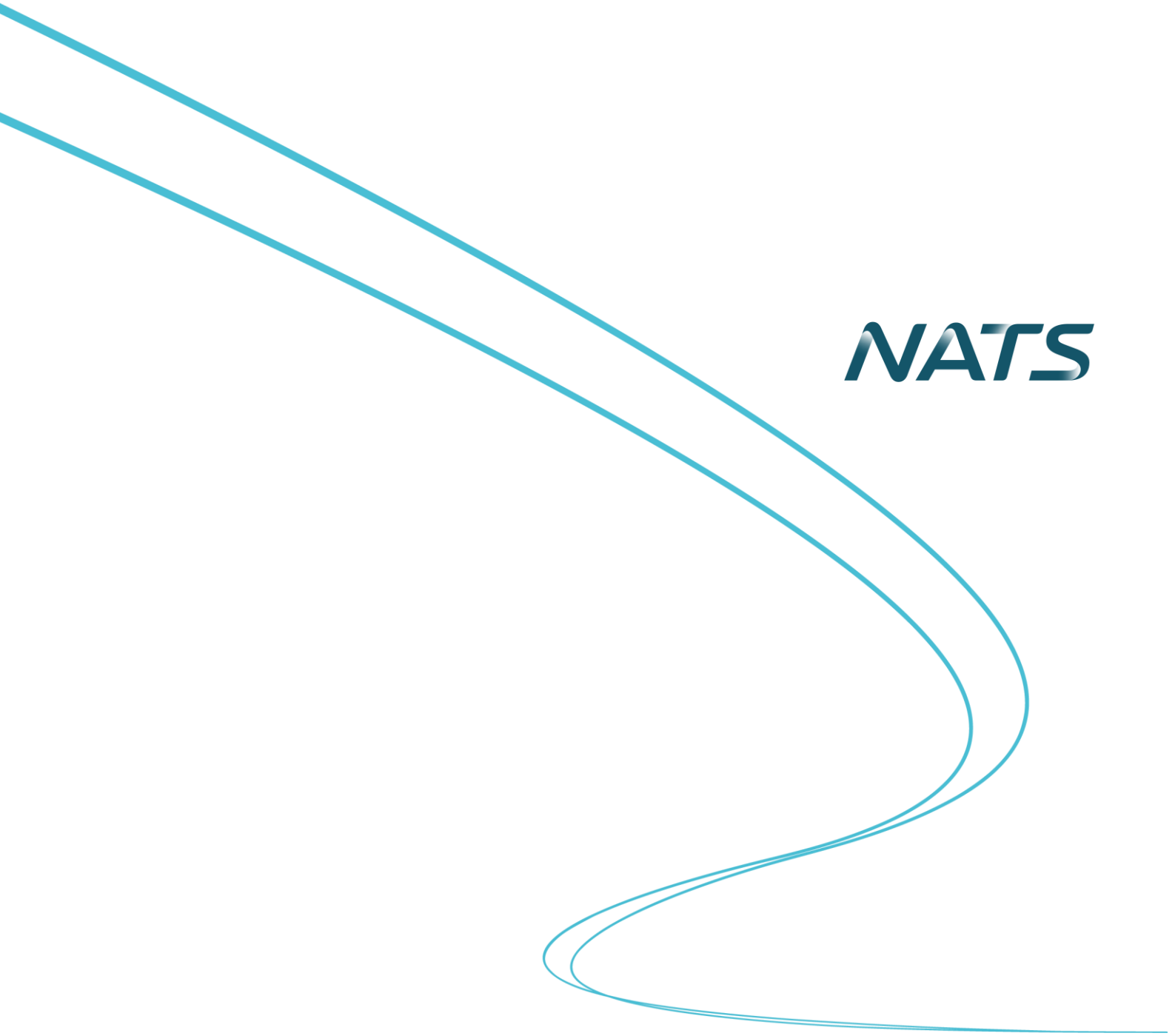
Free Route Airspace Deployment 1

Gateway documentation:
Stage 2 Develop and Assess

Step 2A document (i)
Airspace Change Design Options



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Roles

Action	Role	Date
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Contents

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1. Introduction

1.1 This document forms part of the document set required in accordance with the requirements of the CAP1616 airspace change process.

1.2 This document aims to provide adequate evidence to satisfy Stage 2 Develop and Assess Gateway, Step 2A Airspace Change Design Options.

1.3 The concept of Free Route Airspace (FRA) where aircraft can fly between points and are not constrained to follow a network of routes, is well established and has been recommended as a part of the Eurocontrol Single European Sky ATM Research (SESAR) programme and the CAA's Airspace Modernisation Strategy (AMS). The implementation of FRA by European Union member states was mandated in European Law under the EU Implementing Regulation EU716/2014.

2. Options development – brief history

2.1 In response to SESAR PCP[1] Implementing Regulation EU716/2014, NATS intends to implement Free Route Airspace (FRA) in a phased manner across UK airspace. The SESAR PCP ATM Functionality 3 (AF3) states that Free Route shall be provided and operated in the airspace for which the Member States are responsible at and above flight level 310 in the ICAO EUR region (which includes the Scottish FIR) by 1st January 2022.

2.2 This ACP proposes the introduction of the first deployment of FRA across the majority of the Scottish FIR in order to comply with this Implementing Regulation within the required timescale.

2.3 Since this change is mandatory under EU law and an agreed strategic aim of the European Commission Single European Sky initiative, the options development has been limited to the following:

- Baseline: do nothing – maintain the current high level ATS route structure.
- Implement FRA in accordance with Implementing Regulation EU716/2014. .

2.4 The scope of the first FRA Statement of Need submitted to the CAA which initiated the ACP process was to introduce FRA throughout the UK. Following the Assessment Meeting and initial work on Design Principles and options development, it became apparent that the scale of the ACP, in particular the length of time required to implement FRA in phased geographical deployments[2], did not easily align with the engagement and consultation requirements of the ACP process. Therefore the decision was taken to submit individual ACPs for each planned deployment of FRA. The first deployment will introduce FRA across the majority of the Scottish UIR (as shown in Figure 4).

2.5 The introduction of FRA is mandated under Implementing Regulation EU716/2014. Hence the design options for the implementation of FRA have been focused on meeting the requirements of the mandate. The system requirements specified in the PCP will be delivered through the Deployment Point – En Route project which is being developed in parallel with the FRA project. Therefore system requirements are not considered within the long list options (although they may be referenced).

2.6 It should be noted that some of the legal requirements to implement FRA originate in EU law. It is NATS' position that due to wider commitments (e.g. Borealis Alliance) and the airspace modernisation strategy, it is the intention to introduce FRA regardless of the withdrawal of the United Kingdom from the European Union (EU).

3. Stakeholder Engagement

The following stakeholder engagement meetings have taken place.

[1] The Single European Sky ATM Research (SESAR) Pilot Common Project (PCP) has been formalised in EU law under the Implementing Regulation EU716/2014. For more detail see Eurocontrol SESAR website.

[2] The implementation of FRA was assessed against influencing factors, such as system requirements, simultaneous airspace modernisation projects (LAMP, ScTMA etc) traffic flow complexity, Borealis Alliance commitments and the requirements of neighbouring ANSPs. The results of which necessitated a geographically phased implementation to enable the introduction of FRA within the PCP timescales.

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Date	Subject/Purpose	Meeting with
19th December 2017	FRA CONOPS Review	EUROCONTROL
10th January 2018	Flight Plan Buffer Zones (FBZs) in FRA	CAA
13TH February 2018	FRA Update	Lufthansa Systems (LIDO)
14th February 2018	FRA Update	Sabre Data Services
28th March 2018	FRA Update	British Airways
2nd May 2018	FRA Update	Jeppesen
25th September 2018	FRA update and Design principle engagement	DSNA Reims
5th October 2018	FRA update and Design principle engagement	EUROCONTROL network management
5th October 2018	FRA update and Design principle engagement	Jeppesen
16th October 2018	FRA update and Design principle engagement	IAA Shannon
23rd October 2018	FRA update and Design principle engagement	Naviair
4th December 2018	FRA update	CAA
15th January 2019	FRA update and options engagement (interface specifics)	Avinor
4th February 2019	FRA update and options engagement (interface specifics)	Maastricht UAC
27th March 2019	FRA update and options engagement (interface specifics)	Isavia

3.1 Listed below are the stakeholders involved in the Design Principles and options engagement:

NATMAC
- BAE Systems
- Airlines UK
- British Business and General Aviation (BBGA)
- British Gliding Association (BGA)
- Low Fares Airlines
- MoD via DAATM

Data Houses/Flight-planning providers
- Jeppesen
- Lufthansa Systems
- Sabre

ANSPs
- Eurocontrol Maastricht Upper Area Control Centre (MUAC)
- Eurocontrol Central Flow Management Unit (CFMU)
- Irish Aviation Authority (IAA)
- Direction des Services de la Navigation Aérienne (DSNA) Head of Airspace
- DSNA ACC Brest
- DSNA ACC Reims
- NAVIAIR
- Isavia
- Avinor
- RAF(U) Swanwick

3.2 This section demonstrated two-way engagement with appropriate stakeholders. Ongoing engagement continues via direct email and/or phone contact.

4. Baseline (do nothing) description

The following pages describe the baseline (do nothing) scenario.
It should be noted that "Doing nothing" is useful as a baseline for comparison, but due to the PCP mandate it is not considered as a viable option.

4.1 Current airspace diagram

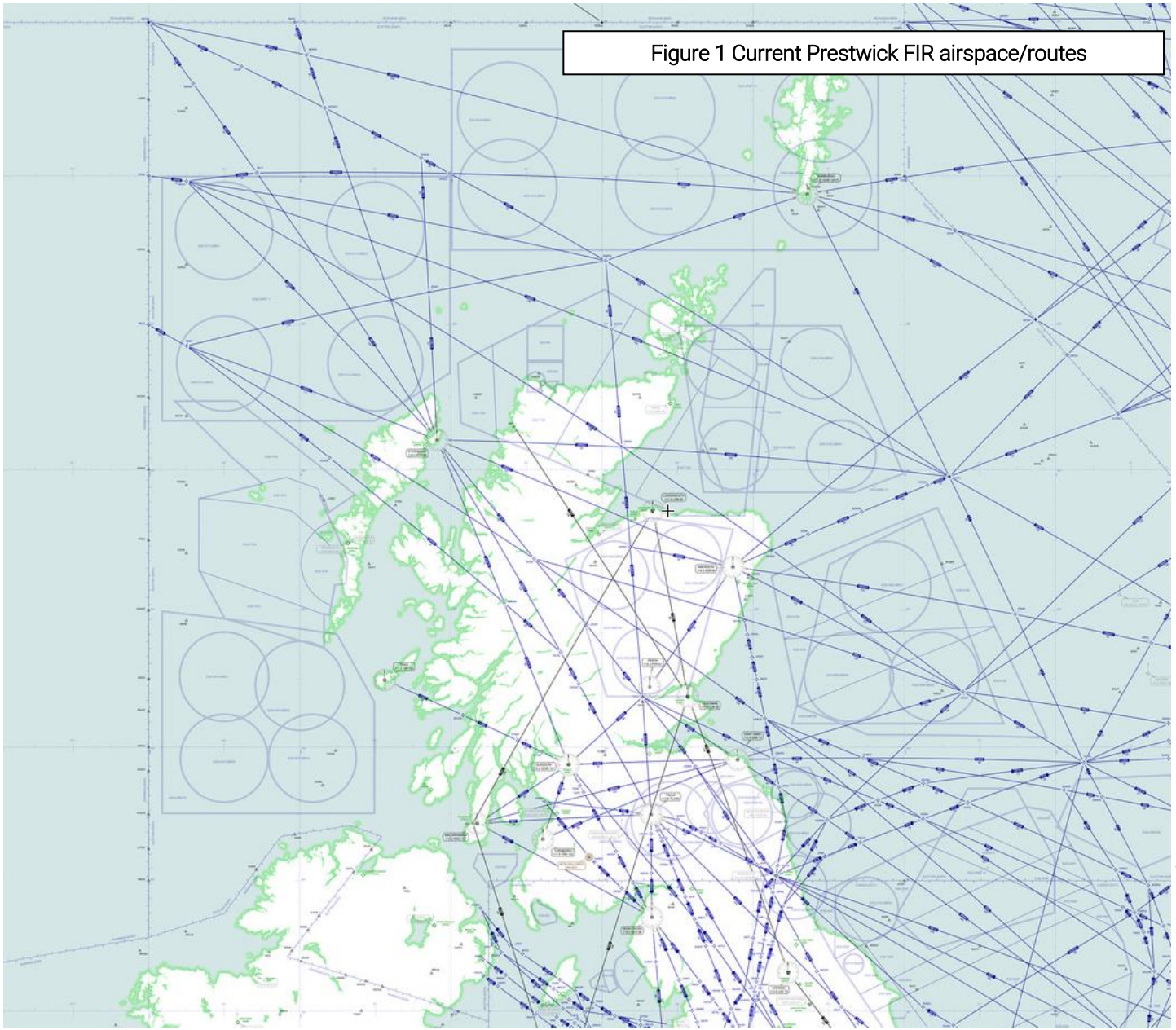

Figure 1 Current Prestwick FIR airspace/routes

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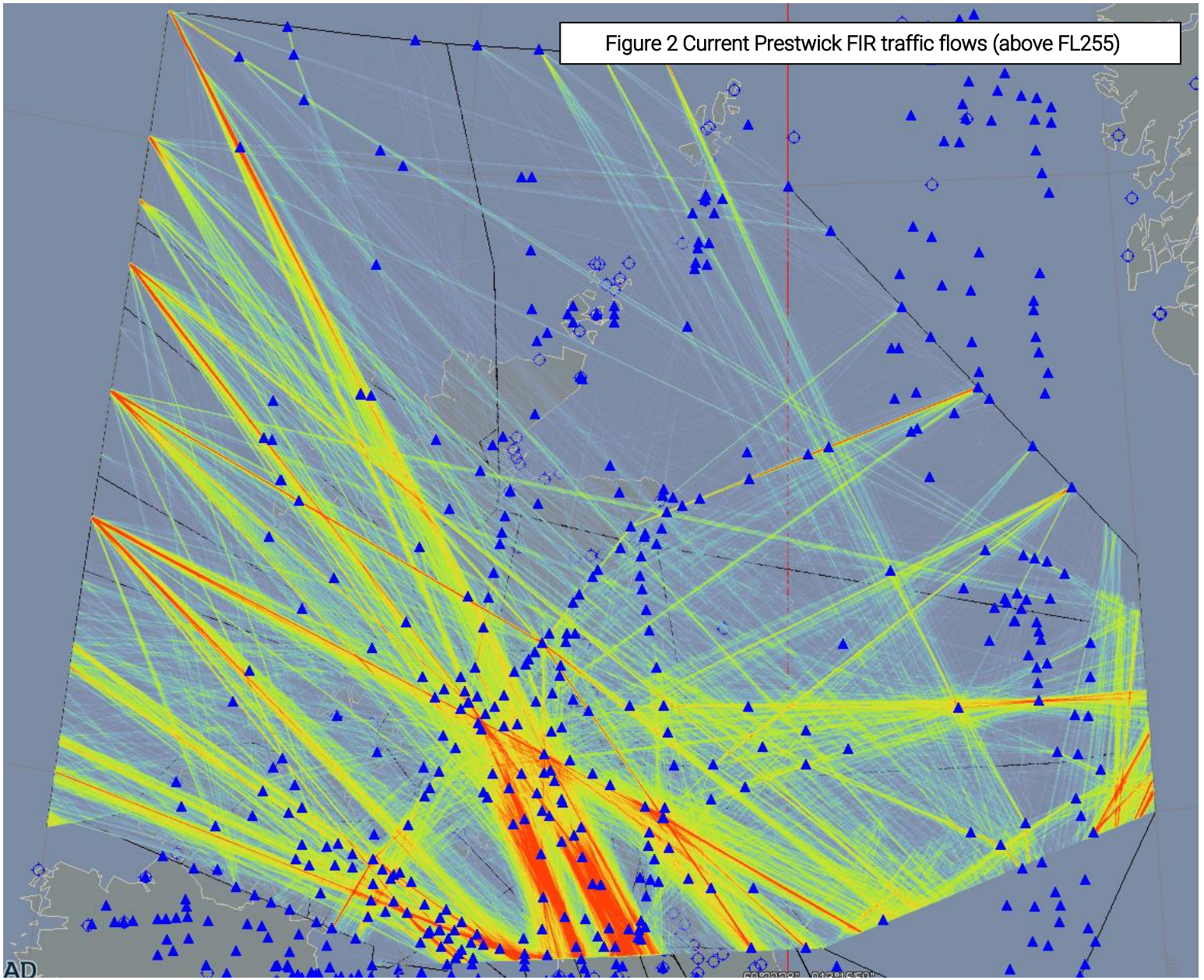

Figure 2 Current Prestwick FIR traffic flows (above FL255)

4.1.1 Figure 1shows the current Prestwick FIR airspace and Upper ATS route network.

4.1.2 Figure 2 shows current flight-path density plots (2018 data, above FL255). This shows the typical flows of traffic above FL255. The use of the designated entry/exit points at the FIR boundary, and the influence on flight-paths of some navaids and the ATS route structure can be seen clearly.

5. FRA Concept Overview

5.1.1 FRA is defined as "*A specified airspace within which users may freely plan a route between a defined entry point and a defined exit point, with the possibility to route via intermediate (published or unpublished) waypoints, without reference to the ATS route network, subject to airspace availability*." Within this airspace, flights remain subject to air traffic control.

5.1.2 Deployment of FRA is a legislative requirement of the SESAR Pilot Common Project (PCP) ATM Functionality 3 (AF3) Implementing Rule. The SESAR PCP AF3 requires ANSPs to implement FRA, at FL305+, by 1st January 2022.

5.1.3 FRA is also expected to deliver Flight Planning and fuel benefits which will contribute to the UK Ireland FAB Performance Plan & UK Airspace Modernisation Strategy (AMS).

5.1.4 In addition, NATS has committed to the Borealis Alliance area of FRA. Borealis members have committed to put in place a seamless and integrated FRA extending from the eastern boundary of the North Atlantic to the western boundary of Russian airspace in the North of Europe.

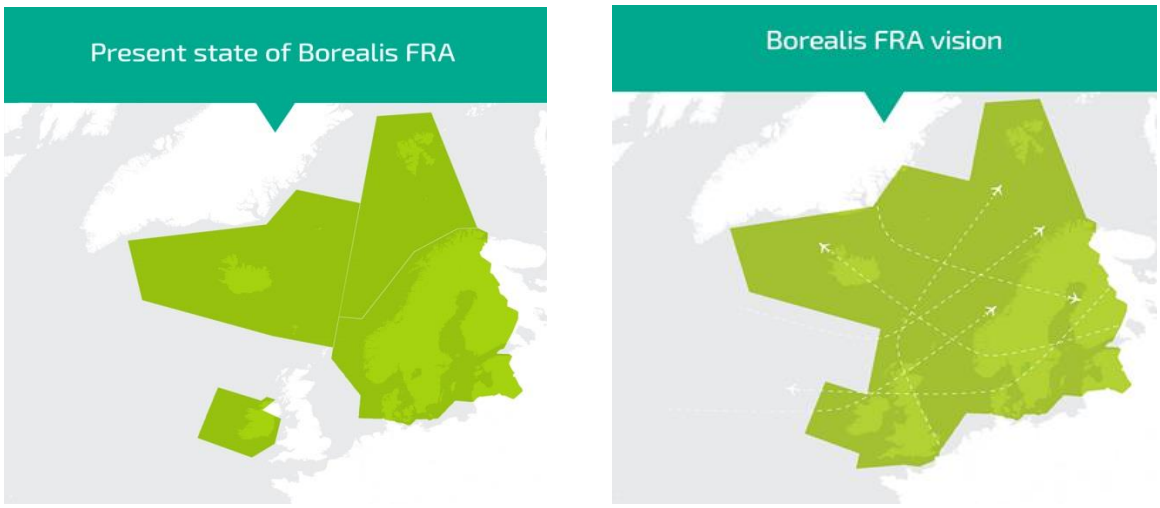

Figure 3 Proposed Borealis FRA area

5.1.5 The intention of the concept is to secure unconstrained cross-border FRA operations at the interfaces, in accordance with the Eurocontrol European Route Network Implementation Plan (ERNIP Part 1) and North Atlantic Documents e.g. ICAO Doc 7030.

5.1.6 This concept will provide the possibility for airspace users to flight plan a preferred trajectory, regardless of national FIR boundaries, and portions of airspace within which ATS is delegated to the participating states.

5.2 FRA- Concept Options

5.2.1 The principal FRA concept with sub-options is discussed in this section. Figure 4 shows the proposed FRA area post implementation of Deployment 1.

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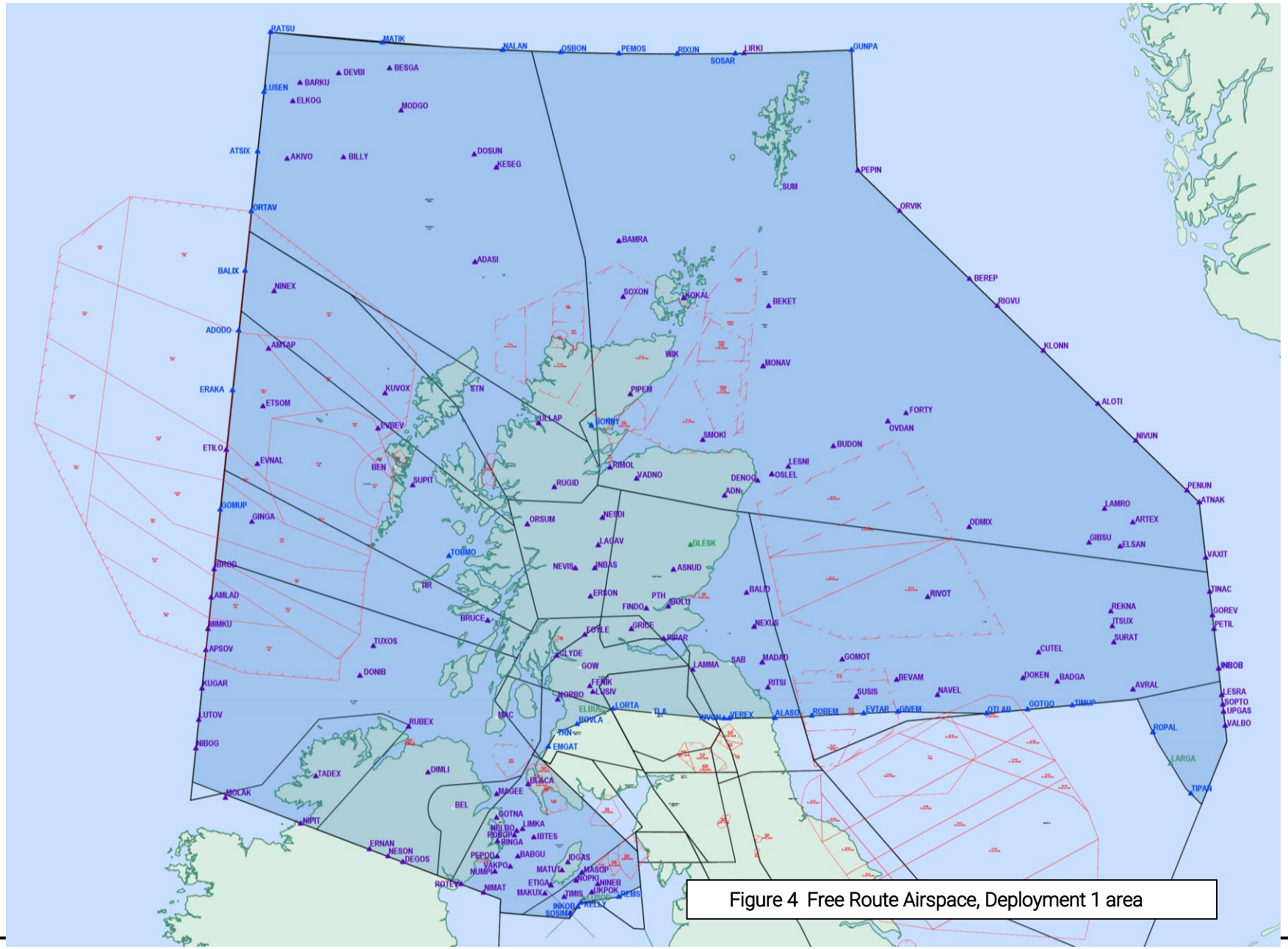

Figure 4 Free Route Airspace, Deployment 1 area

	Mandate Requirement/Option or other design considerations	Design Options
1	Free Route may be deployed both through the use of Direct Routing Airspace and through FRA	Deploy FRA using DCT only
		Deploy FRA using DCT and enabling the use of Lat and Long in the flight plan
2	To facilitate early implementation before the target deployment date specified in Point 3.3, free route could be implemented in a limited way during defined periods	Initially deploy FRA night time only
		Initially deploy FRA night time and weekends only
		Deploy FRA whilst retaining UAR Structure for a limited time to allow operators to assimilate the change
		Deploy FRA H24
3	Procedures for transitioning between free route and fixed route operations shall be set	Mandate FRA entry and exit points as COPS on the UIR boundary
		Extend SIDs and STARs into FRA volume
		Extend routes into FRA volume to a FRA entry/exit point to cater for slowest climbing profile
4	Initial implementation of Free Route may be done on a structurally limited basis, for example by restricting the available entry/exit points for certain traffic flows, through the publication of DCTs, which will allow airspace users to flight plan on the basis of those published DCTs	Maintain the ATS route structure within FRA
		Remove the ATS route structure within FRA
		Stipulate intermediate points as flyby points within RAD for both overflights and inbound out bound flights; these may be time bound to accommodate peak flow.
		Partially remove the ATS rote structure within FRA
		Publish all available DCTs within FRA in the RAD and maintain the current DCT planning restrictions
		RAD restrict waypoints within FRA to manage traffic flow
		Desiging No Planning Zones (NPZ) or enhanced use of Flight plan Buffer Zones (FBZ) to manage flow
5	DCT availability may be subject to traffic demand and/ or time constraints	Partial or complete limitation of DCT avaiability in the RAD
		Enable DCT to be flight planned whenever required
6	Free Route shall be provided and operated in the airspace for which the Member States are responsible at and above flight level 310 in the ICAO EUR region	Introduce FRA in all UK airspace at FL305 and above without structural limitations
		Introduce FRA in all UK airspace at FL305 and above with structural limitations
		Introduce FRA in all UK airspace at FL305 and above as a minimum; enabling FRA to be introduced at lower levels if deemed appropriate
		Limit the lateral introduction of FRA within UK airspace
7	Network Manager, air navigation service providers and airspace users shall operate: — DCT as from 1 January 2018 — FRA as from 1 January 2022	Deploy FRA in UK airspace by 1 January 2022
		Deploy FRA at a time most suited to business needs
8	Flight planned trajectories will need to be manged to maintain a safe distance from SUA	Establish FBZs around SUA within FRA
		Establish FBZs around SUA within FRA and the systemised airspace below
		Mandate waypoints within FRA around SUA in the RAD
		Maintain the ATS route structure around SUA
9	Cross Border FRA	Constrain cross border flight plans to flle via a COP on the UIR boundary
		Unconstrained cross border flight plans
		Unconstrained cross border flight plans where agreed with neighbouring States (partial cross border FRA)
		Introduce intermediate points near boundary that allow cross border but constrain routings.

Table 1: Options for each mandate requirement

5.2.2 Table 1 details the design options considered for each of the FRA mandated requirements. The shaded design options are those considered most feasible, and the NATS preferred options are as indicated. The following sections discuss each option in more detail.

5.3 PCP Requirement 1: Free Route may be deployed both through the use of Direct Routing Airspace and through FRA

Option 1.1: Deploy FRA using DCT only. This introduces constraints due to having to file DCT between fixed waypoints.

Option 1.2 (preferred): Deploy FRA using DCT and by enabling the use of points defined in the flight plan by latitude and longitude, or range and bearing from an existing waypoint. This provides the most flexible form of FRA since it enables flights to be planned between user-defined points.

5.4 PCP Requirement 2: To facilitate early implementation before the target deployment date, free route could be implemented in a limited way during defined periods

Option 2.1: Initially deploy FRA night time only.

Option 2.2: Initially deploy FRA night time and weekends only.

Option 2.3: Deploy FRA whilst retaining UAR Structure for a limited time to allow operators to assimilate the change

Option 2.4: (preferred) Deploy FRA H24.

5.5 PCP Requirement 3: Procedures for transitioning between free route and fixed route operations shall be set.

Option 3.1: Mandate FRA entry and exit points as Coordination Points (COPs) on the UIR boundary

Option 3.2: Extend SIDs and STARs into FRA volume

Option 3.3: (preferred): Extend routes into FRA volume to a FRA entry/exit point to cater for a variety of aircraft performance profile.

5.6 PCP Requirement 4: Initial implementation of Free Route may be done on a structurally limited basis, for example by restricting the available entry/exit points for certain traffic flows, through the publication of DCTs, which will allow airspace users to flight plan on the basis of those published DCTs.

Option 4.1: Maintain the ATS route structure within FRA.

Option 4.2: (preferred): Remove the ATS route structure within FRA.

Option 4.3: Stipulate intermediate points as flyby points within RAD for both overflights and inbound out bound flights; these may be time bound to accommodate peak flow.

Option 4.4: Partially remove the ATS route structure within FRA.

Option 4.5: Publish all available DCTs within FRA in the RAD and maintain the current DCT planning restrictions.

Option 4.6: Mandate RAD restricted waypoints within the RAD in the FRA to manage traffic flows.

Option 4.7: Designing No Planning Zones (NPZ) or enhanced use of Flight plan Buffer Zones (FBZ) to manage flow.

5.7 PCP Requirement 5: DCT availability may be subject to traffic demand and/ or time constraints.

Option 5.1: (preferred), Partial or complete limitation of DCT availability in the RAD.

Option 5.2: Enable DCT to be flight planned whenever required.

5.8 PCP Requirement 6: Free Route shall be provided and operated in the airspace for which the Member States are responsible at and above flight level 310 in the ICAO EUR region.

Option 6.1: Introduce FRA in all UK airspace at FL305 and above without structural limitations.

Option 6.2: Introduce FRA in all UK airspace at FL305 and above with structural limitations.

Option 6.3: (preferred), Introduce FRA in all UK airspace at FL305 and above as a minimum; enabling FRA to be introduced at lower levels if deemed appropriate. (Note: FRA operations down to a base level of FL255 in some areas are being evaluated.)

Option 6.4: Limit the lateral introduction of FRA within UK airspace.

5.9 PCP Requirement 7: Network Manager, air navigation service providers and airspace users shall operate: — DCT as from 1 January 2018 — FRA as from 1 January 2022.

Option 7.1: (preferred), Deploy FRA in UK airspace by 1 January 2022

Option 7.2: Deploy FRA at a time most suited to business needs

5.10 PCP Requirement 8: Flight planned trajectories will need to be managed to maintain a safe distance from SUA

Option 8.1: Establish FBZs around SUA within FRA

Option 8.2: (preferred), Establish FBZs around SUA within FRA and the systemised airspace below.

Option 8.3: Mandate waypoints within FRA around SUA in the RAD.

Option 8.4: Maintain the ATS route structure around SUA.

5.11 Requirement 9 (Borealis): Cross Border FRA.

Option 9.1: Constrain cross border flight plans to file via a COP on the UIR boundary

Option 9.2: Unconstrained cross border flight plans

Option 9.3: (preferred) Unconstrained cross border flight plans where agreed with neighbouring States (partial cross border FRA)

Option 9.4: Introduce intermediate points near boundary that allow cross border but constrain routings.

6. Conclusion and Next Steps

6.1 NATS have engaged with appropriate ANSPs, coding houses, airlines, MoD, and GA stakeholders, resulting in comprehensive discussions on the possibilities for FRA.

6.2 There are a number of potential component permutations of route structures, airspace boundaries, buffer zones and no flight planning zones. It would be disproportionate at this stage to attempt to fully describe every possible component permutation.

6.3 In this document we have described the options for fulfilling the PCP requirements, which have been explored with our stakeholders.

6.4 The next document, Step 2A(ii), will evaluate the design options listed in this document, reducing the longlist to a shortlist for appraisal.

End of document

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