for all airports under the LD1.1 area would be detailed in the AIP. When FRA is deployed these would be published in the Route Availability Document (RAD) Appendix 5.

Point	Route below	STAR (named after start point)
A1	E/bound	XERUS 1C
A2	N/bound	DAWLY1C
A3	W/bound	UA21Q
A4	S/bound	COMET1C ZIPPO1C

Table 9 Indicative examples of FRA Arrival points (Cardiff)

[12] This is in accordance with Eurocontrol FRA Guidance v1.0 (June 2019) which describes FRA arrival connectivity.

9.2. FRA Interface - Departures

Each airport would have a defined set of FRA departure points for airport departures to flight plan the entry (climb) from the lower ATS route structure into FRA. Where SIDs are provided currently, the SIDs would end at the same points and connection from the SID to the proposed lower ATS routes network would be provided.

The LD1.1 deployment area affects departures from Bristol, Cardiff & Exeter airports.

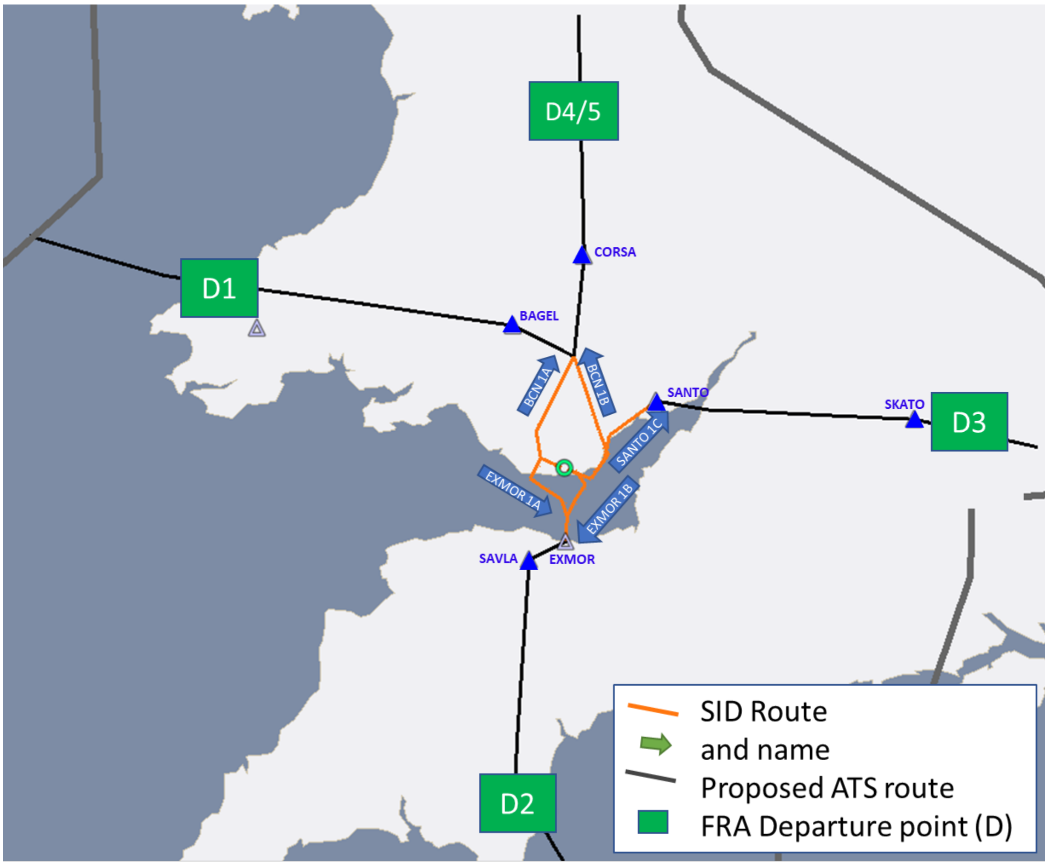

Figure 16 Example of FRA Departure points from Cardiff

Figure 16 show examples of the proposed departure structure using Cardiff as an example.

FRA Departure points for airports under the LD1.1 area would be detailed in the AIP. When FRA is deployed (via ACP-2019-12) these would be published in Appendix 5 of the RAD.

FRA Departure Point	Route direction	SID (end point)
D1	W bound	BCN1A/BCN1B (BCN)
D2	S bound	EXMOR1A/EXMOR1B (EXMOR)
D3	E bound	UA16M (SANTO)
D4	N bound	BCN1A/BCN1B (BCN)
D5	NW bound	BCN1A/BCN1B (BCN)

Table 10 Indicative Examples of departure points (Cardiff)

What will happen to the Standard Route Document (SRD) when FRA is introduced?

We will continue to publish the SRD updates each AIRAC and it will look very similar to today. The difference will be for entries which contain a FRA portion, we will be inserting a new indicator <FRA> to indicate that this portion of routeing is FRA airspace and that the operator may file DCT or via any FRA relevant waypoint in that portion.

Where waypoints are mandated to be used in certain situations, this will also be reflected in the SRD. There are likely to be a high number of mandated waypoints within the West FRA volume. Consequently, there may be less opportunity to insert the <FRA> indicator and a greater number of routes promulgated as waypoint DCT waypoint within the West airspace.

The map in Figure 17 below shows some example FRA routings. Table 11 shows how these routings could be described in the SRD.

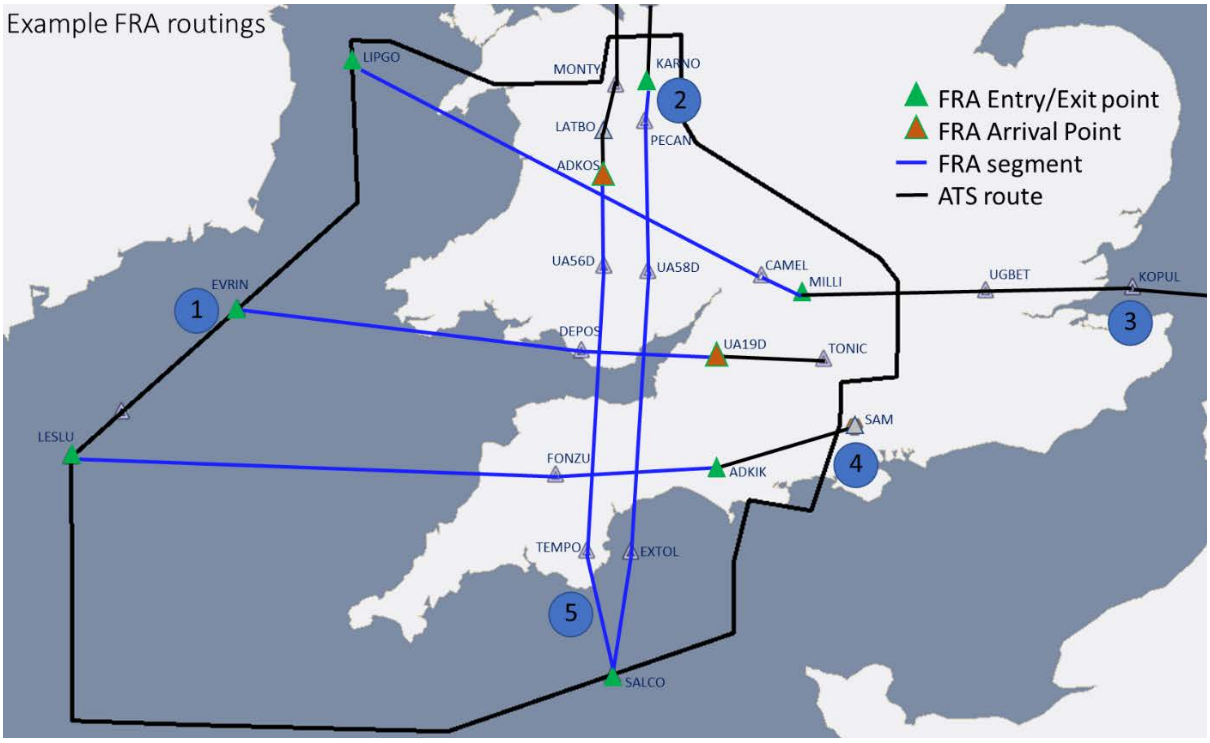

Figure 17 Example FRA routings

Ref	Route	Example FRA routing	Example SRD routing with mandated waypoints
1	Eastbound EVRIN – EGLL	EVRIN <FRA> UA19D P2 TONIC TONIC1H EGLL	EVRIN DCT DEPOS DCT UA19D P2 TONIC TONIC1H EGLL
2	Southbound EGNT – SALCO	KARNO <FRA> SALCO	KARNO DCT PECAN DCT UA58D DCT EXTOL DCT SALCO
3	Westbound KOPUL – LIPGO	RAPIX L610 KOPUL Q60 UGBET UA50E (ROUTE B) MILLI <FRA> LIPGO	RAPIX L610 KOPUL Q60 UGBET UA50E (ROUTE B) MILLI DCT CAMEL DCT LIPGO
4	Westbound EGKK – LESLU	SAM N19 ADKIK <FRA> LESLU	SAM N19 ADKIK DCT FONZU DCT LESLU
5	Northbound SA LCO – EGGP	SALCO <FRA> ADKOS P16 MONTY	SALCO TEMPO UA56D ADKOS P16 MONTY

Table 11 FRA Flight plan examples   KEY: FRA ENTRY POINT FRA ARRIVAL POINT FRA EXIT POINT

Where traffic is joining/leaving FRA to/from an airfield for which there are mandated FRA arrival/departure connecting routes promulgated in the RAD Pan Europe, then this mandated portion will be displayed in the SRD entry, from the FRA Arrival/Departure Points as shown in Example 1 & 5.

For LD1.1 & FRA D2, it may be that there are specific RAD mandated DCTs to avoid danger areas when active. If this is the case, then it is likely that we will publish these as full route strings (waypoint DCT waypoint) in the SRD.

10. Bristol Interface

LD1.1 is progressing on the basis that the start points of STARs would be realigned to connect with the proposed new enroute network. However the end points and traffic delivery from STARs to the airport would remain the same. Bristol Airport has been engaged with and involved in the development of the proposed interface with its arrival and departure procedures (see Appendix A). Engagement and detailed design work with Bristol has ensured that the proposed LD1.1 network will allow Bristol's future design aspirations to be accommodated. Note: if any subsequent changes to the network are necessary to facilitate connectivity these could be progressed via the LD1.2 ACP.

10.1. Arrivals

Due to the changes in the enroute network there would be some realignment of the STARs into Bristol. This would only affect the initial portion of the STARs and would not change any routes below 7,000ft.,

Engagement with Bristol and Cardiff airports led to discussions about potential changes to arrival routes. The proposed changes are described fully in Table 12 below.

We are consulting on realigning Bristol's STARs to connect to the new route structures described in Option 4 and Option 6 (Sections 6 and 7). See Table 12 for a summary of the changes, and Figure 18 and Figure 19 for maps illustrating the proposed changes.

From the north, the STARs would be re-aligned to connect to the new route structure.

From the east, changes to the STAR to be realigned via TENON– BRI were discussed. This offered potential benefits with reduced complexity and improved separation between Cardiff/Bristol arrivals. As this would have changed the position of traffic below 7,000ft, which is outside of the scope of this ACP, the proposed option presented here replicates the current STAR as closely as possible. This strikes the balance of systemisation of routes into S23 and not changing any flight profiles below 7,000ft.

From the west, a new STAR would be added connecting to the new route structure and would start at XERUS. The RNAV5 FIFAH 1B STAR would remain unchanged for use only by RNAV5 traffic, with connectivity provided by DCTs.

From the south, discussions were held with Bristol and Cardiff to explore the possibility of a new STAR further west than the current STAR, via JESSS – EXMOR – BRI/CDF, which optimises systemisation. Simulation of this design showed that it would change the position of traffic below 7,000ft, so was not considered viable within the scope of this ACP. The proposed STAR from the South would closely replicate the current STAR, with a slight realignment of the start point to maximise efficiency. (Aircraft would typically be above FL180 on this portion of the STAR).

All STARs would be named in line with ICAO naming conventions, based on starting waypoint and the 'B' designator used to denote the destination airport (Bristol)

Proposed amendment to Bristol STARs are listed in Table 12 below and shown in Figure 18 & Figure 19 overleaf:

Procedure	STAR PBN type	Ave flts (per day unless other period stated)[13]	Current route/ Connecting point	Proposed route/ Connecting Point	Change
AMRAL 1B	RNAV5	16	N862/: RETSI – AMRAL – RILES – DOBEM - BRI	Route Y (UA54E): COMET – TAPET – INGUR - BRI	Start segments re-aligned via new points COMET and TAPET to connect to route Y. Renamed COMET 1B.
UMOLO 1B	RNAV5	0 (3 per annum)	N864: UMOLO – TALGA - BCN - BRI	Route Y (UA54E) ZIPPO – CORSA – BCN - BRI	Start segments re-aligned via new points ZIPPO and CORSA to connect to route Y. Renamed ZIPPO 1B.
XERUS 1B	RNAV1	7	-	Route C (UA49E): XERUS – BCN - BRI	New STAR
FIFAH 1B	RNAV5	0 (2.6 per week)	Q63: STU, AMMAN, BCN, BRI	PETAL DCT FIFAH - BCN - BRI	No change to STAR, connecting route re-aligned
BRI 1C	Conv	0	L9: CPT, POMAX, BRI	Withdrawn	STAR Withdrawn
UA14Q	RNAV5	37		Route C (UA49E): UA16D POMAX BRI	New STAR
DAWLY 1B	RNAV5	29	N864: DAWLY – EXMOR - BRI	Route X (UA53E) DAWLY-PORUT-IZLAW-EXMOR – BRI	Realigned via two intermediate points PORUT and IZLAW, renamed DAWLY 2B.

Table 12 Proposed amendments to Bristol STARs

[13] All statistics for average flights per day in this document are derived from 1 year of traffic data for calendar year 2019.

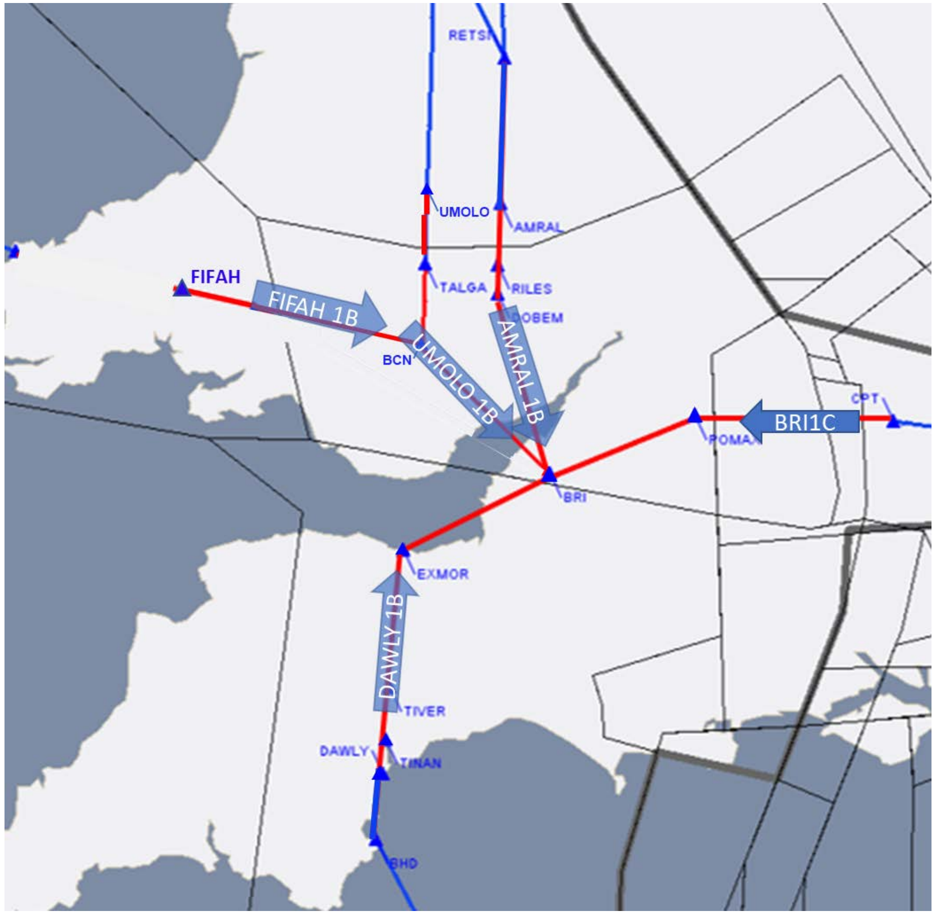

Figure 18 Bristol Baseline: Extant Arrival Connectivity

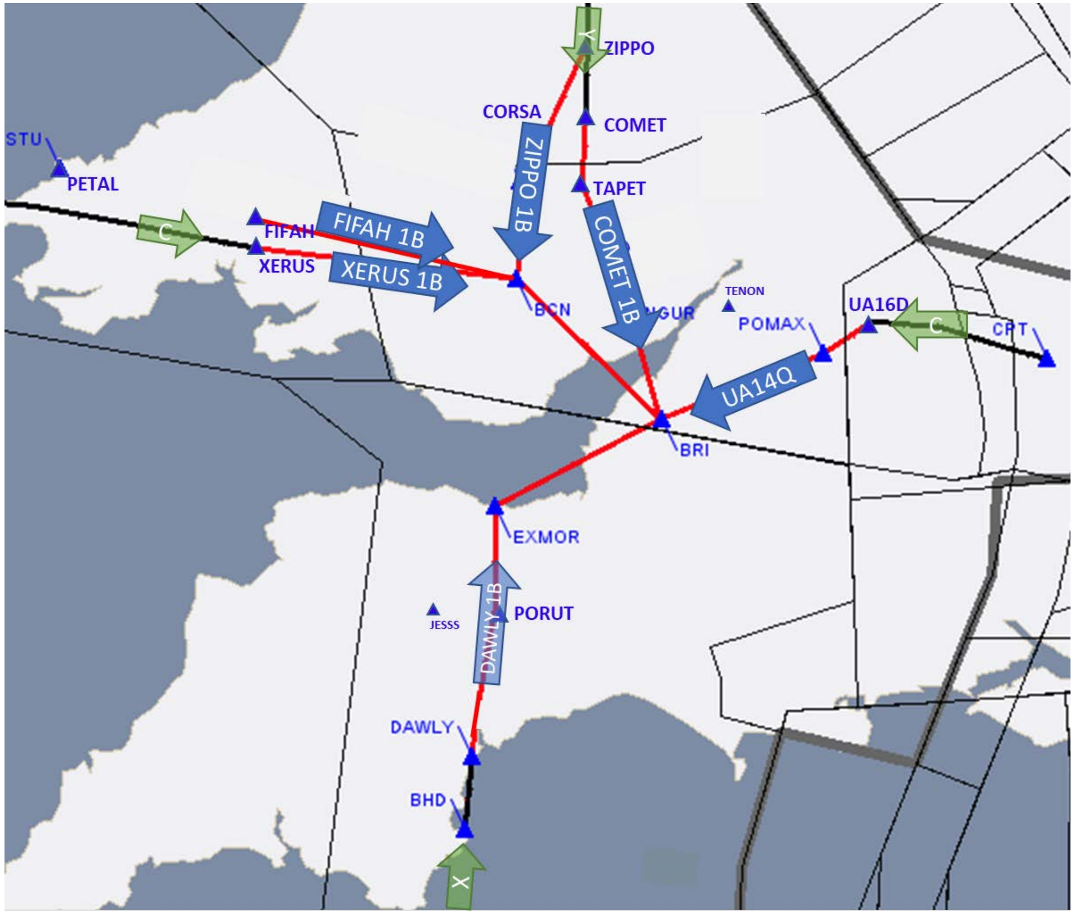

Figure 19 Bristol - Proposed Arrival Connectivity

10.2. Departures

The Bristol SIDs are listed in Table 13 below. Those requiring changes are indicated in blue. (Note that SIDs suffixed with Z are departures using runway 09 and those suffixed X are departures using runway 27.) We are consulting on truncating two of the existing conventional SIDs in order to interface with the proposed enroute network.
Figure 22 and Figure 23 overleaf show the current and proposed departure procedures.

Procedure	SID PBN type	Ave flts per day	Current route/ Connecting point	Proposed route/ Connecting Point	Change
BCN 1X	Conv	17	BRI (west), BCN connect with Q63 w/bound, N864 n/bound	BRI (west) – BCN n/bound connect with Route X via CORSA; w/bound connect Route B via BAGEL	No change to SID.
BCN 1Z	Conv	7	BRI, east, BCN connect with Q63 w/bound, N864 n/bound	BRI (east) BCN n/bound connect with Route X via CORSA; w/bound connect Route B via BAGEL	No change to SID.
BADIM 1X	Conv	23	BRI, west BADIM, connect with Q63	BRI, west, AZLON, connect with Route D	SID truncation, rename to AZLON 1X
WOTAN 1Z	Conv	12	BRI, east WOTAN, connect with Q63	BRI, east, INGOT, connect with Route D	SID truncation, rename to INGOT 1Z
EXMOR 1X	Conv	19	BRI, west, SOMOT, EXMOR, connect with N864 s/bound	BRI, west, EXMOR, connect with Route W s/bound via SAVLA	No change to SID.
EXMOR 1Z	Conv	8	BRI, east, SOMOT, EXMOR, connect with N864 s/bound	BRI, east, EXMOR, connect with Route W s/bound via SAVLA	No change to SID.

Table 13: Proposed amendments to Bristol SIDs

The BCN 1X/1Z and EXMOR 1X/1Z conventional SIDs from Bristol would be unchanged. From the SID end points (BCN & EXMOR) there would be improved connectivity to the enroute network.

The BADIM 1X & WOTAN 1Z SIDs for departures to the east, would be truncated to allow connectivity to the proposed route network (to connect to route D). The BADIM & WOTAN SID is shown in Figure 20, and the network connections (current and proposed) are shown in Figure and Figure . The proposed truncation points are coincident with the extant FL80 altitude restriction points on the BADIM1X/WOTAN1Z SIDs Aircraft currently must be at or above FL80 at these points. As such truncation of the SIDs at these points would not change the profile of flight-paths below 7000ft. Currently virtually all aircraft are vectored off the SID (most to the east) and do not fly to the end of the SIDs via BADIM/WOTAN. Hence truncation of these SIDs would not alter traffic patterns below 7,000ft.

A slide presentation showing the position of departures from Bristol at key altitudes is available on the consultation website here. Figure is an excerpt from this, showing the flight paths of departures between FL80-100.

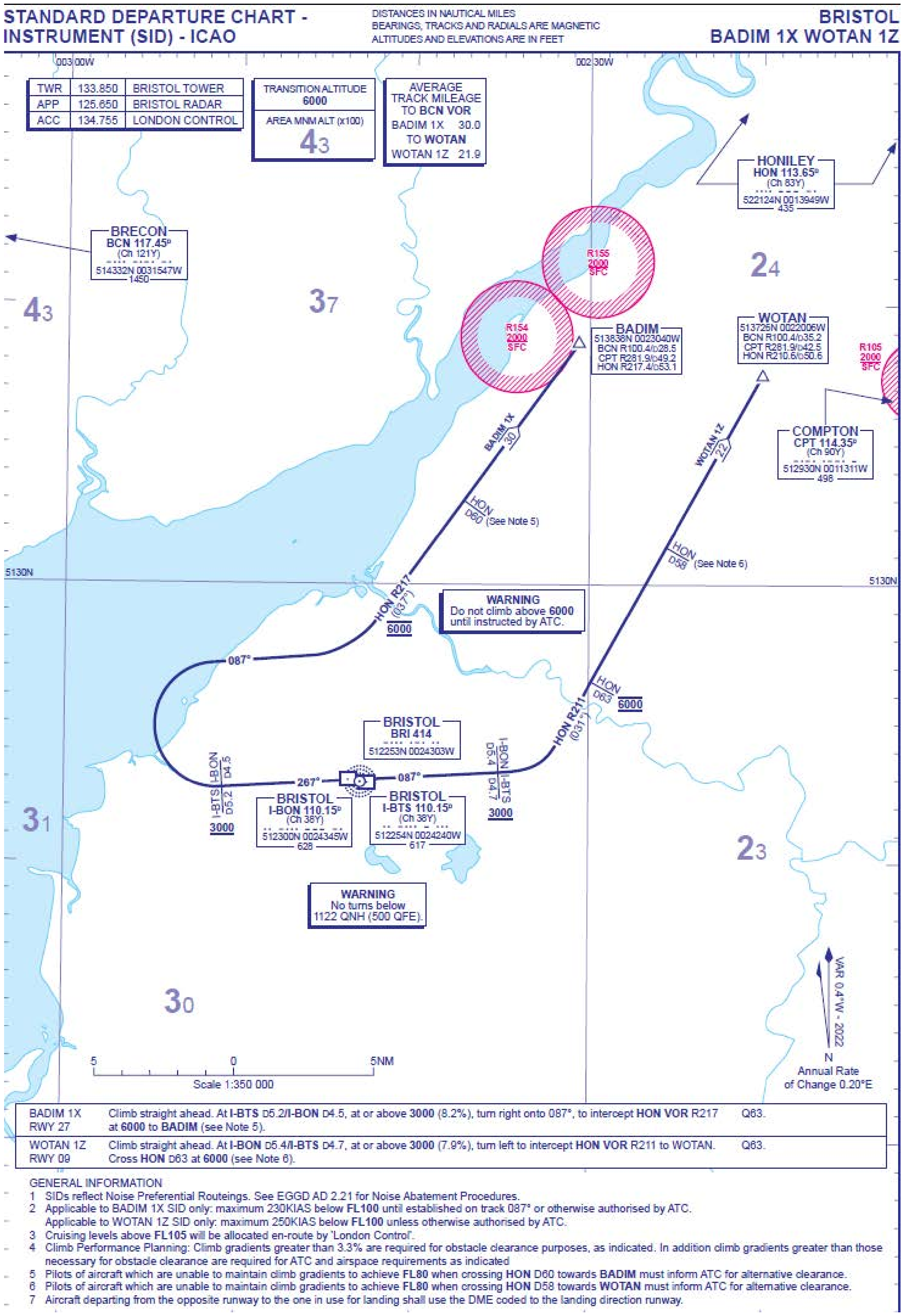

Figure 20 Extant Bristol BADIM 1X WOTAN 1Z SIDs

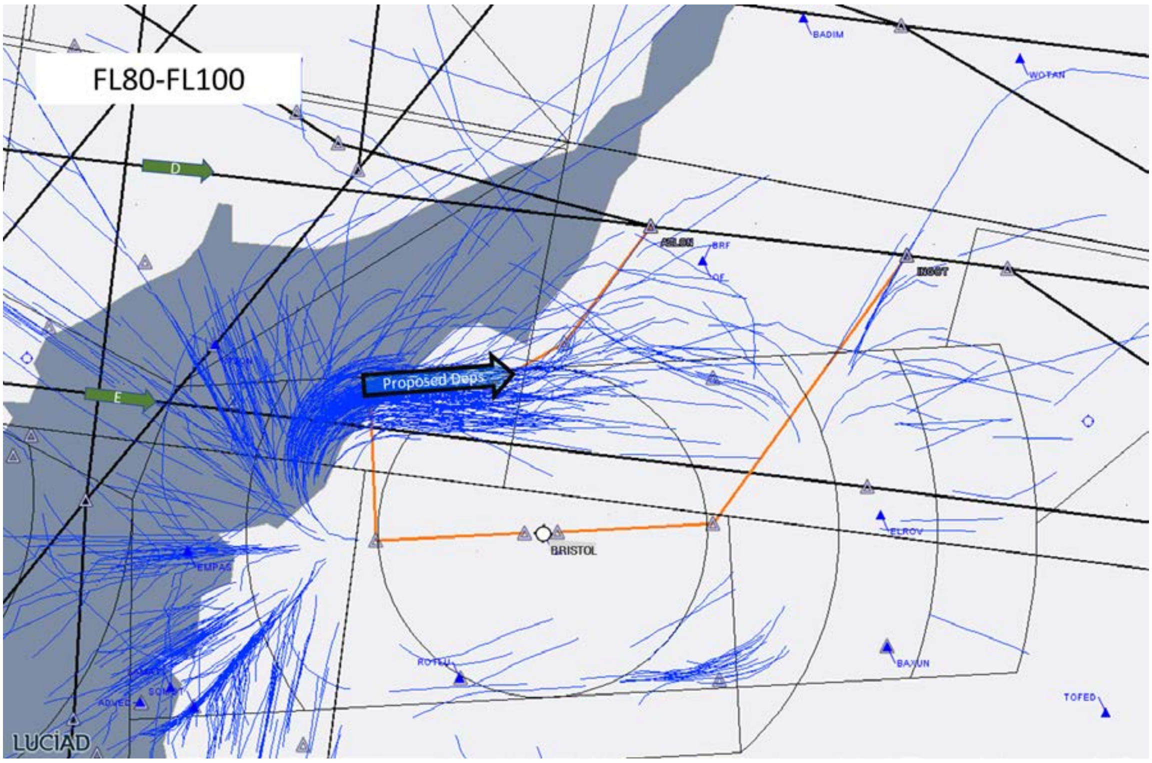

Figure 21 Bristol departures FL80-100, and proposed truncated SIDs

Impact Assessment

For the Bristol interface there is no diff between Option 4 and Option 6. For overall impacts see Section 17.

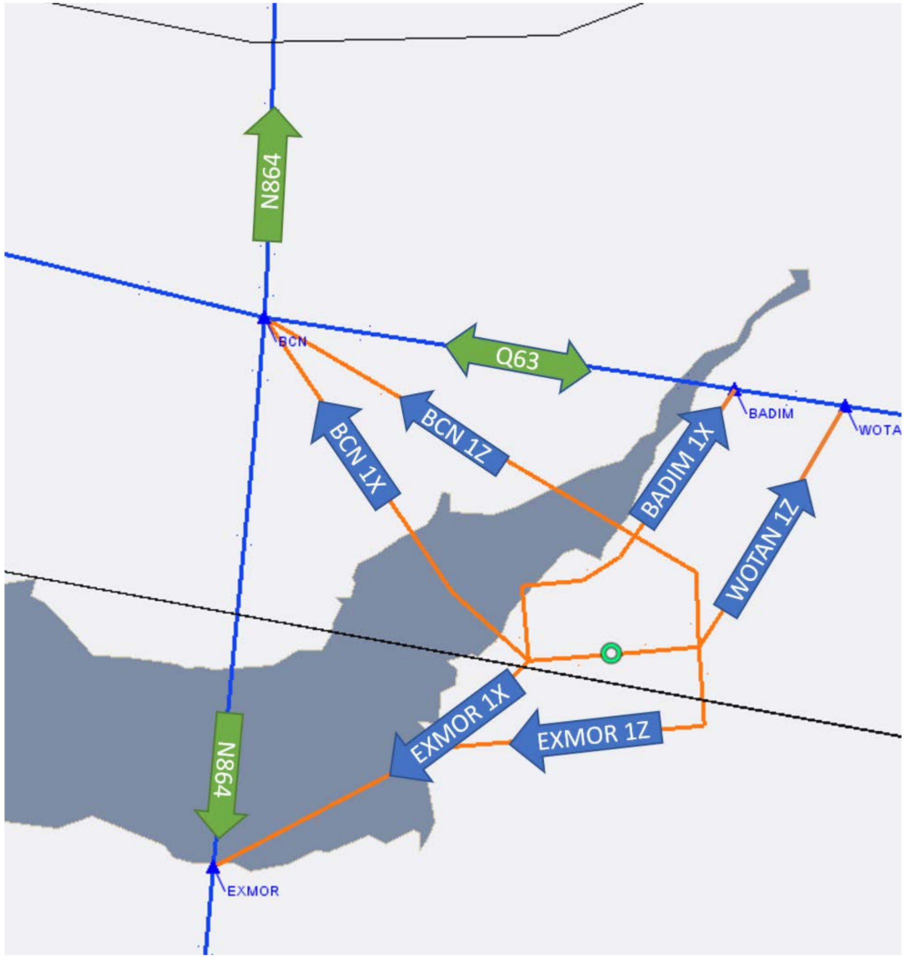

Figure 22 Bristol Baseline: Extant Departure Connectivity

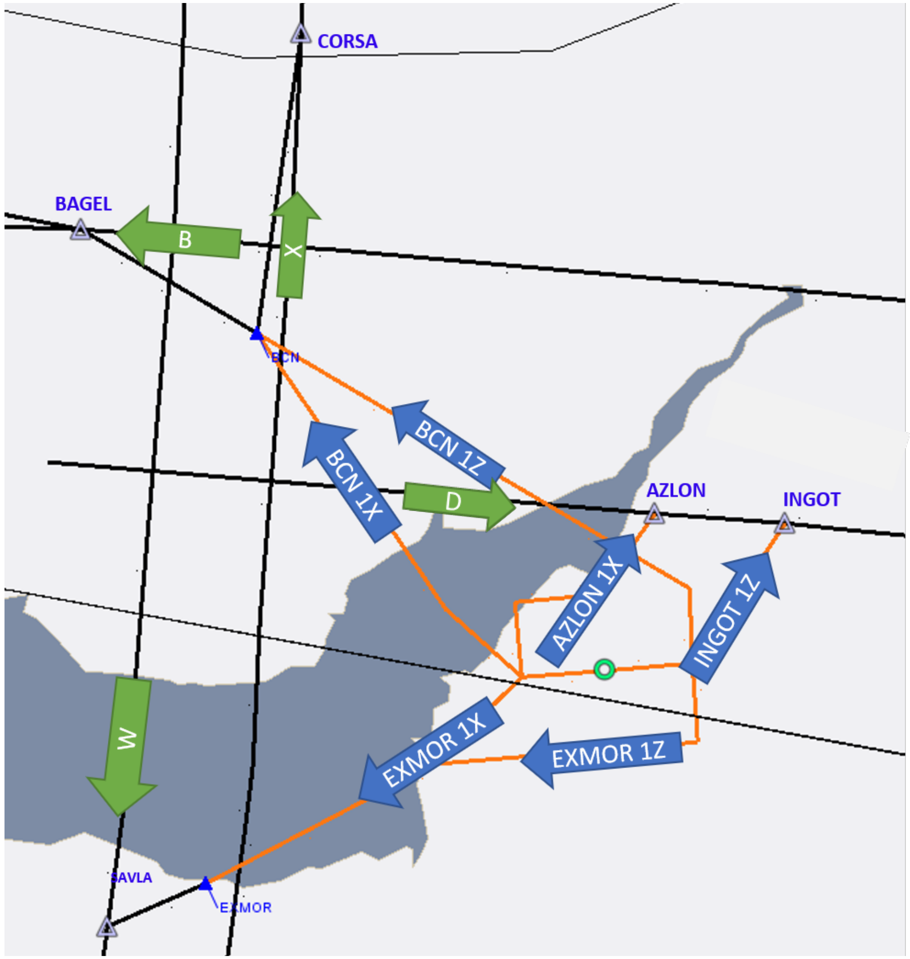

Figure 23 Bristol Proposed Departure Connectivity

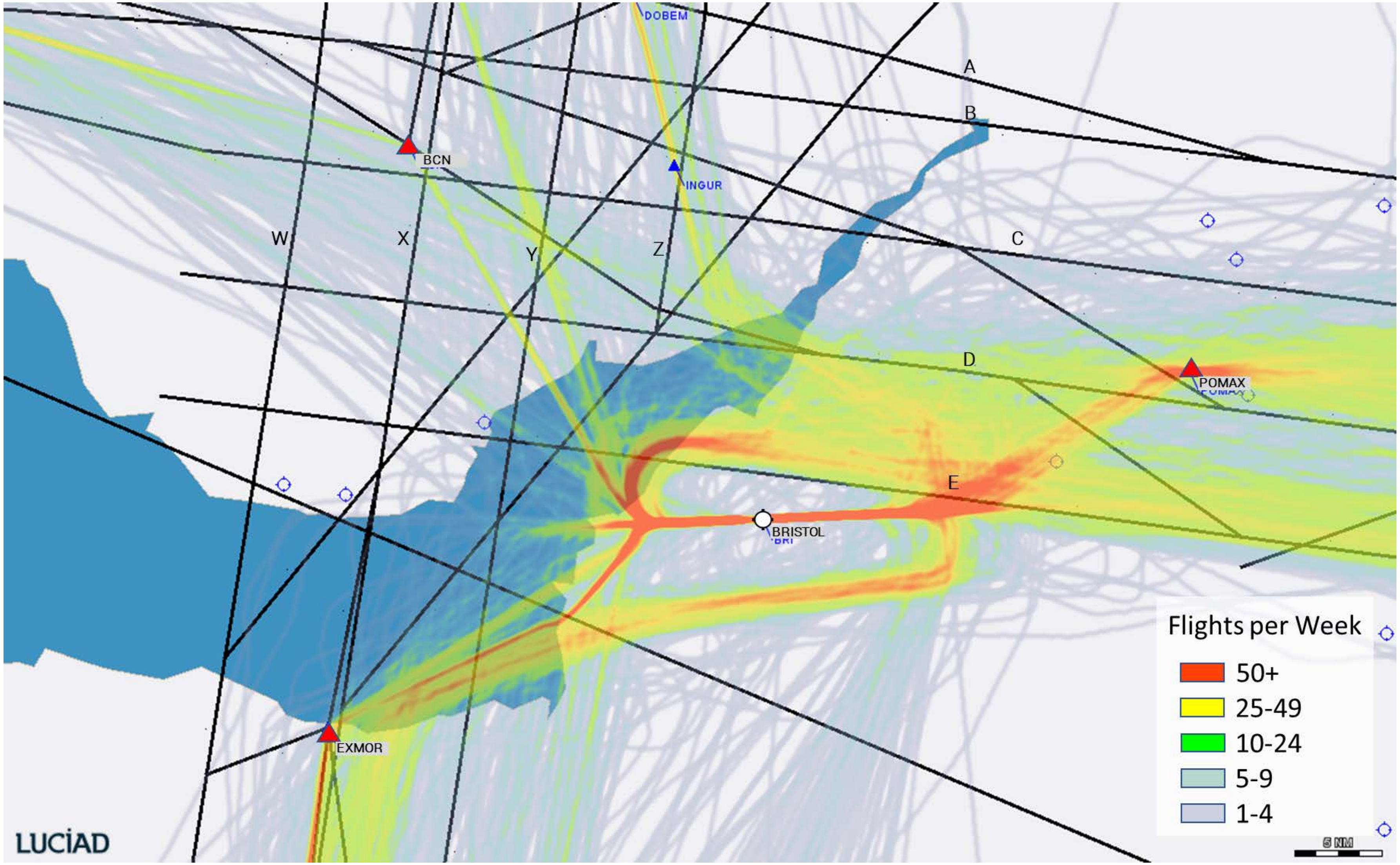

Figure 24 Bristol Current flight path pattern (1 week – Aug 2019 data, below FL245, arrivals and departures)

Figure above shows the typical current day pattern of flight paths to/from Bristol airport, with most flights routing via EXMOR, POMAX or BCN. The black lines are the proposed LD1 route structure. Inside the EXMOR-POMAX-BCN area no change to Bristol arrival and departure flight profiles is anticipated.

11. Cardiff Interface

LD1.1 is progressing on the basis that the start points of STARs would be realigned to connect with the proposed new enroute network. However the end points and traffic delivery from STARs to the airport would remain the same. Cardiff Airport has been engaged with and involved in the development of the proposed interface with its arrival and departure procedures (see Appendix A). Engagement and detailed design work with Cardiff has ensured that the proposed LD1.1 network will allow Cardiff's future design aspirations to be accommodated. Note: if any subsequent changes to the network are necessary to facilitate connectivity these could be progressed via the LD1.2 ACP.

11.1. Arrivals

LD1.1 is progressing on the basis that the start points of STARs would be realigned to connect with the proposed new enroute network. However the end points and traffic delivery from STARs would remain the same. The proposed changes to STARs would only affect the initial portion of the STARs and would not change any routes below 7,000ft.

Engagement with Bristol and Cardiff airports led to discussions about potential changes to arrival routes. The proposed changes are described fully in Table 14 below, and see Figure 18 and Figure 19 for the extant and proposed arrival routes.

From the north, the STARs would be aligned to the new route structure, which requires a truncation of the CDF 1A STAR and an extension of the CDF 1E STAR.

From the East, changes to the STAR to be realigned via TENON – KUKIS – CDF were discussed. This offered potential benefits with reduced complexity and improved separation between Cardiff/Bristol arrivals. As this would have impacted traffic below 7,000ft, which is outside of the scope of this ACP, the proposed option presented here replicates the current STAR. This facilitates systemisation of routes into the adjacent air traffic control sector (Sector 23) and would not change any flight paths below 7,000ft.

From the west, the STAR would be truncated to align to the new route structure and would start at FIFAH and XERUS.

From the south, discussions were had with Bristol and Cardiff for a new STAR further west than the current STAR, via JESSS – EXMOR – BRI/CDF, which optimises systemisation. Simulation of this design has shown it would have the potential to change traffic below 7,000ft, so is not viable within the scope of this ACP. The proposed STAR from the south would closely replicate the current STAR, with a slight realignment (at the start where aircraft are) to maximise efficiency.

From the north, the initial AMRAL 1C STAR segment would be re-aligned via new points COMET and TAPET to connect to route Y and renamed COMET 1C. The UMOLO 1C would be re-aligned via new points ZIPPO and CORSA to connect to route Y and renamed ZIPPO 1C. (see Figure 26 below).

All STARs would be re-named in line with ICAO naming conventions, based on starting waypoint and the 'C' designator used to denote the destination airport (Cardiff).

There is no difference in the benefits between Option 4 and 6. See section 7.1.

Proposed amendment to Cardiff STARs are listed in Table 14 below and shown in Figure 25 and Figure 26.

Procedure	STAR PBN type	Ave flts per day	Current route/ Connecting point	Proposed route/ Connecting Point	Change
AMRAL 1C	RNAV5	5	N862/N42: RETSI – AMRAL – RILES – DOBEM - CDF	Route Y (UA54E): COMET – TAPET – WAXEN – KUKIS- CDF	Start segments re-aligned via new points COMET and TAPET to connect to route Y. Renamed COMET 1C.
UMOLO 1C	RNAV5	1	N864: TALGA, BCN, CDF (via N864 when N862 out of service)	Route Y (UA54E) ZIPPO – CORSA – BCN - CDF	Start segments re-aligned via new points ZIPPO and CORSA to connect to route Y. Renamed ZIPPO 1C.
XERUS 1C	RNAV1		-	Route C (UA49E): XERUS – BCN - CDF	New STAR
FIFAH 1C	RNAV5	3	Q63: STU, AMMAN, BCN, CDF	Route C (UA49E): XERUS – BCN - CDF	No change to STAR, connecting route re-aligned
CDF 1C	Conv		L9: CPT – ABDAL – BRI - CDF	Withdrawn	STAR Withdrawn
UA21Q	RNAV5	10		Route C (UA49E): UA31D - UA19D - BRI - CDF	New STAR
DAWLY 1C	RNAV5	6	N864: DAWLY – IZLAW – EXMOR - CDF	Route X (UA53E): DAWLY – PORUT – IZLAW - EXMOR -CDF	Realigned via intermediate point, re-named DAWLY 2B

Table 14 Proposed amendments to Cardiff STARs

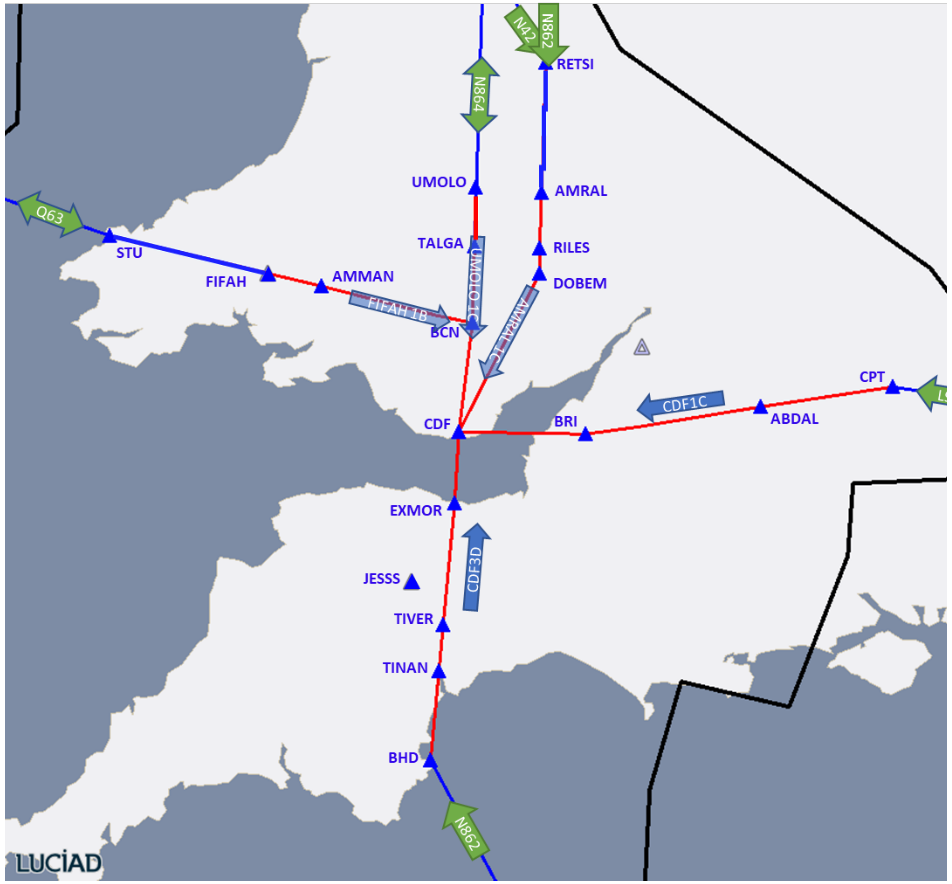

Figure 25 Cardiff extant arrival connectivity

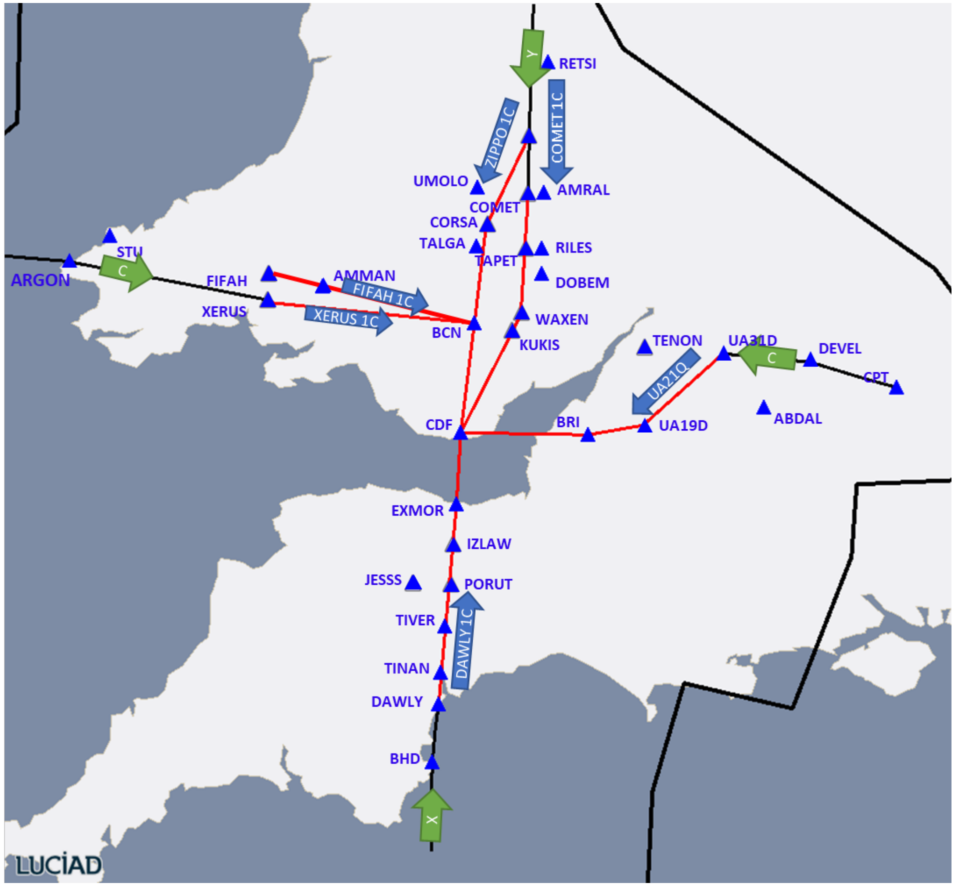

Figure 26 Cardiff proposed arrival connectivity

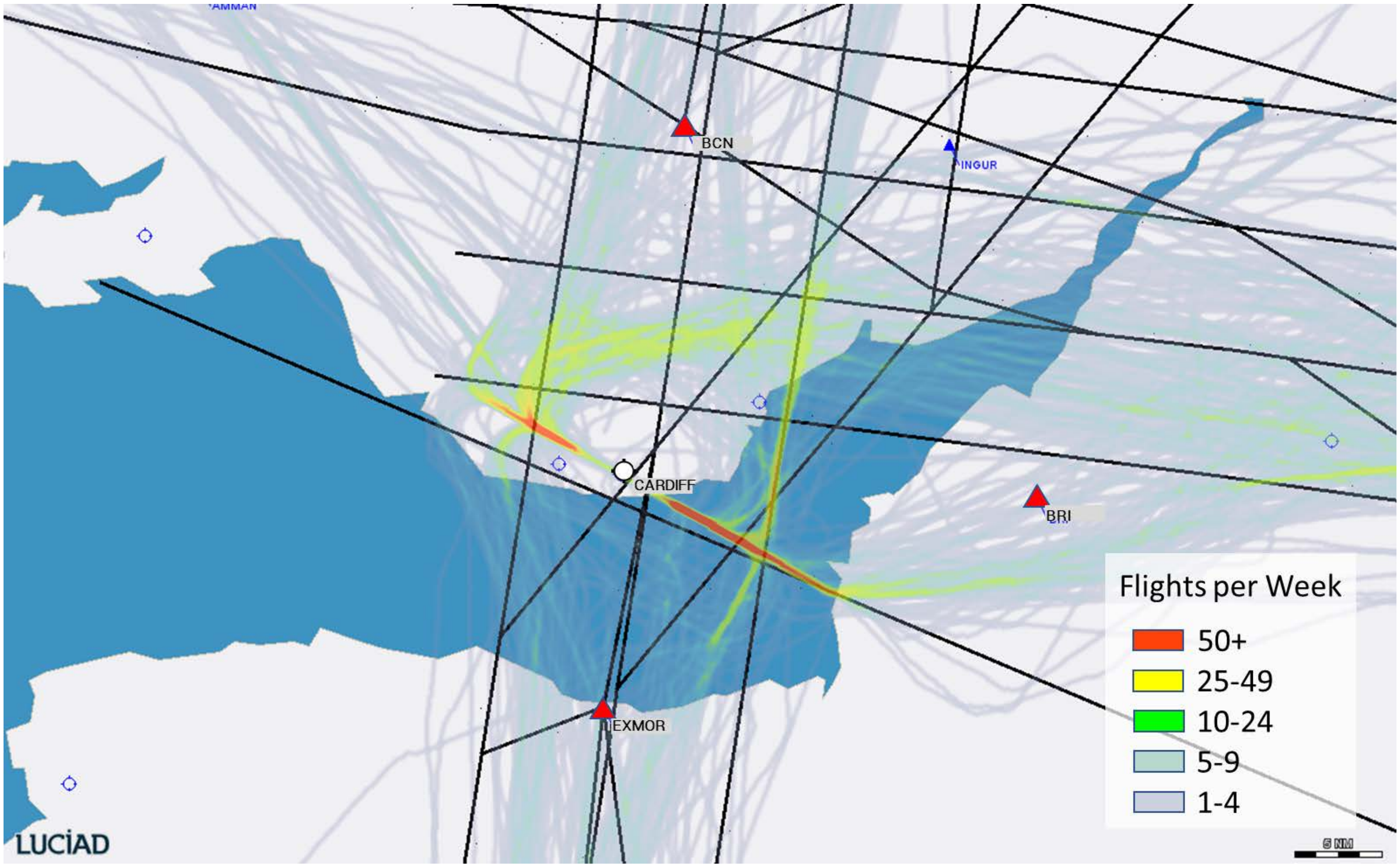

Figure 27 Cardiff, Extant flight paths shown over proposed route structure (1 week – Aug 2019 data, below FL245, arrivals and departures)

Figure above shows the typical current day pattern of flight paths to/from Cardiff airport, with most flights routing via EXMOR, BCN or BRI. The black lines are the proposed LD1 route structure. It is expected that inside the EXMOR/BCN/BRI area there would be no change to Cardiff arrival and departure flight profiles.

11.2. Departures

The Cardiff SIDs are listed in Table 15 below and see Figure 30 and Figure 31 for the extant and proposed arrival routes.. Those suffixed A correspond to departures from Runway 30, those suffixed B correspond to departures from runway 12. Only the ALVIN 1B requires changes.

There would be no changes to the BCN and EXMOR SIDs from Cardiff. From the SID end point there would be improved connectivity to the enroute network.

To the east (CPT area) there would be a requirement for a SID truncation to allow connectivity to the proposed route network, as described below:

Procedure	SID PBN type	Ave flts per day	Current route/ Connecting point	Proposed route/ Connecting Point	Change
BCN 1A	Conv	11	CDF (west), BCN connect with Q63 w/bound, N864 n/bound	CDF (west) – BCN n/bound connect with Route X via CORSA; w/bound connect Route B via BAGEL	No change to SID.
BCN 1B	Conv	5	CDF, east, BCN connect with Q63 w/bound, N864 n/bound	CDF (east) BCN n/bound connect with Route X via CORSA; w/bound connect Route B via BAGEL	No change to SID.
ALVIN 1B	RNAV1	3	CDF, ALVIN, connect with Q63 eastbound	CDF, west, SANTO, connect with Route D via AZLON	SID truncation, rename SANTO 1C
EXMOR 1A	Conv	4	CDF, west, EXMOR, connect with N864 s/bound	BRI, west, EXMOR, connect with Route W s/bound via SAVLA	No change to SID.
EXMOR 1B	Conv	2	CDF, east, EXMOR, connect with N864 s/bound	BRI, east, EXMOR, connect with Route W s/bound via SAVLA	No change to SID.

Table 15 Proposed amendments to Cardiff SIDs

The Cardiff ALVIN 1B SIDs for departures to the east, would be truncated to allow connectivity to the proposed route network (to connect to route D). The extant ALVIN 1B SID is shown in Figure 28, and the network connections (current and proposed) are shown in Figure 30 and Figure 31. The proposed truncation point (SANTO) is north of route D hence a link route to the south east connects the end of the proposed SID to route D at AZLON. Aircraft flying the ALVIN 1B SID pass the proposed truncation point at between FL120-FL140 currently, hence it is clear that truncation of this SID will not change any flight profiles below 7,000ft. Currently most eastbound aircraft are vectored off the SID (which keeps them over the Severn Estuary). Truncation of these SIDs would not alter traffic patterns below 7,000ft.

A slide presentation showing the position of departures from Cardiff at key altitudes is available on the consultation website here. Figure 29 is an excerpt from this, showing the flight paths of departures between FL80-100.

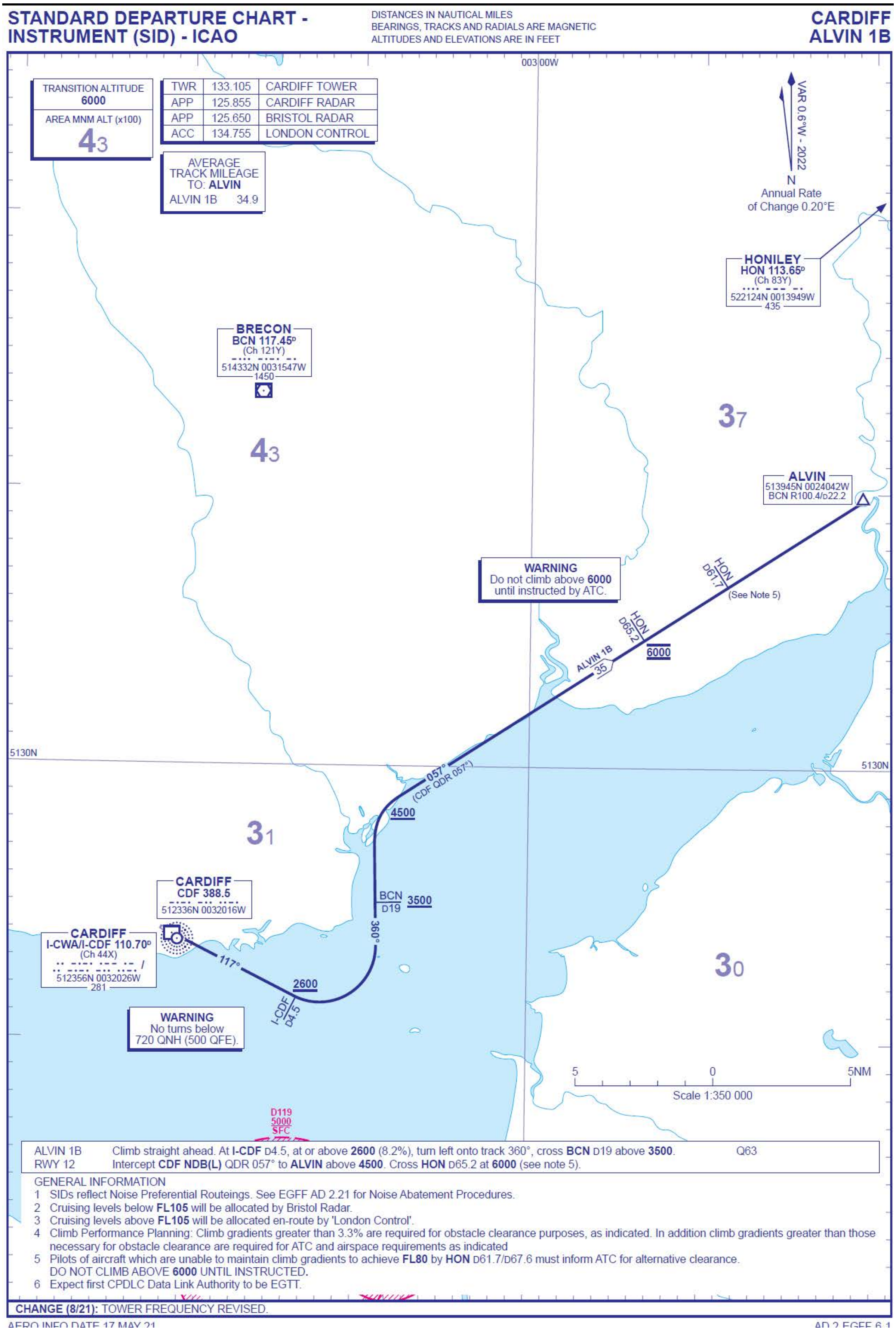

Figure 28 Extant Cardiff ALVIN 1B SID

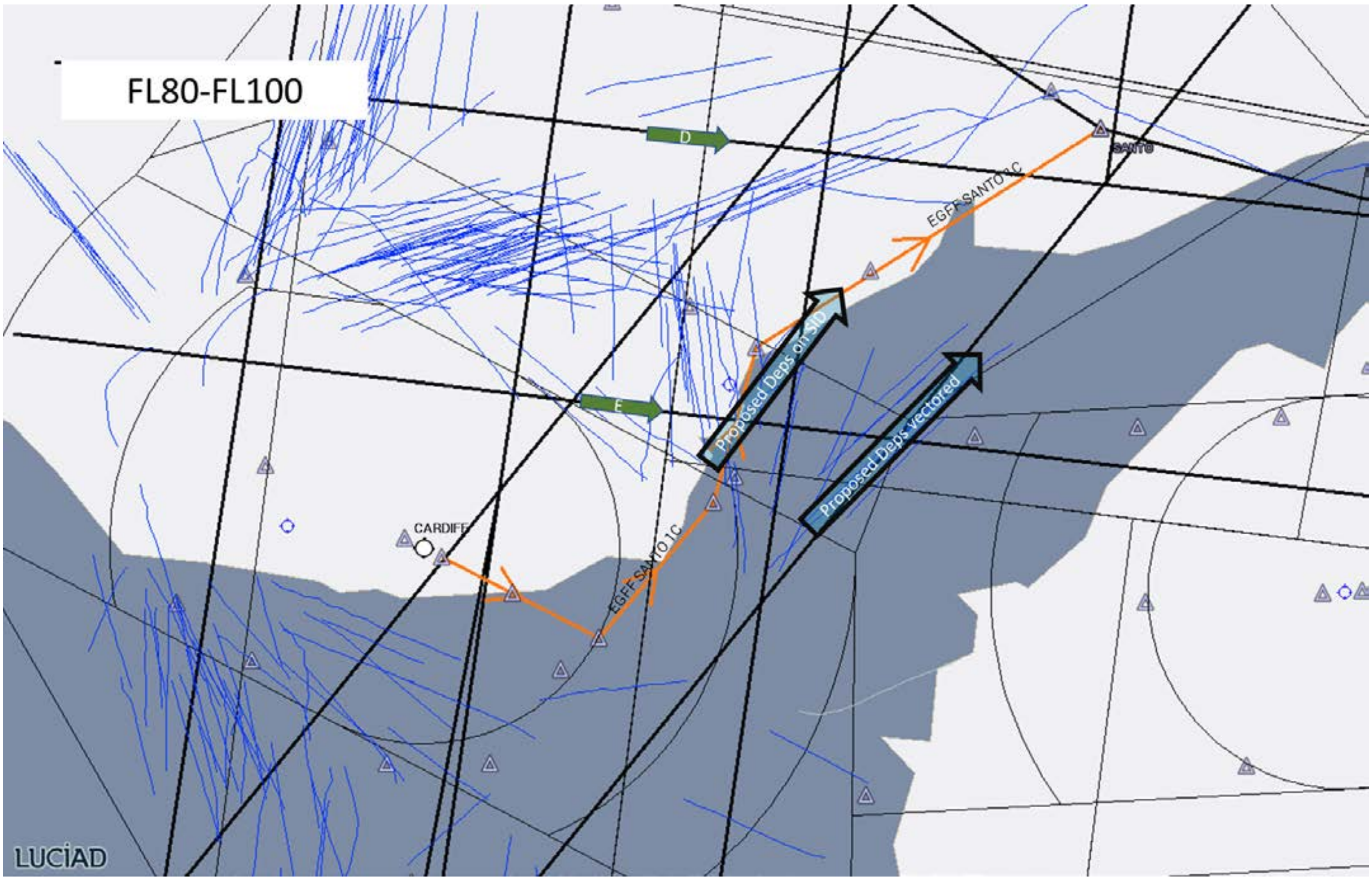

Figure 29 proposed Cardiff SANTO 1C SID (extant flight trajectories FL80-FL100)

Impact Assessment

For the Cardiff interface there is no diff between Option 4 and Option 6. For overall impacts see Section 17.

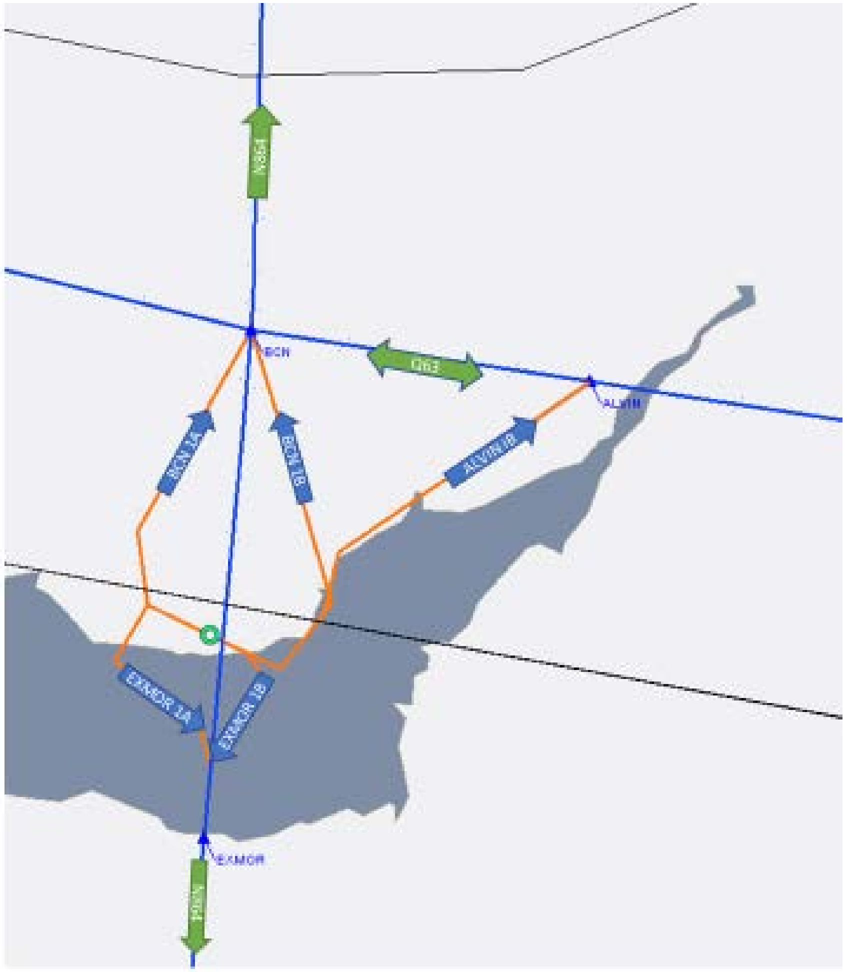

Figure 30 Cardiff Extant Departure Connectivity

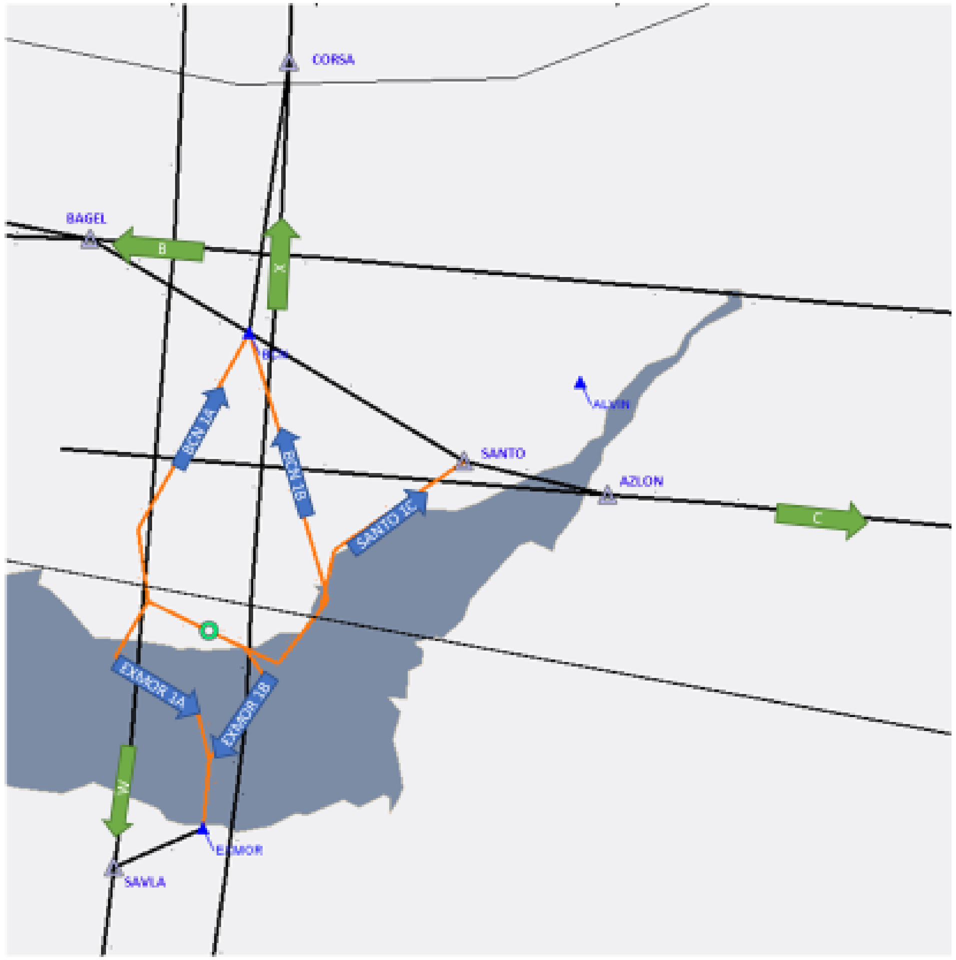

Figure 31 Cardiff Proposed Departure Connectivity

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12. Exeter Interface

LD1.1 is progressing on the assumption that the existing arrival/departure procedures would remain. During the stage 2 engagement with Exeter Airport NATS and Exeter agreed that the proposed network can allow Exeter's future design aspirations to be accommodated. (See Exeter's engagement response in Ref 5.) Note: if any subsequent changes to the network are necessary to facilitate connectivity these could be progressed via the LD1.2 ACP.

As Exeter is outside CAS, traffic would continue to join/leave at the same positions as today, EXMOR, BHD, GIBSO/SAM. Therefore there is no change proposed to the Exeter operations.

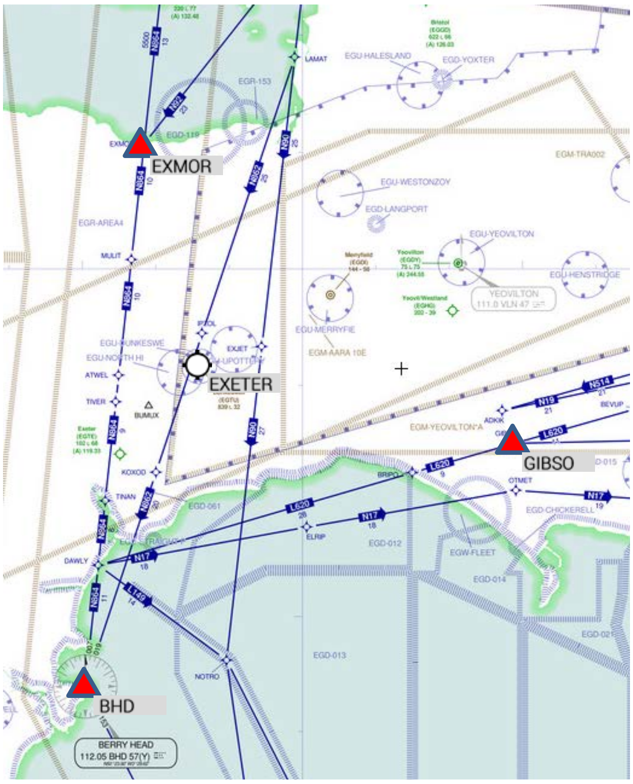

Figure 32 Exeter Extant Connectivity

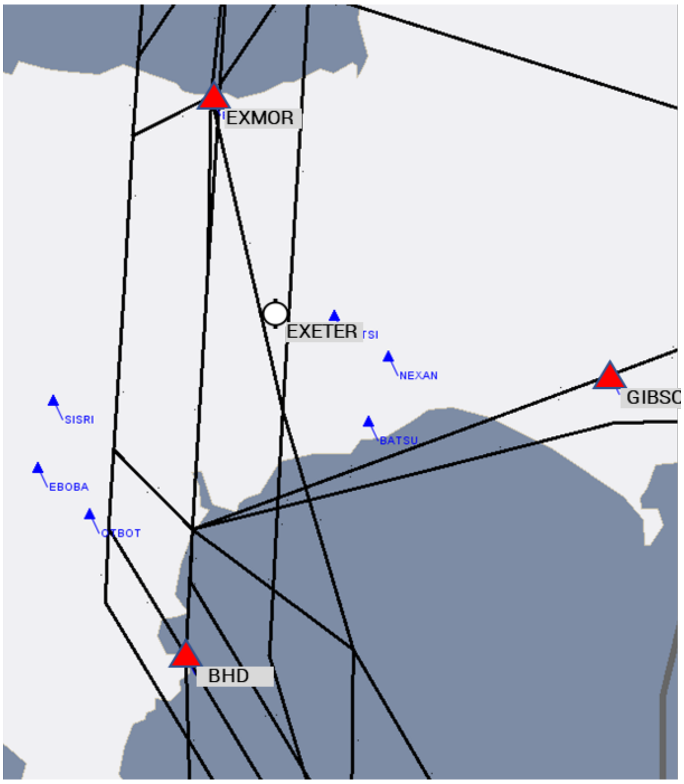

Figure 33 Exeter Proposed Connectivity

Figure 32 and Figure 33 show the current and proposed ATS route structure in the vicinity of Exeter Airport, with the main connection points to the ATS route network of EXMOR, GIBSO and BHD (Berry Head) identified.

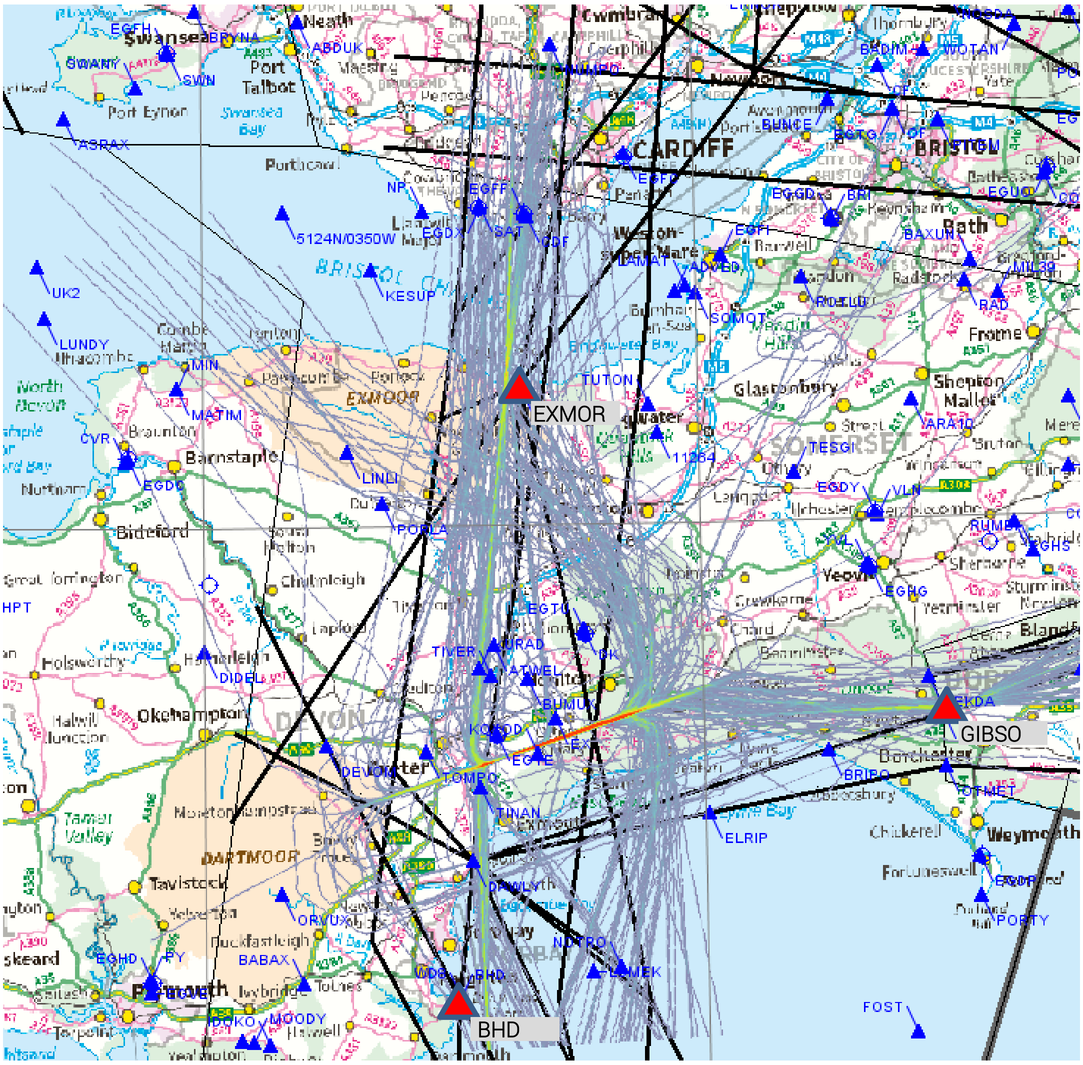

Figure 34 Exeter Extant flight paths shown over proposed route structure (1 week – Aug 2019 data, below FL245, arrivals and departures)

Figure 34 above shows the typical (pre-pandemic) pattern of flight paths to/from Exeter airport, with most flights routing via EXMOR BHD or GIBSO. The black lines are the proposed LD1 route structure. This shows how within the EXMOR-GIBSO-BHD triangle since these points would remain in the proposed airspace design, there would be no change to Exeter arrival and departure flight profiles. Exeter traffic would benefit from the network improvements in the enroute phase of flight (see section 17).

Impact Assessment

For the Exeter interface there is no difference between Option 4 and Option 6. For overall impacts see Section 17.

13. Southern Interface (Brest/Channel Is.)

This interface is at the southern boundary of the London UK FIR. At this interface, the ATS routes below FL195 interface with the Channel Islands Control Zone[14] and routes above FL195 interface with Brest ACC airspace. These are therefore referred to here separately as the Brest Interface and the Channel Islands Interface, and combined as the Southern Interface.

There are two options proposed for this interface, described below. Detail is provided on the baseline and the proposed options for both Brest (above FL195) and Channel Islands (below FL195) interfaces.

There is no change proposed at this interface with regards to any airport's SIDs and STARs. Connectivity with the Channel Islands SIDs and STARs would be at the existing STAR start points and SID end points.

There is no change proposed to the airspace operated by Channel Islands ATC, however, design options north of SKESO are being proposed for the AC route network.

13.1. Brest interface:

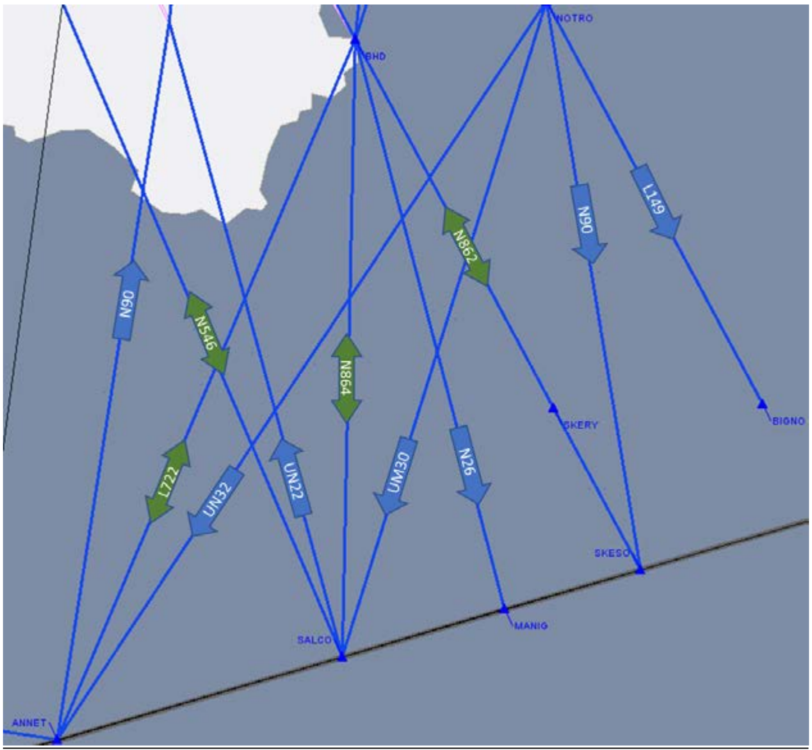

Figure 35 Brest Interface - Current connectivity (Baseline)

Figure 35Error! Reference source not found. shows the extant ATS route network at the Southern interface. With two bi-directional entry/exit fixes to/from the London FIR (SALCO & ANNET) for traffic with RFL245 and above.

N26 via MANIG is a southbound only route utilised when ANNET and/or SALCO are closed due to SUA activity. N862 via SKESO is for bi-directional low-level connectivity between London FIR and Brest ACC.

Additional southbound connectivity at the weekends is via N90 which exits via SKESO.

Channel Islands group arrivals & departures start/finish at SKERY on N862. Additional weekend network connectivity is provided for Channel Islands group inbounds via the use of L149 to BIGNO.

Option 4 proposes limited low-level systemisation of the routes with the introduction of two new RNAV1 routes to/from abeam SKERY.

Option 6 is maximum low-level systemisation of the routes with the introduction of two new RNAV1 routes to/from to SKESO at the FIR boundary.

For both options the design includes FRA connectivity to/from the systemised route structure abeam BHD (Berry Head) to the FIR boundary. Both options also include RNAV5 connectivity with today's N862 remaining between BHD & SKESO. Traffic above FL245 would use DCTs (Option 4) or FRA trajectories (Option 6) as shown below:

[14] Channel Islands CTR SFC-FL80, Channel Islands TMA FL80-FL195.

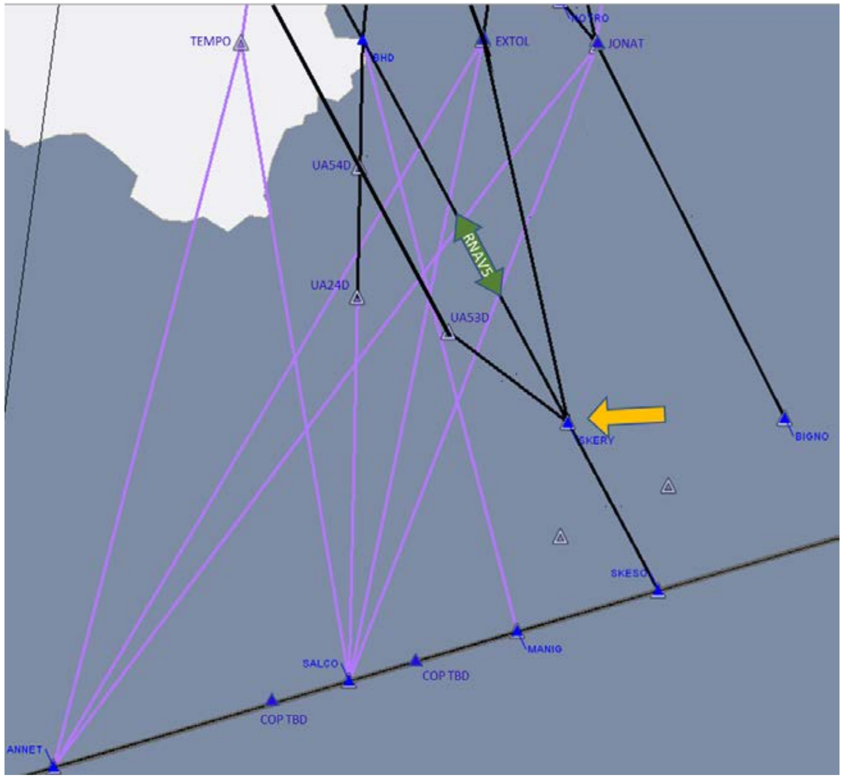

Figure 36 Brest Interface Connectivity (Option 4)

- Systemised route network for all traffic begins and ends at SKERY
- Interface between LAC and Brest via current/new COPs
- N862 remains to facilitate RNAV5 traffic
- Traffic FL245 + will use DCTs as shown to connect to the network

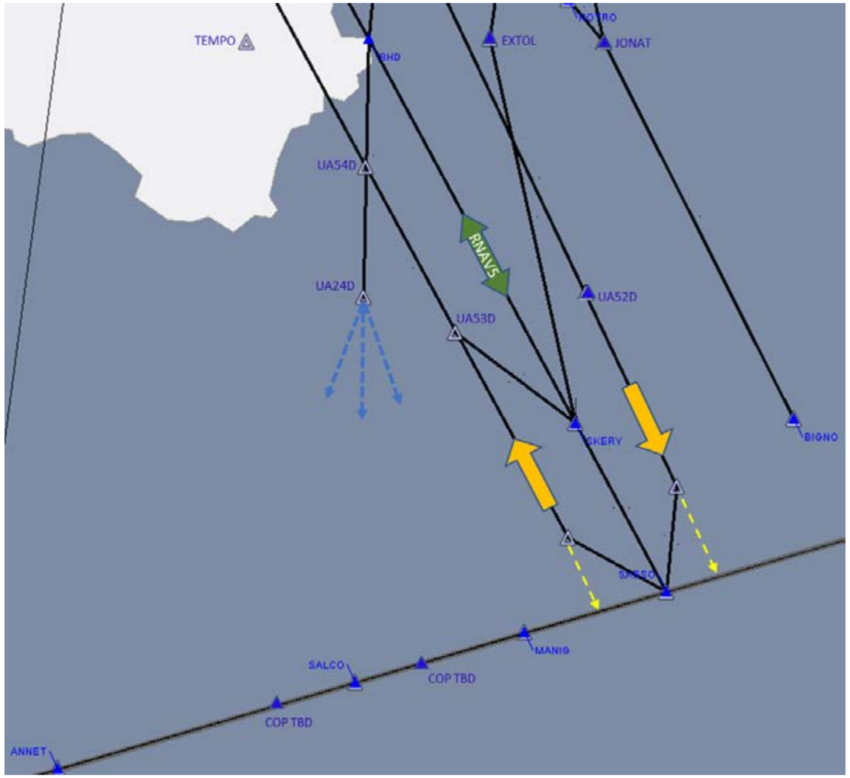

Figure 37 Brest Interface Connectivity (Option 6)

- Systemised route network for all traffic begins and ends at SKESO
- Interface between LAC and Brest via current/new COPs
- Traffic FL245 + will be in FRA
- Gives additional systemisation for traffic inbound and outbound to Brest FL245 below
- RNAV5 N862 remains to facilitate RNAV5 traffic

Two new high level coordination points (COPs) will be introduced (COP TBD on diagrams), one for north bound traffic and one for southbound traffic above FL245, east and west of SALCO. These are dependent on future Brest ACC FDP system implementation and will not be utilised until the Brest system is in place (post LD1.1 implementation) however it is proposed that they are introduced now to future proof.

As shown in Figure 37 for future-proofing the systemised routes either side of N862 can be extended (as shown by dotted yellow arrows) to the FIR boundary (contingent on the required network changes being introduced in the Channel Islands CTA/ Brest FIR).

Engagement with Brest ACC has suggested that two new waypoints should be proposed to be introduced on the FIR boundary either side of SALCO (so that the parallel routes could continue to the FIR boundary) as shown by the dotted yellow arrows in Figure 37. These would be used by Brest ACC in the near-future as coordination points (COPs) for the transfer of traffic above FL245 between Brest and Swanwick ACCs. (N.B. for Option 6 these COPs would be in FRA.)

13.2. Channel Islands interface:

There are no proposed changes to Jersey/Guernsey SIDs or STARs, however route connectivity will be changed to align with the proposed route revisions. The arrival/departure point will remain SKERY/BIGNO and Option 4 and Option 6 are the same for the Channel Islands interface.

Channel Islands Group Departures:

Channel Islands group departure procedures currently finish at SKERY on N862 and there are no changes proposed to this.

Table 16 describes the current (baseline) route structure and the proposed route connectivity changes, as shown in Figure 38 & Figure 39.

Airport	Connecting SIDs/Route	Current route/ Connecting point	Proposed route/ Connecting Point	Change/ Route connectivity
EGJJ	OYSTA 2B; SKERY 3A, SKERY 2B	N862 via SKERY	UA7E - UA82F - SKERY N862 via SKERY (RNAV5 route)	Route connectivity No change to SIDs
EGJB	SKERY 3W SKERY 3E	N862 via SKERY	UA7E - UA82F - SKERY N862 via SKERY (RNAV5 route)	Route connectivity No change to SIDs

Table 16 Channel Islands Group Departure Connectivity

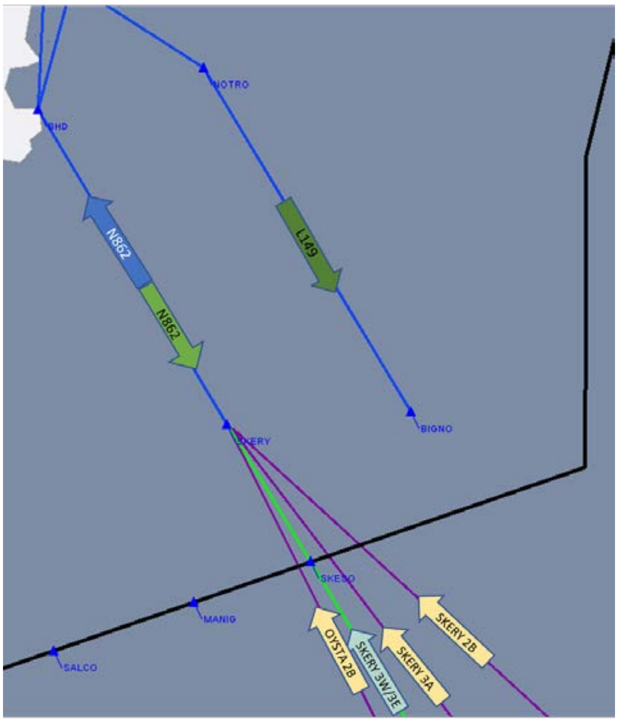

Figure 38 Channel Islands Group Extant Departure Connectivity

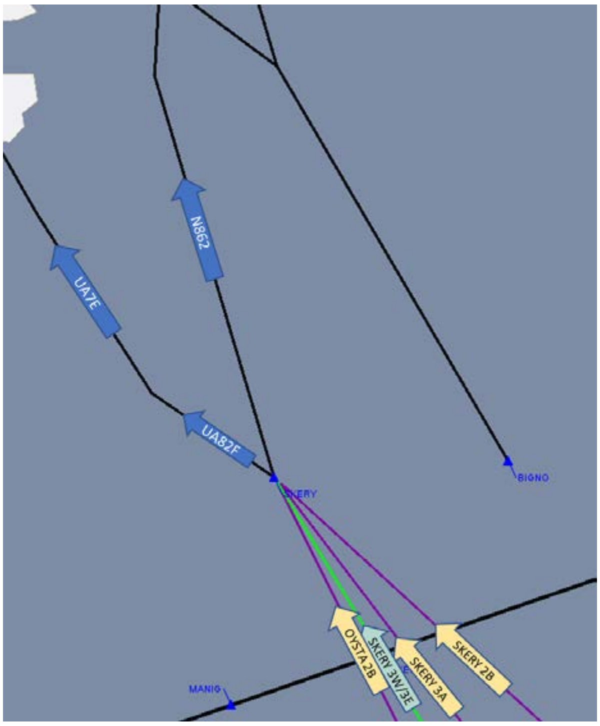

Figure 39 Channel Islands Group Proposed Departure Connectivity

Channel Islands Group Arrivals:

Channel Islands group arrivals start at SKERY on N862. Additional weekend network connectivity is provided for Channel Islands group inbounds via the use of L149 to BIGNO. Table 17 describes the current (baseline) route structure and the proposed changes, as shown in Figure 40 and Figure 41.

Airport	Connecting STARs/Route	Current route/ Connecting point	Proposed route/ Connecting Point	Change/ Route connectivity
EGJJ	JW 2R, 2P, 2Q	L149 – BIGNO (weekend only)	L149 – BIGNO (weekend only)	No change to STAR or route connectivity
EGJJ	JW 1F, 1N, 1M	N862 -SKERY	UA73F – SKERY N862 -SKERY (RNAV5)	Route connectivity No change to STARs
EGJB	Guernsey 2H	L149 – BIGNO (weekend only)	L149 – BIGNO (weekend only)	No change to STAR or route connectivity
EGJB	Guernsey 1F	N862 -SKERY	UA73F – SKERY N862 -SKERY (RNAV5)	Route connectivity No change to STARs

Table 17 Channel Islands Group Arrival Connectivity

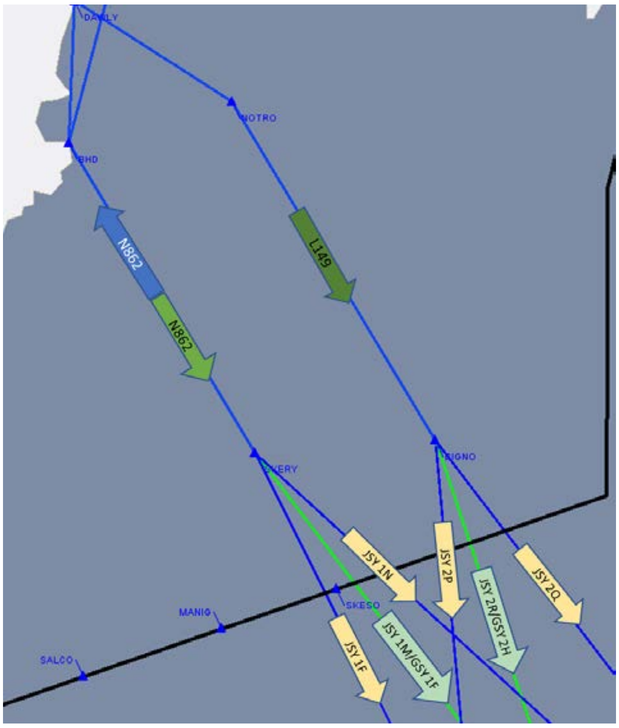

Figure 40 Channel Islands Group Extant Arrival connectivity

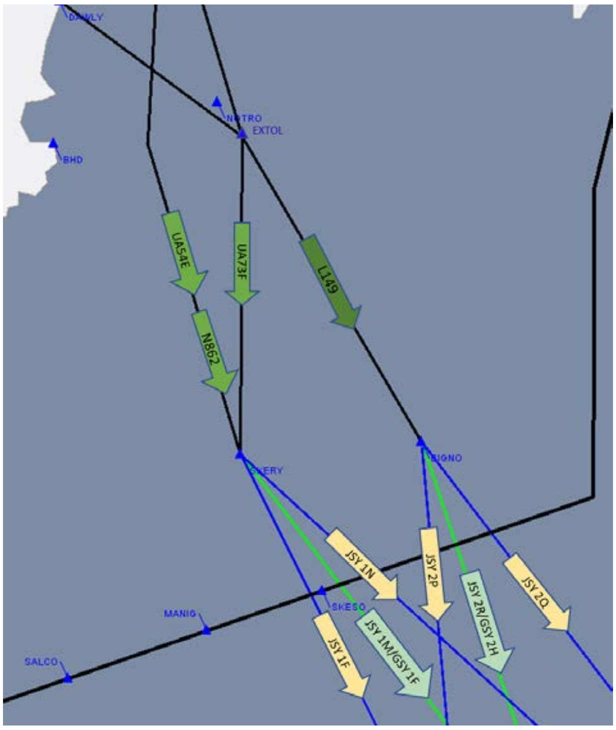

Figure 41 Channel Islands Group Proposed Arrival Connectivity

Impact Assessment of the Sub Options:

Computer modelling assessed the potential impacts for fuel burn and CO_2e emissions for each of the sub-options presented[15], as shown in Table 18.

	Track Distance change per flight (NM)	Fuel burn total 2023 (T)	Fuel burn total 2033 (T)	CO2e change 2023 (T)	CO2e change 2023 (T)
Southern Interface Option 4	+3.1	+41	+58	+132	+183
Southern Interface Option 6	+2.9	+38	+53	+121	+168

Table 18 Impact assessment for Southern interface options

The proposed changes result in an increase in track mileage of approx. 3NM against the current baseline. Both options present a disbenefit for fuel burn /CO_2e. (This is a result of the systemised parallel route structure which introduces a small extended track milage.)

Southern Interface Option 4 (SI-4) and Option 6 (SI-6) both incur an increase in fuel burn and CO_2e emissions, but for SI-6 the increase is lower, hence SI-6 is preferable to SI-4. SI-4 partially meets the design principle of systemised airspace (DP10). SI-6 maximises the opportunity to align fully with the AMS, implementing systemised airspace to the FIR boundary. Given this, and the slightly reduced fuel/CO_2e dis-benefit offered by this option, SI-6 is NATS' preferred option for this interface.

[15] The fuel assessment shown considers the impact of each option to the systemised airspace LD1.1 model.

14. Eastern Interface (LTMA/LUS/LMS)

This section describes the LD1.1 interface with airports and airspace to the east, in particular those airports in the London Terminal Manoeuvring Area (LTMA) (primarily Heathrow, Luton, Stansted, Gatwick and London City); and the interface with the adjoining London Middle Sector (LMS) and London Upper Sector (LUS) airspace.

Currently traffic is not systemised by route in this airspace. Most routes diverge and converge at various points eg. P2 from L607, UL9 and L18, and numerous routes in the Compton (CPT) area.

Where the LD1.1 airspace links with today's London Terminal Manoeuvring Area (LTMA) and London Area Control (LAC) legacy airspace in the vicinity of the CPT VOR, it is proposed that there would be four east/west routes (B-E), expanding to five routes near the Welsh border with the addition of route A (see Figure 43 & Figure 44).

The proposed systemised flow of traffic would be westerly for the two northern routes and easterly for the two southern routes and bi-directional for the middle route The new routes would connect with the existing route network to the east of CPT, and beyond there would be little change to today's network.

The proposed design straightens out the routes compared to today's operation and permits a greater number of closely aligned routings within a comparable airspace volume.

Traffic flows from several airports would be subject to small changes at this interface, and the route connectivity with airport procedures would require the start points of some STARs to be modified. Figure 43 to Figure 53 and Table Table 19 to Table 21 detail the proposed changes to SIDs & STARs for the affected airports. These figures show the current and proposed STARs & SIDs and show where route connectivity with airport procedures is required to be amended.

Connectivity with the wider ATS Route network.

It would be inefficient to connect the proposed LD1.1 routes to legacy airspace exactly on existing sector boundaries. Therefore some connecting routes extend beyond the red outline depicted in Figure 1. These connecting routes are shown in Figure 44 below and listed in Table Table 19.

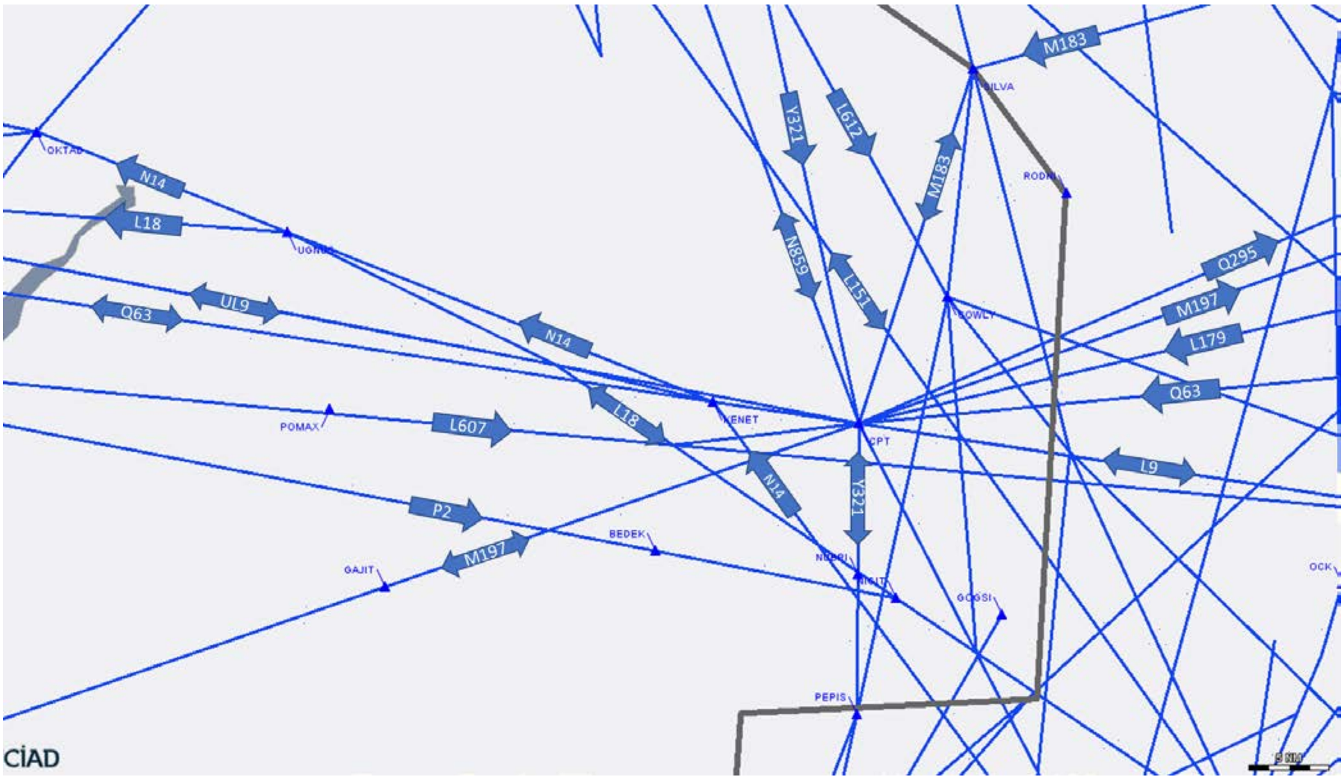

Figure 42 Extant route structure at eastern interface (LTMA/LMS/LUS interface)

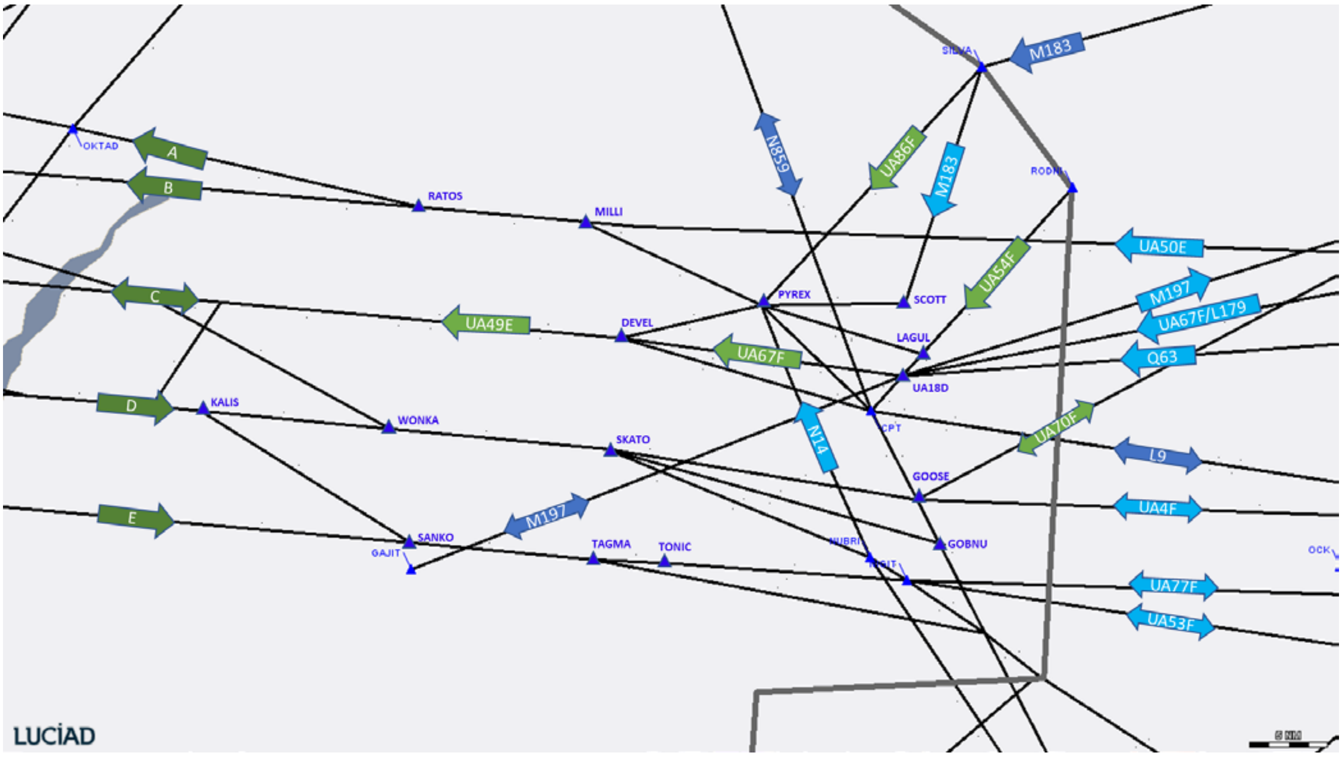

Figure 43 Proposed route structure at eastern interface (LTMA/LMS/LUS interface)

Extant route New route Re-aligned route

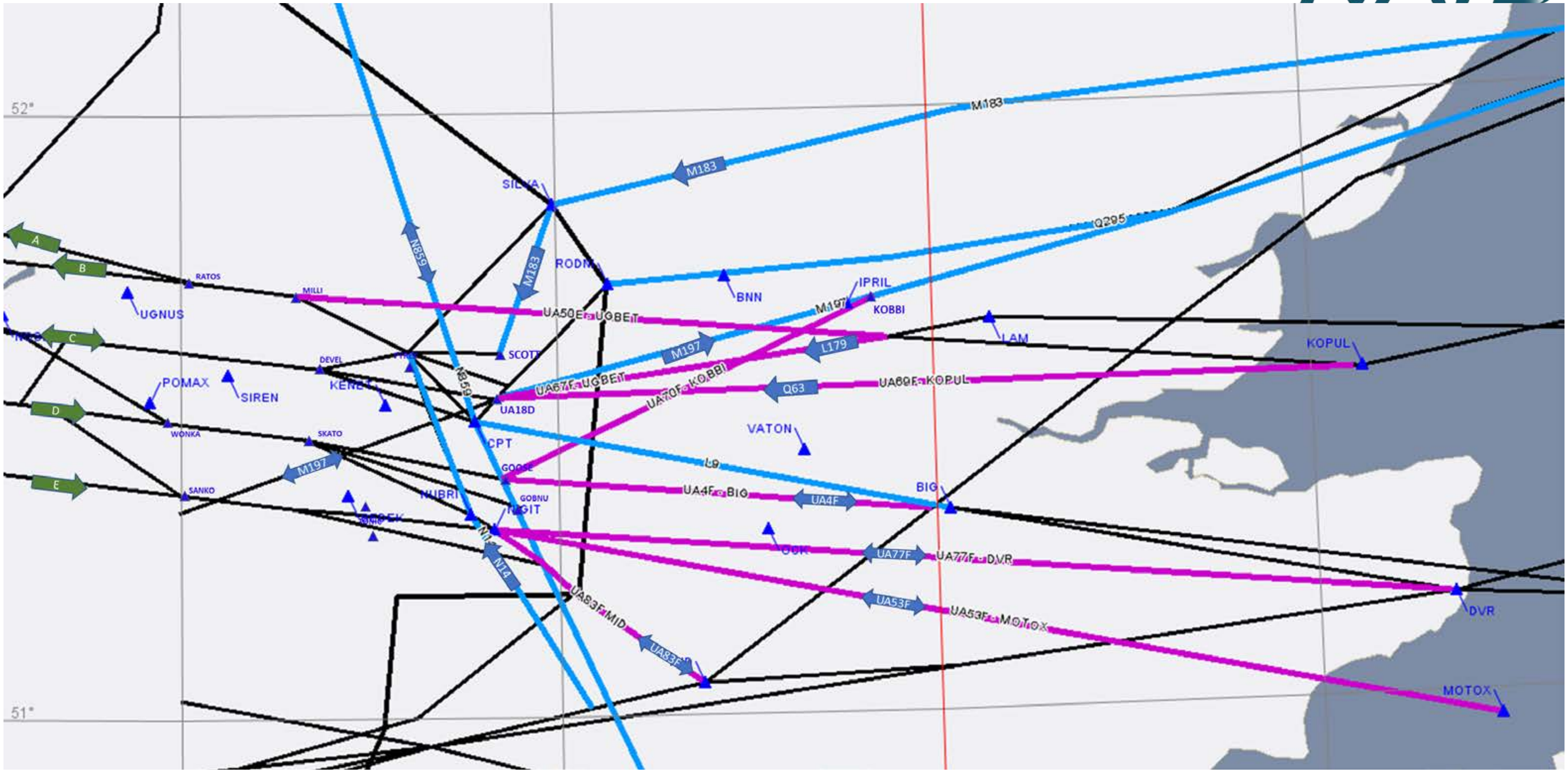

Figure 44 eastern interface – extended routes connecting to wider network

Figure 44 shows how the (purple) link routes at the eastern interface link to the ATS routes to the east to provide efficient connectivity to the extant network.

Route	Start point	End point	Change/ Route connectivity
UA86F	PYREX	SILVA	Re-aligned M183
UA54F	RODNI	PYREX	New route connects from legacy to systemised
M197	UA18D	IPRIL	Re-alignment of M197 between GAJIT and IPRIL with the inclusion of UA18D and removal of CPT
UA70F	GOOSE	KOBBI	New route connects to legacy at KOBBI
UA50E	NEGUS	UGBET	New route (Route B) connects to legacy at UGBET
M183	NUGBO	SILVA	Realigned SCOTT, PYREX with the removal of CPT
UA67F	UA18D	KOPUL	L179 re-aligned at LAM to route via UA18D and not CPT
UA4F	GOOSE	BIG	New route to connect from route D to network at BIG
UA77F	NIGIT	DVR	New route to connect from route E to the network
UA53F	TONIC,NIGIT	MOTOX	New route to connect from route E to the network

Table 19 Eastern interface connectivity to wider ATS route network.

Proposed changes to Airport STARs at Eastern Interface

Table 20 below details the proposed amendments to STARs with the airports at the east interface. (note: proposed points & route IDs are working names, and would thus change prior to ACP submission & implementation.)

Airport	STARs	Current route/ Connecting point	Proposed route/ Connecting Point	Change/ route connectivity	Avg Daily Traffic
EGLL[16]	BEDEK 1H	P2: BEDEK – NIGIT – LLW03 – OCK	Route E (UA61E) via TAGMA to: TONIC – NIGIT - LLW03 - OCK	Re-alignment, of start point from BEDEK to TONIC renamed TONIC 1H. No change after NIGIT, no change below FL100.	76
EGLL Stack swap (tactical use only)	BEDEK 1Z	ATC: BEDEK – CPT – BNN	ATC: TONIC -CPT - BNN	Re-alignment, renamed TONIC 1Z. No change after CPT, no change below FL100.	n/a
EGKK:	BEDEK 1G	P2: BEDEK – NIGIT – MID – TUFOZ – HOLLY – WILLO	Route E (UA61E) via TAGMA to: TONIC – NIGIT - MID – TUFOZ – HOLLY – WILLO	Re-alignment, from BEDEK to TONIC, renamed TONIC 1G. No change after NIGIT, no change below FL100.	0.2 (1 per week)
EGLC EGKB	BEDEK 1C	P2: BEDEK – BIG – UMTUM -GODLU	Route E (UA61E) via TAGMA to: TONIC – BIG – UMTUM - GODLU	Re-alignment from BEDEK to TONIC, renamed TONIC 1C. No change after BIG, no change below FL160.	0.45 (3 per week)
EGGW:	BEDEK 2L[17]	P2: BEDEK – NIGIT - OCK - VATON - BPK - BKY - BUSTA - LOREL	Route E (UA61E) to: TONIC – NIGIT - VATON - BPK - BKY - BUSTA - LOREL	Realignment of first leg of STAR moved from BEDEK to TONIC, renamed TONIC 1L OCK removed from STAR. No change after VATON (all changes above FL150).	4
EGSS[18]:	BEDEK 1L /BEDEK 1E (post AD6)[17]	P2: BEDEK – NIGIT - OCK - VATON - BPK - BKY - BUSTA - LOREL	Route E (UA61E) via TAGMA to: TONIC – NIGIT - VATON - BPK - BKY - BUSTA - LOREL	Re-alignment, Realignment of first leg of STAR moved from BEDEK to TONIC, renamed TONIC 1E OCK removed from STAR. No change after VATON (all changes above FL150).	7
EGHI	CPT 1S	Q63: CPT – PEPIS - SAM	Route D (UA52E) via SKATO to: NUBRI – PEPIS – SAM (BUGUP 1S)	No change to STAR. Traffic to now utilise BUGUP 1S. Repositioned flights above FL100.	3
EGHH	CPT 1S	Q63: CPT – PEPIS - SAM	Route D (UA52E) via SKATO to: NUBRI – PEPIS – SAM (BUGUP 1S)	No change to STAR. Traffic to now utilise BUGUP 1S. Repositioned flights above FL100.	0.2 (1 per week)
EGLF[19]	CPT 1V	Q63, N859, L179: CPT – GOBNU – INDOX – DIXIB – LFS02 – VEXUB	From north: via N859 no change From the east L179 - UGBET - UA67F UA18D UA84F CPT – GOBNU	No change to CPT 1V STAR	24
EGLF	GOBNU 1V	Currently via CPT (CPV 1V as above)	From west: Route D (UA52E) via SKATO – UA55F- GOBNU – INDOX – DIXIB – LFS02 – VEXUB (as per CPT 1V).	New STAR from GOBNU	

[16] STARs for Heathrow (EGLL) are also used for Northolt (EGWU) and Denham (EGLD).
[17] Assuming SAIP AD6 approved (ACP-2018-65)
[18] STARs for Stansted (EGSS) are also used for Cambridge (EGSC).
[19] STARs for Farnborough (EGLF) are also used for Blackbushe (EGLK), Dunsfold (EGTD), Fairoaks (EGTF), Lasham (EGHL), Odiham (EGVO).

EGLF	CPT 1P (RNAV5)	Q63, N859, L179: CPT – HANKY – PEPIS	From west: Route C (UA49E) – DEVEL CPT From north: via N859 no change From the east L179 - UGBET - UA67F UA18D UA84F CPT – GOBNU	Revised connectivity from proposed ATS route network to STAR	0
EGVN	N/A (vectored)	Vectored from MALBY/SIREN on Q63 to EGVN	Vectored from UA31D/ UA16D on Route C to EGVN	Movement of arrival point north by circa 1.6NM	3

Table 20 Eastern interface, proposed amendments to STARs / connectivity

Several STARs currently start at BEDEK, arriving on ATS route P2, serving EGLL/EGWU, EGGW, EGSS/EGSC and EGLC/EGKB (Figure 45). To optimise connectivity with the systemised route structure it is proposed to realign these BEDEK STARs to a new starting point, TONIC (2.5nm south of BEDEK). The only other amendments to these STARs are the removal of OCK from EGGW/EGSS STARs.

EGLL traffic would arrive on Route E, the remainder would arrive on route D - SANKO – Route E - TONIC (Figure 46). (Note TONIC is 2.5nm from BEDEK, aircraft typically join these STARs at FL170/180).

Arrivals from the West to EGHH and EGHI would be via Q63 to join the CPT 1S STAR at CPT (Figure 48). Traffic would now connect from Route D to SKATO where it would leave Route D to connect with the extant BUGUP 1S STAR at NUBRI (see Figure 48).

EGLF arrivals currently utilise the CPT 1V STAR. This STAR would remain for traffic from L179 and N859. Eastbound traffic, currently on Q63, would use Route D to SKATO, and join CPT 1V at GOBNU. (Figure 48).

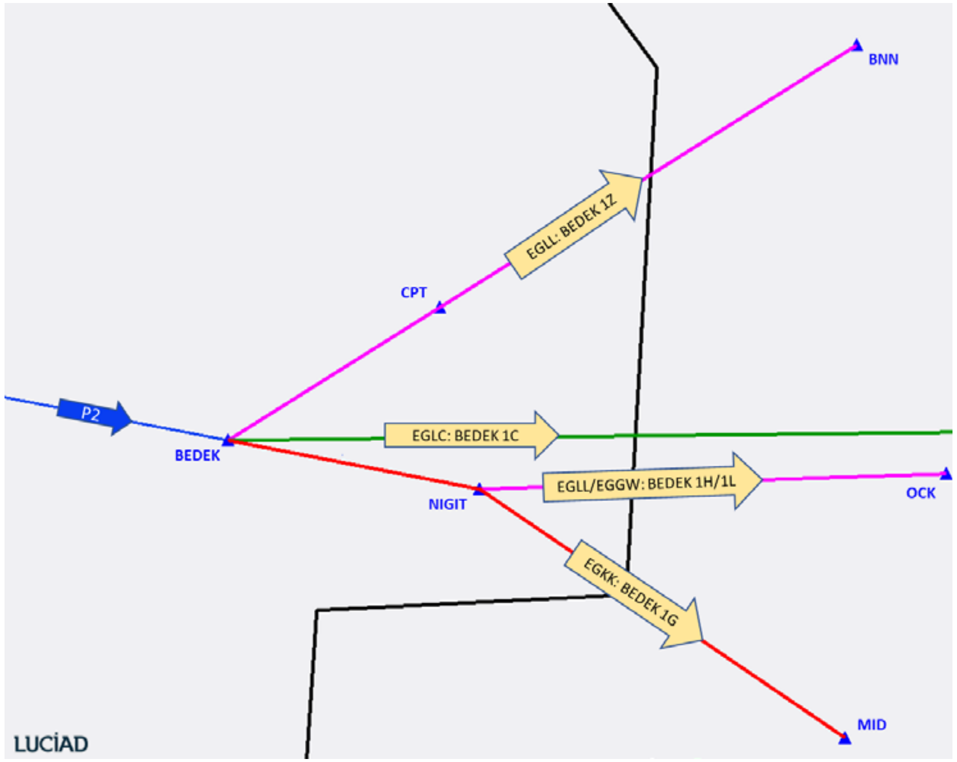

Figure 45 LTMA Extant arrival routes: BEDEK STARs (via P2)

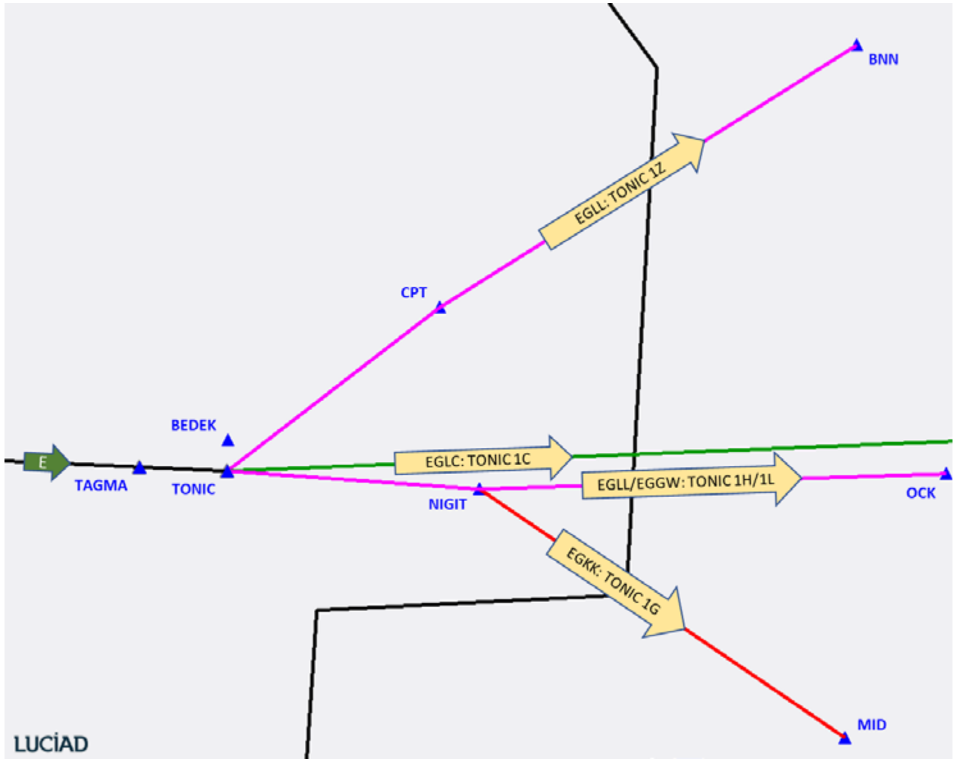

Figure 46 LTMA Proposed arrival routes: TONIC STARs (via Route E)

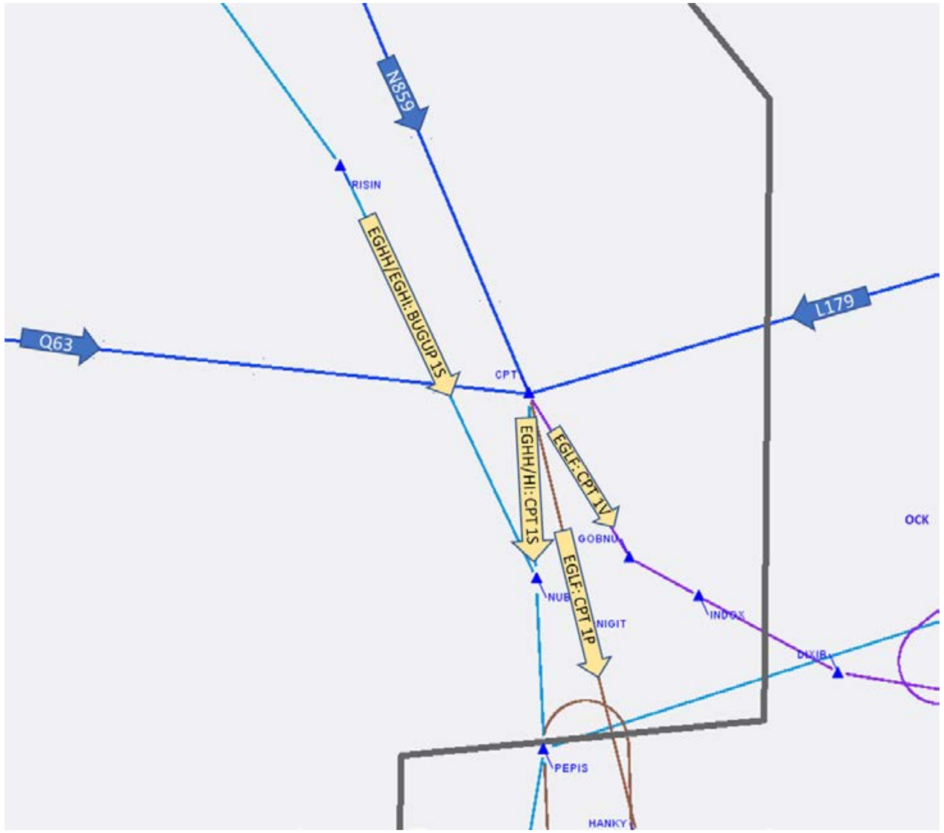

Figure 47 LTMA Extant CPT Southampton, Bournemouth & Farnborough STARs

Figure 48 LTMA Proposed CPT Southampton, Bournemouth & Farnborough STARs

Proposed changes to Airport SIDs at Eastern Interface

Currently there are SIDs from Heathrow (EGLL), Luton (EGGW), and London City (EGLC) airports which carry westbound traffic to CPT and connect with the westbound ATS route Q63.

EGLL CPT SIDs would not be changed, but they would now all connect to Route A/B at MILLI from CPT (via CPT – PYREX – MILLI).

The proposed EGGW and EGLC SIDs to CPT would be truncated[20] from CPT to RODNI to facilitate connectivity with Route B at MILLI (via RODNI-LAGUL-MILLI), and the EGLL CPT SIDs via CPT-PYREX-MILLI. Currently an average of 6 flights per day from EGGW depart via a CPT SID through the LD1.1 airspace to the west. These pass RODNI on average higher than FL100, and CPT on average at between FL170-FL280.

Southbound traffic from EGGW through CPT currently connects to Y321/N859. This is outside the scope of this ACP and would remain unchanged.

Westbound traffic from EGSS currently routes via the NUGBO SIDs onto M183 to CPT to connect with westbound UL9. ATS Route M183 would be realigned from SILVA, with a turn at new waypoint SCOTT, and a new end point at PYREX. The current average flight level of aircraft at SILVA is FL220, so this proposed realignment would have no impact on tracks over the ground at lower levels (below FL100). Traffic departing EGSS via NUGBO SIDs would join Route B at MILLI via UA41F (PYREX-MILLI).

EGKK SIDs for Westbound traffic (RNAV5 only) depart via KENET. This conventional SID would be retained for RNAV5 traffic capped at FL165 or below. This would connect to Route C at DEVEL via DCT from KENET.

EGKK westbound RNAV1 traffic connects to ATS route N14, which traverses the LD1 airspace. N14 would be realigned from VOUGA – KENET to route VOUGA – PYREX, to connect with Routes A/B via PYREX-MILLI. This would affect EGKK departures on the IMVUR and NOMVA SIDs which connect to N14 at NIBDA/VOUGA (approx. 15 flights per day)

[20] Note these SID truncations will be progressed as part of this ACP. Since the track over the ground is changed, they do not meet the requirements to be covered under the CAA SID truncation policy (May 2018)

Route/SID connectivity is detailed in Table 21 below and the extant/proposed routes shown in Figure 51 and Figure 52 overleaf:

Airport Deps	Connecting SIDs/Route	Current route/ Connecting point	Proposed route/ Connecting Point	Change/ Route connectivity	Avg Daily Traffic
EGLL	CPT 3F, 3G, 5J, 4K	Q63 via CPT –	Route B via CPT – PYREX -UA41F– MILLI (UA50E) RATOS	No change to SIDs.	91
EGGW	CPT 4B, 7C	Q63, Y321, N859 via CPT	Route B via RODNI — LAGUL - PYREX – MILLI Y321 no change - via CPT	Truncation of EGGW CPT SID (from CPT truncated to RODNI).	68 (note most (~95%) deps on this SID go south from CPT not West.)
EGLC	CPT 1A/1H	Q63 via CPT	Route B via CPT – PYREX -UA41F– MILLI (UA50E) RATOS	No change to SIDs.	2
EGKB	N/A	CPT UL9 KENET N14	Route B via CPT – PYREX -UA41F– MILLI (UA50E) RATOS	N/A as no SID at EGKB, flights still route via CPT	2
EGSS	NUGBO 1R/1S - M183	UL9 via CPT	Route B via M183 – SCOTT - PYREX – MILLI	No change to SIDs M183 - intersection added at SCOTT.	88 (note most deps on this SID go south from CPT not West.)
EGKK	KENET 3P/3W (Conv)	L9, N14 via KENET	Route C via KENET – DCT – DEVEL	No change to SIDs. DCT connectivity to B & C from end of SID at KENET	0 (1 p.a.)
EGKK	NOVMA 1X	NOVMA – L620 – NIBDA – N14 – VOUGA- N14 - KENET	Route B/A via NOVMA - L620 – NIBDA – N14 – VOUGA - re-aligned N14 PYREX UA41F MILLI	No change to SID.	12
EGKK	IMVUR 1Z	IMVUR – N63 – VOUGA – N14 KENET	Route B/A via – IMVUR – N63 – VOUGA - re-aligned N14 PYREX UA41F MILLI	No change to SID	2
EGLF	HAZEL	L620 SAM Q41 PEPIS Y321 NUBRI DCT KENET N14	Route C L620 SAM Q41 PEPIS Y321 NUBRI – realigned N14 – UA20D – UA49E – DEVEL	No change to SID	8
EGHI/HH Dep (W/bound)	N/A	PEPIS Q41 TABEN DCT KENET N14	Route C via PEPIS Y321 NUBRI realigned N14 – UA20D – UA49E – DEVEL N14	N/A	4
ECMC Dep	N/A	HEN DCT CPT UL9 KENET	Route B via HEN DCT RODNI - UA54F LAGUL – PYREX - MILLI	N/A	1
EGVN	N/A (vectored)	Q63 via MALBY/SIREN	Route C via UA31D/UA16D	Vectored to points UA31D/UA16D on Route C (circa 1.6NM north of extant)	3

Table 21 Proposed amendments to LTMA SIDs / connectivity

The Luton CPT 4B & 7C SIDs for departures to the west, would be truncated to allow the most efficient connectivity to the proposed route network (to connect to route B and C). The extant CPT 4B & 7C SIDs are shown in Figure 49, and the network connections (current and proposed) are shown in Figure 51 and Figure 52. There are link routes from the proposed truncation point (RODNI) via LAGUL, PYREX to connect with route B & C. Aircraft flying the CPT 4B & 7C SIDs pass the proposed truncation point at between FL120-FL140 currently, hence it is clear that truncation of this SID will not change any flight profiles below 7,000ft. Truncation of these SIDs would not alter traffic patterns below 7,000ft.

A slide presentation showing the position of departures from Luton at key altitudes is available on the consultation website here. Figure 50 is an excerpt from this, showing the flight paths of departures between FL70-80.

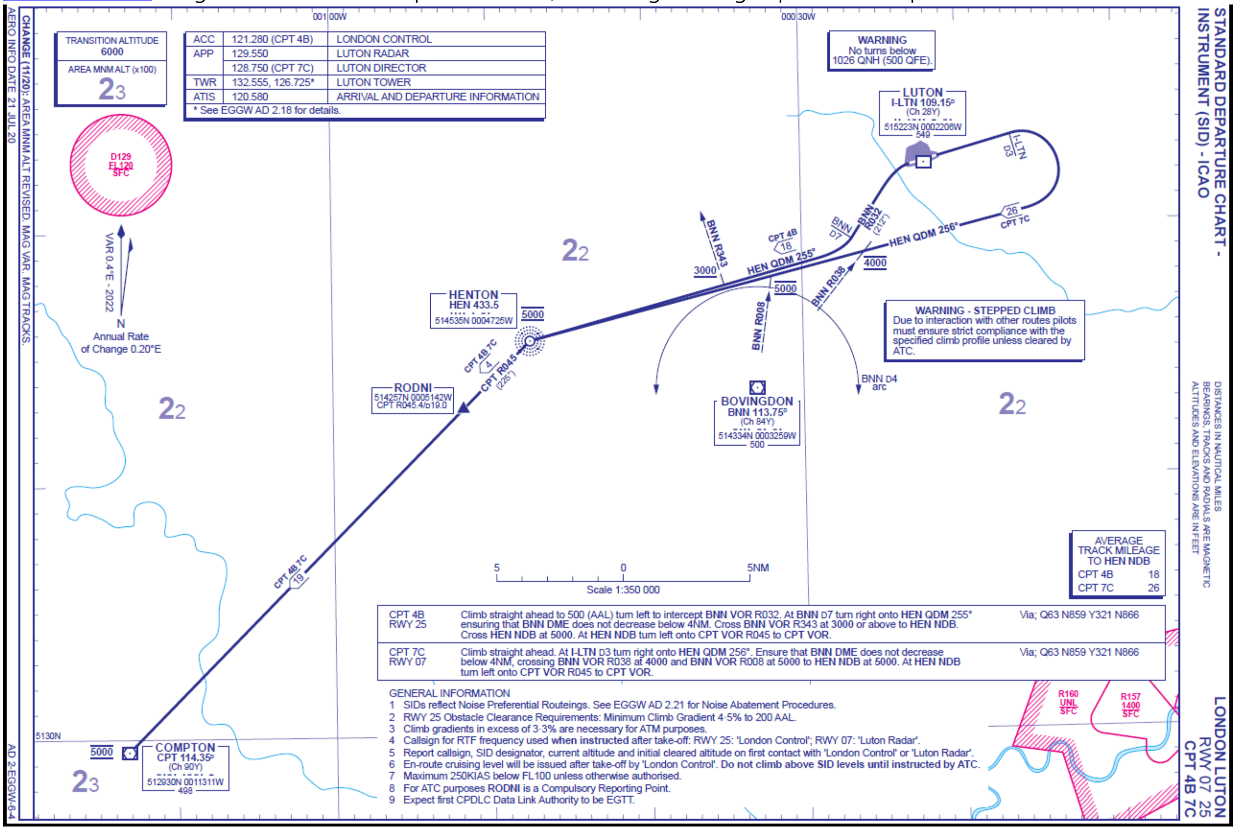

Figure 49 Extant Luton CPT 4B & 7C SIDs

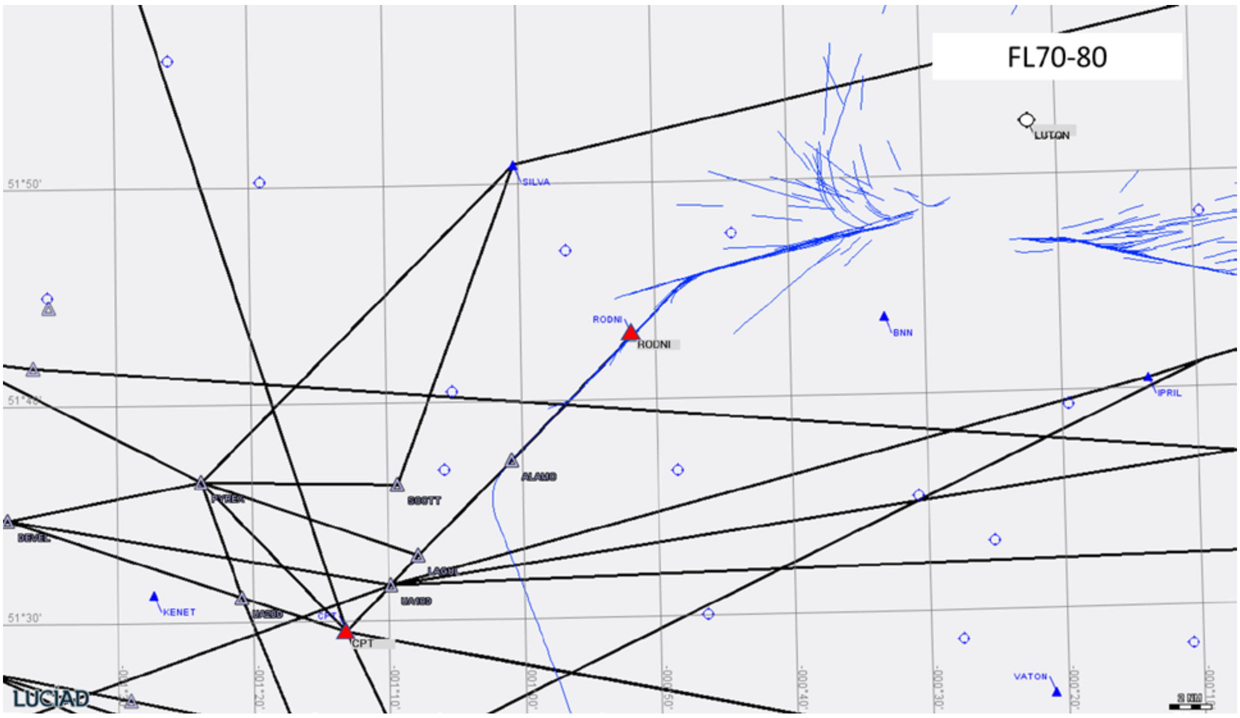

Figure 50 Luton departures on extant CPT 4B/7C SID (trajectories between FL70-80)

Note Figure 50 is an excerpt from a series of slides showing the trajectories of Luton departures at 1000ft intervals . It is recommended that the full slide pack is viewed. This is available from the consultation web-site.

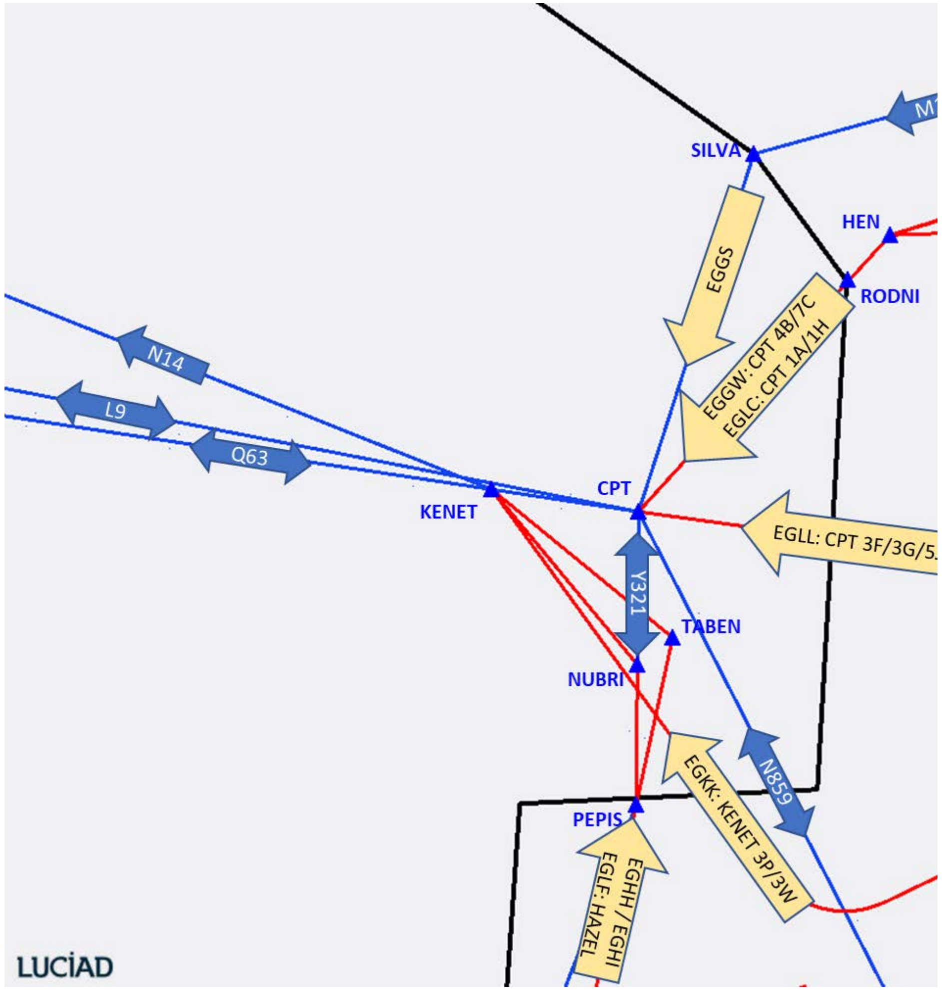

Figure 51 LTMA Baseline (Extant) Departure Connectivity via CPT

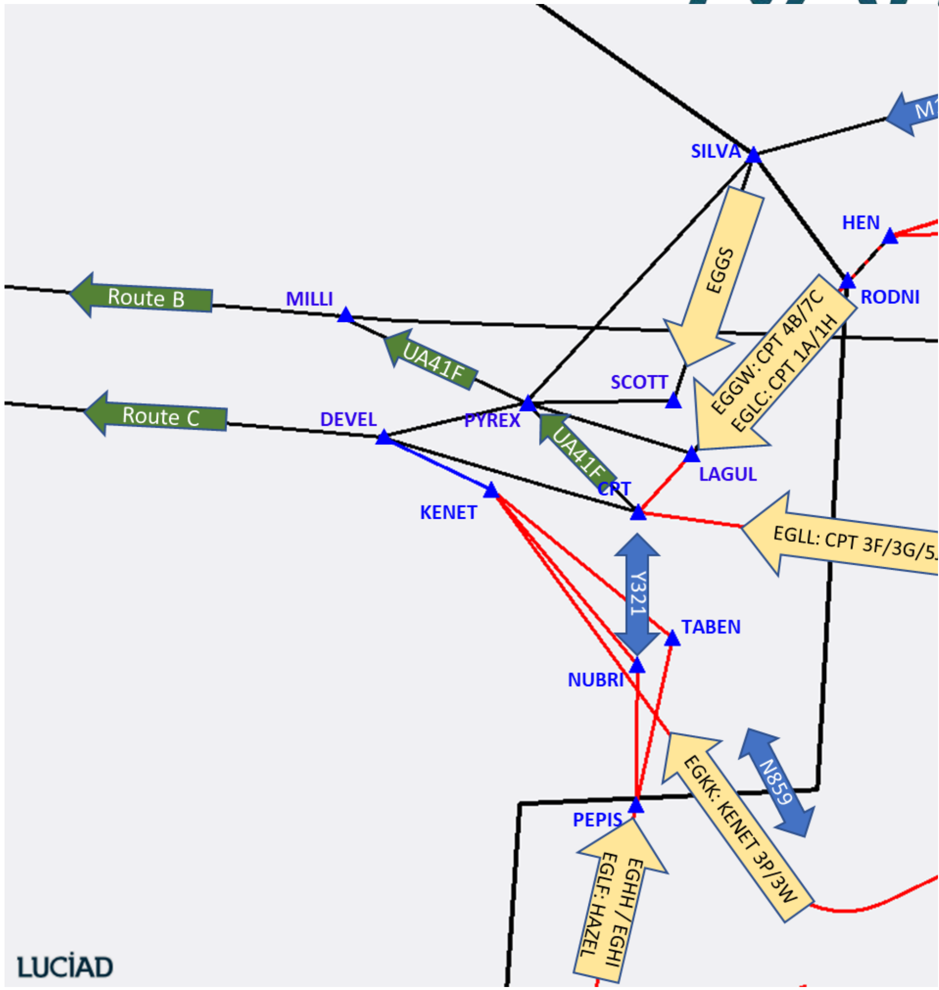

Figure 52 LTMA Proposed Departure connectivity via CPT

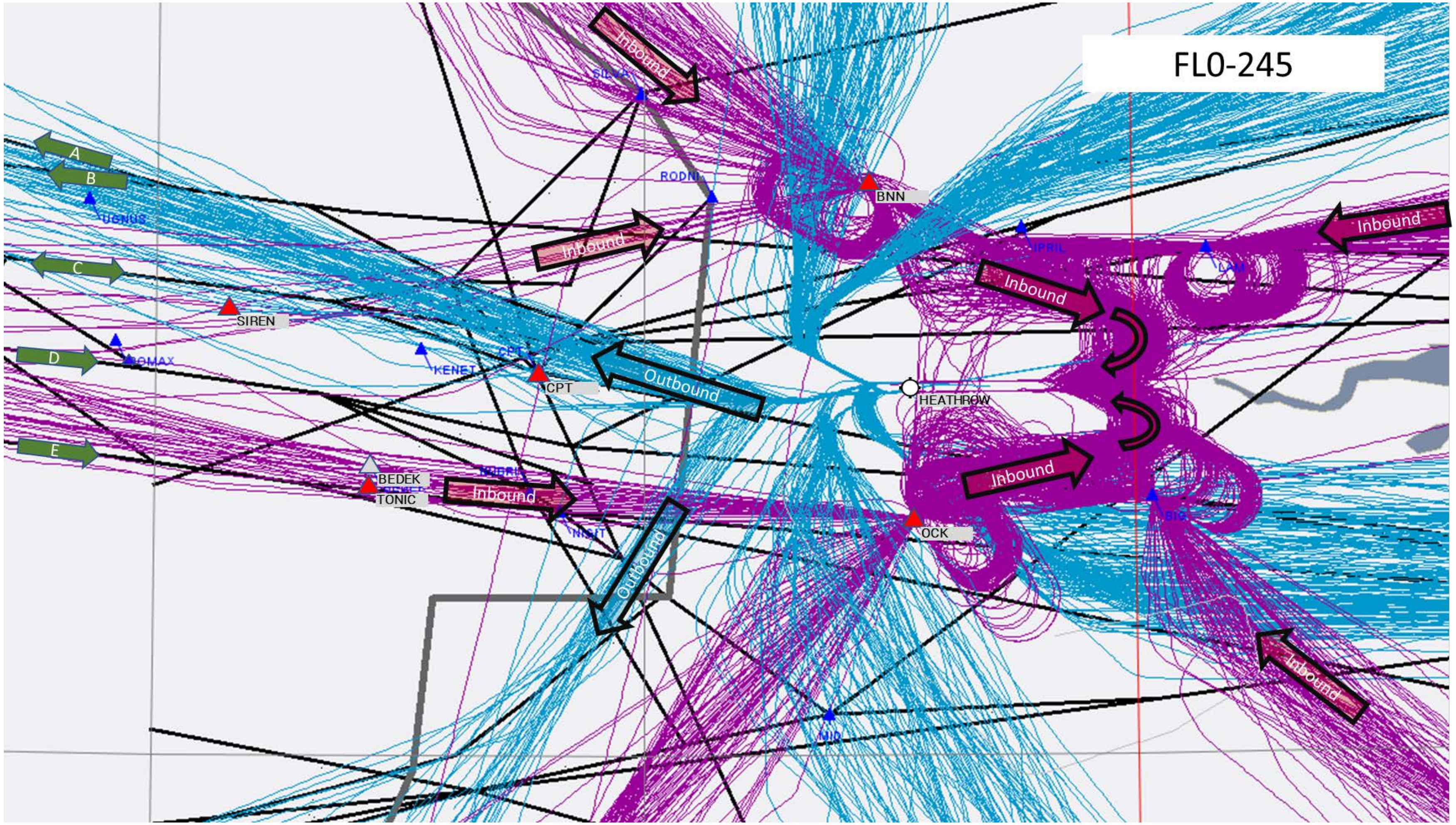

Figure 53 LTMA interface. Extant Heathrow Arrivals & Departures and proposed route structure (1 week – Aug 2019 data, below FL245, arrivals purple and departures blue) (note a separate pdf giving these trajectories layered by altitude is included in consultation materials. This allows you to assess the typical altitude of overflight in a particular location).

Figure 53 shows the typical (pre-pandemic) pattern of flight paths to/from Heathrow airport, with most flights from/to the west (through the LD1.1 airspace) routing inbound via BEDEK-NIGIT-OCK or SIREN-BNN, and outbound via CPT-KENET-N14. The black lines show the proposed LD1 route structure. Departures from Heathrow would follow the same SIDs and their trajectories would be unchanged until above FL80-FL100 at which point they would begin to join the proposed ATS route network. For example, departures using the EGLL CPT 3F, 3G, 5J, 4K would still route to CPT, passing CPT at FL100-FL140. Beyond CPT they would join the systemised route structure (e.g. departing west on route A or B). Arrivals would route via route E, then join a STAR at TONIC (realigned from BEDEK). There would be no change to Heathrow arrival and departure flight profiles below 7000ft.

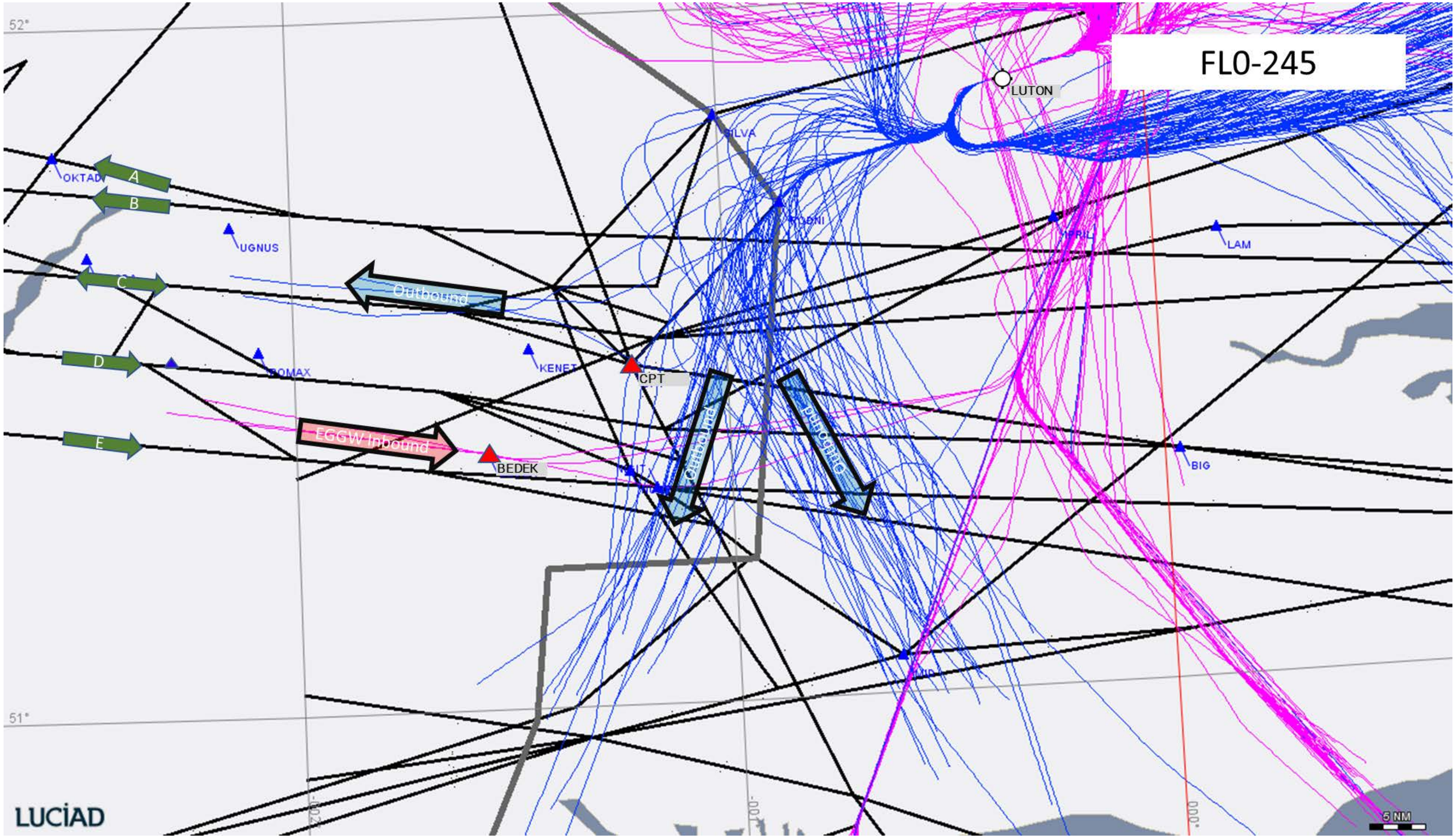

Figure 54 LTMA interface. Extant (2019) Luton Arrivals & Departures and proposed route structure (1 week – Aug 2019 data, below FL245, arrivals pink and departures blue) (note a separate pdf giving these trajectories layered by altitude is included in consultation materials. This allows you to assess the typical altitude of overflight in a particular location)

Note Luton (EGGW) arrivals are subject to change in February 2022 due to implementation of the SAIP AD6 ACP (ACP-2018-65). The departures (relevant here with respect to the connectivity with Route B) are unchanged by the SAIP AD6 ACP. The EGGW CPT 4B & 7C are proposed to be truncated at RODNI by this ACP, to facilitate connectivity with route B (see Figure 51).

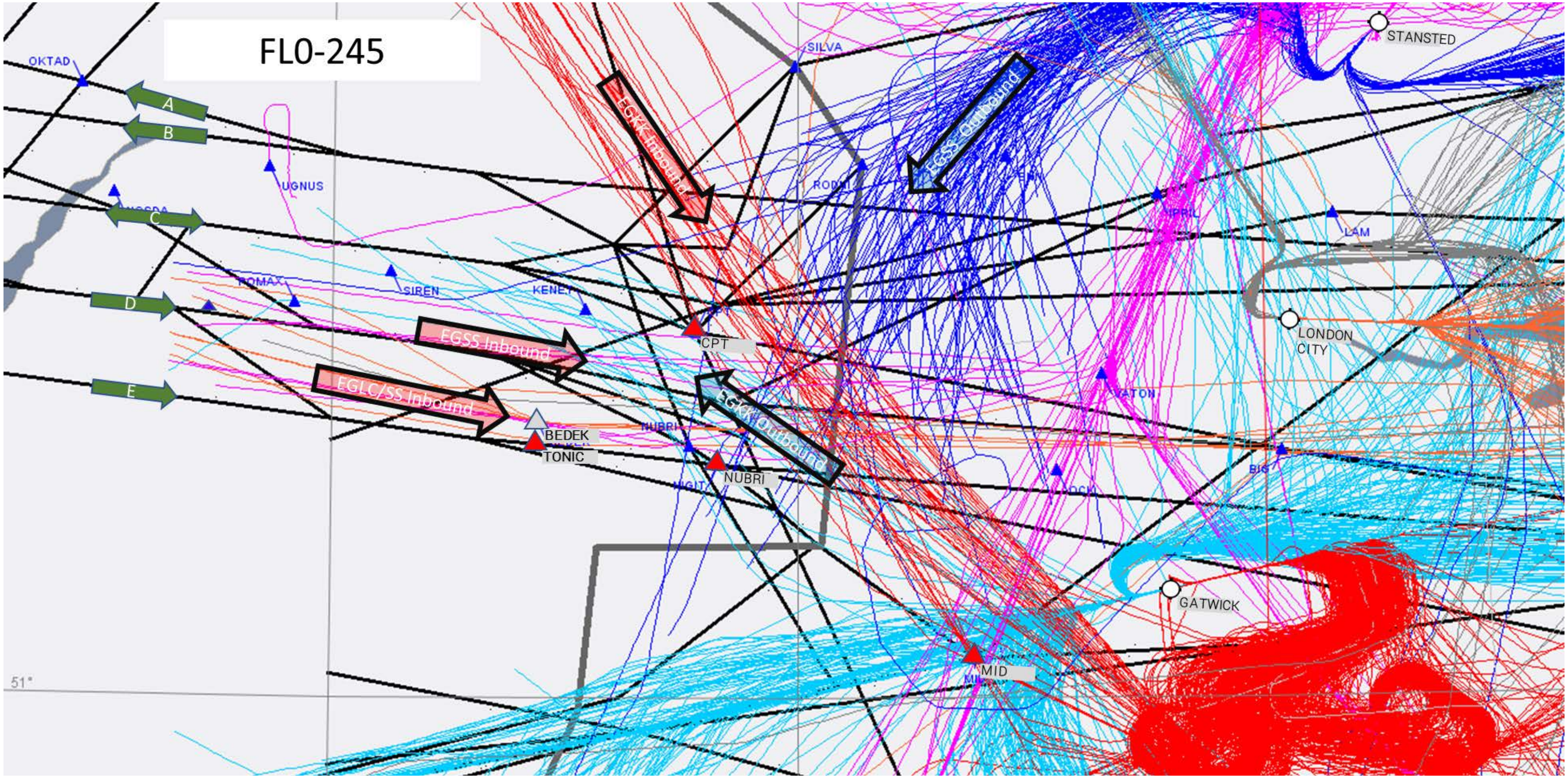

Figure 55 LTMA interface. Extant Stansted, Gatwick, London City Arrivals & Departures and proposed route structure (1 week – Aug 2019 data, below FL245, arrivals pink/red and departures blue/grey) (note a separate pdf giving these trajectories layered by altitude is included in consultation materials.)

Figure 55 shows the typical (pre-pandemic) pattern of flight paths to/from Gatwick, London City and Stansted airports. The black lines show the proposed LD1 route structure. A pdf of these trajectories filtered by with different altitude layers is available on the consultation portal. Note these three airports are depicted together since they are further from the LD1.1 airspace and the changes involved are minor and at high level.

Gatwick (EGKK) inbound flights (shown in red) from the west currently route from the NW or SW generally avoiding the LD1.1 airspace. All Gatwick SIDs would be unchanged. Flights on EGKK KENET, and some NOVMA & IMVUR SIDs to the west would route onward through the LD1.1 systemised route structure, joining route C. Beyond KENET they would join the systemised route structure. There would be no change to Gatwick arrival and departure flight profiles below 7000ft.

London City (EGLC) (and Biggin Hill (EGKB)) inbound flights (shown in pink) from the west currently route from BEDEK. All London City SIDs would be unchanged. There would be no change to London City/Biggin arrival and departure flight profiles below 7000ft.

Stansted (EGSS) inbound flights (shown in pink) from the west currently route from BEDEK-NIGIT-VATON. (Stansted STARs are also used by arrivals to Cambridge Airport (EGSC)). The start point of these STARs would be changed slightly to TONIC. Otherwise the remainder of the Stansted STARs and SIDs would be unchanged. There would be no change to Stansted/Cambridge arrival and departure flight profiles below 7000ft.

Impact Assessment

For the Eastern interface there is no diff between Option 4 and Option 6. For overall impacts see Section 17.

15. Northern Interface (MTMA)

This section describes the LD1.1 interface with airports and airspace to the north. Airports in the Manchester Terminal Manoeuvring Area (MTMA) with procedures which would be affected are Manchester and Liverpool.

Currently there are two parallel permanent routes plus one CDR, which largely separate the northbound (N864) and southbound (N862) traffic: (see Figure 56 below)

Northbound traffic via the MTMA utilises ATS route N864. Arrival procedures (STARs) for Manchester and Liverpool connect with N864. Traffic heading north-east diverges on P17 or the weekend-only high level UP16.

Southbound traffic utilises ATS route N862. Traffic on southbound P16 and P17 converge with N862 at NOKIN. Departure procedures (SIDs) from Liverpool and Manchester connect with southbound N864 – N62 - N862.

Where the LD1.1 airspace links with today's MTMA legacy airspace, it is proposed that there would be four north/south routes (working names W-Z). This systemised flow of traffic has two northbound routes on the west side, and two southbound routes on the east-side. The usage of the routes would be as follows:

Route W: MTMA inbounds
Route X: Bristol, Cardiff & Exeter outbounds to the north
Route Y: Bristol, Cardiff & Exeter inbounds from the north.
Route Z: MTA Departures.

Overflights will generally use the FRA airspace above.

The new routes would converge to connect with the existing route network at NOKIN/REXAM, beyond which there would be little change to today's network (see Figure 57).

A new link route is added BARTN – TORAN. This removes the need for EGNM, EGCN and EGNJ departures, to route via NOKIN.

Traffic flows from several airports would be impacted by the changes at this interface, and route connectivity with airport procedures would be changed.

Detail on the airport procedures and connectivity with the new routes is provided in the STAR/SID sections below.

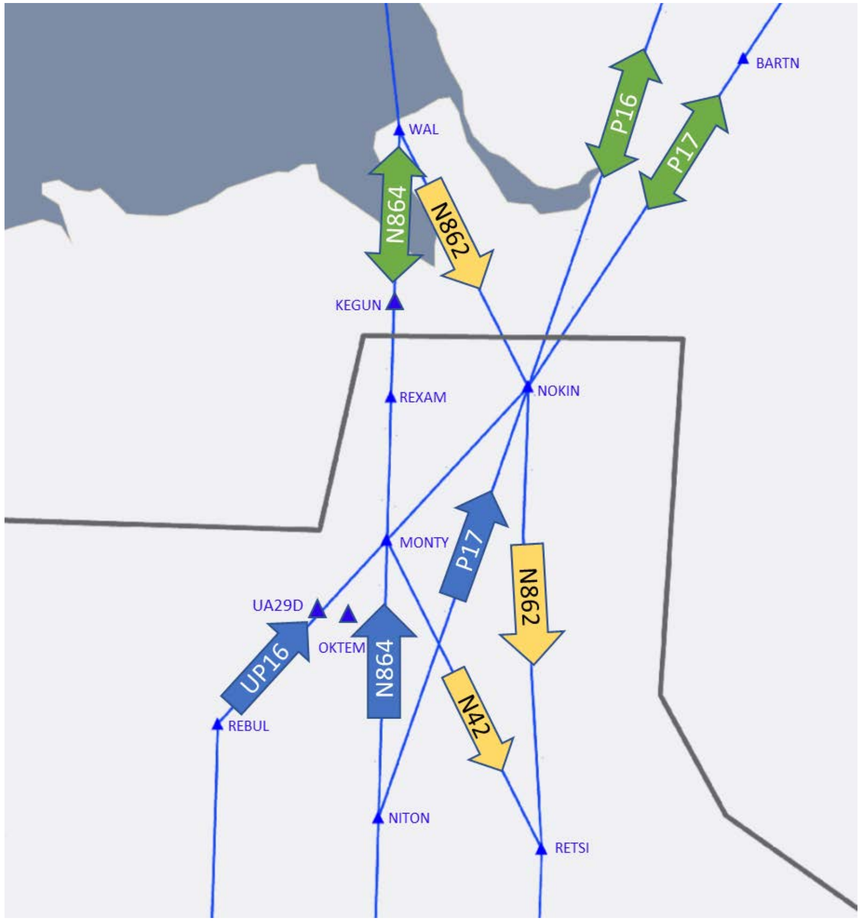

Figure 56 MTMA Extant connectivity

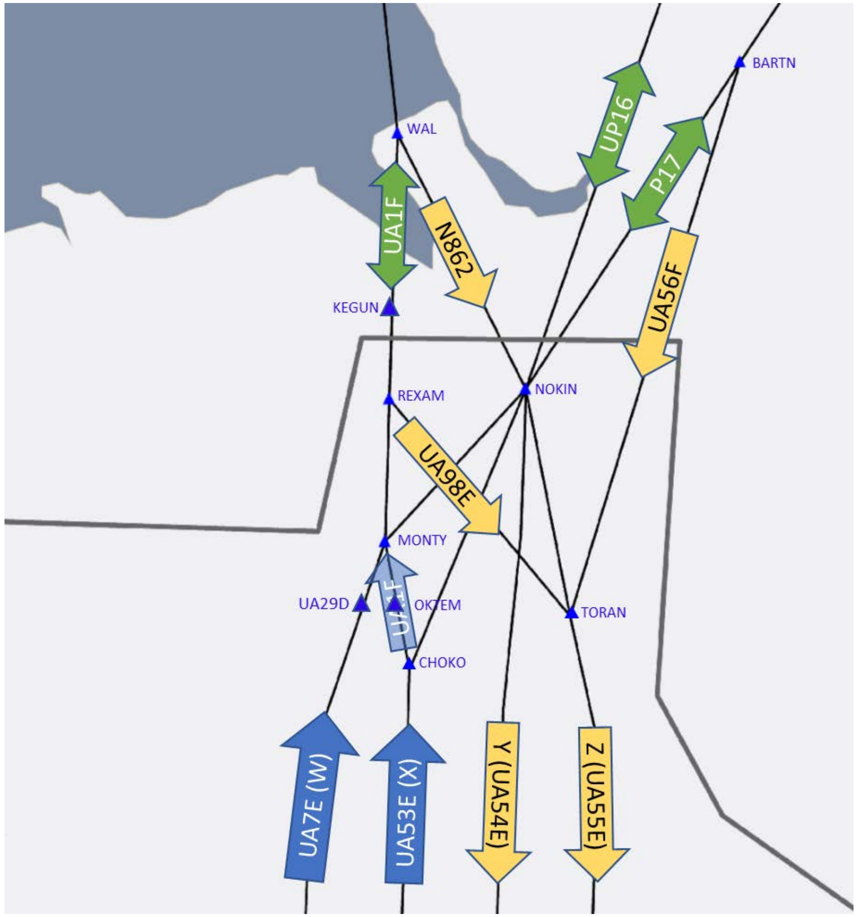

Figure 57 MTMA Proposed connectivity

Proposed changes to Airport STARs at MTMA (Northern) Interface

The STARs which would require to be changed are detailed in Table 22 below. These are illustrated in Figure 58 and Figure 59. Separate ACPs (DVOR rationalisation) propose changes to the extant EGCC MIRSI 1A and EGGP KEGUN 1D as part of DVOR rationalisation. STARs are subject to change in a separate ACP (ACP-2020-101) which should be implemented prior to LD1.1. This proposes to extend the KEGUN STARs to OKTEM. LD1.1 proposes to re-align to a connecting point on route W (UA29D).

The KEGUN 1D STAR is also subject to change as a result of the removal of enroute dependencies from the TNT DVOR (ACP-2020-020).

Airport	STARs	Current route/ Connecting point	Proposed route/ Connecting Point	Change/ route connectivity	Avg Daily Traffic
EGGP	OKTEM 1L (TIPOD 1J[21])	(U)N864: MONTY – KEGUN – WAL – BAROS / TIPOD	UA7E UA29D UA7E MONTY KEGUN WAL	Realignment of STAR between OKTEM & MONTY. To UA29D – MONTY.	16
EGGP	KEGUN 1D	(U)N864: MONTY – KEGUN	UA7E MONTY KEGUN	No change to STAR. Route connectivity	5
EGCC	OKTEM 1M (MIRSI 1A[22])	N864: (OKTEM) - MONTY – REXAM – WAL - MIRSI	UA7E UA29D UA7E MONTY REXAM WAL MIRSI	Realignment of STAR between OKTEM & MONTY. To UA29D – MONTY.	40

Table 22 Proposed changes to STARs at MTMA (Northern) Interface

There are no changes to any other STARs proposed at this interface.

[21] The EGGP TIPOD 1J STAR is being withdrawn by TNT DVOR rationalisation ACP (ACP-2020-020) and replaced by OKTEM 1L.
[22] The EGCC MIRSI 1A STAR is subject to change by separate (DVOR rationalisation ACP (ACP-2020-101)) This proposes to extend the STAR to OKTEM as OKTEM 1M

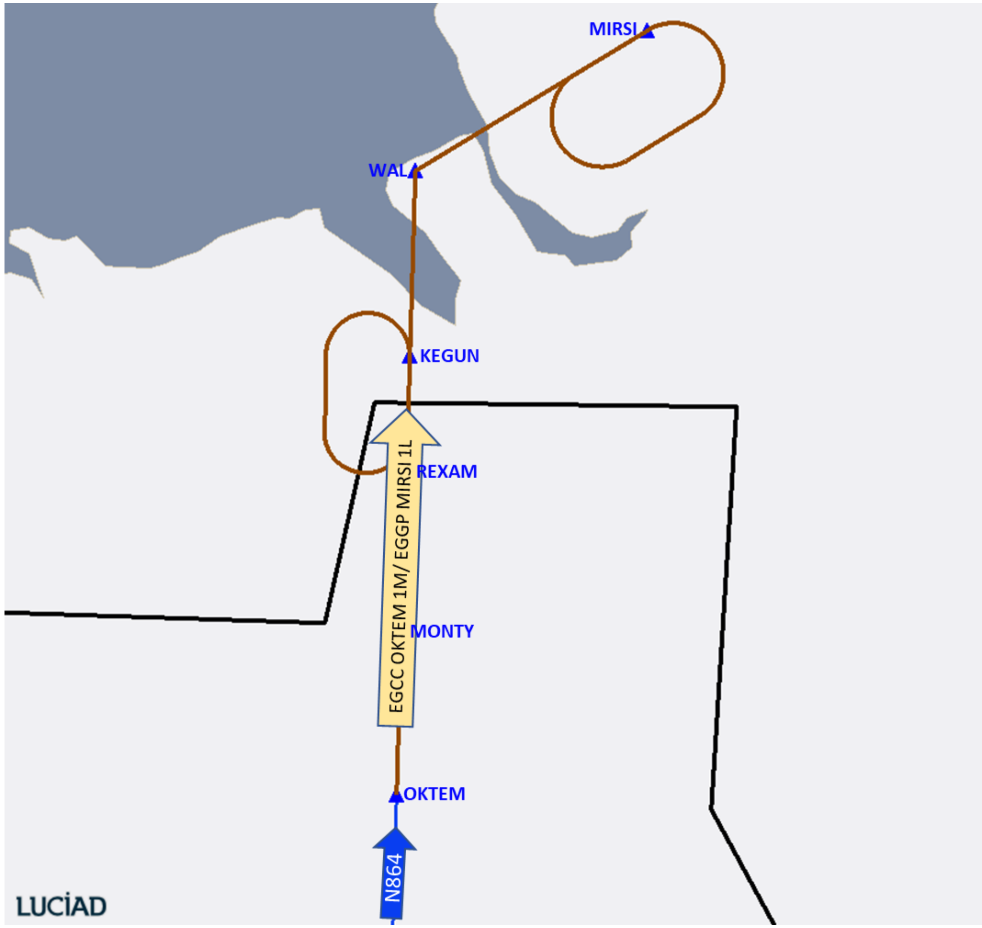

Figure 58 Baseline (extant) arrival routes (STARs) to Liverpool and Manchester

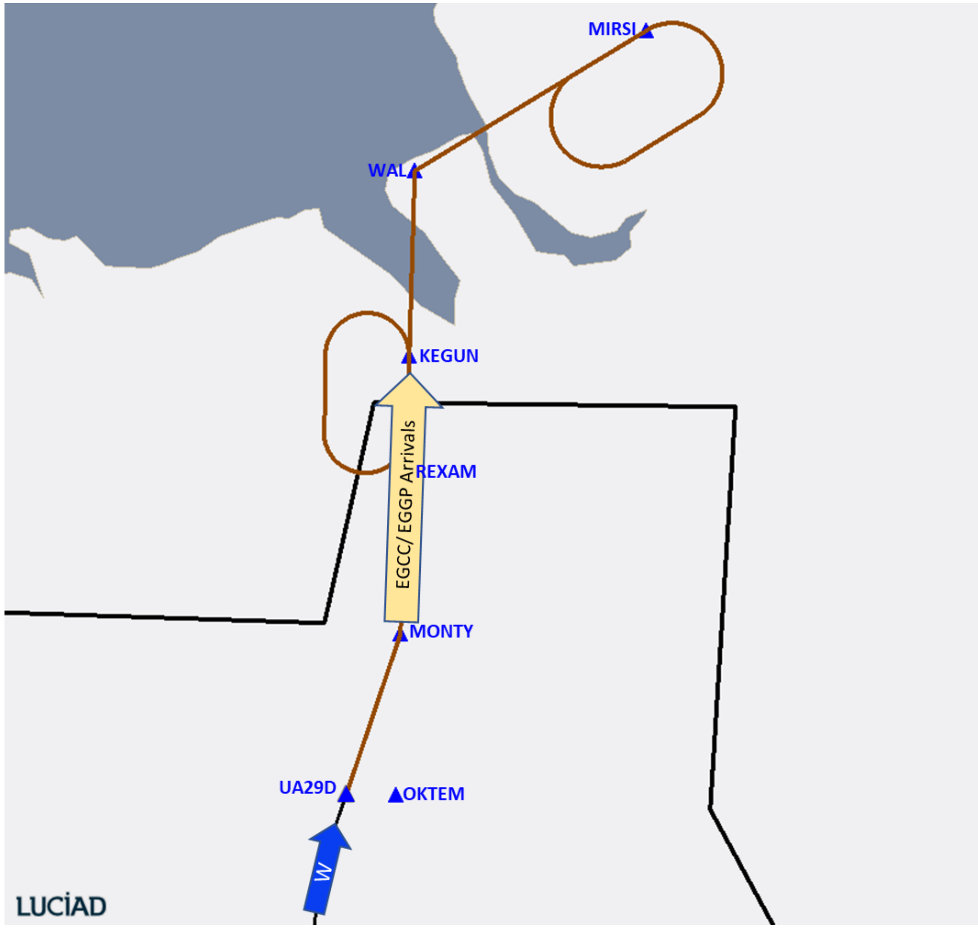

Figure 59 Proposed arrival routes (STARs) to Liverpool and Manchester

Proposed changes to Airport SIDs at MTMA (Northern) Interface

The SIDs which would require to be changed are detailed in Table 23 below. These are illustrated in Figure 60 and Figure 61. Currently there are SIDs from Manchester (EGCC) and Liverpool (EGGP) airports which carry southbound traffic through this interface and would have altered connectivity as a result of these proposed changes.

EGGP REXAM SIDs would not be changed, but they would now all connect to Route Z at TORAN from REXAM (via UA98E).

The EGCC KUXEM SIDs would not change, they currently connect to P17 and would continue to do so. P17 would no longer connect to N862 at NOKIN, onward traffic would utilise Route Y (UA54E) or Route Z (UA55E).

The EGCC MONTY SIDs currently connects to N42 to join N862 at RETSI.

Airport	Connecting SIDs/Route	Current route/ Connecting point	Proposed route/ Connecting Point	Change/ Route connectivity
EGGP	REXAM 2T, 2V	N864 via REXAM	UA55E (Route Z) via REXAM – TORAN (UA98E)	Route connectivity No change to SIDs
EGCC	MONTY 1S/1Z/1Y/1R	N42, N862	MONTY	No change (only used by aircraft leaving CAS)
EGCC	KUXEM 1R/1Y ASMIM 1S/1Z	P17, NOKIN P16, NOKIN	P17, NOKIN UA55E (Route Z) via– TORAN P16, NOKIN UA55E (Route Z) via– TORAN	Route connectivity No change to SIDs Route connectivity No change to SIDs

Table 23 Proposed changes to SIDs at MTMA (Northern) Interface

No other change is proposed at this interface to any other airports' SIDs or STARs.

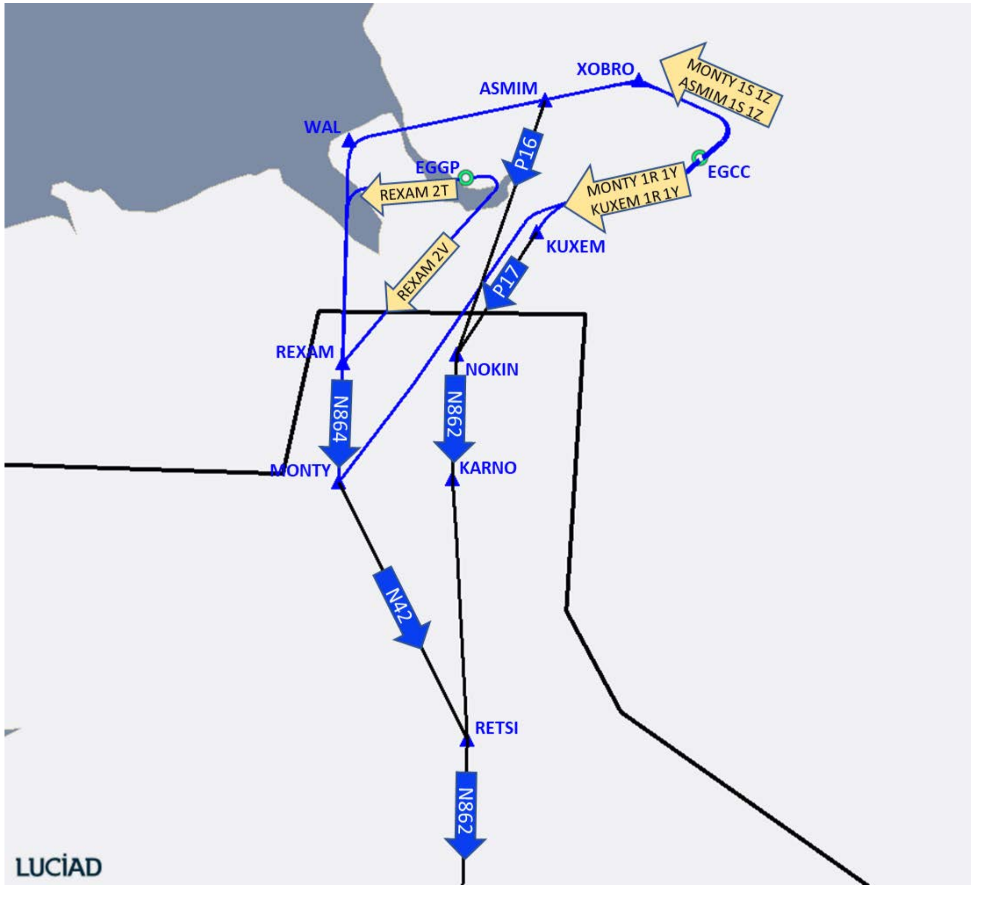

Figure 60 Baseline (extant) departure routes (SIDs) from Liverpool and Manchester

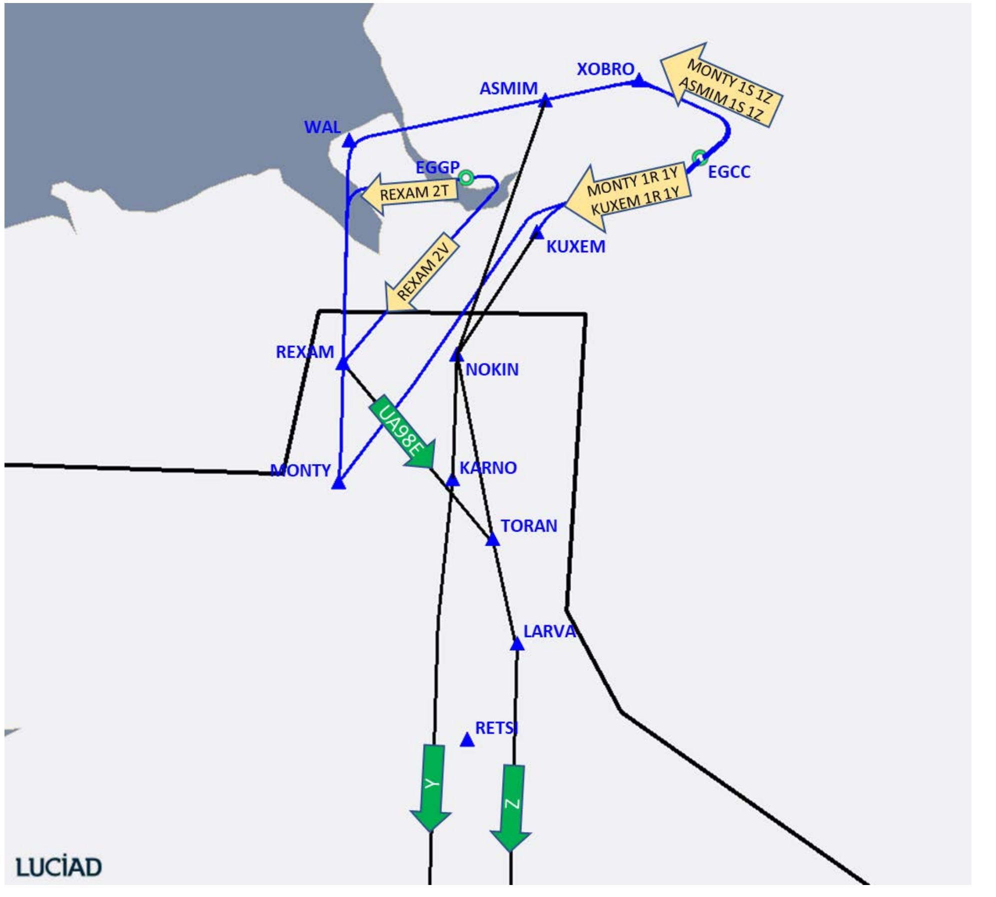

Figure 61 Proposed departure routes (SIDs) from Liverpool and Manchester

Connectivity with the wider ATS Route network at the Northern Interface

It would be inefficient to connect the proposed LD1.1 routes to legacy airspace exactly on existing sector boundaries. Therefore some connecting routes extend beyond the red outline depicted in Figure 1.

The relevant connecting routes at the northern interface are shown in Figure 62 below. These routes would provide enhanced connectivity for flights to/from the northern interface.

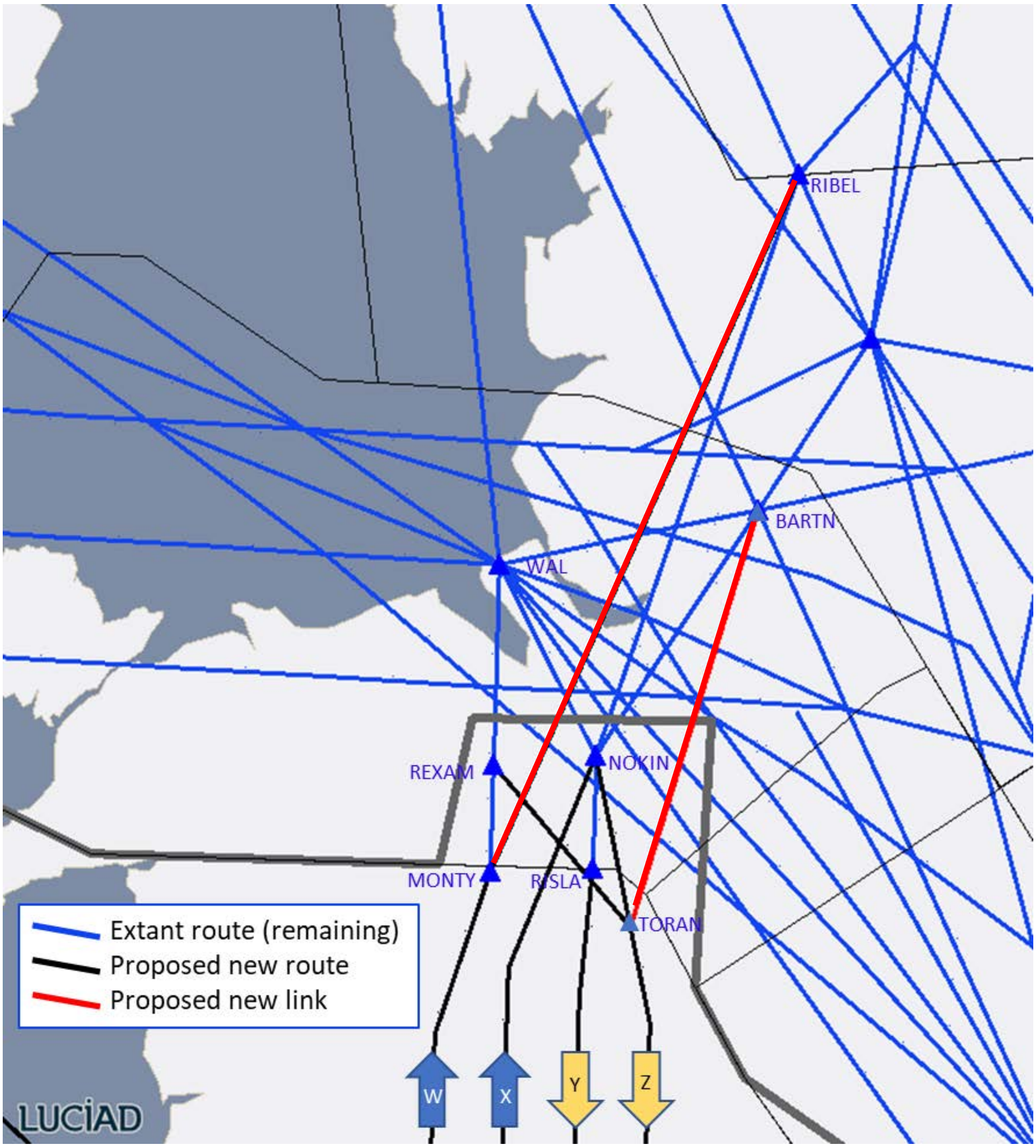

Figure 62 MTMA extended connectivity

Impact Assessment

For the Northern interface there is no diff between Option 4 and Option 6. For overall impacts see Section 17.

16. Western interface (Ireland)

This interface is used by traffic to/from the south and east airports to Dublin, LTMA Oceanic traffic, and overflights. The airspace encompasses the UK Danger Area EGD201 complex, which is used routinely for UK military training activity.

The complex is sub-divided into sections (EGD201A-EGD201J see Figure 63) and managed by the UK Airspace Management Cell, (AMC) using Flexible Use of Airspace (FUA) principles.[23] This enables both military and civil aircraft to share the airspace to meet military requirements and improve airspace efficiency.

The baseline airspace design has options for Dublin arrival flows from the south and east when either or all of D201H/J/A are active to their maximum vertical extent. However, when either or both of D201F/G are activated above FL145, there are no flight planning options available for Dublin arrivals from the south and east. Traffic is forced to route to the north of the D201 complex which has a fuel burn and environmental impact. NATS has engaged extensively with the MoD and QinetiQ (a major contractor for the MoD) throughout the ACP process to achieve a permanent flight plan option for Dublin arrivals from the south and east regardless of the D201 danger area configuration.

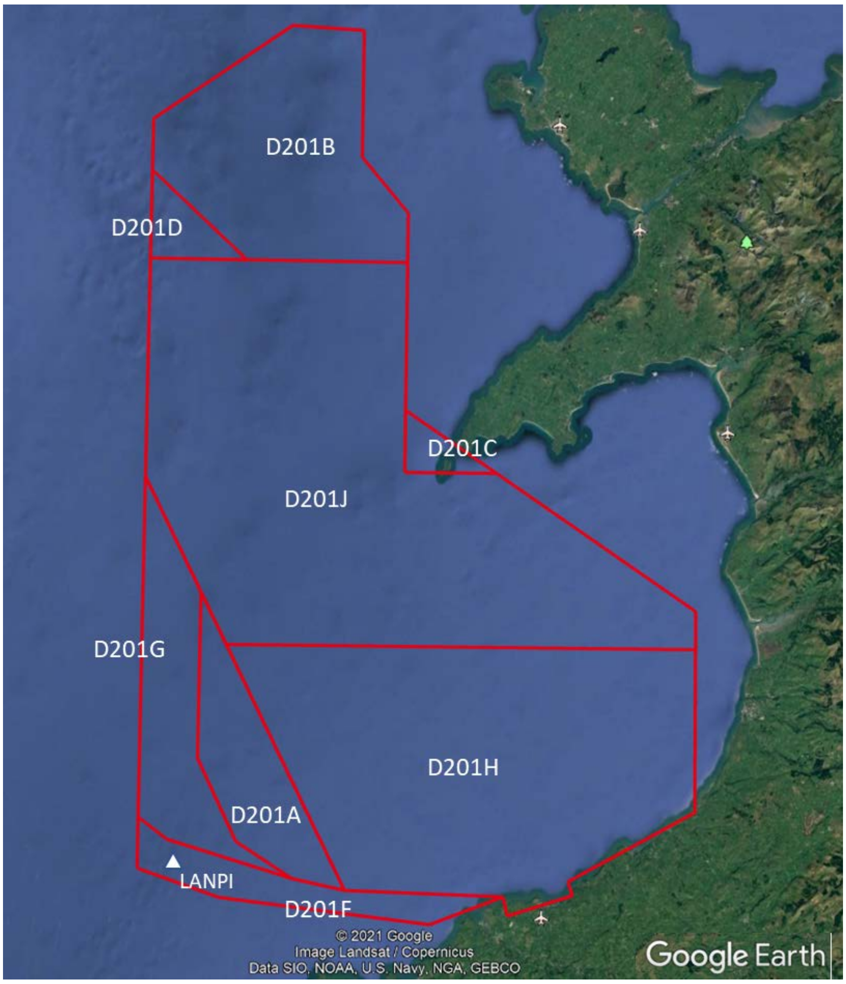

Figure 63 EGD201 Danger Area Complex

The key themes from this engagement are summarised below:

- For aircraft to safely anticipate the turn of the flyby waypoint and re-establish on a straight-line route segment, to avoid clipping the south western corner of the danger area, a redefinition of the danger area boundaries is likely to be required.
- The lead in time to book EG D201 F&G above FL145 (90 days) is restrictive.

As part of the options development, NATS has considered solutions to remove the interdependency between the danger areas.

QinetiQ and the MoD have agreed that NATS can consider redefining the EG D201 complex boundary in the south west corner (in the vicinity of LANPI) to provide connectivity for Dublin arrivals. The extent of the redefinition is dependent on the options presented within this document. The diagrams showing the proposed danger area boundaries are indicative and subject to a safety assessment that would be completed post consultation.

[23] FUA Commission regulation (EC) No 2150/2005 of 23 December 2005 laying down common rules for the flexible use of airspace requirements, is the applicable regulation that defines requirements for flexible use of airspace between Military and Civil entities responsible for Air Traffic Management.

16.1. Current Dublin Interface (Baseline)

Please note that due to the complexities associated with the interaction with the Special Use Airspace (SUA) this section has additional detail. Dublin arrival and departure routes, to and from the south and east are dependent on the status and configuration of the D201 danger area complex as shown in Table 24 below.

Danger Area Configuration	Dublin Arrival Route Options from the South East	Dublin Departures on the PESIT SID to the South East
All inactive	L18 to LIPGO, M17 to VATRY or Q63 to VATRY	BAKUR
201H/J active	M17 to VATRY or Q63 to VATRY	BAKUR
D201H/J/A active	Q63 to VATRY	BAKUR
D201H/J/A/F and or G above FL145 active	Nil	BAKUR

Table 24: D201 Extant configurations

Oceanic traffic enters/exits UK FIR via COPs BAKUR/SLANY/BANBA. Figure 64 shows the current routes and the overlap with D201F and G emphasised.

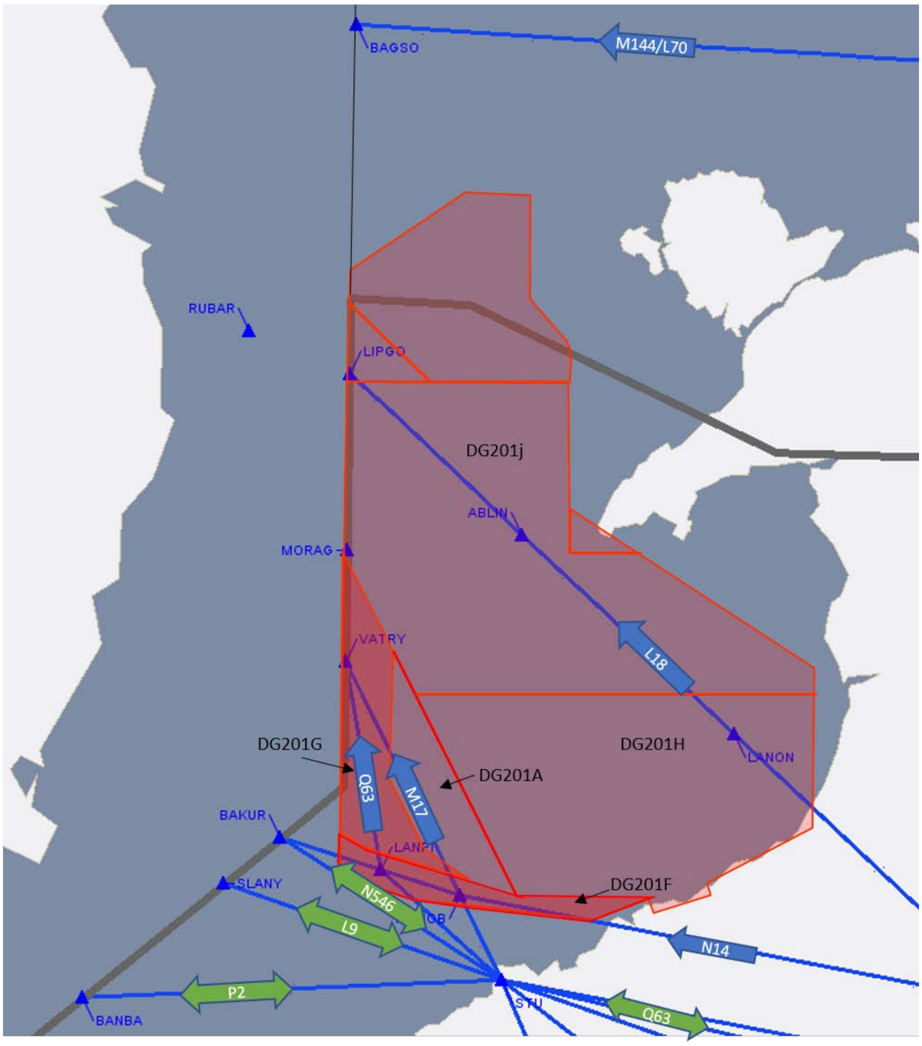

Figure 64 Extant Ireland Interface and D201

When D201F&G are active above FL145, LTMA west-bound oceanic traffic that routes along N14 is also impacted. The majority of LTMA west bound Oceanic traffic has to flight plan alternative routes.

For this reason EIDW arrivals that overfly the UK generally flight plan via BAGSO.

This increases track distance and means aircraft are unable to take advantage of tactical re-routes when a clearance to transit D201 is offered by QinetiQ.

16.2. Proposed Airspace:

This change proposes a systemised interface between Dublin and Swanwick which would improve the interaction with the D201 complex. Engagement with QinetiQ, the MoD, the IAA and NATS has determined that the optimal solution to resolve the issues identified above would be to redefine the corner of the EGD201 complex in order to create a new danger area segment, with a maximum upper level of c.FL145.

The creation of a new segment to enable a Dublin arrival option when D201F & G are active above FL145 would mean traffic would no longer have to flight plan via BAGSO, offering fuel and CO_2e benefits. It would also negate the requirement for the 90-day notice period; which was identified as a key benefit for the MoD (QinetiQ).

The proposed route around the southwest corner of the D201 danger area complex would enable traffic to take advantage of tactical clearance to transit the danger area, again optimising environmental benefits.

No change is proposed to the use of the STU reduced coordination area (RCA), and therefore it is expected that most Dublin arrivals would be provided with a tactical direct to VATRY to reduce flight distance, fuel burn and CO_2e emissions.

At the interface there would be a general orientation of traffic whereby the eastbound traffic is on the southside and the westbound traffic is to the north, with two separate routes to replace the current bi-directional Q63.

Engagement with stakeholders has led to the development of two options for the new Danger Area segment.

Option 4 – a smaller segment is created; this minimises the impact on the MoD/Qinetic

Option 6 – a slightly larger segment is created. This reduces the track mileage for aircraft and offers marginally greater environmental benefits.

These two options are presented in further detail below. Table 25 shows the current baseline flight plannable options for each Danger Area configuration, and the proposed options:

	Dublin Arrival Options from South East			Dublin Departures
Western (Ireland) Interface Danger Area Configuration	Baseline	Option 4	Option 6	Via PESIT SID to the South-East
All inactive	L18 to LIPGO, M17 to VATRY or Q63 to VATRY	L18 to LIPGO, M17 to VATRY or UA39E to VATRY	L18 to LIPGO, M17 to VATRY or UA39E to VATRY	BAKUR
201H/J active	M17 to VATRY or Q63 to VATRY	M17 to VATRY or UA39E to VATRY	M17 to VATRY or UA39E to VATRY	BAKUR
D201H/J/A active	Q63 to VATRY	UA39E: PETAL - VATRY	UA39E: PETAL - VATRY	BAKUR
D201H/J/A/G above FL145 active	Nil	UA75F: PEMOB – UA45D - RUMAR	UA75F: PEMOB – UA47D - RUMAR	UA44D
D201 H/J/A/G/F above FL145 active	Nil	N546: PETAL UA45D RUMAR	N546: PETAL UA47D RUMAR	UA44D

Table 25 Dublin Arrival and Departures: Danger area route configurations

Option I-4 (part of Option 4): Redefine the corner of the D201 complex to create a new SUA segment (D201K). This option presents the smallest segment which could be utilised. Figure 65 shows this indicative area (in blue), which would have a maximum upper level of c.FL145. This is necessary to ensure that when the aircraft FMS anticipates the turn for the flyby waypoint (UA45D), the aircraft trajectory remains outside of the SUA[24].

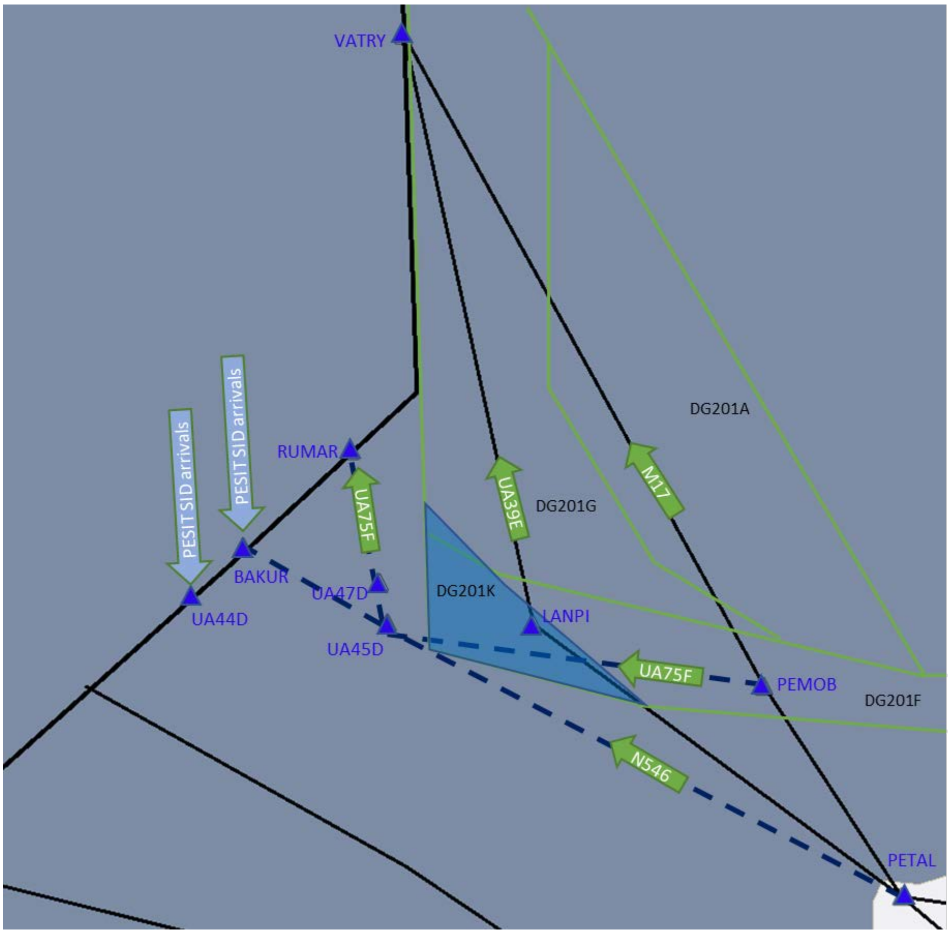

Figure 65 Option 4 Ireland Interface - proposed route structure

For both options, as now, when the Danger Area is inactive, Dublin arrivals can flight plan to LIPGO or to VATRY to join the existing STARs.

For both options, as now, when D201H&J are active but D201A/F/G are inactive, Dublin arrivals route PEMOB-VATRY and join to the existing VATRY STAR.

For both options, as now, when D201A is active, and D201F&G are inactive, Dublin arrivals route PETAL-LANPI-VATRY and join to the existing VATRY STAR.

For Option 4: When D201G is active above FL145; and D201F is inactive or only active below FL145, Dublin arrivals route PEMOB - UA45D - RUMAR and join to the existing VATRY STAR (connectivity to be delivered by the IAA).

When D201F is active above FL145, Dublin arrivals route PETAL - UA45D - RUMAR and join to the existing VATRY STAR (connectivity to be delivered by the IAA)

When D201F/G are active, Dublin departures would route via the PESIT SID to a new COP south of BAKUR (UA44D), to provides a degree of systemisation between Dublin arrivals and departures[25].

The distance between UA44D and SLANY does not align completely with the systemisation concept, but the Dublin departures are likely to be lower than overflights routing via SLANY, which means that this compromise can be mitigated through procedures or tactically by the controller.

[24] The exact dimension of the danger area redefinition are to be determined. The examples used are based on radar data of flight profiles on a similar trajectory to those expected with the new design (Dublin arrivals routing N14, LANPI, Q63). Sample available was relatively small due to the tactical use of the STU RCA.
[25] This flight planning option would only be available for Dublin departures and only when D201 F/G are active.

Option I-6 (Preferred, part of Option 6): Redefine the corner of the D201 complex to create a new SUA segment (D201K): This option presents a slightly larger segment which would offer reduced track mileage. The turn at UA47D is closer to D201 than that proposed in option 4. Therefore the extent of the new danger area segment (D201K) would be larger to ensure that aircraft do not penetrate D201 when making the turn.

Figure 66 shows this area, which would have a maximum upper level of c. FL145. This is necessary to ensure that when the aircraft FMS anticipates the turn for the flyby waypoints (UA45D & UA47D), the aircraft trajectory remains outside of the SUA[26].

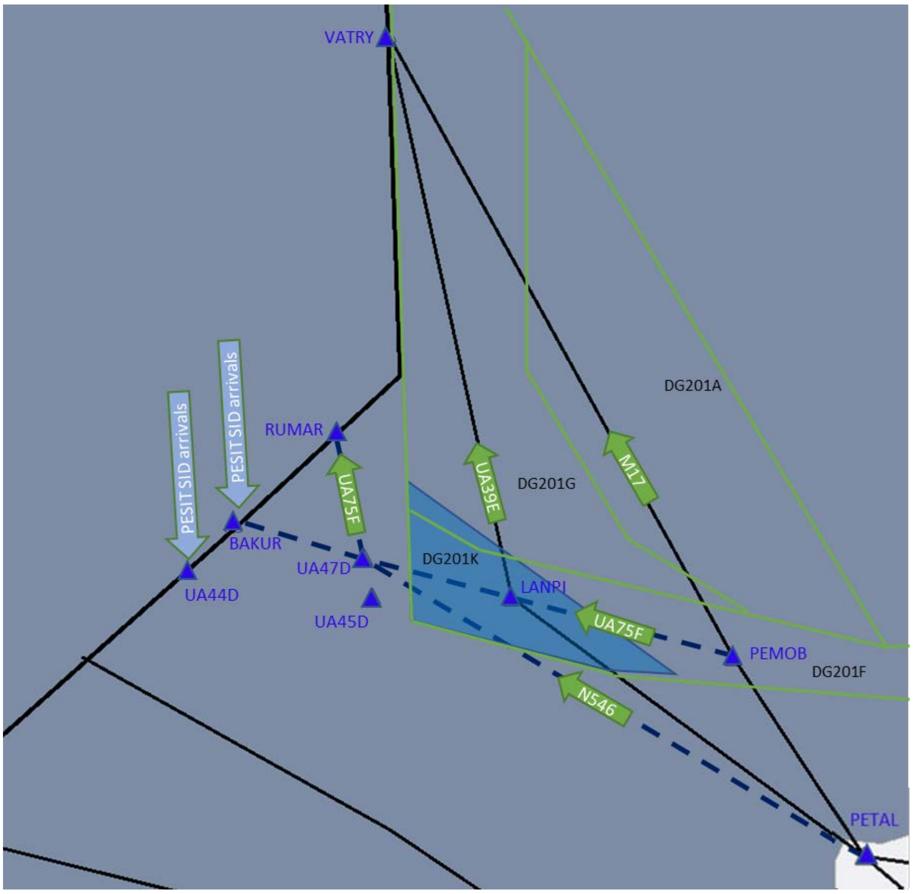

Figure 66 Option 6 Ireland Interface - proposed route structure

Figure 66 shows the proposed arrival routes for this option. For both options, as now, when the Danger Area is inactive, Dublin arrivals can flight plan to LIPGO or to VATRY to join the existing STARs

For both options, as now, when D201H&J are active but D201A/F/G are inactive, Dublin arrivals route PEMOB-VATRY and join to the existing VATRY STAR.

For both options, as now, when D201A is active, and D201F&G are inactive, Dublin arrivals route PETAL-LANPI-VATRY and join to the existing VATRY STAR .

For Option 6: When D201G is active above FL145; and D201F is inactive or only active below FL145, Dublin arrivals route PEMOB - UA47D - RUMAR and join to the existing VATRY STAR (connectivity to be delivered by the IAA).

When D201F is active above FL145, Dublin arrivals route PETAL - UA47D - RUMAR and join to the existing VATRY STAR (connectivity to be delivered by the IAA)

When D201F/G are active, Dublin departures would route via the PESIT SID to a new COP south of BAKUR (UA44D), to provides a degree of systemisation between Dublin arrivals and departures[27].

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[26] The exact dimension of the danger area redefinition are to be determined. The examples used are based on radar data of flight profiles on a similar trajectory to those expected with the new design (Dublin arrivals routing N14, LANPI, Q63). Sample available was relatively small due to the tactical use of the STU RCA.
[27] This flight planning option would only be available for Dublin departures and only when D201 F/G are active.

Impact Assessment

The difference between Option 4 and Option 6 due to the differences at the Ireland Interface are as follows. The proposed changes facilitate a reduction in track mileage of approx. 18NM against the current baseline of traffic routing via BAGSO should the DGA201A/F/G be active[28].

Computer modelling assessed the potential impacts for fuel burn and CO_2e emissions for each of the Ireland Interface options presented, as shown in Table 26:

	Track Distance change per flight (NM)	Fuel burn total 2023 (T)	Fuel burn total 2033 (T)	CO2e change 2023 (T)	CO2e change 2033 (T)
Option I-4	-17.5	-49	-69	-156	-218
Option I-6	-18	-52	-73	-165	-231

Table 26 Impact Assessment for I-4/I-6 sub options

Ireland Interface Option comparison. As described above, the proposed new SUA segment D201K is larger in Option I-6. This facilitates a slightly shorter plannable routing from PEMOB – UA47D – RUMAR (0.5NM), and a slightly greater fuel benefit over I-4.

NATS' preferred option is Option I-6. This option enables the greatest fuel/CO_2e savings.

[28] As this traffic is explicitly linked to the D201 complex, the analysis assumed no Danger Area activity. As BAGSO is outside of the geographical scope of the LD1.1 area, this traffic sample was captured separately.

17. Benefits & Impacts of this proposal

This section describes the impacts and/or benefits of the proposed LD1.1 options.

17.1. Assessment of Environmental Benefits/Impacts

CAP1616 requires that the environmental impacts (e.g. CO_2e emissions) of the proposed airspace changes are assessed for the ACP in question in isolation. However, this ACP (ACP-2017-70) is being implemented concurrently with the FRA D2 ACP (ACP-2019-12) and they are dependent upon each other. One of the reasons for doing this is that there are synergies which result in the combined system being more efficient. Hence the combined/cumulative results for both ACPs are also presented here.

17.2. Noise, visual intrusion, the general public, stakeholders on the ground

The changes proposed herein impact flights at/above 7,000ft. This is above the 7,000ft threshold stipulated by the DfT, below which overflights are deemed to have significant impact on stakeholders on the ground. As such, we assess that there would be no potential to change noise or visual intrusion impacts, and no significant change in impact to stakeholders on the ground due to any of the proposed LD1.1 change options.

17.3. CO_2e emissions

CO_2e emissions analysis has been performed using computer simulations which modelled the operation of the LD1.1 airspace.

This modelling assumes the interface options at Southern (Channel Islands/Brest) interface and Western (Ireland) interface remain as per the baseline model, with separate computer simulations modelled for each of the two interfaces. Table 27 shows the cumulative benefits for each option by combining the LD1.1 systemised model, and the interface options:

	Op4 CO_2e change 2023 (T)	Op4 CO_2e change 2033 (T)	Op6 CO_2e change 2023 (T)	Op6 CO_2e change 2033 (T)
LD1 (base)	-1,476	-2,054	-1,154	-1,606
LD1 Southern interface	132	183	121	168
LD1 Western interface	-156	-218	-165	-231
Total	-1,500	-2,089	-1,198	-1,669

Table 27 Overall CO_2e benefits for Option 4 & Option 6 (negative figures are a reduction i.e. benefit)

The results of the modelling given in Table 27 indicate that the proposed changes would result in a reduction in average CO_2e emissions per flight, with a forecast annual reduction in CO_2e emissions of 1,500 tonnes p.a. for Option 4 and 1,198 tonnes p.a. for Option 6.

It is important to note here the interdependency with the FRA D2 ACP, and to recognise the cumulative impact of both ACPs when considering the potential benefits. Due to the interdependency with this ACP and the FRA D2 ACP, the actual implementation level of FRA in this airspace would be determined post-consultation during Stage 4. The flight level at which FRA is implemented impacts the enabled benefits for FRA.

For transparency, the benefits across the whole airspace, for FRA D2 Option 1 with LD1.1 Option 6 (FRA DFL of FL305 (FL245 in Swanwick AC Sector 9) and FRA D2 Option 1 with LD1.1 Option 6 (FRA DFL of FL245 throughout the region) are presented, with the total overall impacts for each option summarised in Table 28 below:

		2023 CO_2e (T)	2033 CO_2e (T)	CO_2e (£)[29] 2023-33 NPV (traded)	CO_2e (£) 2023-33 NPV (non-traded)
LD1.1 benefits	Option 4	1,500	2,089	321,731	401,907
	Option 6	1,198	1,669	256,892	320,999
FRA benefits	Option 4	1,208	1,680	258,945	323,512
	Option 6	1,530	2,128	327,978	409,863
LD1.1 + FRA combined benefits	Option 4	2,708	3,769	580,676	725,419
	Option 6	**2,728**	**3,797**	**584,870**	**730,862**

Table 28 Combined benefits for LD1.1 and FRA D2 (all figures are a reduction i.e. benefit/saving)

Column 3 & 4 in Table 28 give the annual CO_2e emissions savings estimated for each option in 2023 and 2033. Columns 5 & 6 give the figures for monetised value of traded and non-traded CO_2e emissions savings, totalled across the years 2023-33.

Table 28 shows that when viewed in isolation, LD1.1 Option 4 appears to provide the greater CO_2e benefit than Option 6. However when combined with the implementation of FRA above, Option 6 provides the greatest overall benefit (as highlighted by the red outline). Therefore, to optimise the largest environmental benefit from both ACPs, NATS advocates Option 6 as the preferred option, given the holistic overview.

Results from WebTAG are given in full in Appendix A of the Full Options Appraisal (ref 8).

17.4. Fuel burn

Fuel burn analysis has been performed using computer simulations which modelled the operation of the LD1.1 airspace. This modelling assumes the interface options at Southern (Channel Islands/Brest) and Western Ireland Interface remain as per the baseline model, with separate computer simulations modelled for each of the two interfaces. Table 29 shows the cumulative fuel benefits for each Option by combining the LD1.1 systemised model, and the interface options:

	Op4 fuel burn total 2023 (T)	Op4 fuel burn total 2033 (T)	Op6 fuel burn total 2023 (T)	Op6 fuel burn total 2033 (T)
LD1 (P8 base)	-464	-646	-363	-505
LD1 Southern interface	41	58	38	53
LD1 Western interface	-49	-69	-52	-73
Total	-472	-657	-377	-525

Table 29 Overall fuel burn benefits for Option 4 & Option 6 (negative figures are a reduction i.e. benefit)

The results of this modelling indicate that the proposed changes would result in a reduction in average fuel burn per flight. The best-case forecast average reduction in fuel burn (which corresponds to Option 4) is 1.1kg per flight, this gives a total reduction of 472 tonnes of fuel p.a. (2019 traffic level).

The summed overall impacts for each option are summarised in Table 30 below.

		2023 Fuel saving (T)	2033 Fuel saving (T)	2023 Fuel cost saving (£)[29]	2033 Fuel cost saving (£)
LD1.1 impacts	Option 4	472	657	215,974	300,803
	Option 6	377	525	172,504	240,260
FRA impacts	Option 4	380	528	173,877	241,598
	Option 6	481	669	220,092	306,115
LD1.1 + FRA combined impacts	Option 4	852	1,185	389,851	542,401
	Option 6	**858**	**1,194**	**392,596**	**546,375**

Table 30 Combined fuel benefit (saving) for LD1.1 and FRA D2 (all figures are a reduction i.e. benefit/saving)

[29] See Full Options Appraisal (Ref 8) for more detail of fuel and CO_2e calculations.

Column 3 & 4 in Table 30 give the annual fuel savings estimated for each option in 2023 and 2033. Columns 5 & 6 give the annual saving in fuel cost, estimated for each option for 2023 and 2033.

Table 30 shows that when viewed in isolation, LD1.1 Option 4 appears to provide the greater fuel burn benefit than Option 6. However when combined with the implementation of FRA above, Option 6 provides the greatest overall benefit (as highlighted by the red outline). Therefore, to optimise the economic benefit (in terms of fuel burn) from both ACPs, NATS advocates Option 6 as the preferred option, given the holistic overview.

Results from WebTAG are given in Appendix A of the Full Options Analysis (ref 8). Note that the Option 4 and Option 6 results in Table 30 summarise the computer simulation results which are given in full in Table 2, Appendix A of the Full Options Analysis (ref 8).

17.5. Combined Cost-Benefit

The monetised benefits of both options have been totalled in the analysis below. This analysis shows both the individual benefits for LD1.1 and FRA D2 and the combined results for both Option 4 and 6. The discount rate of 3.5% has been applied as per the standard rate given in the Treasury Green Book Annex A6.

The results in Table 31 show that the monetised benefit over ten years for Option 6 (£5,860,352) is greater than that for Option 4 (£5,817,946).

CAP1616 cost-benefit example - FRA Option 1 implemented at FL305 (LD1 Op4)							2					
	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	
Year	0	1	2	3	4	5	6	7	8	9	10	NPV
Discount factor	1	0.965	0.931	0.899	0.867	0.837	0.808	0.779	0.752	0.726	0.700	
Option 1 - Full FRA (100% benefit)												
Net community benefit (CO2)	£36,062	£42,442	£46,250	£49,112	£51,002	£53,065	£54,605	£56,460	£60,564	£64,774	£68,121	
Net airspace users benefit (Fuel)	£173,877	£197,213	£210,025	£216,431	£219,634	£223,295	£225,583	£229,701	£234,734	£238,395	£241,598	
Net sponsor benefit	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	
Present value	£209,939	£232,753	£241,830	£243,604	£241,464	£239,925	£236,772	£235,460	£237,084	£237,773	£237,307	£2,593,912
LD1.1 Option 4												
Net community benefit (CO2)	£44,821	£52,680	£57,448	£61,022	£63,342	£65,847	£67,831	£70,142	£75,260	£80,538	£84,705	
Net airspace users benefit (Fuel)	£215,974	£244,914	£260,833	£269,180	£272,679	£277,588	£280,641	£285,693	£291,978	£296,358	£300,803	
Net sponsor benefit		£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	
Present value	£260,794	£289,022	£300,343	£302,916	£299,804	£298,141	£294,460	£292,776	£294,828	£295,599	£295,352	£3,224,035
Combined: FRA Op1/LD1.1 Op4)												
Net community benefit (CO2)	£80,883	£95,123	£103,698	£110,135	£114,344	£118,913	£122,436	£126,602	£135,824	£145,312	£152,825	
Net airspace users benefit (Fuel)	£389,851	£426,653	£438,475	£436,386	£426,924	£419,153	£408,796	£401,634	£396,088	£388,060	£379,833	
Net sponsor benefit	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	
Present value	£470,733	£521,775	£542,173	£546,520	£541,269	£538,065	£531,232	£528,236	£531,912	£533,372	£532,659	£5,817,946

CAP1616 cost-benefit example - FRA Option 1 implemented at FL245 (LD1 Op6)												
	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	
Year	0	1	2	3	4	5	6	7	8	9	10	NPV
Discount factor	1	0.965	0.931	0.899	0.867	0.837	0.808	0.779	0.752	0.726	0.700	
Option 1 - Full FRA (100% benefit)												
Net community benefit (CO2)	£45,693	£53,769	£58,587	£62,233	£64,619	£67,213	£69,189	£71,521	£76,707	£82,024	£86,286	
Net airspace users benefit (Fuel)	£220,092	£249,376	£265,849	£274,543	£278,203	£282,779	£285,982	£291,015	£297,421	£301,539	£306,115	
Net sponsor benefit	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	
Present value	£265,785	£294,417	£306,152	£308,945	£305,871	£303,850	£300,131	£298,302	£300,368	£300,846	£300,653	£3,285,320
LD1.1 Option 6												
Net community benefit (CO2)	£35,765	£42,094	£45,909	£48,721	£50,601	£52,624	£54,154	£56,001	£60,082	£64,266	£67,675	
Net airspace users benefit (Fuel)	£172,504	£195,620	£208,335	£215,002	£217,797	£221,717	£224,156	£228,191	£233,211	£236,709	£240,260	
Net sponsor benefit	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	
Present value	£208,269	£230,867	£239,916	£241,929	£239,470	£238,164	£235,169	£233,824	£235,457	£236,041	£235,924	£2,575,031
Combined: FRA Op1/LD1.1 Op6)												
Net community benefit (CO2)	£81,458	£95,863	£104,496	£110,954	£115,220	£119,837	£123,344	£127,522	£136,789	£146,290	£153,961	
Net airspace users benefit (Fuel)	£392,596	£429,421	£441,572	£439,920	£430,121	£422,177	£411,957	£404,605	£399,036	£390,597	£382,617	
Net sponsor benefit	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	
Present value	£474,054	£525,284	£546,068	£550,874	£545,341	£542,014	£535,300	£532,127	£535,825	£536,887	£536,577	£5,860,352

Table 31 Cost Benefit Analysis for LD1.1 individually, and combined with FRA D2.

17.6. Airspace capacity

The systemised route structure proposed by LD1.1 would reduce network constraints on air traffic flows thus increasing capacity and avoiding consequential delay and cost. A capacity benefit is anticipated, however this benefit is not easily quantifiable, and no specific figure for capacity benefit is claimed by this proposal.

LD1.1+FRA requires that some RAD restrictions are used to deconflict traffic and prevent a reduction in the airspace capacity. Hence RAD restrictions are proposed to be used to manage the flow of traffic transitioning into and out of FRA, and to provide some optimisation in areas of high traffic complexity.

17.7. MoD

The LD1.1 project has engaged at all stages with the MoD and the proposed LD1.1 is not expected to have unacceptable impact on MoD operations. Operational Air Traffic (OAT) flight plans would not be adversely affected by the changes.

Where large scale military exercises occur, as extant, flight plan restrictions would be managed by the CAA, Airspace Regulation (Utilisation) (notified by NOTAM).

17.8. General Aviation (GA) airspace users

Engaged – request feedback on proposals. There is expected to be a limited impact on general aviation and sport aviation airspace users. Arrangements for the activation of Upper Gliding Areas within the West airspace would be unaffected by the introduction of LD1.1. NATS has taken the views of all stakeholders into consideration and has attempted, where possible, to accommodate GA stakeholder requests in their key areas of interest. In particular we have endeavoured to release as much CAS as practicable, which has resulted in a significant release of CAS to Class G.

17.9. Commercial Airlines

Overall, the combined LD1.1+FRA is expected to yield a positive impact on the operations of commercial airlines. LD1.1 would enable increased flexibility in flight planning. Tactical intervention by ATC would be reduced which would result in the trajectories being flown correlating more closely to the Flight plan . The preferred LD1.1 option should enable airlines to enter a FRA environment lower than otherwise, and the combined LD1.1+FRA system would bring benefit overall. (see Appendix B).

17.10. Impact on Aviation Safety

The proposed LD1.1 takes advantage of the precise navigation technology available on modern aircraft.

ATC can monitor the track keeping of all aircraft and in LD1.1 the trajectory flown should be the same or very close to the flight-planned trajectory (unless controller intervention is required). Hence in LD1.1 it should be easier for ATC to identify where an unauthorised deviation from the flight planned trajectory occurs. This can be automatically notified/alerted to the air traffic controller by conformance monitoring tools.

With an increase in the proportion of aircraft conforming to the flight plan route (compared to the current day operation), the operation of medium term conflict detection (MTCD) tools becomes more effective and accurate. MTCD uses the flight plan as the basic source of data. If the flight is vectored off the flight plan route, it assumes an extrapolated straight line. Hence if the flight is conforming to the flight plan, MTCD has an accurate prediction of the trajectory for further ahead than when tactical vectoring is employed. This assists the ATC operation and could result in an improvement in safety.

17.11. Reversion Statement

Should the proposal be approved and implemented, depending on the Option implemented, reversion to the pre-implementation state would be:

- LD1.1 Option 4. (Systemised route structure up to FL305) – Complex and very difficult
- LD1.1 Option 6. (Systemised route structure up to FL245, with FRA above) – Complex and very difficult

The introduction of a new large scale ATS routes structure as proposed by option 4 and 6 would permanently and significantly change the airspace structure, hence making reversion complex and extremely difficult.

In the unlikely event that there are unexpected issues caused by this proposal, then short notice changes could be made via NOTAM or by adding Route Availability Document (RAD) restrictions. For a permanent reversion, the changes would have to be reversed by incorporating this into an appropriate future AIRAC date. Due to the limitations of NATS Area System (NAS - flight and radar data processing) large scale airspace changes are only implemented four times a year.

18. How to respond to this consultation

The consultation begins on 6th September 2021 and ends on 29th November 2021, a period of 12 weeks & 1 day.

Consultation material is available on the CAA's airspace change consultation portal at:

https://consultations.airspacechange.co.uk/nats/LD1.1

The list of stakeholders targeted for this consultation is given in the Consultation Strategy (Ref 7) Appendix A. These stakeholders have been directly informed of this consultation.

The consultation is not limited to these stakeholders - anyone may respond.

A feedback questionnaire is provided on the consultation portal.

It is recommended (and preferred by the CAA) that responses are made via the portal. A link is also provided from the NATS website (NATS.aero).

Submissions via the portal are sent direct to the CAA. One supporting document per response may also be submitted via the portal.

Please note that when submitting feedback you will be asked to provide the following information:

Your name, and your role if you are responding on behalf of an organisation.

Your contact details (email)

One of the following:

- Support Option 4
- Support Option 6
- Support Both (no preference)
- Object to Both
- No Comment

Please give your reasons for supporting or objecting to the proposal.

(For example: the impacts and benefits it may have on your flights or organisation, and how often you would be affected.)

If this proposal does not affect your operation, please respond, as that fact itself is useful data.

Note that all responses go direct to the CAA who will moderate submissions. Responses will be publicly visible by being published on the CAA airspace change portal subsequent to submission.

19. Compliance with process, what happens next

19.1. Compliance

If you have questions or comments regarding the conduct of the airspace change process (e.g. adherence to CAP1616 (Ref 9)), please contact the CAA, by email at airspace.policy@caa.co.uk or by post to:

Airspace Regulation
Ref: NATS LD1.1 ACP-2017–70
Safety and Airspace Regulation Group
Aviation House
Beehive Ring Road
Crawley
West Sussex
RH6 0YR

Form FCS 1521 can be used for this purpose

Note: These contact details **must not** be used for your response to this consultation. If you do so, your response may be delayed or missed out.

19.2. What happens next?

After the consultation ends we will carry out a transparent and comprehensive review and categorisation of consultation responses, in accordance with a theming framework, helping us to understand and quantify the feedback. Early responses will inform and develop our categorisation framework.

This categorisation of results will reveal themes and information which may lead to a change in the proposed design, and other themes and information which would not lead to a change. After the consultation period closes, we will publish a report, under Step 3D of the CAP1616 process, which summarises the results into these two categories. This is the first consultation feedback report.

Next we will thoroughly review the items which may lead to a change in the proposed design and consider whether each item will or will not lead to an actual change – reasons will be provided either way, and the output will become the second consultation feedback report. We will also publish the revised final design, and complete a final options appraisal based on that revised design.

These three documents comprise Step 4A of the CAP1616 process and will be followed by the formal application for an airspace change proposal under Step 4B.

The CAA will then study the proposal to decide if it has merit, and will publish a decision on its website.

If the CAA approves this proposal, we plan to implement the changes not before March 2023.

Dependency with FRA D2

The LD1.1 and FRA D2 ACPs are dependent. The dependencies are described in detail in Section 2.7. If there is a delay to the proposed implementation of either ACP, (for example requirements for design modification and re-consultation for one ACP but not the other) this will delay both. Similarly issues with one ACP may necessitate redesign and re-consultation of the other.

- Do both ACPs have to be implemented at the same time? Yes, in practical terms the two ACPs cannot be implemented independently. There are significant design efficiencies and cost benefits to implementing at the same time. Implementing separately would incur very significant additional costs resulting from transitional states requiring additional design, consultation, validation, safety assurance training etc. From the airspace users' perspective the impact of trying to introduce the two changes separately could potentially result in confusion & stakeholder fatigue.

- LD1.1 cannot be implemented independent of FRA because there are no routes proposed above FL245/305 and no routes in sector 9 (see Figure 7 for location of Sector 9). Existing routes in sector 9 do not align to the route structure proposed in the LD1.1 ACP.
- FRA D2 cannot be implemented independently of the LD1.1 ACP because the structural limitation, FRA significant points etc are based on the LD1.1 ACP design options.

- What if there is a delay to either ACP, for example the need to re-consult as a result of the outcome of the other ACP consultation? If there is a delay to either ACP that would result in delay to the other. This risk is recognised and accepted.

20. Glossary of Terms

ACC	Area Control Centre (there are two ACCs in the UK, Swanwick and Prestwick)
ACP	Airspace Change Proposal
AIP	Aeronautical Information Publication (where airspace and route definitions are published)
ANSP	Airspace Navigation Service Provider
AOR	Area of responsibility
ATC	Air Traffic Control
ATS	Air Traffic Services
Baseline	'As is' situation against which proposed changes are measured
CAA	the UK Civil Aviation Authority
CAP	Civil Aviation Publication (publications produced by the CAA)
CONOPS	Concept of operations
DCT	(Direct) Waypoint to waypoint routing, which does not use an airway.
DVOR	Doppler VHF Omnidirectional Range (radio navigation beacon)
Eurocontrol	European Organisation for the Safety of Air Navigation; with 41 members it seeks to achieve safe and seamless air traffic management across Europe.
FAB	Functional Airspace Block. (e.g. the UK + Ireland airspace is agreed as a FAB)
FBZ	Flight Plan Buffer Zones – areas for flight planners to avoid to provide separation from Special Use Airspace.
FIR	Flight Information Region (Airspace below FL255)
FL:	Flight level, the altitude reference which aircraft use at higher altitudes using standard pressure setting, essentially units of 100ft, i.e. FL255 equates approximately to 25,500ft
FMC/FMS	Flight Management Computer/Flight Management System
FRA	Free Route Airspace
ICAO	International Civil Aviation Organisation – an agency of the United Nations.
IFPS	Integrated Flight-plan Processing System
LAMP	London Airspace Modernisation Programme; originally established to redesign the airspace in and around the London TMA region and the south of the UK, providing a more efficient airspace design, modernising the route structure and making better use of aircraft and ATC technologies.
MTCD	medium term conflict detection. Generic term for any ATC tool which looks ahead and predicts when aircraft are likely to be in conflict
NATMAC	National Air Traffic Management Advisory Committee
NDB	Non-Directional Beacon (radio navigation beacon)
NM	Network Management
NPZ	No Planning Zone – area where a flight plan is not permitted to enter at all or only when meeting prescribed criteria.
PCP	SESAR Pilot Common Project.
PBN	Performance Based Navigation – international requirements which standardise accuracy, safety and integrity for satellite navigation systems.
RAD	Route Availability Document: contains the policies, procedures and descriptions for route and traffic orientation. Includes route network and free route airspace utilisation rules and availability.
SESAR	Single European Sky ATM Research A collaborative project to completely overhaul European airspace and its air traffic management
SID	Standard Instrument Departure.
SRD	Standard Routing Document
STAR	Standard Terminal Arrival Route
SUA	Special Use Airspace – areas designated for operations of a nature that limitations may be imposed on aircraft not participating in those operations (i.e. military training areas)
TMA	Terminal Manoeuvring Area
UIR	Upper Information Region (Airspace above FL255)
VOR	VHF Omnidirectional Range (radio navigation beacon)
WebTAG	Department of Transport's WEB-based Transport Analysis Guidance; provides information on the role of transport modelling and appraisal, and templates for analysis (e.g. for Greenhouse gas emissions, and noise).

Appendix A: Airport Requirements

Airport Requirements (for Airspace Modernisation)

During engagement with Bristol, Cardiff and Exeter Airports the following high-level requirements were captured. As a result, the LD1 design options were developed with the facility to meet these requirements. Following the COVID-19 pandemic Bristol, Cardiff and Exeter paused their airspace change proposals, however the facility for these features remains in the LD1.1 designs. Thus, as Bristol, Cardiff and Exeter recommence their ACPs, they will be able to interface their new low-level route designs with the proposed LD1.1 network, and still achieve these aims. If proposed changes to the airports' arrivals and departures necessitate further change to the enroute network, this may be implemented by the LD1.2 ACP. Through the LD1.1 and LD1.2 ACPs:

- NERL will be committed to working with these airports to progress improved connectivity and a reduction in existing restrictions. This includes endeavouring to provide Bristol and Cardiff Airports with first rotation departures which are not restricted by constraints of the enroute airspace network.
- Future introduction of additional hold(s) for Bristol would be possible.
- Future introduction of an additional hold for Cardiff would be possible.
- Systemised flows for Bristol and Cardiff could be facilitated.
- Options for future improvements for connectivity to/from Exeter could be considered.
- NATS will work with Airport stakeholders throughout their ACP process for future design option assessment into the enroute network.

Interactions with FASI-S

NATS has proactively engaged with other sponsors of Airspace Change Proposals in the area including those involved in the FASI-S programme. As part of the stakeholder engagement for *this* ACP we sought to secure agreement with each sponsor, on the degree of dependencies and potential interactions between the LD1.1 ACP and their ACP. The interactions are summarised in Table 32 below and the map in Figure 67 on page 100.

Note: "Dependencies with LD1.1" in Table 32 refers to where an active ACP by another sponsor has an interface with the LD1.1 ACP at the same FLs. i.e. the traffic would transition from one ACP's airspace to the other, and hence changes in one ACP would have to take heed of any proposed in the other, in order to ensure the interface is seamless and efficient.

ACP Sponsor	ACP ref (linked)	Dependencies with LD1.1
Biggin Hill Airport	ACP-2018-69	No dependency with LD1.1. Biggin Hill's ACP area does not adjoin the LD1.1 ACP area. Biggin Hill departures-to / arrivals-from the west would nonetheless benefit from the increased capacity that would be provided by LD1.1. Thus LD1.1 does serve as an enabler for future development at Biggin Hill but there is no direct dependency.
Bournemouth Airport	ACP-2019-43	No dependency. Bournemouth's ACP area has some lateral overlap with that of LD1.1. However, the network interfaces would be as existing. Whilst Bournemouth's ACP area does adjoin the LD1.1 ACP area, LD1.1 is focussed on the BCN (Brecon) and BHD (Berry Head) Sector groups and these do not directly interface with Bournemouth's arrivals or departures. Aircraft would be at ~FL130 at the interface between the LD1.1 and Bournemouth's ACP areas. There is no network connectivity to the West or North West of Bournemouth due to the bases of CAS.
Bristol Airport	ACP-2018-55	Bristol Airport is within the LD1.1 ACP area. LD1.1 is progressing on the assumption that the existing SIDs/STARs routes would remain (notwithstanding possible SID truncation[30]). Engagement and detailed design work undertaken with Bristol during Stage 3 has endeavoured to ensure that the proposed LD1.1 network would allow Bristol's future design aspirations to be accommodated. See Bristol's engagement response in Ref 5. Note: if any subsequent changes to the network are necessary to facilitate connectivity these would be progressed via the LD1.2 ACP.

[30] SID truncation of the existing SIDs would be carried out independent of the LD1.1 ACP.

Cardiff Airport	ACP-2019-41	Cardiff Airport is within the LD1.1 ACP area. LD1.1 is progressing on the assumption that the existing routes would remain (notwithstanding possible SID truncation[3]). However, the proposed network would allow Cardiff's future design aspirations to be accommodated. See Cardiff's engagement response in Ref 5. Note: if any subsequent changes to the network are necessary to facilitate connectivity these would be progressed via the LD1.2 ACP.
Exeter Airport	ACP-2018-47	Exeter Airport is within the LD1.1 ACP area. LD1.1 is progressing on the assumption that the existing arrival/departure procedures would remain. During the stage 2 engagement with Exeter Airport NATS and Exeter agreed that the proposed network can allow Exeter's future design aspirations to be accommodated. See Exeter's engagement response in Ref 5. Note: if any subsequent changes to the network are necessary to facilitate connectivity these would be progressed via the LD1.2 ACP.
London City Airport	ACP-2018-89	No dependency with LD1.1. London City's ACP area does not adjoin the LD1.1 ACP area. London City departures-to / arrivals-from the west would nonetheless benefit from the increased capacity that would be provided by LD1.1. Thus LD1.1 does serve as an enabler for future development at London City but there is no direct dependency.
London Gatwick Airport	ACP-2018-60	No dependency with LD1.1. Gatwick's ACP area does not adjoin the LD1.1 ACP area. Gatwick departures-to / arrivals-from the west would nonetheless benefit from the increased capacity that would be provided by LD1.1. Thus LD1.1 does serve as an enabler for future development at Gatwick but there is no direct dependency.
London Heathrow Airport	ACP-2017-43	No dependency with LD1.1. Whilst Heathrow's ACP area does adjoin the LD1.1 ACP area, LD1.1 is focussed on the BCN (Brecon) and BHD (Berry Head) Sector groups and these do not directly interface with Heathrow approach or Heathrow departures. Stack utilisation at OCK (Ockham) and BNN (Bovingdon) would not be impacted by these changes. Aircraft would be at ~FL140 at the interface between the LD1.1 and Heathrow ACP areas. Departures to and arrivals-from the west would benefit from the increased capacity that would be provided by LD1.1 and therefore LD1.1 serves as an enabler for future development at Heathrow. Subsequent changes to the route network which may be required to accommodate a 2 runway or 3 runway ACP at Heathrow, are expected to be considered in future LAMP Deployments.
London Luton Airport	ACP-2018-70	No dependency with LD1.1. Luton's ACP area does adjoin the LD1.1 ACP area, and Luton departures-to / arrivals-from the west would benefit from the increased capacity that would be provided by LD1.1. Aircraft would be at ~FL160 at the interface between the LD1.1 and Luton ACP areas. Thus LD1.1 does serve as an enabler for future development at Luton but there is no direct dependency. Departures from Luton to Compton (CPT) would benefit from truncation of the SID to facilitate connectivity with the proposed ATS route. This would provide environmental benefit (CO_2e emission reduction) to these departures, with no change to noise impacts below 7,000ft.
London Southend Airport	ACP-2018-90	No dependency with LD1.1. Southend's ACP area does not adjoin the LD1.1 ACP area. Southend departures-to / arrivals-from the west would nonetheless benefit from the increased capacity that would be provided by LD1.1. Thus LD1.1 does serve as an enabler for future development at Southend but there is no direct dependency.
London Stansted Airport	ACP-2019-01	No dependency with LD1.1. Stansted's ACP area does not adjoin the LD1.1 ACP area. Stansted departures-to / arrivals-from the west would nonetheless benefit from the increased capacity that would be provided by LD1.1. Thus LD1.1 does serve as an enabler for future development at Stansted but there is no direct dependency.
MoD (RAF Northolt)	ACP-2018-66	No dependency with LD1.1. Northolt's ACP area is close to the LD1.1 ACP area, and Northolt departures-to / arrivals-from the west would benefit from the increased capacity that would be provided by LD1.1. Aircraft would be at ~FL140 at the interface between the LD1.1 and Northolt ACP areas. Thus LD1.1 does serve as an enabler for future development at Northolt but there is no direct dependency.
MoD (RAF Brize Norton)	ACP to be developed	No dependency with LD1.1. Brize Norton's airspace abuts the LD1.1 ACP area, and Brize departures / arrivals would benefit from the increased capacity that would be provided by LD1.1. Aircraft would be at ~FL80 at the interface between the LD1.1 and Brize Norton. Thus LD1.1 would serve to complement future development at Brize but there is no direct dependency.

Southampton Airport	ACP-2019-03	No dependency. Southampton's ACP area has some lateral overlap with that of LD1.1. However, the network interfaces would be as existing. Whilst Southampton's ACP area does adjoin the LD1.1 ACP area, LD1.1 is focussed on the BCN (Brecon) and BHD (Berry Head) Sector groups and these do not directly interface with Southampton's arrivals or departures. Aircraft would be at ~FL130 at the interface between the LD1.1 and Southampton's ACP areas. There is no network connectivity to the West or North West of Southampton due to the bases of CAS.
Manchester Airport (FASI-N)	ACP-2019-23	No dependency. Manchester's ACP area has some lateral overlap with that of LD1.1. Aircraft would be at ~FL200 at the interface between the LD1.1 and Manchester ACP areas. Thus LD1.1 does serve as an enabler for future development at Manchester but there is no direct dependency and the network interfaces would be as existing.
Liverpool Airport (FASI-N)	ACP-2015-09	No dependency. Liverpool's ACP area has some lateral overlap with that of LD1.1. Aircraft would be at ~FL160 at the interface between the LD1.1 and Liverpool ACP areas. Thus LD1.1 does serve as an enabler for future development at Liverpool but there is no direct dependency and the network interfaces would be as existing.
NATS FRA-D2 (Free Route Airspace)	ACP-2019-12	Dependency. The LD1.1 ACP is being progressed in parallel with the Free Route Airspace deployment 2 ACP. The LD1.1 design options (including Option 6 - the preferred option) are dependent on the two ACPs being approved and implemented concurrently. Both projects are consulting concurrently so that the dependencies are clear.

Table 32 Other ACPs: summary of any dependencies with LD1.1

More details on the AMS and FASI-S are available on the CAA website here and here respectively.

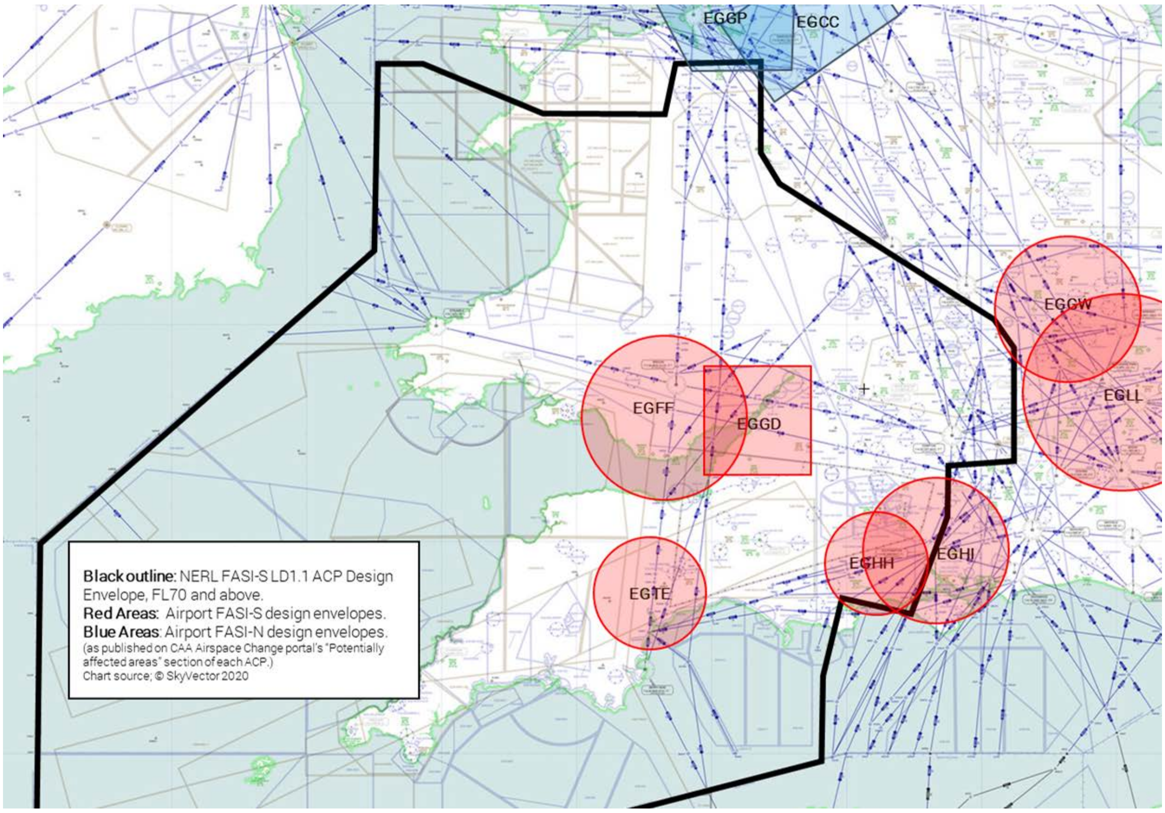

Figure 67 Other ACP interactions

All the airports listed in Table 32 will have airline operators that utilise this airspace. All these airports will continue to be engaged and consulted with as LD1.1 Stakeholders.

Appendix B: SUA - Safety Buffer Policy

The requirement for a buffer between ATS routes and Special Use Airspace (SUA) is contingent on the CAA's SUA - Safety Buffer Policy for Airspace Design Purposes (2014). The policy states that a buffer is only required for specific activity types within SUA[31]. Therefore, for those volumes of SUA which cater for multiple activity types as listed in AIP ENR 5.1, NATS intends to apply the buffer flexibly dependent on the activity being conducted within the SUA. This would be achieved by introducing Flight plan Buffer Zones (FBZ) which would be managed through existing Airspace Management processes. For more information on FBZs refer to Section 3 of the European Route Network Improvement Plan and the FRA D2 consultation document. The SUA volumes that could require a buffer and therefore need to be considered within the proposed FRA D2 region, are listed in Table 33 and illustrated in Figure 68.

Special Use Airspace	Designators				
Flag Officer Sea Training (FOST) Danger Area Complex	EG D006A EG D008C	EG D007A EG D009A	EG D007B EG D009B	EG D008A EG D012	EG D008B EG D013
Okehampton Complex (Okehampton, Willsworthy, Merrivale)	EG D011A	EG D011B	EG D011C		
Castlemartin	EG D113A	EG D113B			
Manorbier	EG D115A	EG D115B			
Salisbury Plain Training Complex	EG D123	EG D124	EG D125	EG D128	
Pendine	EG D117				
Pembrey	EG D118				
Aberporth Ranges	EG D201A EG D201G	EG D201B EG D201H	EG D201C EG D201J	EG D201D EG D201K[32]	EG D201F
West Wales	EG D202A	EG D202B	EG D202C	EG D202D	
Sennybridge	EG D203				
South West Managed Danger Areas	EG D064A	EG D064B	EG D064C		
North Wales Military Training Areas	South Low	South High	North Low	North High	

Table 33 List of Special Use Airspace which may require a buffer within the LD1.1 Region

In support of the design of LD1.1 and FRA D2, NATS intends to seek dispensation from the buffer policy. This has been deemed necessary to enable NATS to deliver specific initiatives of the CAA's AMS (Ref 11), which are:

- maintaining and enhancing high aviation safety standards
- securing the efficient use of airspace and enabling integration
- avoiding flight delays by better managing the airspace network
- improving environmental performance by reducing emissions
- facilitating defence and security objectives

The policy requires that upper ATS and conditional routes are separated from SUA by a minimum of 10nm. CTAs should be 5nm from SUA[33] and a vertical buffer of 2,000ft should be applied. Applying the criteria specified would have a significant impact to route flight plan availability, and therefore either negatively impact efficiency and environmental benefits or defence and security objectives (if a buffer were to be applied internally or SUA booking protocols established to limit SUA activation. For example, when the South West Manged Danger Areas are active, the FOST Danger Areas, Castlemartin and Manorbier Danger Areas could only be activated to a maximum altitude of c.22,00ft (refer to Table 33)). To illustrate this Figure 68 shows the airspace as it is today (where the airspace has evolved prior to the publication of the 2014 buffer policy (except for EG D064 A,B &C) and the airspace inclusive of a 10nm external buffer to the SUA volumes within the FRA D2 area.

[31] The North Wales Military Training Areas do not have any activity descriptors listed in the AIP. NATS assumes that High Energy Manoeuvres are conducted within these SUA volumes for the purposes of buffer policy applicability.
[32] New Danger area proposed by this ACP – see Section 15.
[33] Notwithstanding the Upper Airspace CTA which mirrors the UK UIR. See UK AIP ENR 2.1 FIR, UIR, TMA AND CTA.

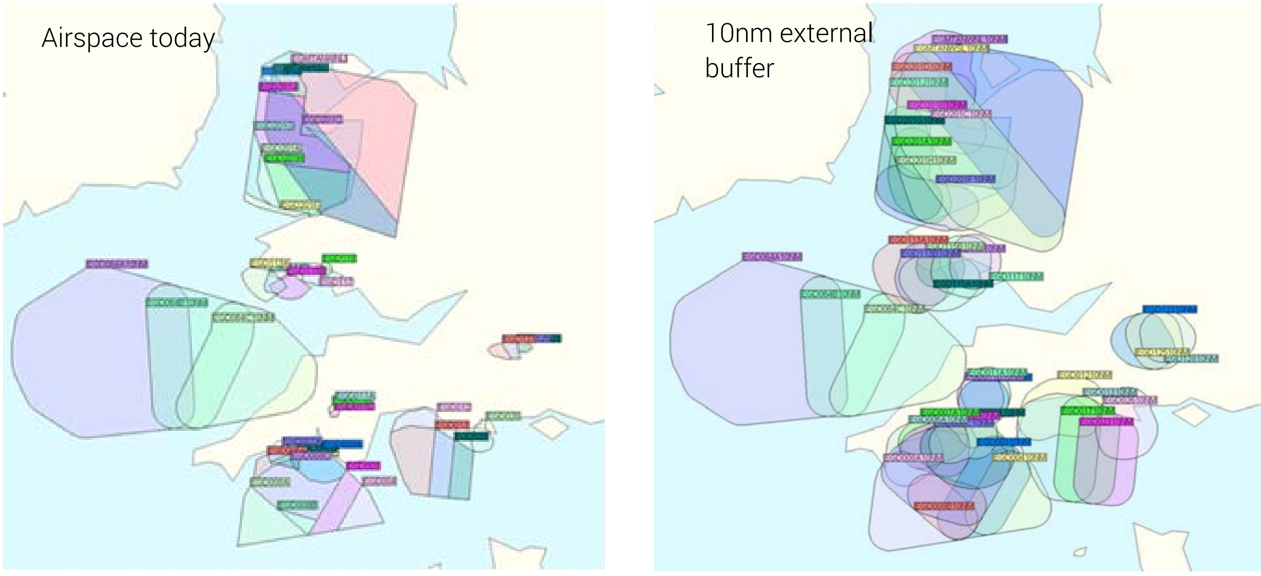

Figure 68 Illustrative example of the buffer policy

To make the case for policy dispensation it is necessary to determine a minimum safe distance that an ATS route can be from each SUA. To achieve this, it is necessary to conduct a hazard identification, risk analysis and assess the mitigations that can be considered (in accordance with the CAP760[34] guidance). CAP1616 recognises that it would be disproportionate to conduct detailed safety assessments while an ACP is at a formative stage with more than one option. Only a qualitative assessment is required until submission of the Final Options Appraisal (stage 4 of the ACP process). This work will be conducted post-consultation, once stakeholder feedback has been considered, an option selected and, if necessary, the design modified. Therefore, it is not possible to consult upon the size and shape of SUA buffers.

The request for dispensation will be based on the maintenance or enhancement of existing airspace arrangements that have been proved safe through established operational practice. It will also consider the outcome of route conformance data contained within CAP1385 (Ref 13), and the High Level High Speed trial report which analysed data on track-keeping conformance[35].

In addition, NATS has engaged extensively with the MoD to fully understand the nature of the activity that occurs within SUA, AIP activity descriptors and the safety barriers applied to ensure containment.

NATS has sought specialist advice from the CAA as advised in the policy. The CAA advised that they cannot make a decision on specific elements of the proposal prior to Stage 5 of the ACP process. The airspace design options are contingent on the safety case achieving dispensation from this policy. NATS will present the case for policy dispensation to the CAA in the ACP submission (Stage 4 of the ACP process).

[34] CAP760 - Guidance on the Conduct of Hazard Identification, Risk Assessment and the Production of Safety Cases
[35] Internal analytics reports completed by NATS. This information will be shared with the CAA as part of the ACP submission