London Airspace Modernisation Programme
Deployment 1
(LAMP D1)

(Part of NATS West Airspace Modernisation Project - L6203)

Gateway documentation:
Stage 2 Develop & Assess

2A Design Options and Evaluation

Roles

Action	Role	Date
Produced	Manager Airspace Change Compliance & Delivery Airspace and Future Operations	12/03/2021
Reviewed Approved	ATC Lead Swanwick Development	12/03/2021
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Drafting and Publication History

Issue	Month/Year	Changes this issue
0.1	Dec 2020	Working draft circulated to stakeholders for comment.
1.0	Jan 2021	Initial version submitted to CAA for Stage 2 (Feb 2021) gateway.
2.0	Mar 2021	Amended following gateway assessment feedback, submitted to CAA for Stage 2 (Mar 2021) gateway.

Contents

References

1. CAA Airspace Modernisation Strategy (CAP 1711)
   (Relevant Sections: Upper Airspace Section 4)
2. CAP 1616 Airspace Change Process
3. All published documentation related to this airspace change proposal is available on the CAA Airspace Change portal: https://airspacechange.caa.co.uk/PublicProposalArea?pID=40

Introduction – about this document, scope, background

This Airspace Change Proposal (ACP) is sponsored by NATS. 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 in accordance with 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.

This document forms part of the document set required for the CAP1616 airspace change process: Stage 2 Develop and Assess, Step 2A Design Options and Design Principle Evaluation. Its purpose is to provide, and describe, a comprehensive list of options, and to provide stakeholders with a high-level evaluation of those options. We sought feedback on the options and used it to perform the analysis against the agreed design principles. This forms the basis for selection of the most appropriate options for further development, and rejection of the remainder.

We re-engaged our representative stakeholder groups to involve them in the development of these options (see Annex A: Summary of Stakeholder Engagement on page 30 for details).

We thank the stakeholders for their involvement and feedback during this engagement.

Where are we in the airspace change process?

We have completed Stage 1 Define, where we established the need for an airspace change and the design principles underpinning it. We are now in Stage 2; Develop and Assess and this document is part of Step 2A.

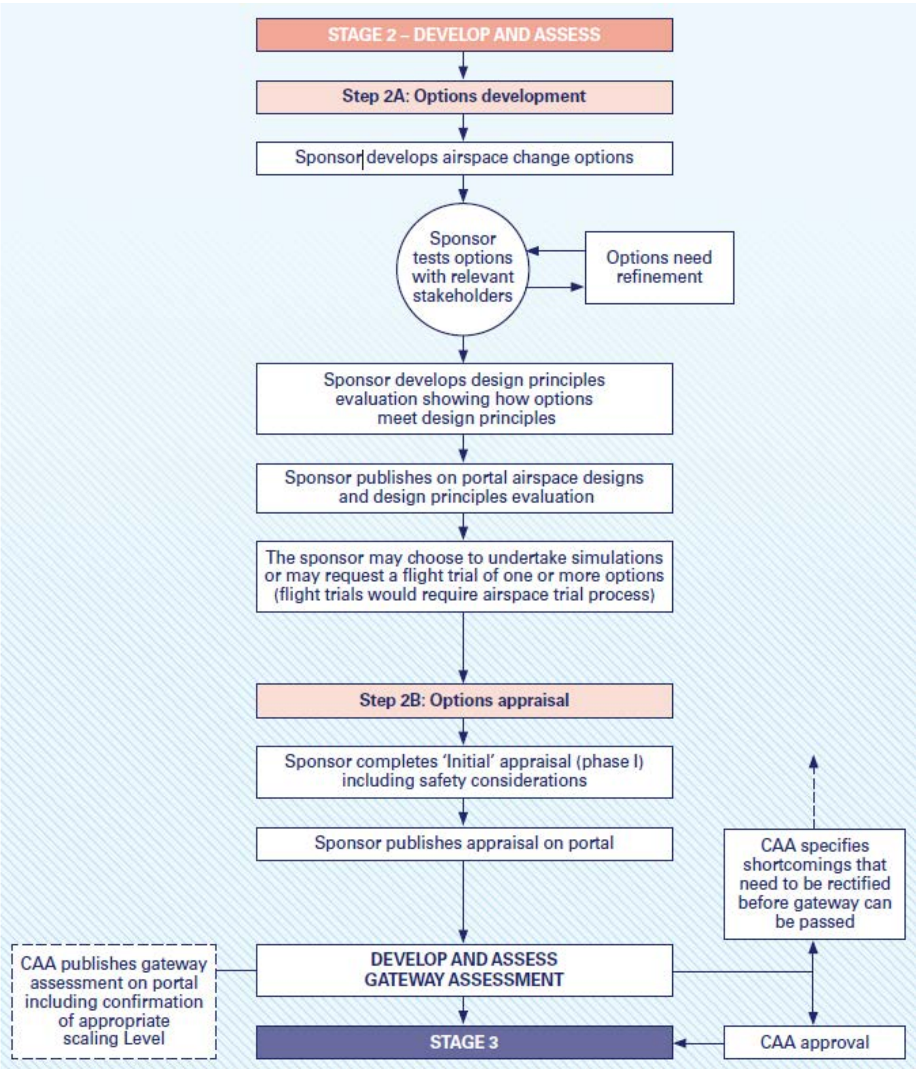

Figure 1 CAP1616 Airspace Change Process Stage 2

Scope

This Airspace Change Proposal (ACP) is the first deployment in the London Airspace Modernisation Programme (LAMP) of changes – known as LD1. Figure 2 below shows the lateral extent of the changes, vertically the changes will extend from a lowest level of FL75 (~7,500ft) up to where the ATS routes will interface with overlying Free Route Airspace[1] (FRA) (nominally FL245-FL305, ~24,500/30,500ft, exact levels to be determined).

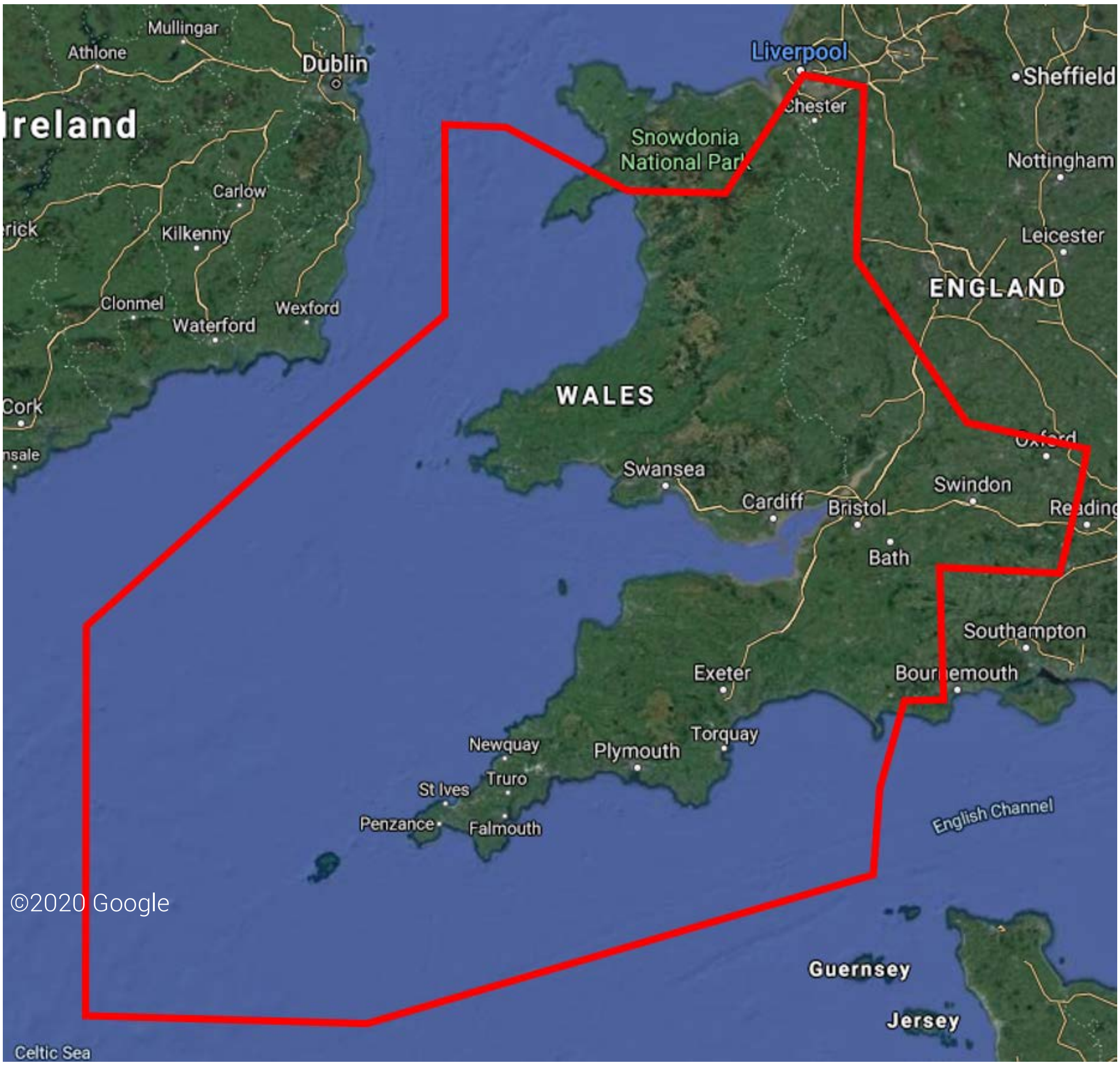

Figure 2 Airspace area covered by LAMP Deployment 1 (LD1)

Figure 2 shows the airspace within which the LD1 changes will be implemented. Note there will also be connecting link routes established to abutting airspace/sectors.

LD1 is the first of several deployments within the LAMP programme of airspace changes. These changes represent the first step towards modernising the en-route network which will benefit traffic flows to/from all airports in the South of England and Wales including all London Airports, Manchester and Liverpool as well as traffic overflying the region.

These changes are in accordance with the UK Airspace Modernisation Strategy (AMS) (ref 1) which was initiated by the CAA and the UK Government (this superseded the CAA Future Airspace Strategy (FAS)). The AMS aims to make large-scale improvements in the South of the UK, and the corresponding NATS-led programme is referred to as the Future Airspace Strategy Implementation – South (FASI-S). This is a large

[1] The ACP to introduce FRA is being progressed in parallel. Details are on the CAA portal here.

programme of projects involving many airports in the south of England and Wales, changing their traffic flows in a coordinated way.
This ACP also involves extensive changes within London Area Control (LAC) airspace and hence there may also be changes with the interface between NATS LAC and:

- NATS London Terminal Control Centre
- NATS Prestwick Centre
- Shannon Area Control Centre (Irish Aviation Authority (IAA))
- Dublin Centre (IAA)
- Brest Area Control Centre (Direction des Services de la Navigation Aérienne (DSNA) France)
- Ports of Jersey (PoJ) Authority

Why must this change happen now?

The en-route network has evolved over many years and was constrained by the use of ground-based navigation beacons. Improvements in navigation technology (e.g. satellite-based navigation) have removed these constraints and hence it is possible to do a complete redesign of the route network. This aims to give benefits in safety, environment and capacity. Undertaking such a fundamental redesign of the airspace is considered a once in a generation opportunity and will secure efficiencies and benefits for many years to come.

What was the Statement of Need for this proposal?

The Statement of Need is the first step a Sponsor must take, to initiate an airspace change proposal with the CAA. The design concepts in this document strive to address the Statement. Ours is summarised below. The full document is published on the CAA's Airspace Change Portal.

Current situation The ATS route network serving the UK is managed by the en route ANSP NATS, which handled 2.5m flights in 2017. In the southern UK this is handled at Swanwick by London Area Control (LAC), in the wider London and South East region by London Terminal Control (LTC). Issue or opportunity to be addressed, and the cause Today's network was has evolved over time and does not exploit modern navigation technology. It does not provide capacity for the long-term growth in aviation. Many airports served by our network plan to change their low-level airspace structures to better meet their needs, driven by increasing demand by the flying public & the carrier airlines. This leads to the increased use of modern aircraft with flight & navigation performance far exceeding that of the types for which the network was originally designed. There is an opportunity to enable significant benefits in capacity and environmental impacts by taking those needs and changing the network to suit. Desired outcome Optimal alignment & connectivity of the ATS route network with each airport's airspace structures, such that network capacity should not be a significant constraint on airport capacity and environmental impacts are minimised. Specific challenges Will be a very large scale undertaking - the main region of interest is likely to be from the Midlands to the FIR boundaries in the south and east but it may go further still in places. Design and implementation challenges are proportional to the extent of the change – a clean-sheet redesign of a large region would have the most challenges but the most potential benefit. Each airport would be responsible for their local procedures at lower levels, with NATS being responsible for the higher level ATS route network. This proposal relates to the latter, however, some level of coordination will be required with airport-led design.

Note this Statement of Need was written pre-COVID19 pandemic, and clearly the "current situation" has changed since then. However, the airspace change is designed to address long-term growth and capitalise on available modern navigation capabilities to facilitate efficiencies and environmental benefits. NATS believes that, despite the current downturn in air traffic, the changes proposed remain fully justified and beneficial for the long-term benefit of the UK economy and the aviation industry.

Design principles

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 will be used to evaluate the design options to determine which will be discarded and which will be progressed. This analysis is contained in Annex C Design Principle Evaluation.

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_2 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.
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

The design principle development document is published on the CAA airspace change portal here.

Altimetry – altitudes, heights and flight levels

In aviation, 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, and "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 are above an altitude of 7,000ft which is above the transition altitude[2] (TA). Above the TA aircraft fly with reference to Flight Levels, hence in this document we generally refer to flight levels (FLs).

The Airspace Modernisation Strategy (AMS) Alignment

The Department for Transport (DfT) and CAA's co-sponsored Airspace Modernisation Strategy (CAP1711) is detailed in Ref. 1.

It was originally intended that a Masterplan would be developed which would facilitate coordination of the FASI-S ACPs and assist where there may be dependencies or conflicting requirements between ACPs. The DfT/CAA issued the following additional guidance related to the AMS Masterplan in October 2020:

> *One of the purposes of the masterplan is to help the CAA make decisions on airspace design changes that, together, create a systemised upgrade to UK airspace, identifying dependencies between changes. We have previously stated that if an individual sponsor wanted to progress to stage 2 of the airspace change process (CAP1616) without an accepted masterplan, the CAA would have to work*

[2] 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.

with ACOG and NERL to understand whether that proposal had any dependencies with or impacts on other changes before making any stage 2 gateway decisions.

Given that the CAA is not in a position to confidently accept a masterplan at this time, and consistent with ACOG's recommendations, the CAA is now considering what information it will need before any FASI-S airspace changes could pass through a stage 2 gateway. ***Sponsors will need to demonstrate their potential interactions or dependencies with other sponsors****, who may be working to different timescales or have opted out of the programme.*

The LD1 ACP is fully aligned with the objectives in the Airspace Modernisation Strategy. A matrix detailing how the LD1 ACP aligns with each objective of the AMS is given in Annex E: Airspace Modernisation Strategy Alignment. (Note this matrix relates to the alignment of the LD1 ACP with the AMS, not the alignment of individual options).

Potential Interactions and Dependencies with other FASI-S ACPs

The Future Airspace Strategy Implementation - South (FASI-S) programme includes the involvement of NATS and numerous airports which are sponsoring separate ACPs. The LAMP Deployment 1 en-route changes will interface with Bristol, Cardiff and Exeter airports, and aircraft transiting to/from the other airports will also benefit from the proposed network improvements.

These airports have been engaged with on numerous occasions throughout the CAP1616 process thus far (see Annex A: Summary of Stakeholder Engagement on p.30). Prior to the COVID-19 pandemic and the resulting downturn in traffic, it had been anticipated that these airports would sponsor their own ACPs (in parallel with this ACP) to propose changes to the routes and airspace below 7,000ft close to the airports. However, the effects of the pandemic have resulted in the airports having to pause their ACPs and put the planned changes on hold. NATS however is continuing with the proposed changes[3] to the en-route network, and is endeavouring to maintain future-proofing aspects so that the airports will be able to introduce improvements to their low level routes in the future.

- The stakeholder engagement has ensured that the LD1 options are sympathetic in concept and can accommodate the future aspirations of all FASI-S airports.
- The LD1 design will not preclude Bristol, Cardiff, Exeter or other FASI-S airports from doing an airspace change after LD1 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 design does not preclude changes being made in the same airspace by subsequent LAMP deployments if this is necessary to facilitate network connectivity with airport designs.

NATS has proactively engaged with all other sponsors of Airspace Change Proposals included in the FASI-S programme. As part of the Stage 2 stakeholder engagement for *this* ACP we have sought to secure agreement with each sponsor, on the degree of dependencies and potential interactions between the LD1 ACP and their FASI-S ACP. The interactions are summarised in Table 2 below and the map in Figure 3.

Note: "ACP Interactions" refers to where an active ACP by another sponsor has an interface with the LD1 ACP at the same FLs and is planned to be implemented in a similar timescale. i.e. the traffic will transition from one ACP's airspace to the other, and hence changes in one ACP will have to take heed of any proposed in the other, in order to ensure the interface is seamless and efficient.

The LD1 ACP area borders with the airspace operated by three other air navigation service providers (ANSPs): IAA (Ireland) and DSNA (France) the Ports of Jersey (Channel Islands). NATS confirms that there are no known critical interdependencies with any neighbouring ANSPs. (A critical interdependency would be, for example, where a neighbouring ANSP requires new coordination points (COPs) to be introduced on the boundary, or if NATS required similar of a neighbouring ANSP.)

[3] This is in order to avoid delay in providing benefits to NATS' customers (airlines) and environmental benefit where possible.

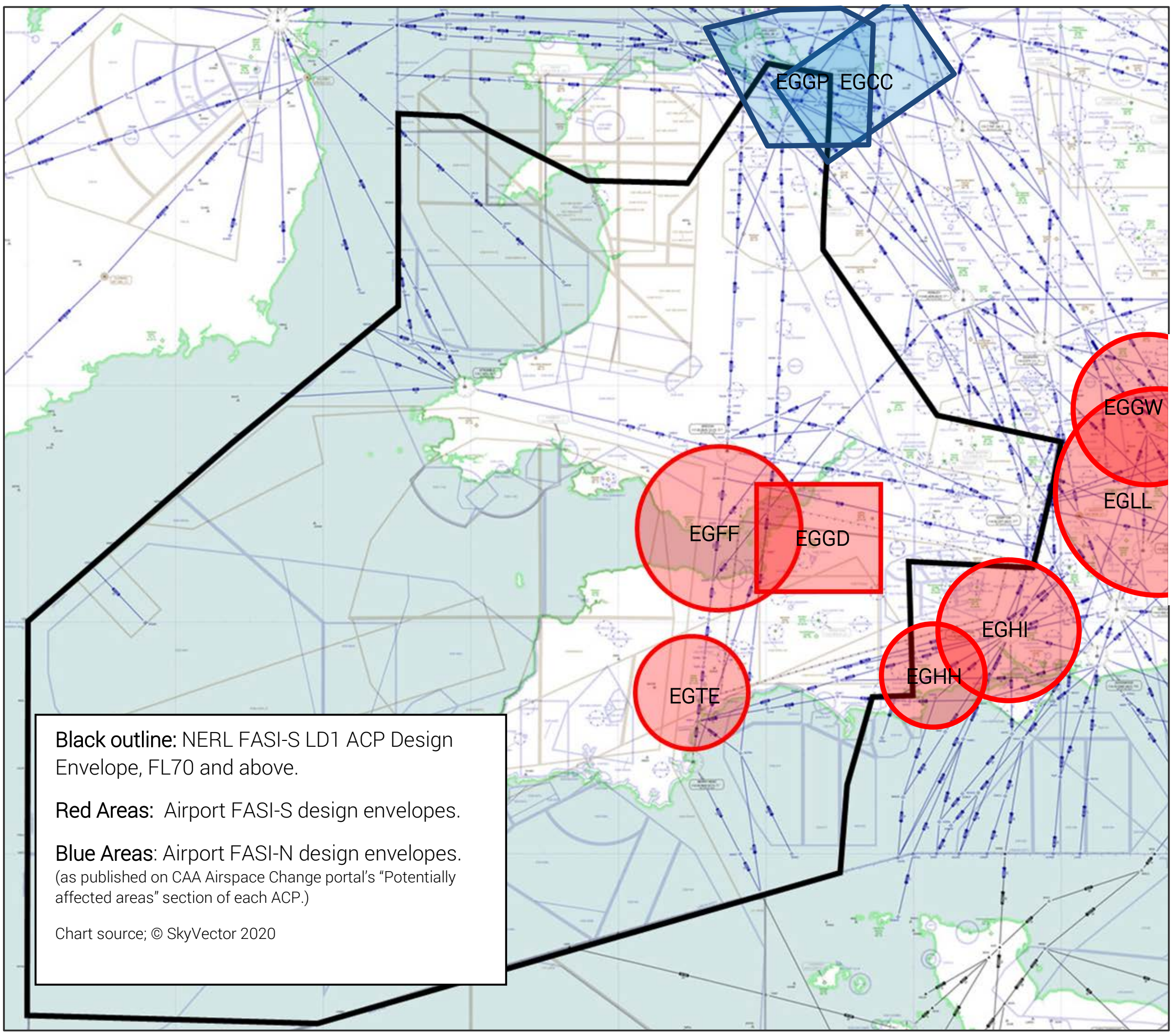

Figure 3 FASI-S & FASI-N ACP interactions

FASI-S ACP Sponsor	ACP ref (linked)	Dependencies with LD1
Biggin Hill Airport	ACP-2018-69	No dependency with LD1. Biggin Hill's ACP area does not adjoin the LD1 ACP area. Biggin Hill departures-to / arrivals-from the west will nonetheless benefit from the increased capacity that would be provided by LD1. Thus LD1 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. However, the network interfaces will be as extant. Whilst Bournemouth's ACP area does adjoin the LD1 ACP area, LD1 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 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 ACP area. LD1 is progressing on the assumption that the extant SIDs/STARs routes will remain (notwithstanding possible SID truncation[4]). Engagement and detailed design work planned with Bristol during Stage 3 will ensure that the proposed LD1 network will be future proofed to allow Bristol's future design aspirations to be accommodated. See Bristol's engagement response in Annex C: Stakeholder feedback

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

Cardiff Airport	ACP-2019-41	Cardiff Airport is within the LD1 ACP area. LD1 is progressing on the assumption that the extant routes will remain (notwithstanding possible SID truncation[3]). However, the proposed network will be future proofed to allow Cardiff's future design aspirations to be accommodated. See Cardiff's engagement response in Annex C: Stakeholder feedback
Exeter Airport	ACP-2018-47	Exeter Airport is within the LD1 ACP area. LD1 is progressing on the assumption that the extant arrival/departure procedures will remain. During the stage 2 engagement with Exeter Airport NATS and Exeter agreed that the proposed network can be future proofed to allow Exeter's future design aspirations to be accommodated. See Exeter's engagement response in Annex C: Stakeholder feedback .
London City Airport	ACP-2018-89	No dependency with LD1. London City's ACP area does not adjoin the LD1 ACP area. London City departures-to / arrivals-from the west will nonetheless benefit from the increased capacity that would be provided by LD1. Thus LD1 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. Gatwick's ACP area does not adjoin the LD1 ACP area. Gatwick departures-to / arrivals-from the west will nonetheless benefit from the increased capacity that would be provided by LD1. Thus LD1 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. Whilst Heathrow's ACP area does adjoin the LD1 ACP area, LD1 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) will not be impacted by these changes. Aircraft would be at ~FL140 at the interface between the LD1 and Heathrow ACP areas. Departures to and arrivals-from the west will benefit from the increased capacity that would be provided by LD1 and therefore LD1 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. Luton's ACP area does adjoin the LD1 ACP area, and Luton departures-to / arrivals-from the west will benefit from the increased capacity that would be provided by LD1. Aircraft would be at ~FL160 at the interface between the LD1 and Luton ACP areas. Thus LD1 does serve as an enabler for future development at Luton but there is no direct dependency.
London Southend Airport	ACP-2018-90	No dependency with LD1. Southend's ACP area does not adjoin the LD1 ACP area. Southend departures-to / arrivals-from the west will nonetheless benefit from the increased capacity that would be provided by LD1. Thus LD1 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. Stansted's ACP area does not adjoin the LD1 ACP area. Stansted departures-to / arrivals-from the west will nonetheless benefit from the increased capacity that would be provided by LD1. Thus LD1 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. Northolt's ACP area is close to the LD1 ACP area, and Northolt departures-to / arrivals-from the west will benefit from the increased capacity that would be provided by LD1. Aircraft would be at ~FL140 at the interface between the LD1 and Northolt ACP areas. Thus LD1 does serve as an enabler for future development at Northolt 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. However, the network interfaces will be as extant. Whilst Southampton's ACP area does adjoin the LD1 ACP area, LD1 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 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. Aircraft would be at ~FL200 at the interface between the LD1 and Manchester ACP areas. Thus LD1 does serve as an enabler for future development at Manchester but there is no direct dependency and the network interfaces will be as extant.
Liverpool Airport (FASI-N)	ACP-2015-09	No dependency. Liverpool's ACP area has some lateral overlap with that of LD1. Aircraft would be at ~FL160 at the interface between the LD1 and Liverpool ACP areas. Thus LD1 does serve as an enabler for future development at Liverpool but there is no direct dependency and the network interfaces will be as extant.
NATS FRA-D2 (Free Route Airspace)	ACP-2019-12	Dependency. The LD1 ACP is being progressed in parallel with the Free Route Airspace deployment 2 ACP. Some LD1 design options (including Option 6 - the preferred option) are dependent on the two ACPs being approved and implemented concurrently. Detail for the shortlisted options will be presented in more detail during stage 3, and both projects intend to consult concurrently so that the dependencies are clear. (note this dependency is independent from AMS Masterplan FASI-S dependency)

Table 2 FASI-S and FASI-N ACP dependencies with LD1

All the airports listed in Table 2 will have airline operators that utilise the BCN and BHD airspace. All these airports will continue to be engaged and consulted with as LD1 Stakeholders.

As described above the LD1 ACP is considered to have significant dependencies with Bristol, Cardiff and Exeter Airports. 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 through stage 2 would cause any issue with their own ACP. These emails are included in Annex C: Stakeholder feedback .

ACP Categorisation Level

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 25).

Prior to the COVID-19 pandemic this ACP was being progressed in parallel with ACPs sponsored by several airports (Bristol, Cardiff, Exeter). Prior to the pandemic discussions were held between NATS and the CAA regarding whether the LD1 ACP, proposing changes to the en-route 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.

The impact of COVID-19 on air traffic levels has resulted in the airports suspending progress on their ACPs. NATS however is continuing with proposed changes to the ATS route network above 7,000ft due to the wider network benefits it can provide to our customers. The ACP will progress on the assumption of a scaled Level 1. This will continue to allow any airport led changes to be progressed in parallel if this is appropriate.

Currently we are working on the basis that changes to the route network will interface with the existing airport low-level arrival & departure routes (SIDs and STARs) and not change aircraft tracks below 7000'. The proposed network design will also be able to accommodate airports' future design aspirations, and not constrain their ability to deliver appropriate noise mitigation opportunities for their local communities.

The basis of the scaling of "Scaled Level 1" is assumed to be as follows.

NATS intends to:

Continue to work closely with airport partners on options development and, as changes are being progressed by an airport, provide support to their consultations (where requested and appropriate).

Consult with relevant identified stakeholders on the proposals for change to the enroute network above 7000ft.

Produce network (and system wide) CO_2 emissions analysis.

NATS does not intend to:

Consult on routes below 7000ft. If no changes below 7000ft are proposed by airports, the LD1 design will interface with the extant routes.

Proactively consult local communities.

Produce noise analyses (unless related to ATS route changes below 7000ft agl not within the scope of one of the FASI-S associated airport ACPs).

Figure 4 Illustrative airspace and air traffic flows in the London FIR

Design options summary

Table 3 below summarises the comprehensive list of design concept options considered. Each option is described in detail in the following pages.

Due to the geographical scope of this proposal and the sheer number of options to position routes within the airspace, it is not proportional to list all of the possible permutations. Therefore, for this stage of the ACP process, the design options are presented as high-level concepts.

	Comprehensive list of options	Description
0	Baseline	The "Do nothing" option. Keep everything as it is currently.
1	Minimal systemisation - Direct routes	All flights could fly direct from 7,000ft. Effectively Free Route Airspace from 7,000ft
2	Systemisation - 5nm separation	Systemisation using PBN routes based on 5nm radar separation environment
3	Systemised routes with 3nm separation	Systemisation using PBN routes based on 3nm radar separation environment
4	Systemisation with 5nm separation with direct routing (build on option 2)	Systemisation using PBN routes based on 5nm radar separation environment with improved connectivity provided by direct routes.
5	Current day legacy route network, enhanced with some new direct routes.	Maintain majority of existing route structure but enhance with some new direct routes.
6	Systemised 5nm with FRA (build on option 4)	Systemisation using PBN routes based on 5nm radar separation. Interfacing with Free Route Airspace (FRA) above.

Table 3 Summary of Comprehensive-List Design Options

Illustration of numbers of flights

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

CALLSIGN	%
RYR	17.8%
EZY	10.4%
EIN	8.6%
BAW	8.4%
TOM	4.3%
EXS	4.1%
UAL	4.1%
AAL	4.0%
DAL	3.5%
VIR	2.8%
AFR	2.7%
KLM	2.1%
DLH	1.8%
ACA	1.6%
SWR	1.2%
NRS	1.2%
STK	1.0%
TSC	0.9%
IBS	0.6%
NAX	0.5%

Table 4 Percentage of flights by airline

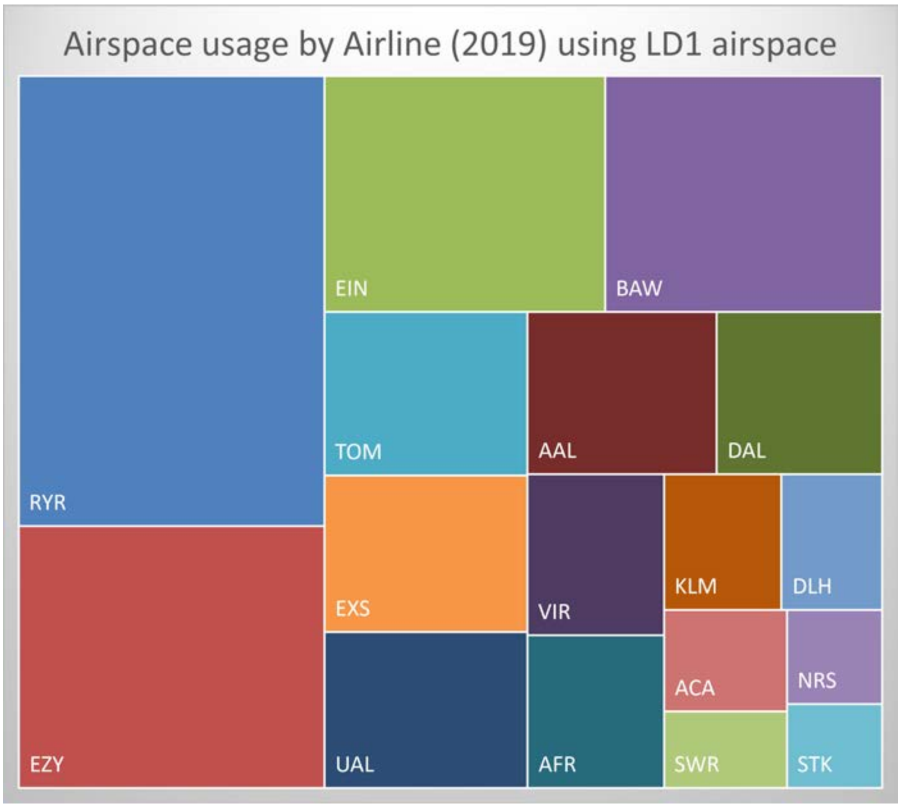

Figure 5 Airlines with greater than 1% of flights

Table 4 shows the percentage usage of the airspace for the top 20 airlines. Figure 5 depicts the proportions of flights for those airlines having more than 1% of the total (in 2019).

Introduction and Release of Controlled Airspace

Some options may require a change to the volume of controlled airspace (CAS). A comprehensive review of existing CAS will also be undertaken as part of this ACP and where possible CAS that is no longer required will be released. This could serve to off-set in part, any new CAS that may be required. (Note: this is separate to the CAP1991 Airspace Classification Review being undertaken by the CAA, but the relevant CAA department will be kept informed).

The lowest level of new CAS proposed by any option herein, is FL75. However, where the base of CAS could be raised, it is possible that a base below 7000ft (e.g. 5500ft or FL65) could be raised to say FL75, thereby *releasing* CAS (converting it to uncontrolled Class G airspace). In this instance this is not considered to constitute a Level 1 change (ref. CAP 1616 page 25 Table 2).

Airport Requirements (for future-proofing the en-route design)

During engagement with Bristol, Cardiff and Exeter airports the following 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 have paused their airspace change proposals, however the facility for these features remains in the LD1 designs. Thus when Bristol, Cardiff and Exeter recommence their ACPs, they should be able to interface their new low-level route design with the proposed LD1 network, and still achieve these aims.

- 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 in the en-route network.
- Allow future introduction of additional holds for Bristol. (e.g. one to the north and one to the south.)
- Allow future introduction of an additional hold for Cardiff. (e.g. a hold to the south west of their airfield which could be utilised for training purposes)
- Provide systemised flows for Bristol and Cardiff
- Options for future improvements for connectivity to/from Exeter.

Interface with SIDs & STARs at Bristol & Cardiff

In order to integrate the arrivals to Bristol and Cardiff into the proposed systemised en-route network it may be necessary to change/truncate some existing SIDs & STARs. This would impact aircraft flying typically between FL200-FL75.
The proposed solution may involve revision of the SIDs /STARs to structurally deconflict them from other traffic streams. The utilisation of RNAV SIDs, STARs and ATS routes could be used to keep the traffic streams separated, make the airspace more systemised, efficient and less complex.

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 air 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. same direction parallel routes separated by ~7nm in a 5nm minimum radar separation environment).
- 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 will need to use tactical intervention (e.g. radar headings or shortcuts between waypoints) to resolve conflictions

Option 0 Do Nothing Option (Baseline)

A 'Do Nothing' option representing the current day operation must be included, and is used as the baseline against which all other options are measured.

The area covered by this ACP is shown in Figure 6, which covers the airspace over the Southwest of England and most of Wales.

The lower airspace (FL70 – FL245) routinely accommodates flights arriving to and departing from aerodromes within the area including:

- Bristol
- Cardiff
- Exeter
- Fairford
- St Athan
- Merryfield
- Yeovilton
- Colerne
- Upavon
- Boscombe Down
- Swansea,
- Gloucester
- Kemble
- Oxford
- Brize Norton
- Newquay
- Perranporth
- Dunkeswell
- Culdrose
- Predannack

Additionally the airspace is used extensively by aircraft arriving at and departing from airports outside the area, including

- London Heathrow
- Northolt
- London Gatwick
- London Stansted
- London Luton
- London City
- Birmingham
- Liverpool
- Manchester
- Dublin

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

The upper airspace (FL245 and above) accommodates flights arriving to the London Flight Information Region (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.

Figure 6 (Lower airspace) and Figure 7 (Upper airspace) below, show the ATS routes and the density distribution of flights within this airspace for a typical summer week (11-18th August 2019):

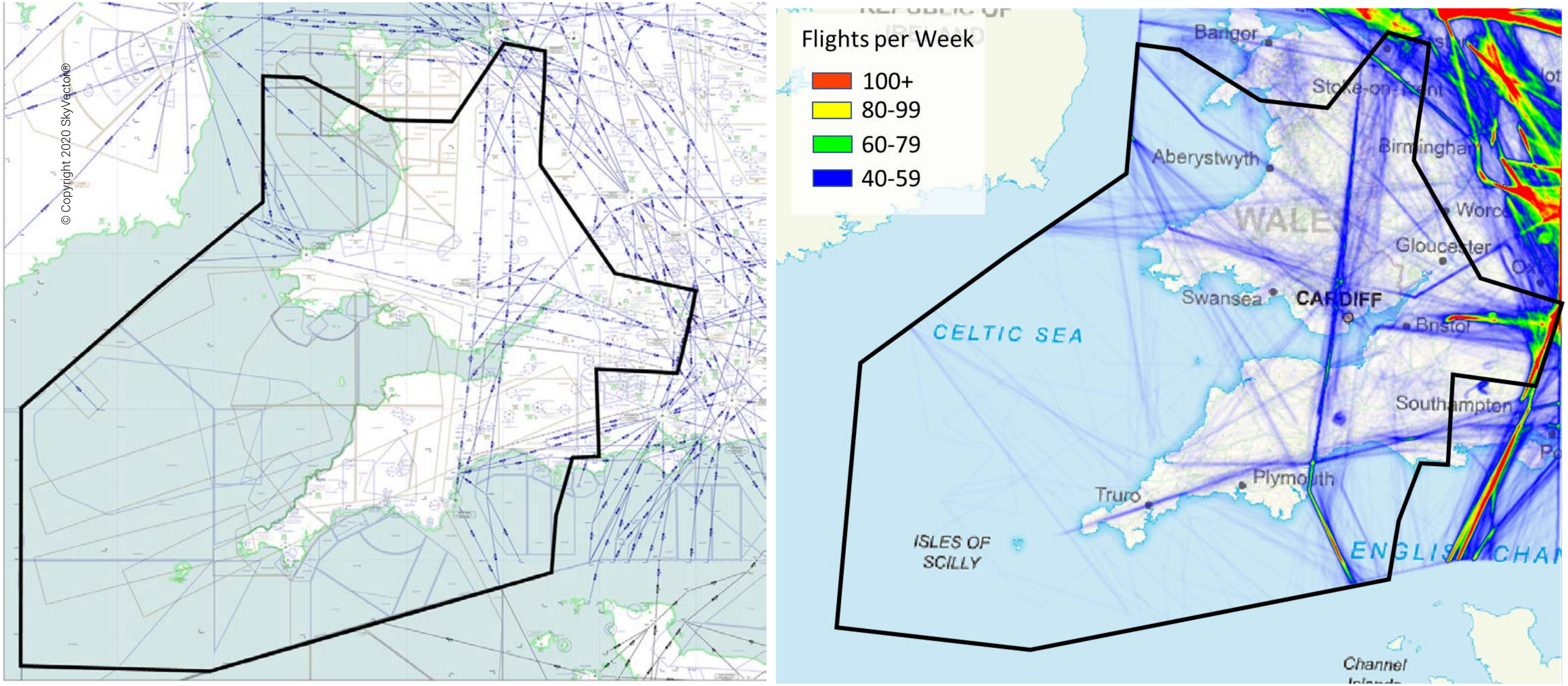

Figure 6: Lower ATS Routes (FL70 – 245) within the LD1 area and the density of flights (Aug 11-18 2019)

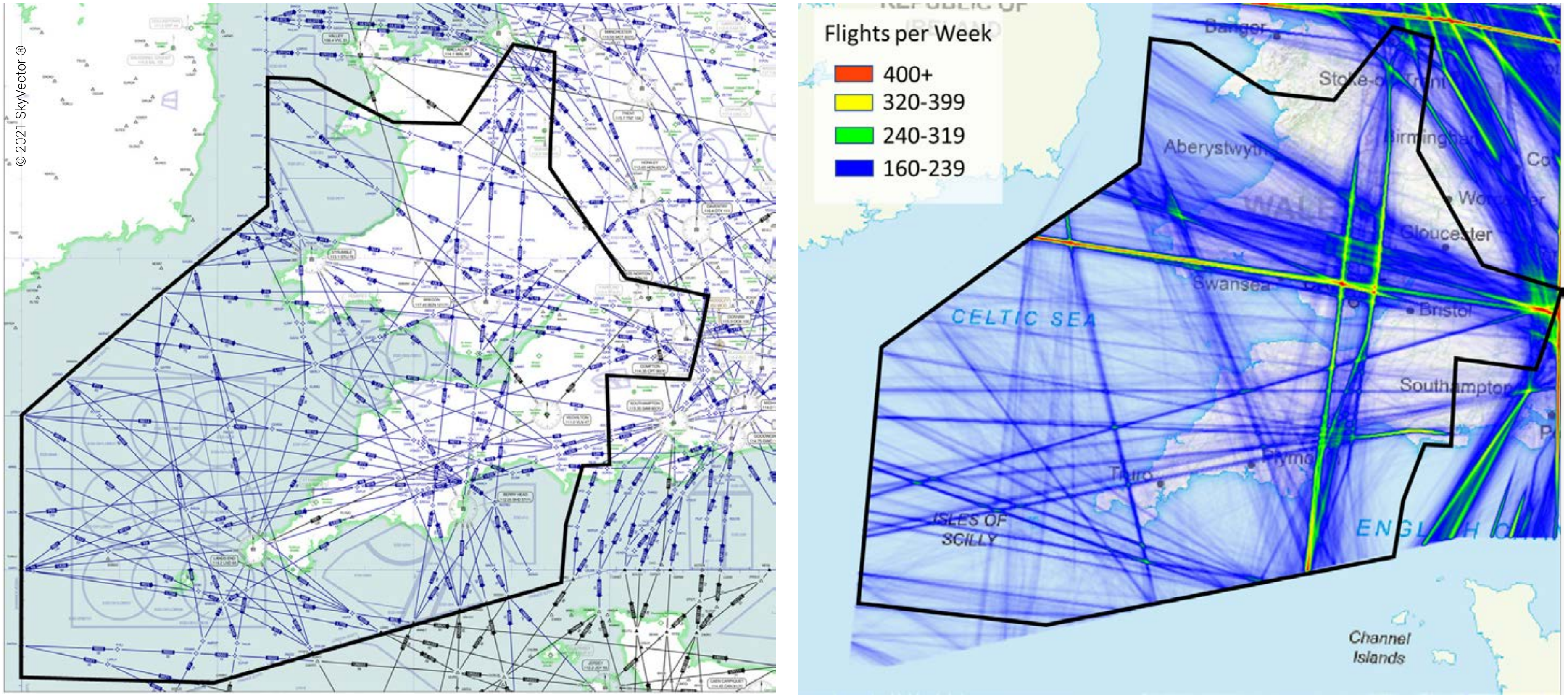

Figure 7: Upper ATS Routes (FL245 and above) within the LD1 area and the density of flights (Aug 11-18 2019)

The “Do-nothing” option is **rejected**, since it would bring no benefit.

Option 1   Minimal Systemisation: user-preferred flight plan trajectories

The concept of Option 1 was the removal of ATS routes and to extend Free Route Airspace (FRA) across the lower airspace allowing flight planning of user-preferred trajectories (direct routes) from coordination points (COPs) at the boundary of LAMP airspace to/from the airport specific interface areas. This option assumes the use of the existing controlled airspace. Vectoring would be used to resolve conflicts.
This option would be environmentally efficient for very low traffic volumes since direct great circle routings would be enabled. However, with rising traffic, interactions between flight trajectories would very soon introduce a high level of complexity, with Air Traffic Control (ATC) having to intervene and vector aircraft to keep flights safely separated. This complexity would increase exponentially and, compared to a systemised route network, would require a much lower capacity cap in order to maintain a safe operation.

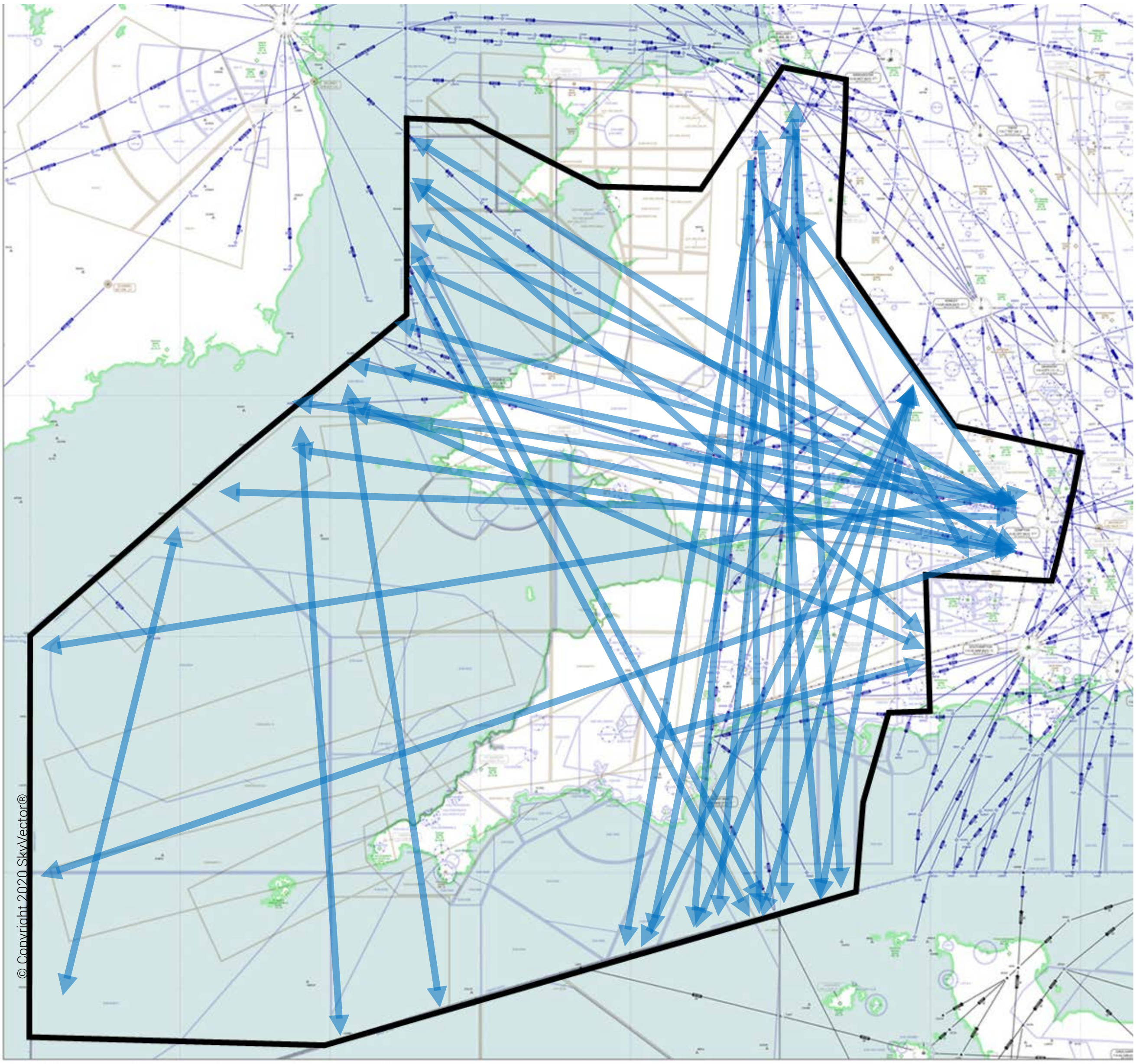

Figure 8: Option 1, Minimal Systemisation: user-preferred flight plan trajectories (illustrative)

Benefits

- Environmentally efficient for CO_2 emissions at low traffic volumes.

Issues

- No systemisation.
- A high degree of controller intervention would be required to keep aircraft safely separated.
- High complexity and workload.
- Complexity would markedly increase thus reducing capacity (potentially significantly).
- This option does not provide for areas of Class G airspace and special use airspace (SUA), it would require large amounts of new controlled airspace.

Conclusion

Design Principle Evaluation concluded that:

- 4 design principles were "Met"
- 3 were "Partially Met"
- 4 were "Not Met").

Please see Annex D: Design Principle Evaluation, for detailed analysis.
Due to this and the issues listed above, this option was **rejected** for further consideration, and will not be carried forward to the short-list.

Option 2 Maximum Systemisation using PBN routes based on 5nm radar separation

The concept of Option 2 was based on the use of a fixed network of systemised PBN routes to connect FRA with airports' STAR start points and SID end points for Bristol and Cardiff (note Exeter does not currently have SIDs & STARs). This network would allow aircraft to be safely separated with minimal ATC intervention. The route spacing was based on CAP1385 route separation criteria assuming a 5nm radar environment. This option assumes appropriate delay absorption structures would be available.

Option 2 would provide an efficient, deconflicted network which would yield safety and capacity benefits. This fully systemised airspace minimises tactical ATC vectoring and opportunistic direct routings.

Unlike the 3nm radar environment (described in Option 3), a 5nm radar environment is currently standard within UK en-route airspace, hence no change would be required to radar infrastructure and other ATC tools and systems.

This option would provide an efficient, deconflicted network hence yielding safety and capacity benefits.

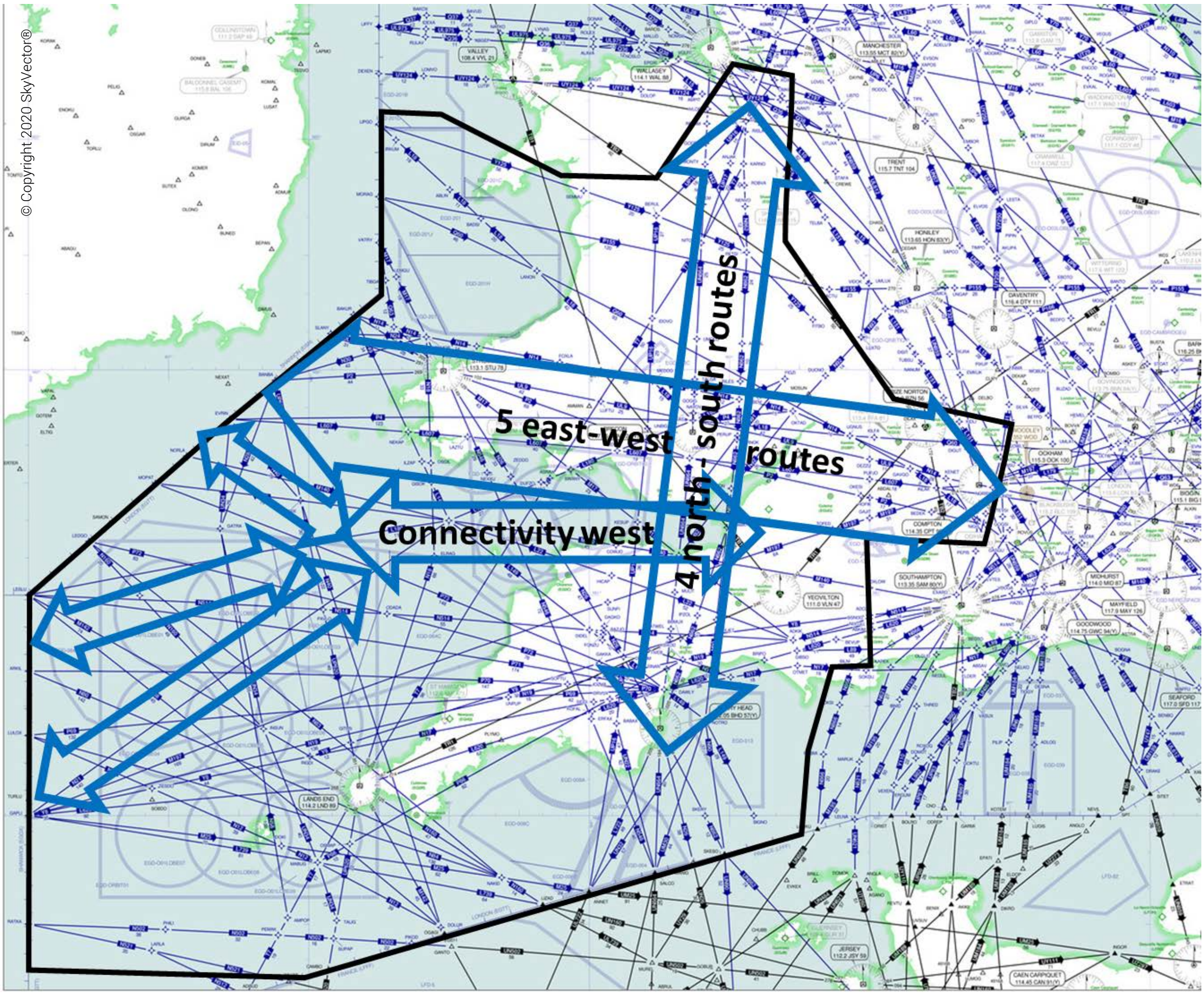

Figure 9: Option 2, Systemisation using PBN routes based on 5nm radar separation.

Note: route positions shown are illustrative only.

Benefits

- Systemised airspace
- Reduction in ATC complexity

- Reduction in controller intervention
- Design permits some offload scenarios due to Special Use Airspace (SUA) activity (i.e. alternative routings when SUA such as Danger Areas are active).
- 5nm radar environment does not require any changes to radar infrastructure or related systems.

Issues

- This option utilises a high degree of systemisation which would impact the environmental performance (CO_2 emissions).

Conclusion

This option had promising aspects, however, the route network systemisation was somewhat rigid. As such, when compared with Option 4 its performance is not as good.
Design Principle Evaluation concluded that:

- 5 design principles were "Met"
- 6 were "Partially Met"
- 0 were "Not Met").

Please see Annex D: Design Principle Evaluation, for detailed analysis.
This option was progressed for further consideration in the Initial Options Appraisal (Step 2B).

Option 3 Systemisation using PBN routes based on 3nm radar separation environment

The concept of Option 3 was based on the use of a fixed network of systemised Performance Based Navigation (PBN) routes to connect FRA with airports' STAR start points and SID end points. This design would allow aircraft to be safely separated with minimal ATC intervention. The route spacing was based on CAP1385 route separation criteria assuming a 3nm radar environment. The objective was to provide an efficient, deconflicted network which could yield capacity and environmental benefits. (Note there is little difference in route layout between Option 3 and Option 2 hence a separate figure illustrating this option is unnecessary.)

A 3nm radar environment is not currently available in the majority of en-route airspace. This option would require significant change to the radar infrastructure and numerous associated systems.

The costs associated with upgrading the radar environment do not justify the marginal differences to the route structure that this would enable.

Benefits

- Using 3nm radar separation allows routes to be spaced more closely together. If the volume of airspace is constrained this can permit more parallel routes to be fitted into a given volume (e.g. 5 routes instead of 4). However, the airspace available in the LD1 area is relatively large and is not significantly constrained.
- Systemisation.
- Potential reduction in sector complexity
- Potential reduction in controller intervention
- Design permits some offload scenarios due to SUA activity

Issues

- The costs of upgrading radar and associated trajectory monitoring systems to support 3nm radar separation are prohibitively high, compared to the marginal incremental benefit (compared to a similar structure based on 5nm radar separation as per Option 2). In short there is enough space in the LD1 airspace volume to accommodate sufficient systemised routes without having to use the closer spacing that 3nm separation would enable. Thus, this is considered to be a radical option due to the engineering costs involved.
- separation standards in upper airspace would have to change to match, to prevent having multiple separation standards in same sectors. As a reduced MRS cannot be assured at all levels (the highest level with 3nm separation in UK is FL300) there would still be a requirement for multiple separation standards within the same sectors which has knock on issues for human performance and system capabilities"

Conclusion

Design Principle Evaluation concluded that:

- 5 design principles were "Met"
- 6 were "Partially Met"
- 0 were "Not Met").

Please see Annex D: Design Principle Evaluation, for detailed analysis.

This option was **progressed** for further consideration in the Initial Options Appraisal (Step 2B).

Option 4 Systemised route structure with additional direct routes

Option 4 builds on the fixed network of systemised PBN ATS routes with a limited network of direct routes to connect FRA with airports' STAR start points and SID end points introduced in Option 2. As in Option 2, this network would be compatible with current systems, keep aircraft safely separated with minimal ATC intervention and assumes appropriate delay absorption structures would be available.

This option enables improved environmental performance by introducing the option of new direct routings for some high level routes (additional routes are shown in red in Figure 10).

This option should provide an efficient, deconflicted network which would yield safety, capacity and environmental benefits.

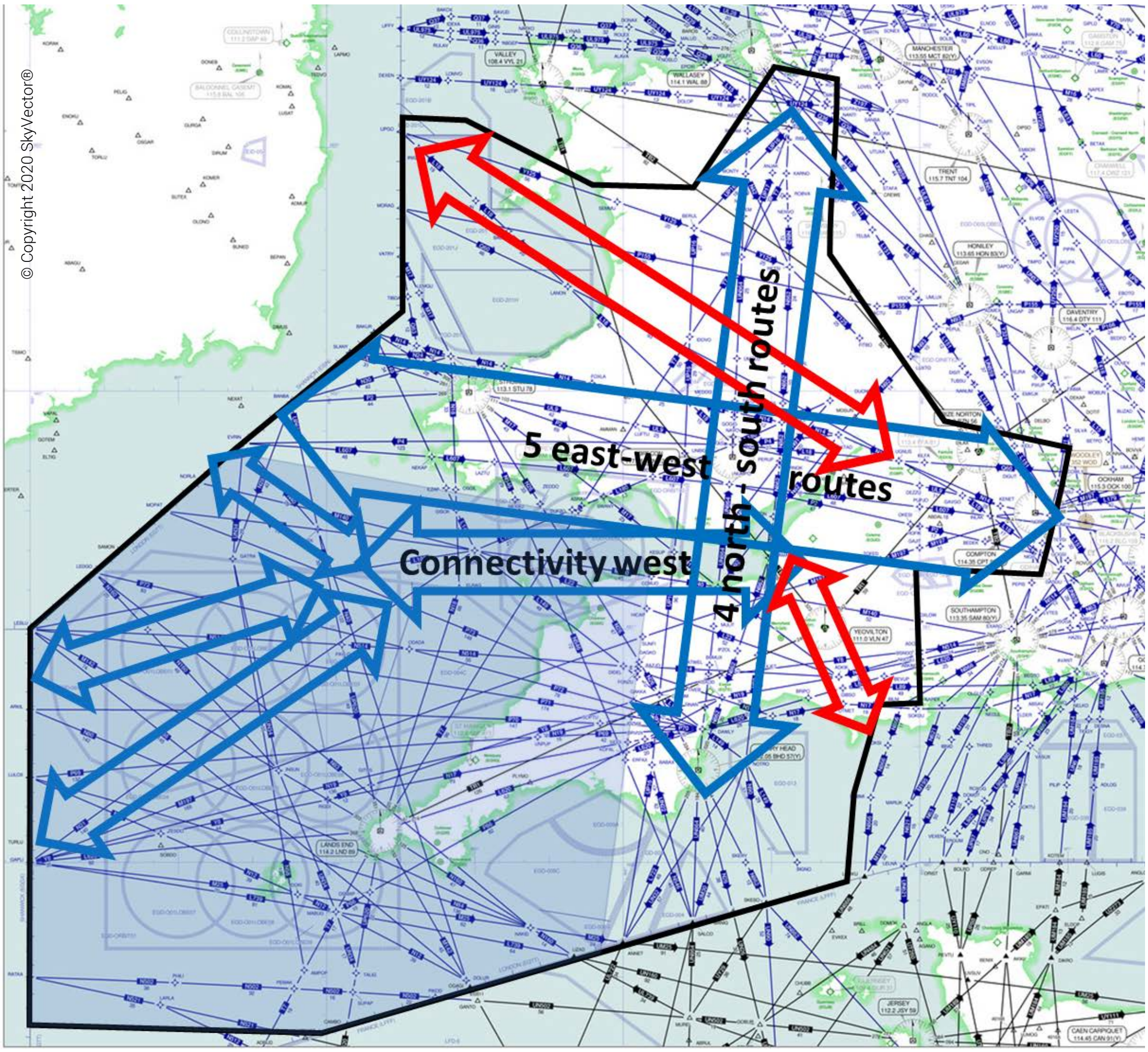

Figure 10: Option 4, Systemised route structure with additional direct ATS routes

Benefits

- Systemised airspace
- Potential reduction in ATC complexity
- Potential reduction in controller intervention
- Design permits some offload scenarios due to SUA activity
- Provides a systemised 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.

Issues

- Additional Controlled airspace may be required in some areas (potentially mitigated by release of other CAS elsewhere)
- Does not align with the FRA concept.

Conclusion

The Systemised PBN routes offer a highly 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. The introduction of direct routings enables further environmental benefits not present in Option 3.

Design Principle Evaluation concluded that:

- 6 design principles were “Met”
- 5 were “Partially Met”
- 0 were “Not Met”).

Please see Annex D: Design Principle Evaluation, for detailed analysis.

This option was accepted and progressed for further consideration in the Initial Options Appraisal (Step 2B).

Option 5 Current route network with some new direct routes and extensions of existing route availability

This option was based on maintaining the majority of the existing route network and but augmenting this with additional routes to achieve efficiencies.

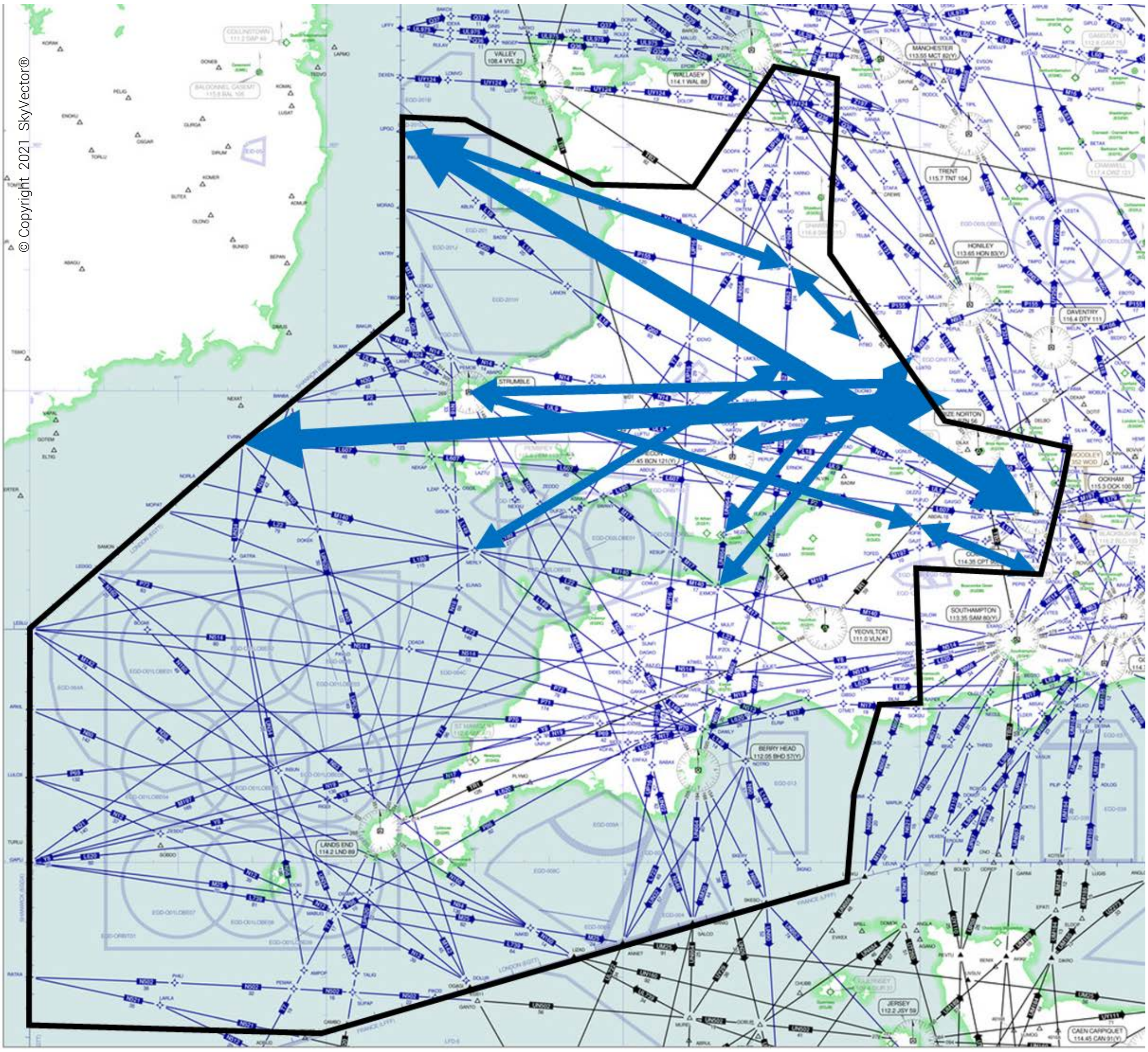

Figure 11: Option 5, Current route network with some new direct routes

Benefits

- Additional direct routes enable enhanced environmental benefits
- 5nm radar environment does not require any changes to radar infrastructure or related systems.

Issues

- Non-systemised airspace
- Additional Controlled airspace may be required in some areas
- No reduction in ATC complexity
- No reduction in controller intervention

It may be necessary for a small amount of additional CAS to be introduced to support this design option.

Conclusion

Design Principle Evaluation concluded that:

- 7 design principles were "Met"
- 3 were "Partially Met"
- 1 was "Not Met").

Please see Annex D: Design Principle Evaluation, for detailed analysis.

This option does not meet one Design Principle and does not give sufficient benefit compared to other candidate options. As such this option was rejected for further consideration and will not be carried forward to the short-list.

Option 6 Systemised routes with FRA above (c. FL245)

Option 6 is an evolution from Option 4, with the systemised routes up to c.FL245 with FRA above.

It proposes a systemised network of RNAV routes, comprising:

- Circa five east-west RNAV routes
- Circa four north-south RNAV routes
- Interfaces with SIDs and STARs for Cardiff and Bristol
- FRA introduced c.FL245 and above

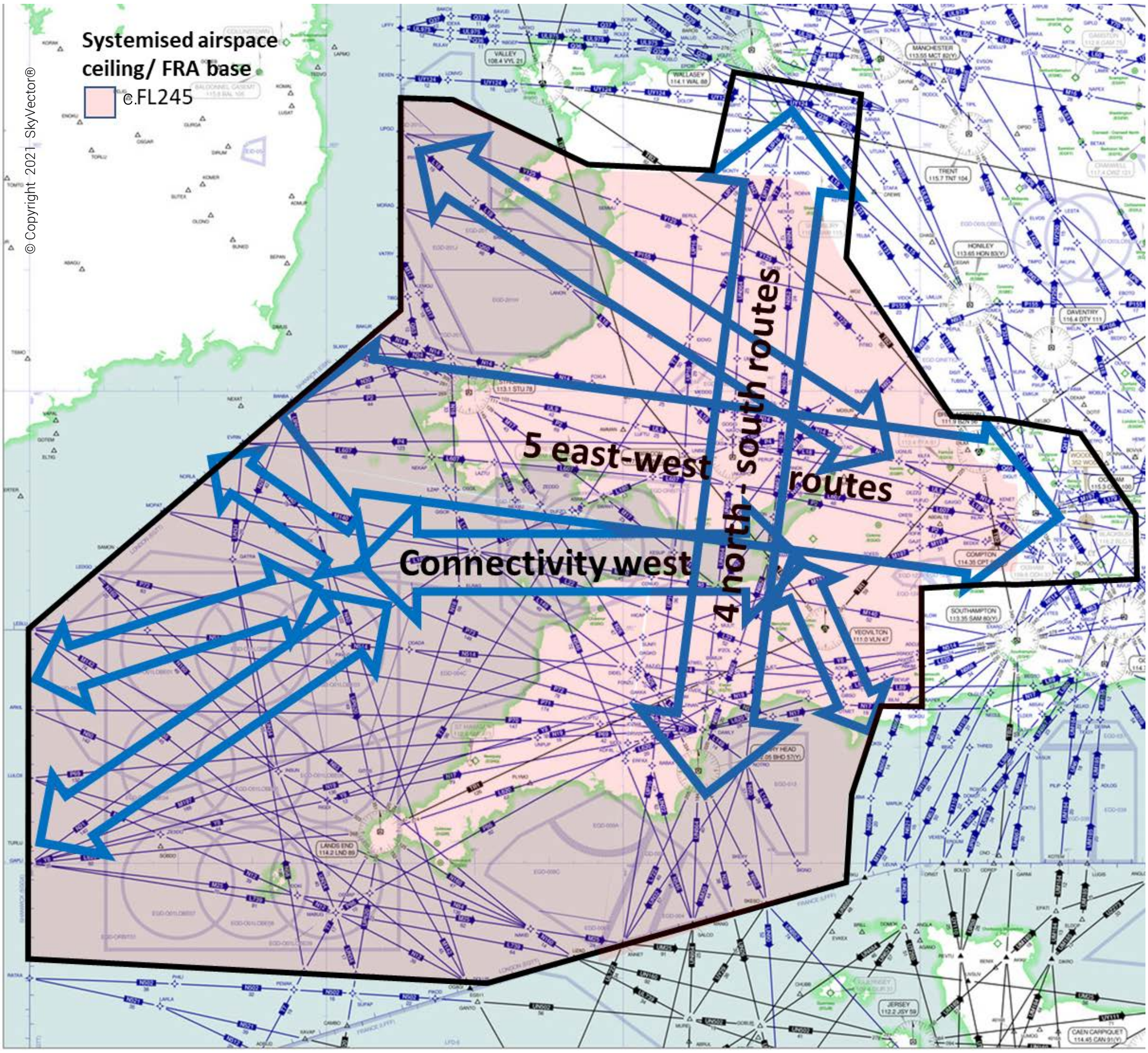

Figure 12: Option 6, Systemised routes interfacing with FRA above

Benefits

- Potential reduction in ATC complexity
- Potential reduction in controller intervention
- Systemised Airspace
- Provides systemised flow for Bristol and Cardiff for arrivals and departures
- Design permits offload scenarios due to SUA activity
- Direct routings enable enhanced environmental benefits

- 5nm radar environment does not require any changes to radar infrastructure or related systems.
- Supports the AMS target (ref 1) and Pilot Common Project (PCP) mandate of 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.

Issues

- Additional controlled airspace may be required (potentially mitigated by release of other CAS elsewhere).

Conclusion

Design Principle Evaluation concluded that:

- 9 design principles were "Met"
- 2 were "Partially Met"
- 0 were "Not Met".

Please see Annex D: Design Principle Evaluation, for detailed analysis.
The Systemised PBN routes offer a highly efficient network design which will keep aircraft safe with minimal ATC intervention. The use of a 5nm separation radar environment requires no upgrade to existing radar or associated systems. The introduction of direct routings enables further environmental benefits. Please see Annex D: Design Principle Evaluation, for detailed analysis.
This option was accepted and progressed for further consideration in the Initial Options Appraisal (Step 2B).

Stage 2a Conclusion and Next Steps

We have engaged with appropriate stakeholder groups, resulting in comprehensive discussions on the possibilities for the region.

This document illustrates the main individual design concept options for the proposed LAMP Deployment 1 en-route airspace changes.

The options presented for consideration have been created bearing in mind the Statement of Need and the Design Principles from Stage 1 of the airspace change process CAP1616.

This long-list of options was presented to stakeholders during the stage 2 engagement to obtain their feedback. Having received feedback from the stakeholders, we undertook a detailed evaluation of each option against the Design Principles (see Annex D: Design Principle Evaluation).

The Design Principle Evaluation indicated that Options 2, 3, 4 and 6 (highlighted in green in Table 5 below) are best aligned with the Design Principles. These four options have been carried forward to Stage 2B.

	Comprehensive list of options	Description
0	Baseline	The "Do nothing" option. Keep everything as it is currently.
1	Minimal systemisation - Direct routes	All flights could fly direct from 7,000ft. Effectively Free Route Airspace from 7,000ft
2	Systemisation - 5nm separation	Systemisation using PBN routes based on 5nm radar separation environment
3	Systemised routes with 3nm separation	Systemisation using PBN routes based on 3nm radar separation environment
4	Systemisation with 5nm separation with direct routing (build on option 2)	Systemisation using PBN routes based on 5nm radar separation environment with improved connectivity provided by direct routes.
5	Current day legacy route network, enhanced with some new direct routes.	Maintain majority of existing route structure but enhance with some new direct routes.
6	Systemised 5nm with FRA (build on option 4)	Systemisation using PBN routes based on 5nm radar separation. Interfacing with Free Route Airspace (FRA) above.

Table 5 Summary of Comprehensive-List Design Options

Annex A: Summary of Stakeholder Engagement

This section summarises the external stakeholder engagement activities conducted during stage 2. Copies of the engagement material will be sent unredacted to the CAA so they can make sure our engagement was effective.

We met with representative stakeholder groups to discuss our design concepts, tailoring each presentation to their interests. Most of these stakeholders are the same as those we engaged with in Stage 1.
The engagement activities typically followed this format (this is the “we asked…” element of the typical cycle “we asked, they said, we did”):

- Introductions and scene setting, background to LAMP and LD1
- Airspace change CAP1616 process and the role of stakeholders, design principles
- Today’s situation in the region.
- Progress to date and illustrations of concepts for consideration
- Impacts on, and mitigations for, the interests of this stakeholder – two-way discussion
- Summarise discussions
- Process notes, conclusions and close
- Minutes and a copy of the presentation sent out afterwards, sometimes extra email feedback acquired

Pre-COVID, meetings were a combination of face to face, by visiting their offices or by hosting them at one of our sites. Post-COVID, via webex or teleconference. Table 5 lists the meetings held, giving the date of the primary engagement activity only (subsequent calls/emails etc not listed in this summary), and the primary discussion points. It should be noted that some of these meetings were not purely focussed on LD1.
An example presentation is included on the CAA portal, so you can see how we explained this proposal’s development to our participating stakeholder groups.

Table 6 Summary of external stakeholder engagement

Date	Audience	Number of Attendees	Activity
06/03/2019	Airlines		Airspace and Flight Efficiency Partnership
18/09/2019	Heathrow	12	LAMP/Heathrow Bi-LAT: Workshop to explore potential design options specific to Heathrow airport operations
11/10/2019	Prestwick		LAMP/PLAS joint workshop: Workshop to explore potential design options specific to the interface between LAMP and PLAS operations
15/10/2019	Airlines: Easy jet, KLM, BA City Flyer, Jet 2	10	LAMP Airline Engagement webex NE: Initial stakeholder engagement with specific reference to the North East Segment i.e. why airspace change is required, design principles. Feedback from airlines regarding their initial requirements.
16/10/2019	Airlines: Ryanair, BA, Virgin, American, Easy Jet	16	LAMP Airline Engagement webex SW: Initial stakeholder engagement with specific reference to the South West Segment i.e. why airspace change is required, design principles. Feedback from airlines regarding their initial requirements. from airlines regarding their initial requirements/thoughts
18/10/2019	Airlines: Easy jet, Virgin, Delta, United, Air Canada	12	LAMP Airline Engagement webex NW: Initial stakeholder engagement with specific reference to the North West Segment i.e. why airspace change is required, design principles. Feedback from airlines regarding their initial requirements. from airlines regarding their initial requirements/thoughts
21/10/2019	DSNA Reims		LAMP/FRA meeting with Reims: Airspace change process, design principles, initial requirements of the adjacent ANSP’s
23/10/2019	Airlines: Ryanair, Emirates, BA City Flyer, Wizz Air	12	LAMP Airline Engagement webex SE: Stakeholder engagement with specific reference to the South East Segment i.e. why airspace change is required, design principles. Feedback from airlines regarding their initial requirements. from airlines regarding their initial requirements/thoughts
07/11/2019	LVNL, MUAC		LAMP meeting with LVNL and MUAC: Airspace change process, design principles, initial requirements of the adjacent ANSP’s
08/11/2019	DSNA (Paris, Brest, Reims)		LAMP meeting with DSNA: Airspace change process, design principles, initial requirements of the adjacent ANSP’s
08/11/2019	GA		NATS/GAA meeting

Date	Audience	Number of Attendees	Activity
12/11/2019	Various	27	FASI South Tech Sub Group Meeting: ACOG Comms, CAA Policy, Deployment. Stakeholder updates.
13/11/2019	Airlines	20	Airspace and Flight Efficiency Partnership
18/11/2019	Airlines: BA	8	British Airways unit visit: LAMP briefing to senior staff
09/12/2019	Various	~15	FASI South Tech Sub Group Meeting
10/12/2019	Various		FASI South Deployment Strategy Workshop
12/12/2019	Bristol, Cardiff, Exeter, ACOG		FASI South ACP1 Kick off meeting
14/12/2019	Bristol		Bristol requirements Priority Check (dial in)
18/12/2019	Southampton	11	Southampton Concept Presentation: Workshop to explore the potential design options specific to Southampton airport operations.
08/01/2020	Bristol	15	Bristol ACP Design Workshop: Workshop to explore potential design options specific to Bristol airport operations
14/01/2020	Heathrow	19	LAMP/Heathrow Surge Activity: Workshop to explore potential design options specific to Heathrow airport operations
15/01/2020	Heathrow	27	LAMP/Heathrow Surge Activity: Workshop to explore potential design options specific to Heathrow airport operations
16/01/2020	Heathrow	33	LAMP/Heathrow SIM Planning Workshop
16/01/2020	Airlines	12	Lead Operator Carrier Panel
17/01/2020	Gatwick	10	Gatwick Pre Surge Meeting: Workshop to explore potential design options specific to Gatwick airport operations
21/01/2020	Northolt / MOD	10	LAMP briefing: Introduction of Network Prototype and MOD Engagement
22/01/2020	Bristol, Cardiff	9	ACP1 design Surge: Workshop to explore potential design options specific to the integration of Bristol and Cardiff airport operations
27/01/2020	MoD	14	NATS – MoD, LAMP/FASI-S Airspace change bilateral liaison meeting: specific discussions regarding the integration of Northolt and Brize
27/01/2020	Mil ATC		LAMP briefing: presentation given to Military ATC
27/01/2020	ACOG	4	Benefits Framework: meeting to explore the concept of a Benefits Framework for FASI-S
30/01/2020	ACOG	2	General Catch-Up
05/02/2020	Heathrow, Northolt	13	LAMP/Heathrow/Northolt Tri-LAT: Workshop to explore potential design options specific to the integration of Heathrow and Northolt airport operations
07/02/2020	ACOG	13	LAMP Design Process: Collaborative meeting between LAMP and ACOG to discuss the LAMP Design Process
10/02/2020	ACOG	7	ACOG Bi-Lateral: programme plan, consultation strategy etc..
11/02/2020	ACOG/Airports	9	Airport/Swanwick interoperability workshop
12/02/2020	ACOG/NSL	8	ACP1 Stage 2 Planning Session
12/02/2020	Exeter Airport	8	LAMP/Exeter Airport: Initial 'dial in' meeting to welcome Exeter to the project, intital requirements, progress so far.
13/02/2020	Bristol Airport	14	Bristol Stage 2 Design Workshop: Further workshop to explore potential design options specific to Bristol airport operations
24/02/2020	ICCAN	5	LAMP Network briefing
24/02/2020	Bristol Airport	9	Bristol Airport Face to Face Engagement Meeting: LAMP proof of concept network briefing
24/02/2020	Cardiff Airport	5	Cardiff Airport Face to Face Engagement Meeting : LAMP proof of concept network briefing
25/02/2020	LVNL	15	LVNL engagement: Discussing the FIR boundary interface with UK and Dutch FIRs.
25/02/2020	FASI-N	13	FASI-N Planning Meeting
03/03/2020	Bristol Airport	11	LAMP LD1, Bristol and Cardiff engagement day: Workshop activities to further explore design options specific to Bristol and Cardiff airport operations and the interactions between the two.
06/03/2020	HAL	8	Heathrow Deployment Options Workshop: Workshop to explore potential deployment options specific to Heathrow airport operations
22/01/2020	Bristol Airport	11	Bristol Surge: Workshop to explore potential design options specific to Bristol airport operations
20/03/2020	GA Alliance	5	NATS/GAA meeting
24/03/2020	ACOG	7	ACOG Bi-Lateral: contingency planning, masterplan
30/03/2020	ACOG	7	ACOG Bi-Lateral: contingency planning, progress update, airport delays
06/04/2020	ACOG	5	ACOG Bi-Lateral: Updates from both LAMP and ACOG

Date	Audience	Number of Attendees	Activity
16/09/2020	Bristol, Cardiff, exeter and ACOG	11	LD1/Airports engagement: Post COVID update by the LD1 team to the airports on the proposed Network change
15/10/2020	DAATM	9	LD1/DAATM engagement: Post COVID update by the LD1 team to the military on the proposed Network change
23/11/2020	MUAC	7	Meeting between LD1 and MUAC to discuss the interface design options
02/12/2020	LD1 and DAATM		
03/12/2020	LD1 and Bristol Airport	10	Design meeting specifically relating to the possible options for the network and Bristol airport traffic. Discussion regarding dependencies and LD1 progressing to Stage 3 in advance of masterplan acceptance.
12/02/2021	LD1 and Exeter Airport		Design meeting specifically relating to the possible options for the network and Exeter airport traffic
15/12/2020	LD1 and PC	9	Meeting between LD1 and PC to discuss the interface design options
16/12/2020	LD1 and DAATM		
17/12/2020	LD1 and Cardiff Airport	9	Design meeting specifically relating to the possible options for the network and Cardiff airport traffic. Discussion regarding dependencies and LD1 progressing to Stage 3 in advance of masterplan acceptance.
05/01/2021	LD1 and Exeter Airport	6	Meeting with LD1 and Exeter to discuss LD1 progressing to Stage 3 without masterplan acceptance..
07/01/2021	LD1 and Brize Norton	10	Meeting with LD1 and Brize to discuss progress of Brize ACP and the design options for LD1 with specific reference to the areas where the two ACP interact.
12/01/2021	LD1 , American Airlines, British Airways, Delta easyJet, Jet2, Ryanair, Swissair, Virgin Atlantic	17	Engagement with Airline stakeholders to introduce the proposed airspace change and present the 6 design options in Stage 2 documentation.
18/01/2021	LD1 and Exeter Airport	9	Design meeting with LD1 and Exeter specifically related to possible design options for the network and Exeter traffic.
20/01/2021	LD1 and Qinetiq	12	Engagement meeting with LD1 and Qinetiq specifically to discuss the interface between the network and airspace managed by Qinetiq. (e.g. D201)
26/01/2021	LD1 and IAA (Shannon)	9	Initial engagement meeting between LD1 and IAA Shannon control. The meeting discussed the design options for LD1 with specific reference to the areas where the two ANSP's interact.
28/01/2021	Bristol Airport, ACOG	11	Stage 2 submission feedback + CAA pro-forma discussion.
28/01/2021	Bristol & Cardiff Airports, ACOG	13	Technical Design meeting, plus feedback & discussion of Stage 2 submission.

Table 7 List of Stakeholders

	Stakeholder		
NATMAC (National Air Traffic Management	Aircraft Owners & Pilots Association (AOPA UK)	British Microlight Aircraft Association (BMAA)	
	Airport Operators Association (AOA)	British Model Flying Association (BMFA)	
	Airspace4All (Formally FASVIG)	British Skydiving	
	Association of Remotely Piloted Aircraft Systems (ARPAS UK)	General Aviation Alliance (GAA)	
	Aviation Environment Federation (AEF)	General Aviation Safety Council (GASCo)	
	British Airways (BA)	Guild of Air Traffic Control Officers (GATCO)	
	British Aerospace Systems (BAE Systems)	Heavy Airlines	
	British Airline Pilots Association (BALPA)	Helicopter Club of Great Britain (HCGB)	
	British Balloon & Airship Club (BBAC)	Honourable Company of Air Pilots (HCAP)	
	British Business & General Aviation Association (BBGA)	Light Aircraft Association (LAA)	
	British Gliding Association (BGA)	Low Fares Airlines (LFA)	
	British Hang Gliding & Paragliding Association (BHPA)	Ministry of Defence (MoD) via the Defence Airspace and Air Traffic Management (DAATM)	
	British Helicopter Association (BHA)	PPL/ IR	
Airline Operators	Aer Lingus	Eastern Airways	Qantas
	Air Canada	easyJet	Qatar Airways
	Air France	Emirates	RyanAir
	Air New Zealand	Etihad	SAS
	Air Portugal	Eurowings	Saudia
	Air Transat	FedEx	Singapore Airlines
	American Airlines	FinnAir	South African Airways
	Aurigny Air Services	Fly Dubai	Stobart Air
	Austrian Airlines	Gama Aviation	Tag Aviation
	Azerbaijan Airlines	Iceland Air	TUI
	BA Cityflyer	Jet2	Turkish Airlines
	Blue Islands	KLM	UK Air Tanker
	Bristow Helicopters	Logan Air	United Airlines
	British Airways	Lufthansa	UPS Europe
	Cathay Pacific	Malaysia Airlines	Virgin Atlantic
	CityJet	Middle East Airlines	West Jet
	Delta Airways	Norwegian Air	WizzAir
	DHL	Novair	
ANSPs	NATS Swanwick	IAA (GM En Route Ops)	
	NATS Prestwick	Belgocontrol (Chief Ops Officer)	
	NATS Corporate	DSNA (Head of Airspace Department, Operation directorate)	
	LVNL (Ops Director)	DSNA (ACC Paris)	
	LVNL (ATM Architect)	DSNA (ACC Brest)	
	MUAC Head of Ops	DSNA (ACC Reims)	
	IAA GM Terminal Ops	Ports of Jersey (SATCO)	
Airports	Biggin Hill	Gatwick	
	Birmingham	Heathrow	
	Blackpool Airport	London City	
	Bournemouth	Luton	
	Bristol	Manchester Airports Group (MAG)	
	Cardiff	Southampton	
	East Midlands	Southend	
	Exeter	Stansted	
	Farnborough		
Other	Department for Transport	Thales	
	IATA	Rockwell Collins	
	Airbus	Trax International	
	Boeing	NTASA	
	General Electric	AIRE	
	Honeywell	Airlines for America	
	Jeppesen	AOC Heathrow	
	LH Systems	BAR UK	
	NavBlue	European Lower Fares Airline Association	

Annex B: Glossary - Acronyms

Term	Definition
AC	Area Control
ACP	Airspace Change Proposal
AMS	Airspace Modernisation Strategy; the CAA's plan for modernising UK airspace
ANSP	Air Navigation Service Provider; an organisation which provides an ATS
ATC	Air Traffic Control
ATCO	Air Traffic Control Officer
ATS	Air Traffic Service; a generic term meaning variously, flight information service, alerting service, air traffic advisory service or an air traffic control service.
BCN	Brecon Sector Group
BHD	Berry Head Sector Group
CAA	Civil Aviation Authority; the UK regulator for aviation matters
CAP	Civil Aviation Publication; publications relating to airspace matters prepared by the CAA
CAP1385	Civil Aviation Publication 1385, Performance-based Navigation (PBN): Enhanced Route Spacing Guidance
CAP1616	Civil Aviation Publication 1616, the airspace change process regulated by the CAA
CAP1711	Civil Aviation Publication 1711, The CAA's Airspace Modernisation Strategy
CAS	Controlled Airspace; Generic term for the airspace in which an air traffic control service is provided as standard; note that there are different sub classifications of airspace that define the particular air traffic services available in defined classes of controlled airspace.
CO_2	Carbon Dioxide
COP	Coordination Point; A waypoint on the FIR boundary used for coordination between neighbouring ANSP's
DP	Design Principle; one of a set of criteria used to evaluate design options against.
DSNA	Direction des Services de la Navigation Aérienne (the French national Air Navigation Service Provider)
EGXX	ICAO Code for UK Airports, e.g. EGLL- Heathrow, EGKK- Gatwick
FAS	Future Airspace Strategy; a plan to modernise UK airspace. Note that this has been superseded by the Airspace Modernisation Strategy
FASI-S	Future Airspace Strategy Implementation- South; Airspace modernisation plan covering the Southern UK.
FIR	Flight Information Region; an airspace volume which is managed by a controlling authority that has responsibility for ensuring that air traffic services are provided to aircraft flying within it.
FL	Flight Level, an aircraft's altitude refenced to standard air pressure (1013 hPa).
FRA	Free Route Airspace; a specified volume of airspace in which users can freely plan a route between defined entry and exit points i.e. aircraft are not required to fly on specified routes.
ft	feet
GA	General Aviation; all civil aviation operations other than scheduled air services and non-scheduled air transport operations for remuneration or hire. The most common type of GA activity is recreational flying by private light aircraft and gliders, but it can range from paragliders and parachutists to microlights and private corporate jet flights.
hPa	Hectopascal; unit of barometric pressure used in UK aviation for altimeter setting.
IFACTS	Interim Future Area Control Tools Support
LAC	London Area Control; The unit responsible for managing en route traffic within the London FIR
LAG	Local Area Group
LAMP	London Airspace Modernisation Programme; a series of airspace change deployments looking to modernise the London FIR Lower Airspace to increase efficiency and capacity.
LD1	LAMP Deployment 1; 1st deployment of LAMP
LMS	London Middle Sector Group
LTC	London Terminal Control; the unit responsible for aircraft below 24,500 ft flying to or from London's airports
LTMA	London Terminal Manoeuvring Area
LUS	London Upper Sector Group
MoD	Ministry of Defence
NATS	The UK's licenced air traffic service provider for the en route airspace that connects our airports with each other, and with the airspace of neighbouring states.
NERL	NATS En Route Limited
PBN	Performance Based Navigation, a generic term for modern standards for aircraft navigation capabilities including satellite navigation (as opposed to 'conventional' navigation standards).
RNAV	Area Navigation; a generic term for a particular specification of Performance Based Navigation
SID	Standard Instrument Departure; this is a route for departures to follow straight after take-off
SME	Subject Matter Expert
STAR	Standard Instrument Arrival Route; the published routes for arriving traffic. In today's system these bring aircraft from the route network to the holds (some distance from the airport at high levels), from where they follow ATC instructions rather than a published route. Under PBN it is possible to connect the STAR to the runway via a Transition.
TA	Transition Altitude, the altitude at which an aircraft changes to/from FL for maintaining vertical separation
IFP	Instrument Flight Procedure; a published procedure used by aircraft flying IFR.
IFR	Instrument Flight Rules; rules which allow properly equipped aircraft to be flown under instrument meteorological conditions.

Annex B: Glossary - Terms

Altitude	The distance measured in feet, above mean sea level. Due to variations in terrain, air traffic control measures altitude as above mean sea level rather than above the ground. If you are interested in the height of aircraft above a particular location to assess potential noise impact, then local elevation should be taken into account when considering aircraft heights; for example an aircraft at 6,000ft above mean sea level would be 5,500ft above ground level if the ground elevation is 500ft.
AMSL	Above Mean Sea Level
AONB	Area of Outstanding Natural Beauty
ATC	Air traffic control
ATC intervention	This is when ATC instruct aircraft off their planned route, for example, in order to provide a short cut, they may be instructed to fly directly to a point rather than following the path of the published route
CAA	Civil Aviation Authority, the UK Regulator for aviation matters
CAP1616	Civil Aviation Publication 1616, the airspace change process regulated by the CAA
Capacity	A term used to describe how many aircraft can be accommodated within an airspace area without compromising safety or generating excessive delay
CAS	See Controlled Airspace
Centreline	The nominal track for a published route (see Route)
CO_2	Carbon dioxide
Concentration	Refers to a density of aircraft flight paths over a given location; generally refers to high density where tracks are not spread out; this is the opposite of Dispersal
Continuous descent	A climb or descent that is constant, without long periods of level flight
Controlled airspace (CAS)	Generic term for the airspace in which an air traffic control service is provided as standard; note that there are different sub classifications of airspace that define the particular air traffic services available in defined classes of controlled airspace. (e.g. Class A, C, D, E) Abbreviated to CAS.
Conventional navigation	The historic navigation standard where aircraft fly with reference to ground based radio navigation aids
Conventional routes Delay Absorption Area	Routes defined to the conventional navigation standard See Holds
Dispersal	Refers to the density of aircraft flight paths over a given location; generally refers to lower density – tracks that are spread out; this is the opposite of Concentration
Easterly operation	When a runway is operating such that aircraft are taking off and landing in an easterly direction
Final approach path	The final part of a flight path that is directly lined up with the runway;
Flexible Use Airspace FUA	Airspace which can be designated as neither "civilian" nor "military" but which can operate in either guise, allocated according to need, or switched entirely on/off according to a schedule.
Flight-path	The track flown by aircraft when following a route, or when being directed by air traffic control (see also Vector)
ft, feet	The standard measure for vertical distances used in air traffic control
GA	See General Aviation
General Aviation (GA)	All civil aviation operations other than scheduled air services and non-scheduled air transport operations for remuneration or hire. The most common type of GA activity is recreational flying by private light aircraft and gliders, but it can range from paragliders and parachutists to microlights and private corporate jet flights.
Holds/Holding Stacks	An airspace structure where aircraft circle in a racetrack-shaped pattern above one another at 1,000ft intervals when queuing to land.
Lower airspace	Airspace in the general vicinity of the airport containing arrival and departure routes below 7-8,000ft. Airports have the primary accountability for the design of this airspace, as its design and operation is largely dictated by local noise requirements, airport capacity and efficiency
NATS	The UK's licenced air traffic service provider for the en route airspace that connects our airports with each other, and with the airspace of neighbouring states. Also the air navigation service provider at Luton Airport, under commercial contract for the aerodrome control provision and via the London Licence for the approach control function.
Nautical Mile	Aviation measures distances in nautical miles. One nautical mile (nm) is 1,852 metres. One road mile ('statute mile') is 1,609 metres, making a nautical mile about 15% longer than a statute mile.
Network airspace	En route airspace above 7,000ft in which NATS has accountability for safe and efficient air traffic services for aircraft travelling between the UK airports and the airspace of neighbouring states
nm	See Nautical Mile
PBN	See Performance Based Navigation
Performance Based Navigation (PBN)	Referred to as PBN; a generic term for modern standards for aircraft navigation capabilities including satellite navigation (as opposed to 'conventional' navigation standards).
Radar, radar blip, radar target, radar return	Generic terms covering how ATC 'sees' the air traffic in the vicinity. One type of radar (Primary) sends out radio pulses that are reflected back to the receiver (the 'return'), defining the target's position accurately and displaying a marker on the controller's screen ('blip' or 'target'). The other type (Secondary, often attached to the Primary and rotating at the same speed) sends out a request for information and receives coded numbers by return (see Transponder). These numbers are decoded and displayed on top of the Primary return, showing an accurate target with callsign identity and altitude.
RNAV	Short for aRea NAVigation. This is a generic term for a particular specification of Performance Based Navigation
RNAV1	See RNAV. The suffix '1' denotes a requirement that aircraft can navigate to with 1nm of the centreline of the route 95% or more of the time. In practice the accuracy is much greater than this.

RNP1+RF	Required Navigation Performance 1. An advanced navigation specification under the PBN umbrella. The suffix '1' denotes a requirement that aircraft can navigate to with 1nm of the centreline 95% or more of the time, with additional self-monitoring criteria. In practice the accuracy is much greater than this. The RF means Radius to Fix, where airspace designers can set extremely specific curved paths to a greater accuracy than RNAV1.
Route	Published routes that aircraft plan to follow. These have a nominal centreline that give an indication of where aircraft on the route would be expected to fly; however, aircraft will fly routes and route segments with varying degrees of accuracy based on a range of operational factors such as the weather, ATC intervention, and technical factors such as the PBN specification. RNAV1 routes and RNP1 routes are flown accurately.
Route system or route structure	The network of routes linking airports to one another and to the airspace of neighbouring states.
Separation	Aircraft under Air Traffic Control are kept apart by standard separation distances, as agreed by international safety standards. Participating aircraft are kept apart by at least 3nm or 5nm lateral separation (depending on the air traffic control operation), or 1,000ft vertical separation.
Sequence	The order of arrivals in a queue of airborne aircraft waiting to land
SID	See Standard Instrument Departure
Standard Arrival Route (STAR)	The published routes for arriving traffic. In today's system these bring aircraft from the route network to the holds (some distance from the airport at high levels), from where they follow ATC instructions (see Vector) rather than a published route. Under PBN it is possible to connect the STAR to the runway via a Transition.
Standard Instrument Departure	Usually abbreviated to SID; this is a route for departures to follow straight after take-off
STAR	See Standard Arrival Route
Statute mile	A standard mile as used in normal day to day situations (e.g. road signs) but not for air traffic where nautical miles are used
Stepped descent	A descent that is interrupted by periods of level flight required to keep the aircraft separated from another route in the airspace below
Systemisation	The process of reducing the need for human intervention in the air traffic control system, primarily 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.
Tactical methods	Air traffic control methods that involve controllers directing aircraft for specific reasons at that particular moment (see Vector)
Terminal airspace	An aviation term to describe a designated area of controlled airspace surrounding a major airport or cluster of airports where there is a high volume of traffic; a large part of the airspace above London and the South East is defined as terminal airspace (or Terminal Manoeuvring Area – TMA). This is the airspace that contains all the arrival and departure routes for Heathrow, Gatwick, Stansted, Luton and London City from around 2,000ft-3,000ft up to approximately 20,000ft.
Tonne, t	Metric Tonne (1,000kg)
Top of Descent (TOD)	The aircraft ends its cruise phase and starts its descent from the en-route environment towards the runway
Transition	The part of a PBN arrival route, defined to either RNAV1 or RNP1 standard, between the last part of the hold and the final approach path to the runway. Typically followed accurately in three dimensions by an aircraft's flight management system.
Transition Altitude	The altitude at which aircraft change to using FL as the altimetry reference for maintaining vertical separation.
Transponder	An electronic device on board aircraft which sends out coded information which is picked up by radar and other systems. Most importantly the aircraft altitude, and identity code, by which the aircraft can be identified on the radar screen.
Uncontrolled Airspace	Generic term for the airspace in which no air traffic control service is provided as standard. (aka Class G airspace)
Unknown traffic	Aircraft not participating in ATC services. They may show on radar with altitude information (if they are operating with a Transponder) or in the worst case they will only show as a blip on the radar screen (a radar primary return) with no other information. If ATC sees a primary return on radar, they have to assume that it could be at the same altitude as any flight they are controlling, and hence the flight has to be tactically vectored to safely avoid it.
Vector, Vectoring, Vectored	An air traffic control method that involves directing aircraft off the established route structure or off their own navigation – ATC instruct the pilot to fly on a compass heading and at a specific altitude. In a busy tactical environment, these can change quickly. This is done for safety and for efficiency.
Westerly operation	When a runway is operating such that aircraft are taking off and landing in a westerly direction

Annex C: Stakeholder feedback

Stage 2 engagement with stakeholders has been ongoing from Dec 2019 to Jan 2021, as evidenced by the meeting schedule in Annex A. The draft Stage 2A document was circulated to 159 stakeholders for comment in December 2020. 18 stakeholders responded with feedback.
This Annex contains redacted responses from the three FASI-S ACP sponsor stakeholders with significant dependencies with LD1 (Bristol, Cardiff & Exeter Airports). These give feedback on the degree of dependencies between their ACP and the LD1 ACP, and whether there is any perceived issue with progression through the Stage 2 gateway.

Exeter Airport

Good afternoon xxxx

Many thanks for the presentation on Tuesday.
Exeter Airport agrees that mutual engagement has occurred between NERL (London Airspace Management Programme (LAMP) Deployment 1 (ACP-2017-70), "LD1") and Exeter Airport. There is a dependency between the LD1 ACP and the Airport's FASI-S ACP.

I believe both parties are confident that this dependency can be managed via continued engagement between NERL and the Airport.

Appropriate mitigations are likely to be developed, but there is no commitment to any particular design solution at this stage.

The Airport has no objection to the LD1 ACP proceeding through the CAP1616 Stage 2 gateway.

Best regards

XXXX

xxxx xxxx xxxx xxxx xxxx
Air Traffic Services Manager
Exeter Airport
DDI: xxxx xxxx xxxx xxxx
xxxx xxxx xxxx xxxx xxxx xxxx xxxx

Exeter Airport
Exeter
Devon
EX5 2BD
T: +44 (0)1392 367433
www.exeter-airport.co.uk

Cardiff Airport

From:
Sent: 27 January 2021 11:53
To:
Cc: ;
Subject: RE: LD1 Stakeholder engagement
Importance: High

,

As requested in your email below, please accept this as the formal response from Cardiff Airport in relation to the LD1 Stakeholder Engagement:

- The Cardiff NATS GM, , has provided me with a briefing in relation to the LD1 options.
- Cardiff airport agrees that mutual engagement has occurred between NERL (London Airspace Management Programme (LAMP) Deployment 1 (ACP-2017-70), “LD1”) and Cardiff Airport (sponsor of an ACP within the FASI-S programme), under CAP1616.
- There is a dependency between LD1 ACP and Cardiff Airport’s FASI-S ACP; both parties are confident that this dependency can be managed via continued engagement between NERL and the Airport.
- Appropriate mitigations are likely to be developed, but Cardiff Airport understands that there is no commitment to any particular design solution at this stage.
- Cardiff Airport acknowledges that routes have only been considered to the North of Cardiff and the Southern routes have yet to be considered.
- Cardiff Airport has no objection to the LD1 ACP proceeding through the CAP1616 Stage 2 gateway.
- With regards to the RNAV1 question, this is not information I have readily available, but we would look to capture this as part of our own ACP which is currently ‘Paused’ having reached, and successfully passed, the Stage 1 gateway. We are not expecting the mix of aircraft/traffic operating in/out of CWL to change significantly and therefore any data you already have regarding airlines and/or aircraft types would provide you with a good indicator to work upon.

Thank you

Head of Airfield Operations
Pennaeth Gweithrediadau Maes Glanio

+
+

Cardiff Airport, Vale of Glamorgan, Wales, CF62 3BD
Maes Awyr Caerdydd, Bro Morgannwg, Cymru, CF62 3BD

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.

Bristol Airport

From:
Sent: 28 January 2021 14:32
To:
Cc:
Subject: RE: LD1 response to stakeholder engagement

Hi ,

Many thanks for your response. As discussed Bristol have no further concerns with LD1 proceeding through the 1616 Stage 2 Gateway.

We look forward to working with you as you proceed into Stage 3 and hopefully we can bring our programmes back into alignment as far as possible between now and Stage 3 gateway.

Kind regards,

Airfield Technical and Compliance Manager
Bristol Airport
Bristol
BS48 3DW

www.bristolairport.co.uk

ANNEX D

1. Conclusion and Shortlist

The design principle evaluation of each design option presented on the previous pages and are summarised in the table below.

Design Principle / Option Name:	0. Baseline (do nothing)	1. Direct Route (minimal systemisation)	2. Systemisation - 5nm separation	3. Systemisation - 3nm separation	4. Systemisation, 5nm Sep, imp connectivity	5. Legacy ATS routes plus DCTs	6. Systemised 5nm with FRA
Accept / Reject .	REJECT	REJECT	ACCEPT & PROGRESS	ACCEPT & PROGRESS	ACCEPT & PROGRESS	REJECT	ACCEPT & PROGRESS
Design Principle 0: Safety Safety is the highest priority (Priority A)	MET	MET	MET	MET	MET	MET	MET
Design Principle 1: Operational (Resiliance) The airspace will enable increased operational resilience (Priority B)	PARTIAL	PARTIAL	MET	MET	MET	PARTIAL	MET
Design principle 2: Economic (Fuel etc) Optimise network fuel performance (Priority C)	NOT	MET	PARTIAL	PARTIAL	PARTIAL	MET	MET
Design principle 3: Environmental (CO2) Optimise CO_2 emissions per flight (Priority C)	NOT	MET	PARTIAL	PARTIAL	PARTIAL	MET	MET
Design principle 4: Environmental (Noise) Minimising of noise impacts due to LAMP influence will take place in accordance with local needs (Priority C)	MET	MET	MET	MET	MET	MET	MET
Design principle 5: Technical (CAS) 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 (Priority C)	MET	NOT	PARTIAL	PARTIAL	PARTIAL	MET	PARTIAL
Design principle 6: Technical (GA) The impacts on GA and other civilian airspace users due to LAMP will be minimised (Priority C)	MET	PARTIAL	PARTIAL	PARTIAL	PARTIAL	MET	PARTIAL
Design principle 7: Technical (MOD) Technical - The impacts on MOD users due to LAMP will be minimised (Priority C)	MET	PARTIAL	MET	MET	MET	MET	MET
Design principle 8: Operational (Capacity) Systemisation will deliver the optimal capacity and efficiency benefits (Priority B)	PARTIAL	NOT	PARTIAL	PARTIAL	MET	PARTIAL	MET
Design principle 9: Technical (PBN) The route network linking Airports procedures with the En-Route phase of flight will be spaced to yield maximum benefits by using an appropriate standard of PBN. (Priority B)	NOT	NOT	MET	MET	MET	PARTIAL	MET
Design principle 10: Technical (AMS) Accords with the CAA's published Airspace Modernisation strategy (CAP1711) and any current or future plans associated with it. (Priority A)	NOT	NOT	PARTIAL	PARTIAL	PARTIAL	NOT	MET

Progression criteria: options having any Design Principles are which are Not Met (red) have been rejected (Options 0,1 & 5). Options 2, 3, 4 and 6 were accepted and will be carried forward to the Step 2B.

2. Next Steps

Options 2, 3. 4 & 6 will be formally appraised under the Stage 2, Step 2B Options Appraisal (Phase 1 Initial), including Safety Assessment.

ANNEX D - LAMP Options assessment matrix

DP	Priority	Quick Ref	Description	Suggested areas to consider (but not limited to)	Assessment means	Red	Amber	Green
0	A	Safety	Safety is always the highest priority	Human Performance - ATCO (control-ability)	SME (DT) - subjective	Unlikely to pass a safety case	Issues identified that would require a robust safety case	no significant safety issues identified
				Human Performance - Pilot (flyability)	SME (DT) - subjective			
				IFP (flyability)	SME (DT) - subjective			
				Flight Plan-ability (ATM)	SME (DT) - subjective			
				Surrounding airspace users' issues (inside/outside CAS)	SME (DT) - subjective			
1	B	Resilience	Operational - The airspace will enable increased operational resilience	Arrivals - Holding capacity	SME (DT) - Calculation	<5min scheduled traffic	5-19 min scheduled traffic	20+ min scheduled traffic
				Departures - Access via more than one route (for contingency or routine use)	SME (DT) - Assessment	No extra routes to UK FIR exit areas	Few extra routes to each FIR exit area	Extra routes to some UK FIR exit areas
				Disruption Recovery -	SME (DT) - Assessment	Worse than current	No Change	Better than current
2	C	Economic	Economic - Optimise network fuel performance	Suggested areas to consider: horizontal profile, vertical profile, track mileage, holding.	Quantitative assessment	>15% of optimum	between 5-15% greater than optimum	<5% greater than optimum
					Qualitative - SME	Qualitative does not support CCO/CDO and/or increases track mileage	Qualitative partially supports CCO/CDO	(Qualitative) Enables CCO/CDO and or reduces track mileage
3	C	CO_2	Environmental - Optimise CO_2 emissions per flight		as above	large deviation from the optimum	Sub-optimal CO2 benefit	Optimised CO2
4	C	Noise	Environmental - Minimising the noise impacts due to LAMP influences will take place in accordance with local needs	DFT ANG directs that noise is not the priority above 7000ft however it should still be considered.	SME (DT) - subjective	Increase in noise impacts below 7000ft	Change, but no net detrimental impacts below 7000ft	No change in noise impacts below 7000ft.
5	C	CAS	Technical - 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 the UK airspace users	CAS increase above 7000ft-FL195 only to be considered unless a specific element of the option influences the design below 7000ft that would require extra CAS below 7000ft	SME (DT) - subjective	Major increase in CAS volume required	Only a small increase in CAS volume required	No extra CAS required
6	C	GA	Technical - The impacts on GA and other civilian airspace users due to LAMP will be minimised	Any impact on GA traffic	SME (DT) – subjective <u>or</u>	Major impact or safety critical impact	Minor impact and not Safety critical	No impact or positive impact
					Stakeholder feedback - Subjective			
7	C	MOD	Technical - The impacts on MOD users due to LAMP will be minimised	Any impact on MOD airspace or traffic	SME (DT) – subjective <u>or</u>	Major impact or safety critical impact	Minor impact and not Safety critical	No significant impact or positive impact
					Stakeholder feedback - subjective			
8	B	Capacity	Operational - Systemisation will deliver the optimal capacity and efficiency benefits	Capacity - Network capacity	SME (DT) - subjective	Not able to support the traffic schedule	Slight modifications needed to the design and/or traffic schedules	No issues with supporting the traffic schedule
				Capacity – LAMP airspace can accommodate expected airport schedule	QAA	Schedule not met	Schedule met except for peak times	Airport schedule can be met including peak hourly movement rate
				Efficiency - Workload per controller would be reduced	QA or (if not available)	Workload per flight increased	Workload per flight like today, cost increase	Workload per flight reduced
					SME (DT) - subjective			
9	B	PBN	Technical - The route network linking Airports procedures with the En-Route phase of flight will be spaced to yield maximum benefits by using an appropriate standard of PBN.	The minimum RNAV standard required can accommodate all likely traffic utilising the airport	SME (DT) - subjective	Mix of conventional and PBN	Mix of RNAV1 and RNAV5	All routes RNAV1 or better.
				RNAV standards are the highest level needed to accommodate all routes separated within the airspace volume	SME (DT) - subjective	No PBN utilised	All routes are accommodated however an increase in airspace volume is required due to lower RNAV standards	All routes needed are accommodated or the highest RNAV standards used
10	A	AMS	Technical - Accords with the CAA's published Airspace Modernisation strategy (CAP1711) and any current or future plans associated with it.	Appropriate use of PBN, coordination with other FASI-S ACPs.	SME (ACCD) - subjective	Not aligned with AMS.	Partially aligned with AMS.	Aligned with AMS,

ANNEX D

Option 0: Baseline (do nothing)	REJECT	Assessmt matrix ref
This option represents the existing airspace design, i.e. the "do nothing" option.		
Design Principle 0: Safety Safety is the highest priority (Priority A) The exsiting airspace is demonstrably safe. This option represents the baseline for safety against which other options will be assessed.	MET	no significant safety issues identified
Design Principle 1: Operational (Resiliance) The airspace will enable increased operational resilience (Priority B) Resilience maintained but not enhanced. No improvement from today's operation.	PARTIAL	No change
Design principle 2: Economic (Fuel etc) Optimise network fuel performance (Priority C) Network routings not optimal. Tactical intervention routine to provide improved routings & improve fuel performance.	NOT	Qualitative does not support CCO/CDO and/or increases track
Design principle 3: Environmental (CO2) Optimise CO_2 emissions per flight (Priority C) Network routings not optimal. Tactical intervention routine to provide improved routings & improve CO2 performance.	NOT	Sub-optimal
Design principle 4: Environmental (Noise) Minimising of noise impacts due to LAMP influence will take place in accordance with local needs (Priority C) No Change - no impact.	MET	No adjustment required to the letterboxes and no
Design principle 5: Technical (CAS) 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 (Priority C) No new CAS	MET	No extra CAS required
Design principle 6: Technical (GA) The impacts on GA and other civilian airspace users due to LAMP will be minimised (Priority C) No change - no impact.	MET	No extra CAS required
Design principle 7: Technical (MOD) Technical - The impacts on MOD users due to LAMP will be minimised (Priority C) No change - no impact.	MET	No impact or positive impact
Design principle 8: Operational (Capacity) Systemisation will deliver the optimal capacity and efficiency benefits (Priority B) No Change workload and capacity as per today	PARTIAL	Workload per flight like today
Design principle 9: Technical (PBN) 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. (Priority B) PBN utilisation is not optimised in the extant enroute network.	NOT	Mix of conventional and PBN
Design principle 10: Technical (AMS) Accords with the CAA's published Airspace Modernisation strategy (CAP1711) and any current or future plans associated with it. (Priority A) PBN utilisation is not optimised in the extant enroute network.	NOT	PBN partially utilised. Not aligned with AMS.

Conclusion:
The Do nothing Option represents no change, and will not be progressed.

Option 1 Direct routing (COP-DCT-Letterbox)	REJECT	Assessmt matrix ref
This option represents the use of direct routes (DCT) by operators to/from the airport specific letterboxes. Assumes the use of the existing controlled airspace.		
Design Principle 0: Safety Safety is the highest priority (Priority A) Free routing could be achieved safely, within the limits of restricted capacity	MET	no significant safety issues identified
Design Principle 1: Operational (Resiliance) The airspace will enable increased operational resilience (Priority B) Resilience maintained but not enhanced. No improvement from today's operation. Would require structural limitation.	PARTIAL	No change
Design principle 2: Economic (Fuel etc) Optimise network fuel performance (Priority C) Optimum per flight. But would be degraded depending on increased traffic volume. (Less efficient as traffic increases.)	MET	(Qualitative) Enables CCO/CDO and or reduces track mileage
Design principle 3: Environmental (CO2) Optimise CO_2 emissions per flight (Priority C) Optimum per flight. (However tactical intervention required as traffic increases thus CO2 performance reduces with	MET	shortest route with CCO/CDO
Design principle 4: Environmental (Noise) Minimising of noise impacts due to LAMP influence will take place in accordance with local needs (Priority C) No significant change below 7000ft	MET	No adjustment required to the letterboxes and no impact below 7000ft
Design principle 5: Technical (CAS) 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 (Priority C) Large volume of additional CAS required.	NOT	Major increase in CAS volume required
Design principle 6: Technical (GA) The impacts on GA and other civilian airspace users due to LAMP will be minimised (Priority C) Volume of CAS required not known, until designs progressed	PARTIAL	Minor impact and not Safety critical
Design principle 7: Technical (MOD) Technical - The impacts on MOD users due to LAMP will be minimised (Priority C) Minor MOD impact due to additional CAS required.	PARTIAL	Minor impact and not Safety critical
Design principle 8: Operational (Capacity) Systemisation will deliver the optimal capacity and efficiency benefits (Priority B) High workload with increased traffic levels. Leading to reduced capacity.	NOT	Workload per flight increased
Design principle 9: Technical (PBN) 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. (Priority B) PNB not utilised.	NOT	No PBN utilised
Design principle 10: Technical (AMS) Accords with the CAA's published Airspace Modernisation strategy (CAP1711) and any current or future plans associated with it. (Priority A) PBN utilisation is not optimised in the extant enroute network.	NOT	Not aligned with AMS.

Conclusion:
This option appears efficient due to the possibility of direct great circle routes. However, in reality as traffic levels rise a very high degree of controller intervention would be required to keep aircraft safely separated. This would create high complexity and ATC workload and deviate the aircraft from the optimum routes. The high workload would necessitate ATC restrictions being imposed which would significantly reduce capacity. Four DPs were Not Met and hence this Option was REJECTED.

ANNEX D

Option 2 Systemisation with 5 Mile Radar Separation	ACCEPT & PROGRESS	Assessmt matrix ref
This option represents the introduciton of additional systemisation with radar separation remaining as 5nm (in AC).		
Design Principle 0: Safety Safety is the highest priority (Priority A) A systemised structure could be achieved safely.	MET	no significant safety issues identified
Design Principle 1: Operational (Resiliance) The airspace will enable increased operational resilience (Priority B) Resilience improved.	MET	Extra routes to some UK FIR exit areas
Design principle 2: Economic (Fuel etc) Optimise network fuel performance (Priority C) Systemised network routings carry small penalty compared to direct great circle route.	PARTIAL	Qualitative does not support CCO/CDO and/or increases track mileage
Design principle 3: Environmental (CO2) Optimise CO_2 emissions per flight (Priority C) Small penalty in CO2 performance	PARTIAL	Sub-optimal CO2 benefit
Design principle 4: Environmental (Noise) Minimising of noise impacts due to LAMP influence will take place in accordance with local needs (Priority C) No Change - no impact.	MET	No change in noise impacts below 7000ft.
Design principle 5: Technical (CAS) 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 (Priority C) Small increase in CAS, in some areas, reduction in others.	PARTIAL	Only a small increase in CAS volume required
Design principle 6: Technical (GA) The impacts on GA and other civilian airspace users due to LAMP will be minimised (Priority C) Small increase in CAS, in some areas, reduction in others.	PARTIAL	Only a small increase in CAS volume required
Design principle 7: Technical (MOD) Technical - The impacts on MOD users due to LAMP will be minimised (Priority C) No change - no impact.	MET	No significant impact or positive impact
Design principle 8: Operational (Capacity) Systemisation will deliver the optimal capacity and efficiency benefits (Priority B) No change to current day.	PARTIAL	Workload per flight like today
Design principle 9: Technical (PBN) 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. (Priority B) RNAV1 PBN route structure is implemented.	MET	All routes RNAV1 or better.
Design principle 10: Technical (AMS) Accords with the CAA's published Airspace Modernisation strategy (CAP1711) and any current or future plans associated with it. (Priority A) Partially aligned with AMS, but not with respect to introduction of FRA.	PARTIAL	Partially aligned with AMS.

Conclusion:

This option introduces a high degree of systemisation, which facilitates a reduction in ATC complexity and a reduction in controller intervention. However the route network systemisation was somewhat rigid. As such, when compared with Option 4 its performance is not as good. This option was progressed to Stage 2B (initial options appraisal) for further appraisal.

Option 3 3 Mile Radar Separation	ACCEPT & PROGRESS	Assessmt matrix ref
This option represents a systemised solution with the radar separation also being upgraded to 3nm (in AC). This would also require changes to supporting tools and systems.		
Design Principle 0: Safety Safety is the highest priority (Priority A) A systemised structure with 3nm radar separation could be achieved safely.	MET	no significant safety issues identified
Design Principle 1: Operational (Resiliance) The airspace will enable increased operational resilience (Priority B) Reduced radar separation will enable increased resilience	MET	extra routes to some UK FIR exit areas
Design principle 2: Economic (Fuel etc) Optimise network fuel performance (Priority C) Slight reduction in fuel performance	PARTIAL	Qualitative partially supports CCO/CDO
Design principle 3: Environmental (CO_2) Optimise CO_2 emissions per flight (Priority C) Slight reduction in CO_2 performance.	PARTIAL	Sub-optimal CO2 benefit
Design principle 4: Environmental (Noise) Minimising of noise impacts due to LAMP influence will take place in accordance with local needs (Priority C) No Change - no impact.	MET	No adjustment required to the letterboxes and no impact below 7000ft
Design principle 5: Technical (CAS) 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 (Priority C) Small increase in CAS, in some areas, reduction in others.	PARTIAL	Only a small increase in CAS volume required
Design principle 6: Technical (GA) The impacts on GA and other civilian airspace users due to LAMP will be minimised (Priority C) Small increase in CAS, in some areas, reduction in others.	PARTIAL	Only a small increase in CAS volume required
Design principle 7: Technical (MOD) Technical - The impacts on MOD users due to LAMP will be minimised (Priority C) No change - no impact.	MET	No impact or positive impact
Design principle 8: Operational (Capacity) Systemisation will deliver the optimal capacity and efficiency benefits (Priority B) 3nm separation would not give any additional benefit over 5 nm separation and would cost a significantly greater amount (cost would not justify benefit). Current ATM systems do not support 3nm separation in the enroute environment.	PARTIAL	Workload per flight like today, cost increase
Design principle 9: Technical (PBN) 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. (Priority B) PBN could be introduced however the complexity of integrating 3nm separation presents significant issues for the operational systems which would cost a disproportionate amount.	MET	All routes RNAV1 or better.
Design principle 10: Technical (AMS) Accords with the CAA's published Airspace Modernisation strategy (CAP1711) and any current or future plans associated with it. (Priority A) Partially aligned with AMS, but not with respect to introduction of FRA.	PARTIAL	Partially aligned with AMS.

Conclusion:
In common with option 2 this option offers systemisation, potential reduction in sector complexity, potential reduction in controller intervention. However the airspace available in the LD1 area is relatively large and is not significantly constrained in terms of the volume within which to position routes. The cost (and technical challenge) of upgrading radar and associated systems to support 3nm radar separation are prohibitively high, compared to the marginal incremental benefit (compared to a similar structure based on 5nm radar separation as per Option 2). Separation standards in upper airspace would also have to change to match, to prevent having multiple separation standards in same sectors. Vertical integration of upper/lower airspace with different separation standards introduces additional complexity. In short there is enough space in the LD1 airspace volume to accommodate sufficient systemised routes without having to use the closer spacing that 3nm separation would enable. This option was progressed to Stage 2B (initial options appraisal) for further appraisal.

Option 4. Systemisation with 5nm separation with improved connectivity (P5)	ACCEPT & PROGRESS	Assessmt matrix ref
Systemisation using PBN routes based on 5nm radar separation environment with improved connectivity (build on option 3)		
Design Principle 0: Safety Safety is the highest priority (Priority A) A systemised structure using PBN routes based on 5nm radar separation environment with improved connectivity could be achieved safely.	MET	no significant safety issues identified
Design Principle 1: Operational (Resiliance) The airspace will enable increased operational resilience (Priority B) Resilience improved from today's operation.	MET	extra routes to some UK FIR exit areas
Design principle 2: Economic (Fuel etc) Optimise network fuel performance (Priority C) Systemised network routings carry small penalty compared to direct great circle route.	PARTIAL	Qualitative does not support CCO/CDO and/or increases track mileage
Design principle 3: Environmental (CO2) Optimise CO_2 emissions per flight (Priority C) Systemised network routings carry small penalty compared to direct great circle route.	PARTIAL	Sub-optimal CO2 benefit
Design principle 4: Environmental (Noise) Minimising of noise impacts due to LAMP influence will take place in accordance with local needs (Priority C) No impact below 7000ft.	MET	No adjustment required to the letterboxes and no impact below 7000ft
Design principle 5: Technical (CAS) 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 (Priority C) Small increase in CAS, in some areas, reduction in others.	PARTIAL	Only a small increase in CAS volume required
Design principle 6: Technical (GA) The impacts on GA and other civilian airspace users due to LAMP will be minimised (Priority C) Small increase in CAS, in some areas, reduction in others.	PARTIAL	Only a small increase in CAS volume required
Design principle 7: Technical (MOD) Technical - The impacts on MOD users due to LAMP will be minimised (Priority C) No change - no impact.	MET	No impact or positive impact
Design principle 8: Operational (Capacity) Systemisation will deliver the optimal capacity and efficiency benefits (Priority B) Systemised solution will deliver optimal capacity and efficiency benefits.	MET	Airport schedule can be met including peak hourly movement rate
Design principle 9: Technical (PBN) 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. (Priority B) Aligned with AMS, and PBN used to a large extent.	MET	All routes RNAV1 or better.
Design principle 10: Technical (AMS) Accords with the CAA's published Airspace Modernisation strategy (CAP1711) and any current or future plans associated with it. (Priority A) Partially aligned with AMS, but not with respect to introduction of FRA.	PARTIAL	Partially aligned with AMS.

Conclusion:

The Systemised PBN routes offer a highly efficient network design which would keep aircraft safe with minimal ATC intervention. The use of a 5 NM separation radar environment requires no upgrade to existing radar or associated systems. The introduction of direct routings enables further environmental benefits not present in Option 3. This Option is considered a promising candidate, and has been progressed to the next stage.

Option 5 Legacy plus DCTs	REJECT	Assessmt matrix ref
Current day route network, enhanced with some new direct routes		
Design Principle 0: Safety Safety is the highest priority (Priority A) A legacy structure plus DCTs could be achieved safely.	MET	no significant safety issues identified
Design Principle 1: Operational (Resiliance) The airspace will enable increased operational resilience (Priority B) Resilience maintained but not enhanced. No improvement from today's operation.	PARTIAL	No change
Design principle 2: Economic (Fuel etc) Optimise network fuel performance (Priority C) DCTs provide improved routings & improve fuel performance.	MET	(Qualitative) Enables CCO/CDO and or reduces track mileage
Design principle 3: Environmental (CO2) Optimise CO_2 emissions per flight (Priority C) DCTs provide improved routings & improve CO2 performance.	MET	shortest route with CCO/CDO
Design principle 4: Environmental (Noise) Minimising of noise impacts due to LAMP influence will take place in accordance with local needs (Priority C) No Change - no impact.	MET	No adjustment required to the letterboxes and no impact below 7000ft
Design principle 5: Technical (CAS) 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 (Priority C) No new CAS	MET	No extra CAS required
Design principle 6: Technical (GA) The impacts on GA and other civilian airspace users due to LAMP will be minimised (Priority C) No change - no impact.	MET	No extra CAS required
Design principle 7: Technical (MOD) Technical - The impacts on MOD users due to LAMP will be minimised (Priority C) No change - no impact.	MET	No impact or positive impact
Design principle 8: Operational (Capacity) Systemisation will deliver the optimal capacity and efficiency benefits (Priority B) Little change from extant.	PARTIAL	Workload per flight like today
Design principle 9: Technical (PBN) 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. (Priority B) No Change - PBN capability not fully utilised.	PARTIAL	Mix of RNAV1 and RNAV5
Design principle 10: Technical (AMS) Accords with the CAA's published Airspace Modernisation strategy (CAP1711) and any current or future plans associated with it. (Priority A) Not aligned with AMS.	NOT	Not aligned with AMS.

Conclusion:

This Option introduces additional direct routes which would enable some environmental and economic benefits. The 5 NM radar environment does not require any changes to radar infrastructure or related systems. Additional Controlled airspace may be required in some areas. There would be no reduction in ATC complexity, and no reduction in controller intervention. It may be necessary for a small amount of additional CAS to be introduced to support this design. Two DPs were Not Met. Hence this Option was REJECTED.

Option 6. Systemisation with 5nm separation, improved connectivity, interfacing with FRA above (P8)	ACCEPT & PROGRESS	Assessmt matrix ref
Systemisation using PBN routes based on a 5nm radar separation environment with improved connectivity (build on option 4)		
Design Principle 0: Safety Safety is the highest priority (Priority A) A systemised structure using PBN routes based on 5nm radar separation environment with improved connectivity could be achieved safely.	MET	no significant safety issues identified
Design Principle 1: Operational (Resiliance) The airspace will enable increased operational resilience (Priority B) Resilience improved. Extra routes to UK FIR exit areas. Disruption recovery better than current.	MET	extra routes to some UK FIR exit areas
Design principle 2: Economic (Fuel etc) Optimise network fuel performance (Priority C) Systemised network routings combined with overlying FRA can provide optimised network economic fuel performance.	MET	(Qualitative) Enables CCO/CDO and or reduces track mileage
Design principle 3: Environmental (CO2) Optimise CO_2 emissions per flight (Priority C) Systemised network routings combined with overlying FRA can provide optimised network CO2 performance.	MET	Shortest route with CCO/CDO
Design principle 4: Environmental (Noise) Minimising of noise impacts due to LAMP influence will take place in accordance with local needs (Priority C) No Change - no impact.	MET	No change in noise impacts below 7000ft.
Design principle 5: Technical (CAS) 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 (Priority C) Small increase in CAS, in some areas, reduction in others.	PARTIAL	Only a small increase in CAS volume required
Design principle 6: Technical (GA) The impacts on GA and other civilian airspace users due to LAMP will be minimised (Priority C) Small increase in CAS, in some areas, reduction in others.	PARTIAL	Only a small increase in CAS volume required
Design principle 7: Technical (MOD) Technical - The impacts on MOD users due to LAMP will be minimised (Priority C) No significant impact.	MET	No significant impact or positive impact
Design principle 8: Operational (Capacity) Systemisation will deliver the optimal capacity and efficiency benefits (Priority B) Systemised solution will deliver optimal capacity and efficiency benefits.	MET	Airport schedule can be met including peak hourly movement rate
Design principle 9: Technical (PBN) 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. (Priority B) PBN used to greatest extent.	MET	All routes needed are accommodated or the highest RNAV standards used
Design principle 10: Technical (AMS) Accords with the CAA's published Airspace Modernisation strategy (CAP1711) and any current or future plans associated with it. (Priority A) Aligned with AMS.	MET	Aligned with AMS,

Conclusion:

The Systemised PBN routes offer a highly efficient network design which would keep aircraft safe with minimal ATC intervention. The use of a 5 NM separation radar environment requires no upgrade to existing radar or associated systems. The introduction of direct routings enables further environmental benefits not present in Option 3. This Option is considered a promising candidate, and has been progressed to the next stage.

AMS ref	Description	RAG	Notes
DfT+CAA objectives Pg 23	Create sufficient airspace capacity to deliver safe and efficient growth of commercial aviation	G	LD1 aims to deliver safe and efficient growth in capacity
DfT + CAA objectives Pg 23	Progressively reduce the noise of individual flights, through quieter operating procedures and, in situations where planning decisions have enabled growth which may adversely affect noise, require that noise impacts are considered through the airspace design process and clearly communicated	G	This ACP proposes changes to the enroute network which will only affect flights above 7000ft. As such, in accordance with the DfT altitude based priorities, noise impacts are not prioritised.
DfT + CAA objectives Pg 23	Use the minimum volume of controlled airspace consistent with safe and efficient air traffic operations	G	The volume of airspace required will be minimised. The extant bases of airspace will be reviewed and where possible raised.
DfT + CAA objectives Pg 23	In aiming for a shared and integrated airspace, facilitate safe and ready access to airspace for all legitimate classes of airspace users, including commercial traffic, General Aviation and the military, and new entrants such as drones and	G	The airspace will be classified to support access to users as appropriate.
DfT + CAA objectives Pg 23	Not conflict with national security requirements (temporary or permanent) specified by the Secretary of State for Defence.	G	There is no conflict with national security requirements.
Stakeholders affected Pg 26	Passengers- Fewer flight delays and service disruptions at short notice will save time and improve the passenger experience. A more efficient airspace will increase capacity while continuing to improve current high safety standards, leading to better value, including consistent quality of service, and more choice.	G	This ACP aims to introduce more efficient airspace which will increase capacity while continuing to improve current high safety standards.
Stakeholders affected Pg 26	Aircraft Operators- the airspace structure is a key determinant of costs, punctuality and environmental performance. More direct and efficient flightpaths will mean lower costs for operators because they will save on fuel and be able to enhance the utilisation of their aircraft. Timely access to appropriate airspace is essential for the maintenance of military capability. Airspace modernisation must enable this while minimising impact on other users. Airspace modernisation is also expected to improve access to airspace for General Aviation, by enabling greater integration (rather than segregation) of different airspace user groups. The same is true for new airspace users such as drones and spacecraft.	G	This ACP aims to meet these objectives. Airline operators and GA have been continuously engaged, with positive feedback.
Stakeholders affected Pg 26	Airports- the sharing of accurate flight information about traffic using our airspace is expected to improve runway throughput and resilience. Additional airspace capacity will provide airports with the scope to develop their operations in line with their business plans (subject to planning considerations). Enhanced technology combined with updated airspace design enables safe, expeditious and efficient management of increased traffic.	G	This ACP aims to meet these objectives. Improved capacity of the network airspace is a key objective which will assist airports to develop their operations in line with their business plans.
Stakeholders affected Pg 26	UK Economy- efficiency and enhanced global connections and emerging aviation technologies can help drive growth.	G	This ACP aims to meet these objectives. Improved capacity, efficiency and reduced environmental impacts are all targets which will help the wider UK economy.

Stakeholders affected Pg 26	**Communities-** airspace modernisation offers environmental improvements because aircraft can climb sooner, descend more quietly and navigate more accurately around populated centres. In some areas, the increase in traffic can lead to an increase in noise, or the concentration of traffic can concentrate noise over a smaller area, which can reduce the areas in which noise is heard and offer the opportunity for respite routes. This means that not every community will benefit, so it is important that noise is managed as well as possible, in adherence to government policy. Airports should also consider whether they can develop airspace change proposals to reduce noise, i.e. to reduce the total adverse health effects of noise. Where aircraft are able to follow more fuel-efficient routes, wider society will also benefit because fewer CO2 emissions will reduce greenhouse-gas impacts.	G	This ACP aims to meet these objectives. Reduced environmental impacts are key targets. Improved airspace allowing CCO/CDOs aim to reduce CO_2 emissions and GHG impacts. The changes proposed are all above FL75 (not withstanding possible release of CAS) hence no significant noise impacts are anticipated.
Ends modernised airspace **must deliver** Pg 51	**Safety-** maintaining a high standard of safety has priority over all other ends to be achieved by airspace modernisation	G	This ACP will maintain the high standard of safety.
Ends modernised airspace **must deliver** Pg 51	**Efficiency-** consistent with the safe operation of aircraft, airspace modernisation should secure the most efficient use of airspace and the expeditious flow of traffic	G	This ACP aims to use the airspace efficiently to enable the expeditious flow of traffic.
Ends modernised airspace **must deliver** Pg 51	**Integration-** airspace modernisation should satisfy the requirements of operators and owners of all classes of aircraft across the commercial, General Aviation and military sectors	G	This ACP aims to use the airspace efficiently to enable the expeditious flow of traffic, including all classes of aircraft across the commercial, General Aviation and military sectors.
Ends modernised airspace **must deliver** Pg 51	**Environmental performance-** the interests of all stakeholders affected by the use of airspace should be taken into account when it is modernised, in line with guidance provided by the Government on environmental objectives, the Air Navigation Guidance 2017, which sets out how carbon emissions, air quality and noise should be considered	G	This ACP aims to be consistent with the objectives in ANG2017. The proposed airspace structures will aim to strike an appropriate balance in accordance with the environmental objectives as set out in the ANG 2017. .
Ends modernised airspace **must deliver** Pg 52	**Defence and security-** airspace modernisation should facilitate the integrated operation of air traffic services provided by or on behalf of the armed forces and take account of the interests of national security	G	This ACP aims to meet these objectives. Liaison with the MoD will ensure effective integration of operation of air traffic services provided by or on behalf of the armed forces and take account of the interests of national security.
Ends modernised airspace **must deliver** Pg 52	**International alignment-** airspace modernisation should take account of any international recommended practices or obligations related to the UK's air navigation functions, such as those from ICAO and the EU.	G	This ACP has considered all international recommended practices and obligations.
Ends modernised airspace **must deliver** Pg 52	Airspace **must** enable growth	G	This ACP aims to enable future growth.