Future Airspace Implementation- ScTMA

Gateway Documentation:

Stage 3 Consultation Document Annex E: Option Development

ACP-2019-74

NATS

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Roles

Action	Role	Date
Produced	Airspace Change Specialist Airspace Change Compliance & Delivery	August 2025
Reviewed Approved	Manager Airspace Change Compliance & Delivery Airspace Change Compliance & Delivery	August 2025
Reviewed Approved	Airspace Implementation Manager Airspace & Future Operations	August 2025
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Change History

Issue	Month/Year	Changes this issue (most recent first)
Version 3.0	August 2025	Updated following Cluster Gateway July 2025 including: • Change history Added.
Version 2.0	December 2024	Updated Document following Gateway Feedback. Updates include: • Sponsor options added to system wide description • Development simulation attendees updated to include MoD • Clarification that all airport options had common procedure endpoints, so the NERL design is compatible whichever option was chosen. • Typo corrections
Version 1.0	August 2024	Original submission to CAA for Gateway Assessment.

1. Design Option Development

1.1 Introduction

1.1.1 This annex provides a brief overview of how the design was developed from the concepts submitted at Stage 2 of the CAP1616 process.

1.2 Stage 2 Concept Development

1.2.1 During stage 2 of the Airspace Change Process, NATS developed concept options which addressed the issues identified in the SoN. NATS categorised the concept options into 2 distinct areas:

- ATS route network between the lower airspace and FRA (FL70 to FL255).
- ScTMA airport connectivity (above 7,000 ft), including holds[1], arrival routes and departure connectivity.

1.2.2 The ATS route network area for the in-scope area shown in Figure 1 was subdivided into 6 distinct geographical elements and concept solutions were proposed for each element.

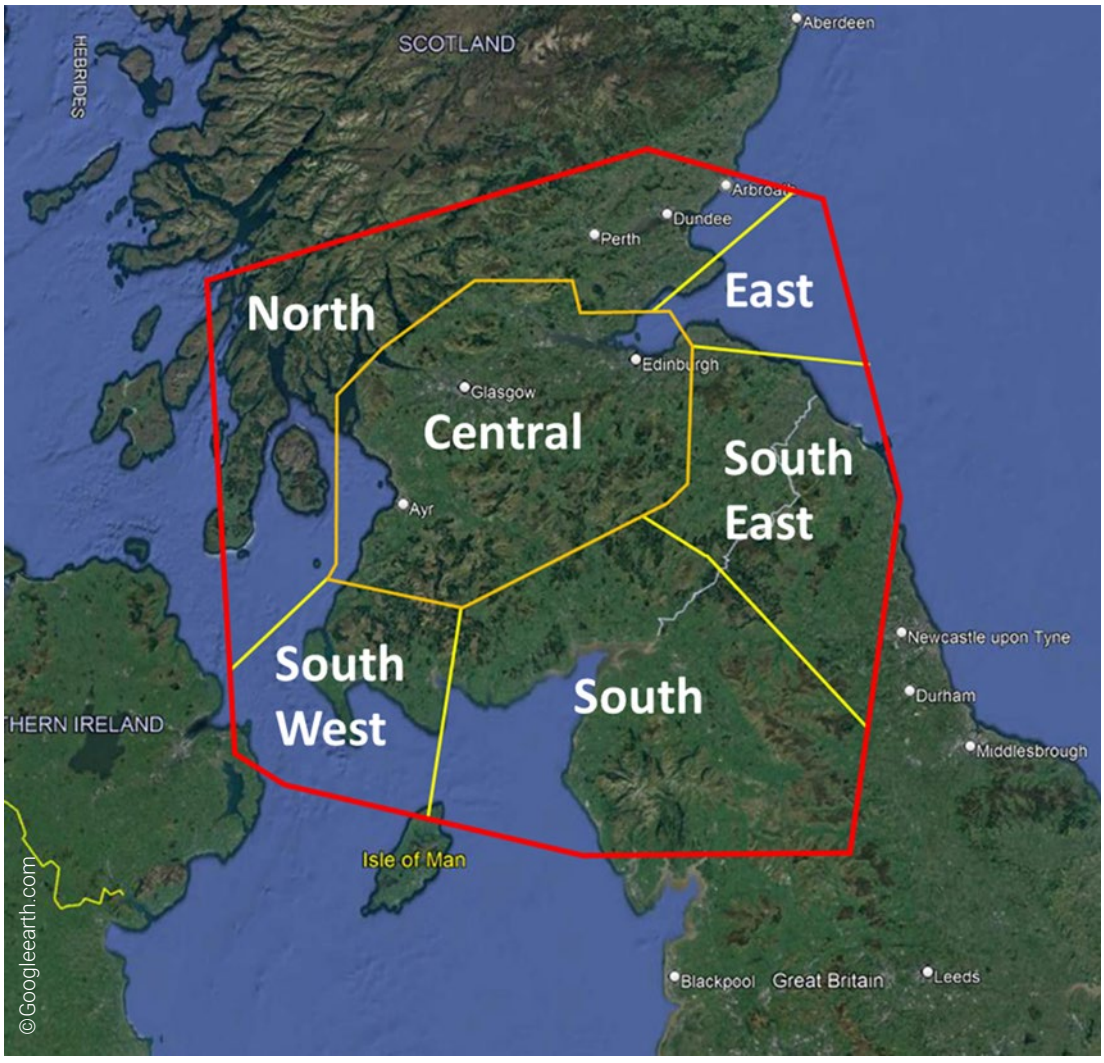


Figure 1: Geographic lateral limits of each option element area.

1.2.3 The ScTMA airport connectivity area was subdivided into elements which:

[1] When not specified the word "hold" refers to any delay absorption structure.

- Provided connectivity to SID end points.
- Provided connectivity to airport arrival structures.
- Airport arrival structures, i.e. holds.

1.2.4 The concepts for each element which remained following the Stage 2 shortlisting have been used to develop, in collaboration with our airport partners and impacted stakeholders, a single system-wide design option (comprising of NERL Option 1, Edinburgh Airport Option 1 and Glasgow Airport Option 5) which will be consulted on.

Visualisation Simulations: A Proof of Concept

1.2.5 Prior to submission of the Stage 2 documentation, NERL undertook visualisation simulations of the combined element changes with indicative tracks to confirm compatibility between each element. The visualisation simulation design tested took limited consideration of the surrounding airspace i.e. connectivity with neighbouring sectors, SUAs and CAS; hold locations; nor the future airspace requirements for the tested design were constraints on the proof of concept design. This visualisation simulation can be considered a preliminary proof of concept. This "proof of concept" design was subsequently used as the starting point to develop a system wide ScTMA option.

1.2.6 During Stage 2, stakeholders were invited to provide preliminary feedback on the concepts being considered as well as highlighting any potential constraints. Stakeholder feedback including feedback from these simulations, detailed in Table 1 below, was used to develop preliminary options which were appraised in Development Simulations.

Stakeholder	Related Element	Feedback (Reference 5)	Impact
MoD	General	MoD requires continued access to SUAs	Flexible Use of Airspace (FUA) will be considered throughout the design process.
Airline Operators	General	General support for systemisation	Systemisation has been proposed within the southern traffic flows.
BGA/MoD/LAA	General	New CAS should be kept to a minimum	Additional CAS volumes only proposed where there are proportional benefits.
EGPF/EGPH	General	Designs should accommodate aircraft with different RNAV specification or performance	Aircraft RNAV specification and performance will be considered throughout the design process.
EGPK	Arrival Connectivity	Increased CAS west of the TMA could alleviate congestion and reduce fuel burn	Increased CAS to the west was considered within the wider design. However, it was not compatible with the Glasgow operation.
EGPK	Arrival Connectivity	CTAs should accommodate aircraft descent profiles	All procedures will be contained within CAS.
EGPF	Arrival Connectivity	Increased CAS west of the TMA to allow a redistribution of traffic to the north of EGPF is unfavourable	Increased CAS to the west was considered within the wider design. However, it was not compatible with the Glasgow operation.

Stakeholder	Related Element	Feedback (Reference 5)	Impact
EGPF/EGPH	Departure Connectivity	Support an option that would allow the introduction of a "TUTOR"[2] style SID from EGPH	A TUTOR style SID was considered in the system wide design.
EGPH	Departure Connectivity	"TUTOR" style SID would need additional CAS	This will be considered within the options. All procedures are contained within appropriate CAS
EGPH	Departure Connectivity	SIDs options are to existing waypoints, could be influenced by network design	Connectivity was developed to SID end points if not aligned to proposed network changes. Existing points were not used as this would have restricted the design options
EGPH/EGPF	Arrival Structure	Provided view on overhead holds	Overhead holds were considered and discounted owing to stakeholder feedback.
EGPH	Arrival Structure	Amended SIDs could impact hold locations	Interactions between procedures was considered during the option development.
EGPH/EGPF	Arrival Structure	Provided proposals on hold locations	These will be considered in the option development. Design work has been collaborative.
EGPH	Arrival Structure	Would better support TALLA SID options if TARTN hold moved west	This was considered in the option development. Location of TARTN hold was moved through collaborative design work.
EGPF/EGPH	Eastern	Support the development of arrival and departure options within this element for EGPK operations	The availability of the Firth of Forth option for Prestwick will be considered.
BGA/LAA/ Millfield Gliding	Eastern	Eastern element could impact GA access to gliding areas	The ScTMA will seek to minimise any impact on GA operations.
BGA/LAA/ Millfield Gliding	Eastern	Redefining the northern boundary of the Northumbrian Gliding areas would not unduly influence gliding operations	This was considered during the design development.
MoD	Eastern and South Eastern	MoD would like to highlight their ACP relating to TDA597 and their continued access	The MoD ACP will be assessed for any interdependencies with this FASI-N ScTMA submission. MoD have been kept informed throughout the design process.

[2] The TUTOR SID was a trial departure route that provided more direct routing towards Newcastle.

Stakeholder	Related Element	Feedback (Reference 5)	Impact
EGPH/BGA/ LAA	Eastern and South Eastern	Combining the northern and southern elements of the Northumberland Gliding area was viewed as a positive change	This was considered during the design development and could provide improved access for GA operations. The Northumbria areas are proposed to be combined.
BGA	Northern	Can P600 be redesignated from Class A to Class D	Airspace classification within this change was considered to ensure the most appropriate airspace classification is chosen. The portion of P600 within the lateral limits is proposed to be Class D.
Millfield Gliding	South Eastern	Amending the western boundary of the Northumberland Gliding could impact Millfield operations	This was be considered during the design development.
Millfield Gliding	South Eastern	The MoD proposed Temporary Danger Area (TDA597) erodes Class G airspace, any further reduction is unwelcome	This was considered during the design development. However, the proposed Firth of Forth connectivity will require additional airspace which will be the minimal to deliver a safe and efficient airspace design. Airspace has been released throughout the design where able.
BAE Warton	South Eastern	BAE Warton would like to ensure access to Spadeadam (D510 complex) is maintained	This was considered during the design development and access is maintained.

Table 1: Feedback received during Stage 2 engagement pertinent to the development of a system-wide design option.

1.3 Stage 3 Option Development

Development Simulations

1.3.1 NERL undertook 2 sets of Development Simulations following the Stage 2 submission. The first ran from 5th – 9th December 2022 and the second from the 1st - 3rd February 2023. These simulations were attended by the following stakeholders with dependent ACPs as well as representatives from the CAA and the MoD (DAATM and 78 Squadron):

- Members of the NERL FASIN ScTMA Design Team
- Representatives of the Edinburgh Airport FASIN Design Team
- Representatives of the Glasgow Airport FASIN Design Team

1.3.2 The starting design used in the Development Simulations is shown below in Figure 2.

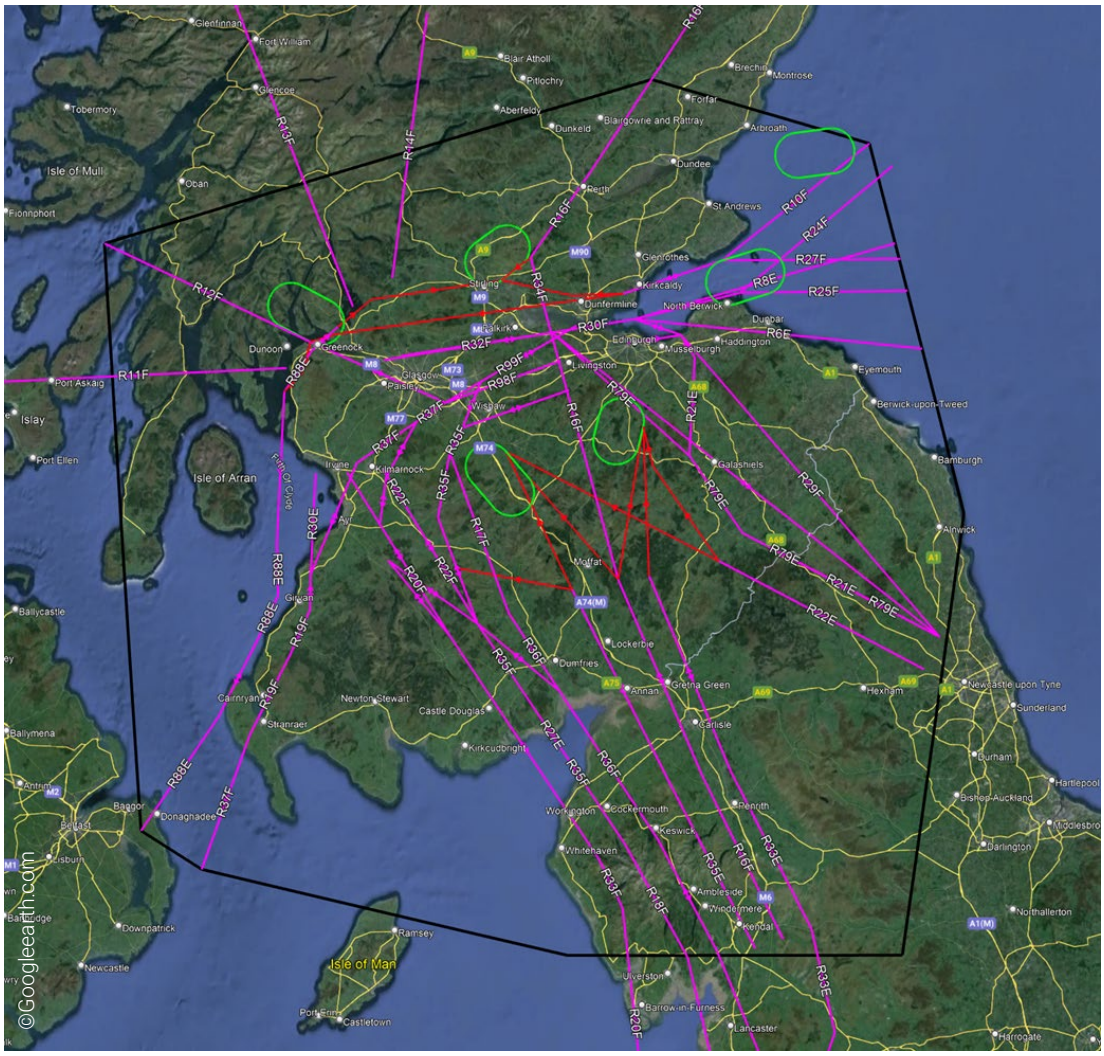


Figure 2: NERL Development simulation design. Whilst the NERL and airport designs are dependent on each other, the low-level airport routes used are not shown above as these were modelled on the current day operation and outside the scope of this ACP. Airport connectivity was considered as the options matured.

1.3.3 During these simulations, qualified ATCOs managed the traffic flows as they would expect to in a real-life environment. This allowed SMEs, to assess preliminary options, resolve design elements which are not workable and refine the remaining options so that they can be developed into implementable designs. In addition, these simulations were used to develop sufficient design detail so that the system-wide options can be consulted on.

1.3.4 The details which were identified through development simulations included:

- Number, location and type of routes.
- Number of holds and locations.
- Planned traffic utilising these routes and holds.
- Interface points between lower and en-route airspace.
- CAS volume including bases and classification.
- Connectivity to surrounding airspace.
- Methods of Operation.

1.3.5 Some of the identified issues were considered unacceptable, in terms of risk and resulted in significant redesign to achieve a design suitable for consultation.

Visualisation Simulations- Design Refinement

1.3.6 NERL undertook a series of small-scale visualisation simulations throughout August 2023. These simulations were focused on specific areas of the design where it was identified through SME input that improvements in the design could be made. These rapid simulations enabled concepts to be tested, and subsequently rejected or progressed into the wider network design.

Assurance Simulations

1.3.7 NERL undertook a large-scale assurance simulation between 27th November and 1st December 2023. The purpose of this simulation was to test the system wide design to inform the safety case for the proposed design. In addition to informing the safety case, this simulation identified and incorporated improvements into the design, such as rotating and flipping hold axes to deconflict the holding traffic from departing traffic.

Option Development and Alignment with Stage 2

1.3.8 Following the CAP1616 Stage 2 gateway, the NERL network design has evolved from the proof-of-concept design shown in Figure 2. In developing the NERL design, NERL has used Subject Matter Experts (SMEs) to identify:

- Whether the required connectivity including number of routes, STARS and holds is provided.
- Whether proposed routes and procedures are operable and are separated in line with CAP1385 (Reference 11).
- Whether the airspace design has the required containment in line with SARG Policy 126: Policy for the Design of Controlled Airspace Structures (Reference 12).
- Which superfluous CAS volumes following the redesign could be reclassified as Class G.
- Whether the remaining CAS volumes have a suitable classification.

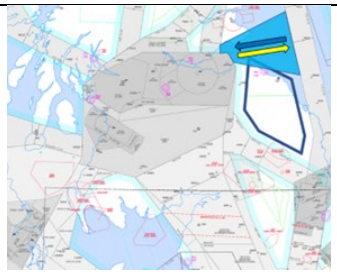
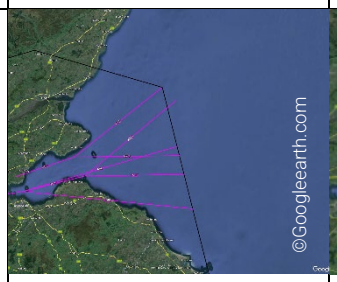
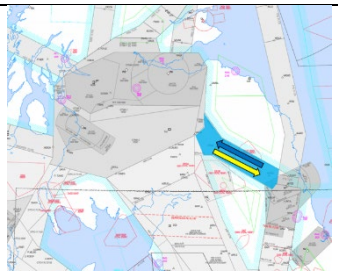
1.3.9 This has ensured that NERL is confident that the consulted upon design in this document provides a safe and efficient airspace design that is aligned with the AMS and compatible with the surrounding airspace operations.

1.3.10 It is not feasible to provide a complete list of all decisions taken due the complexity and interdependency of the airspace. Any decision taken may ripple through the entire design resulting in multiple updates.

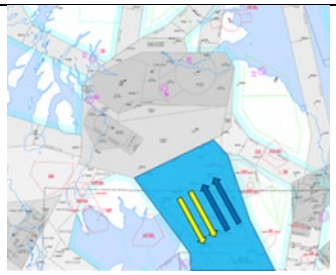
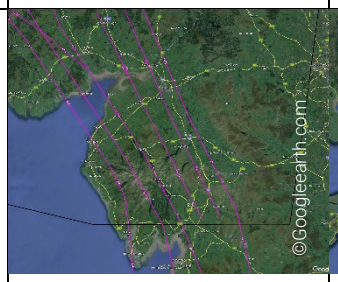
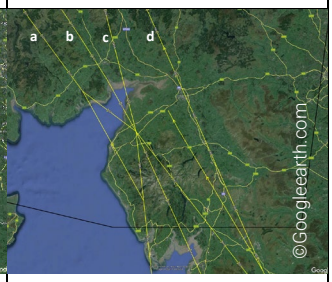
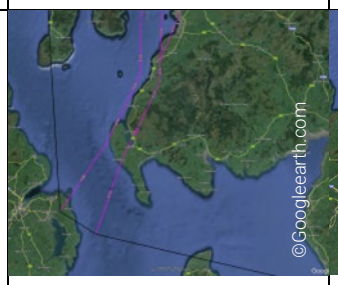
1.3.11 The NERL design consulted upon herein, forms part of an updated system-wide ScTMA design featuring NERL, Glasgow Airport and Edinburgh Airport. The airports are each sponsoring their own ACP to amend their low-level procedures. ACOG has coordinated this collaboration to ensure the work adheres to the masterplan and delivers against the AMS (Ref 10).

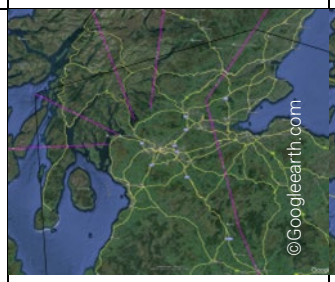
1.3.12 In addition to the collaborative design work featuring Glasgow Airport Edinburgh Airport, NERL has engaged with airspace stakeholders whose operation may be materially impacted by the proposed design. A complete record of the outcomes and considerations which have been made following this engagement is shown in Appendix B: Summary of Stakeholder Engagement in the Consultation Document.

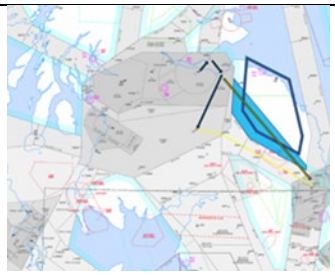
1.3.13 Table 2 below shows how the consulted upon design aligns with the Stage 2 documentation.

Element	Stage 2 Concepts shown on internal airspace map	Development Simulation Design	Stage 3 Option
Eastern (Firth of Forth)	 Systemised routes impacting gliding area		
The eastern element concept was to introduce systemised arrival and departure routes overhead the Firth of Forth which may impact the Northumberland Gliding area to the south. A second concept was considered to avoid this gliding area. However, this has not been pursued due to the increased benefits from being able to fly a more direct route as well as increasing the available airspace within the gliding area by combining the North and South areas into a single larger area. Previously the gliding community were only able to activate one area at a time. The proposed design has two ATS routes which connect to SIDs serving both Glasgow Airport and Edinburgh Airport to FRA. One will serve the more northerly destinations and the other, the southerly destinations. Inbound routes will be served by STARs (see Arrival Connectivity element below) parallel and separated from these ATS routes forming a systemised design.			
Element	**Stage 2 Concept shown on internal airspace map**	**Development Simulation Design**	**Stage 3 Option**
South-eastern	 Systemised route with lowered CAS bases		
The south-eastern element concept proposed to introduce a systemised arrival and departure route towards Newcastle and includes a review of the CAS bases. During the design development phase, closer inspection of the available spacing between the D510 and D512 complexes identified that there is insufficient spacing to safely fit a parallel route structure whilst adhering to the buffer policy. Modelling of the design demonstrated that there was no requirement for a separate departure flow in the southeastern element due to the low numbers of aircraft exiting the ScTMA via this route. As these aircraft would preferentially use the new Firth of Forth routes, conflictions which previously existed on Y96 were reduced and a "pseudo systemised [3]" design is naturally introduced. Subsequently, Y96, the existing route will remain, and the CAS bases reviewed and described in the Proposed Design section of the Consultation Document (Section 6.2).			

[3] A "pseudo systemised" structure is an airspace design which acts as a systemised design, limiting conflictions, with no formal parallel tracks being introduced.

Element	Stage 2 Concepts shown on internal airspace map	Development Simulation Design	Stage 3 Option
Southern (Spine)	 Systemised routes orientated according to traffic flow with a review of CAS bases.		
The southern element concept proposed to introduce a systemised arrival and departure structure towards the Manchester TMA (MTMA) and includes a review of the CAS bases. The proposed stage 3 design features two systemised southbound routes (a and b) in the northern portion of the spine on the west side with a single northbound route (d) on the east side as well as an ATS route from the south connecting to the STARs serving Glasgow Airport and Glasgow Prestwick Airport. In addition, there is a low-level overflight route (c) for turboprop traffic departing Edinburgh Airport to the southwest. The systemised southbound routes converge in the vicinity of Dean Cross (DCS) to align with the remaining extant airspace to the south. This option provides a comparable number of ATS routes as the current design. However, most aircraft departing the TMA to the south are likely to be climbing into FRA and these routes will only be used by aircraft not entering FRA. Some traffic that currently uses these routes may redistribute onto the Firth of Forth options. CAS bases reviewed and described in the Proposed Design section of the Consultation Document (Section 6. 2).			
Element	**Stage 2 Concept shown on internal airspace map**	**Development Simulation Design**	**Stage 3 Option**
South-western	 Systemised routes with a review of CAS bases		
The south-western element concept proposed to introduce a systemised arrival and departure structure towards the Irish interface and includes a review of the CAS bases. The proposed Stage 3 design features two parallel tracks providing an ingress to and egress from the ScTMA. The development simulation design has been updated to include a crossing structure to accommodate the existing orientation of Irish traffic to comply with published Dublin STARs. Most aircraft using this route will be exiting/entering FRA north of the crossing structure. CAS bases reviewed and described in the Proposed Design section of the Consultation Document (Section 6. 2).			

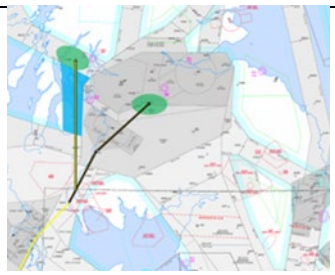
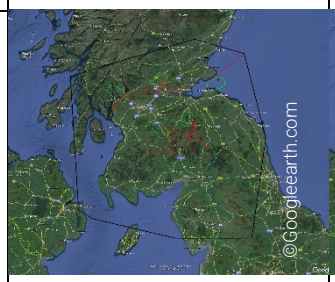
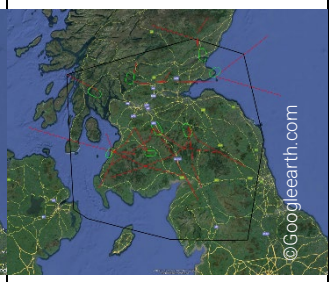
Element	Stage 2 Concepts shown on internal airspace map	Development Simulation Design	Stage 3 Option
Northern	 Bi-directional route structure and review bases		
The northern element concept proposed to introduce a bidirectional route structure and includes a review of the CAS bases. The proposed Stage 3 design provides 3 bidirectional routes for the existing westerly traffic flows. The final flow (most easterly flow) will exist in the design, but this will purely be for arrivals, via 2 STARs (see arrival connectivity row below) and departures (see SID connectivity row below) via SID link routes (SIDs are included within the airports documents). CAS bases reviewed and described in the Proposed Design section of the Consultation Document (Section 6. 2).			
Element	**Stage 2 Concept shown on internal airspace map**	**Development Simulation Design**	**Stage 3 Option**
Central	 Provide ATS route connectivity to/between surrounding elements within existing CAS		
The central element concept proposed to introduce ATS route connectivity to/between surrounding elements within existing CAS includes a review of the CAS bases. The connectivity shown provides low-level route connectivity across the ScTMA and has been deconflicted against arrival and departure procedures. Most aircraft using seeking overflying the ScTMA change will be contained within FRA and this connectivity is only required for aircraft that are not operating above FL255. CAS bases reviewed and described in the Proposed Design section of the Consultation Document (Section 6.2).			

Element	Stage 2 Concepts shown on internal airspace map	Development Simulation Design	Stage 3 Option
Departure Connectivity	 Provide departure connectivity from airport SID end points to adjacent elements via ATS routes requiring new CAS		

The departure connectivity element concept proposed to connect the SID end points to the ATS route network, requiring new CAS and includes a review of the CAS bases.

For safety and system compatibility purposes SIDs generally require a common endpoint independent of the runway end i.e., the extant TLA 6C/6D both terminate at TALLA (TLA). The airport proposed common end points align with the proposed network design, or a link route has been provided from the common end point to the network. The figures above only show the initial routings following the SIDs to join the wider network and/or FRA. Airport departure options all have common end points and only differ between the start and finish of procedures. Subsequently the proposed NERL design is compatible with all designs proposed by Edinburgh Airport and Glasgow Airport.

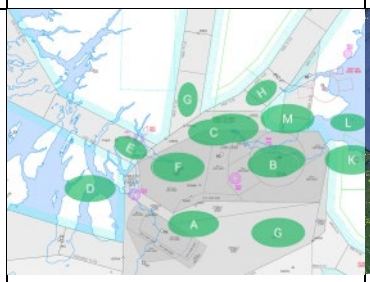
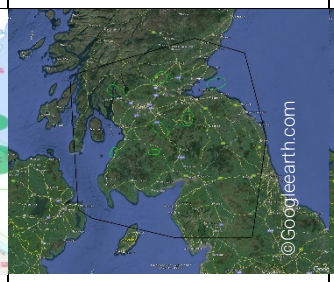
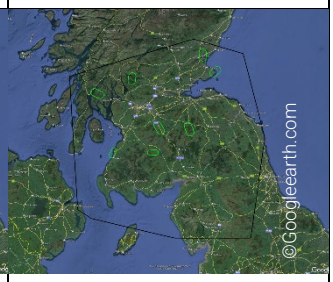
Two concepts were originally progressed through the Stage 2 documentation. One requiring acquiring new CAS and the second not. As the options have matured it was realised that the option requiring CAS did not preclude those options which did not require additional CAS and was aligned better with the AMS. Subsequently the developed options aligned best with this option. This option has developed as the airport low level designs have matured and a better understanding where additional CAS may be required to contain the link routes. In line with the current operation, two of the SIDs proposed to depart Glasgow Airport do not have ATS route connectivity. These SIDs provide connectivity to the Scottish FIR.

Element	Stage 2 Concepts shown on internal airspace map	Development Simulation Design	Stage 3 Option
Arrival Connectivity	 Provide arrival connectivity from ATS route network to airport arrival structure via STARs requiring additional CAS		

The arrival connectivity element concept proposed to introduce connectivity from the ATS route network to the arrival structure via STARs requiring new CAS and includes a review of the CAS bases.

The figures above show only the STAR routings. All the proposed STARs commence from the proposed route network or FRA. Two options were originally progressed through the Stage 2 documentation. One requiring new CAS and the second not. As the options have matured it was identified that the option requiring new CAS did not preclude those options which did not require additional CAS and aligned better with the AMS. Subsequently the developed options align best with this option. This option has developed as the route network (impacts the STAR initial fix) has matured as well as the low-level transitions (impacts the final STAR fix or the IAF).

In the proposed design, STARs have been provided from all traffic flows approaching the ScTMA airspace with some being contained within existing CAS and some proposing an amendment to the CAS boundaries.

Element	Stage 2 Concepts shown on internal airspace map	Development Simulation Design	Stage 3 Option
Arrival Structures			
	Review existing holds and introduce new radial holds where required		

The arrival structure element concept proposed to review the existing holding structures and to propose new ones as needed. The holds are situated at the end of STARs and are defined from the IAF.

In the proposed design:

Edinburgh Airport will have three holds, one for traffic from the north, one for the south and west, and one for traffic arriving via the new connectivity to the east.

Glasgow Airport will have three holds, one for traffic from the south, one from the west and one from the north and for traffic arriving via the new connectivity to the east.

The holds serving Glasgow Prestwick Airport have remained unchanged to ensure there are no changes to the Glasgow Prestwick Airport arrival flows below 7000ft.

In considering the location of the holds, NERL has considered the feedback received during Stage 2 and any operational limitations, such as the operational requirement for the hold to be within 40 NM of the airfield. NERL has ensured the holds are separated from the other traffic flows and are contained within CAS.

The extant shared hold STIRA is proposed to be removed as a shared hold and the extant location it is not optimal for any operation. Its current location impacts the operation by requiring aircraft to stay lower for longer and requires controller intervention to deconflict arrivals and departures.

The proposed Airport arrival transitions all start at the proposed NERL holds. They only differ between the start and finish of procedures. Subsequently the proposed NERL design is compatible with all arrival transitions proposed by Edinburgh Airport and Glasgow Airport.

Table 2: Description of how the proposed design has evolved and aligns with the submitted Stage 2 documentation.

1.3.14 This has led to the following Network Design shown in Figure 3:

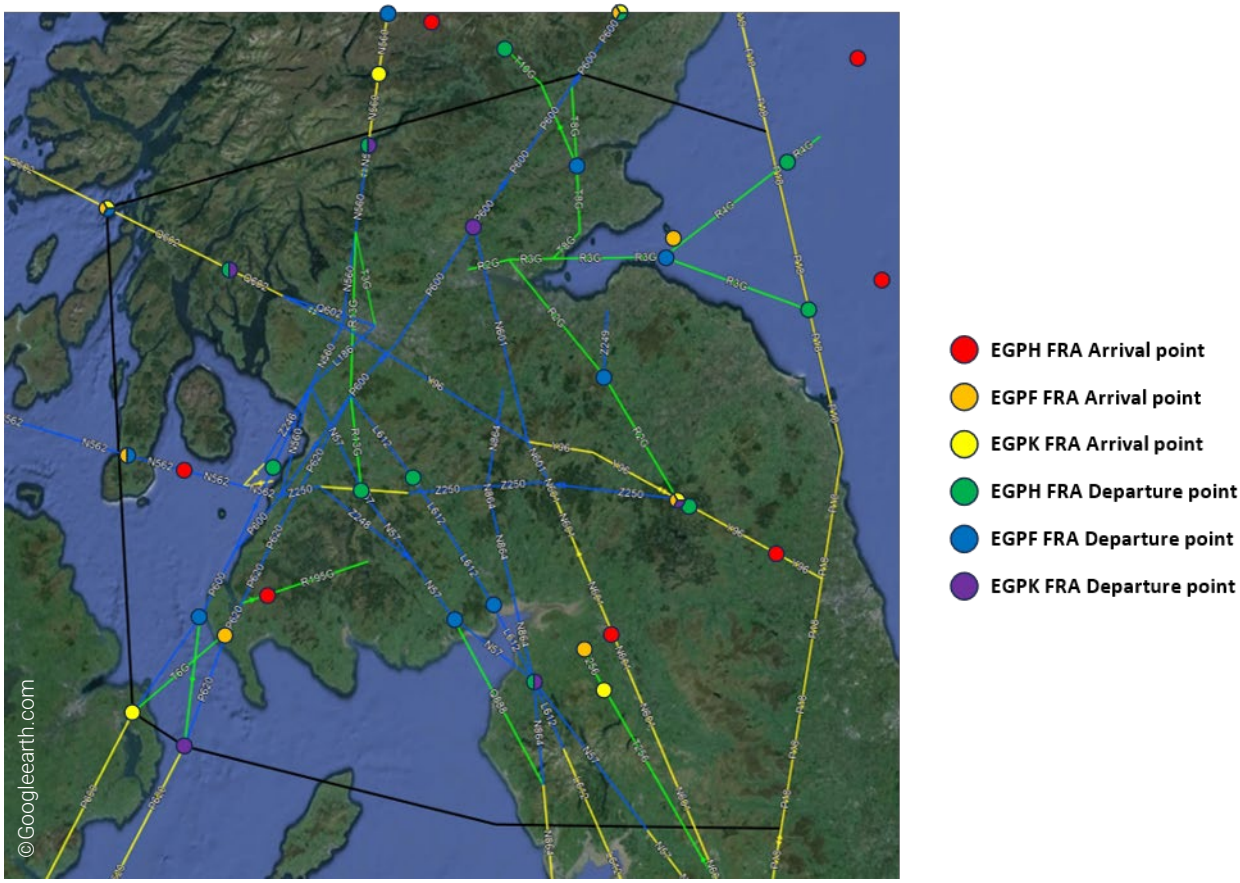


Figure 3: Proposed ATS route structure within the ScTMA. Retained existing routes are shown in yellow, modified route sections in blue and new routes in green.

End of Future Airspace Implementation- ScTMA Stage 3 Consultation Document Annex E: