GOW DVOR STARs and Holds Documentation: Stage 4 Update and Submit

Glasgow DVOR (GOW) Removal Airspace Change Proposal V1.2

NATS Uncontrolled

Publication History

Issue	Month/Year	Change Requests in this issue
Issue 1.0	Sep 2019	Published and submitted to SARG
Issue 1.1	Sep 2019	Updated following queries on the use of 5LNCs (Section 15); correct description of Design Options (Section 2); implementation costs (Section 7.8); further detail on FL for ERSON-FOYLE STAR (Section 4.4); amended wording for Section 14
Issue 1.2	Oct 2019	Updated to clarify Off Route Requirements (Section 14) and add reference to engagement (Section 16.1)

Step 4A – Update Design

No changes to the Design from Stage 3.

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2. Introduction

The intent of this document is to summarise and satisfy the requirements of CAP1616 Stage 4: update design and submit airspace change proposal to the CAA. The CAA reference is ACP-2019-26, the link to the CAA progress page is here.

NATS operates 46 DVORs around the UK which are going through the first batch of rationalisation as part of NATS' DVOR Rationalisation Programme. This is due to the DVORs operating well beyond their design life and no longer being needed due to RNAV5 (Area Navigation – 5NM) mandated Air Traffic Service (ATS) routes. This extended period of use has also created continued and unnecessary maintenance costs; as well as impacting upon airport development work prevented by safeguarding the navaids.

Within the UK, there are several en-route Instrument Flight Procedures (IFP) which are dependent on these radio navigation aids (navaids). As a number of them are scheduled to be removed from service, the en-route IFP definitions require updating so that they no longer refer to the navaids scheduled to be removed.

This airspace proposal is primarily focused on en-route IFPs, in the UK AIP, which use Glasgow DVOR (GOW) as a materially important navaid. The scope of the proposal is limited to standard instrument arrival routes (STARs) and their associated holding patterns, referring to GOW as a conventional navaid; where NATS is the primary air navigation services provider (ANSP).

Airport-based procedures such as Standard Instrument Departures (SIDs) and instrument approaches are not relevant to the en-route scope of this proposal. Airport operators are separately developing their own equivalent procedures to mitigate the removal of GOW DVOR.

As described in Section 8.2.1 below, there are several methods in which a STAR/ Hold's dependency on a navaid can be removed. As such, each STAR and Hold has been evaluated in order to determine the most appropriate method in which to remove the dependency from GOW. This method improves the overall network connectivity, reduces duplication and accounts for the current usage levels.

3. Executive Summary

In support of the DVOR Rationalisation Programme, NATS has identified all AIP en-route references to, and dependencies on GOW DVOR. In order to remove IFP dependencies from this navaid, a list of six design principles have been created which have been used to assess the individual IFPs against.

The Design Principle (DP0) with overriding priority is that the airspace change must "maintain or enhance the current level of safety". The Design Principle (DP1) driving this change is that none of the proposed technical changes would result in a change to flight behaviours. The remaining design principles focused on techniques which could be used to remove the dependencies, such as IFP replication or withdrawal.

As described in the Stages 2-3 multi-gateway documentation (Ref 3), four separate design options were developed in order to remove the en-route IFP dependencies on GOW DVOR.

- Option 0 (do nothing) would retain all of the current STARs and holds unchanged from today's AIP definition.
- Option 1 would replicate each IFP with a dependency on GOW DVOR by replacing existing conventional procedures using PBN procedures.
- Option 2 would evaluate the use of existing STARs and Holds from a practical point of view; re-evaluate how they are used and how the network may be improved by rationalising/ truncating/ replicating them in a considered manner.
- Option 3 would completely remove each IFP with a dependency on GOW DVOR.

The design principles mentioned above were used to qualitatively assess each of the four options (Ref 3). This process reduced the four options down to one, known as Option 2, which is the preferred concept option presented here. Consultation regarding DVOR rationalisation was undertaken in 2009. Due to the technical nature of the changes which will not result in changes to flight paths, no further consultation has been required.

4. Current Airspace Description

The current en-route IFPs which are dependent on GOW DVOR as an essential navaid, are associated with Glasgow and Edinburgh Airports. There are also a number of additional IFPs which, although not dependent on GOW, feature GOW DVOR on the charts; these are associated with Glasgow Airport.
These have all been summarised in Table 1 below and the relevant charts can be found in the Stages 2-3 multi-gateway document (Ref 3).

Associated Airport	Current IFP	Current Routing	GOW Dependency
Edinburgh/Glasgow	STIRA Hold	N/A - Hold	Yes

Associated Airport	Current IFP	Current Routing	GOW Dependency
Edinburgh/Glasgow	STIRA 1A STAR	PTH VOR – GRICE – STIRA	Yes
Edinburgh	EDN 1D STAR	PTH VOR – GRICE – NDB(L)UW – NDB(L) EDN	Yes
Glasgow	LANAK Hold	N/A – Hold	Yes
Glasgow	GOW Hold	N/A – Hold	Yes
Glasgow	FOYLE Hold	N/A – Hold	Yes
Glasgow	FYNER Hold	N/A – Hold	Yes
Glasgow	GOW 1A STAR	FYNER – CLYDE – GOW VOR	Yes
Glasgow	GOW 1D STAR	FOYLE – GOW VOR	Yes
Glasgow	LANAK 2D STAR	HAVEN – TLA VOR – LANAK	Yes (TLA – LANAK)
Glasgow	LANAK 2A RNAV5 STAR	RIBEL – ASLIB – ENIPI – ODIGI – PFS30 – LANAK	None – RNAV reference only to GOW position via lat/long on the STAR chart
Glasgow	LANAK 1B RNAV5 STAR	APPLE – ASLIB – ENIPI – ODIGI – PFS30 - LANAK	None – RNAV reference only to GOW position via lat/long on the STAR chart
Glasgow	GLW 1E STAR	PTH VOR – GRICE – GLW NDB	No
Glasgow	LIBBA 2A STAR	RIBEL – ASLIB – ENIPI – ODIGI – PFS30 – LANAK – LIBBA	No
Glasgow	LIBBA 1B STAR	APPLE – ASLIB – ENIPI – ODIGI – PFS30 – LANAK – LIBBA	No
Glasgow	LIBBA 1D STAR	FYNER – CLYDE – NDB GLW	No
Glasgow	GLW 1A STAR	FYNER – CLYDE – NDB GLW	No
Glasgow	GLW 1D STAR	FOYLE – NDB GLW	No

Table 1: Current IFPs associated with GOW DVOR

4.1 Structures and Routes

The full technical notes and associated charts for each of the above current dependant IFPs, listed in Table 1, can be found in the following references:

- Edinburgh/Glasgow IFPs – Slides 8 and 11 of the Assessment Meeting slide pack (Ref 2)
- Edinburgh IFPs – Slide 12 of the Assessment Meeting slide pack (Ref 2)
- Glasgow IFPs – Slides 9, 10, 13 and 14 of the Assessment Meeting slide pack (Ref 2)

4.2 Airspace usage and proposed effect

The proportions of aircraft, including fleet mix and operators, using any of the IFPs related to this project would not change as an outcome of the proposed changes. The proposed connectivity remains entirely unchanged due to RNAV5 replication; therefore, the usage would remain the same as today.

There would be no change to pilot or controller behaviour, and no change to lateral or vertical traffic dispersion, nor to any impact on adjacent IFPs. Therefore, the airspace capacity, usage and current operation will stay the same as today with no discernible change to the flight paths of aircraft using the airspace.

4.3 Operational efficiency, complexity, delays and choke points

There are no specific issues relating to operational efficiency, complexity, delays or choke points associated with any of the IFPs related to this airspace change proposal.

4.4 Controlled Airspace Containment

There are three procedures related to this airspace change proposal which have sections which are outside controlled airspace (ERSON 1G STAR, FOYLE and FYNER Holds). This reflects the extant situation in the current operation and is a corollary of the replication process in accordance with CAA policies[1].

ERSON 1G STAR: (Replicates the GOW 1D): the base of Controlled Airspace on the leg ERSON-FOYLE is FL195, hence arrivals on this leg (which are already outside controlled airspace) are likely to remain outside of controlled airspace until reaching FOYLE (as is the case today).

FYNER Hold: FYNER Hold is an existing conventional hold location. The hold nominal track is contained within controlled airspace; however, a proportion of the primary protection area of the RNAV hold falls outside of controlled airspace.

FOYLE Hold: FOYLE Hold is an existing conventional hold location. The Hold nominal track is not wholly contained within controlled airspace as the base of the ERSON-FOYLE portion of N560 is FL195, and the FOYLE Hold is below FL195. This portion of the STAR was previously raised following feedback from the GA community to the CAA.

4.5 Safety issues

Ensuring the safety of the proposed changes is a priority for NATS. NATS has a dedicated safety manager for the DVOR Rationalisation Programme who ensures that the safety representatives from SARG have oversight of the safety assurance process. Section 10 contains further details on the safety assessment for this proposal.

4.6 Environmental issues

There are no specific environmental issues associated with any of the IFPs related to this project, to be solved by this airspace change proposal.

5. Statement of Need

The text from the Statement of Need (DAP1916 ref 3226) (Ref 1) submitted in April 2019 for this proposal summarises the individual changes in support of the en-route dependency on GOW DVOR, due for removal in 2019. This has been included in Appendix Section 16.2 below.

6. Proposed Airspace Description

6.1 Objectives/ requirements for Proposed Design

[1] Policy for RNAV holding attached to arrival procedures in UK airspace (Feb 2016) and PBN STAR replication design requirements (Sept 2016)

The primary objective for this proposed airspace design is to remove any en-route IFP dependencies from GOW DVOR. This will be achieved by replacing the current connectivity using RNAV5 procedures. Where procedures already have an RNAV5 specification, we are proposing to simply re-designate them in line with ICAO policy, any references to GOW will refer to the RNAV lat/long position, not the conventional navaid. The en-route flight procedures under consideration are all STARs, en-route holding patterns and terminal holding patterns where GOW is material to their definition.

These changes are in support of the NATS DVOR Rationalisation Programme which aims to reduce dependence on ground infrastructure without reducing en-route services.

The CAA's PBN STAR Replication Policy for Conventional STAR Replacement (Ref 5) has been used as a basis for this proposal. It defines PBN STAR Replication as a PBN redesign of an existing conventional STAR from the commencement of the STAR in the ATS en-route network to the termination point without introducing any change to existing track patterns over the ground. RNAV5 is mandated for en-route IFPs and does not require consultation under the CAA's replication policy.

This proposal has been used as an opportunity to review the relevance of the existing procedures and their details. As such, methods such as introducing truncations where an existing ATS route already formed the initial section of a STAR have been explored and considered, in line with the STAR replication policy mentioned above.

6.2 Proposed New Airspace/ Route Definition and Usage

There is no predicted change to current connectivity or flight behaviour as a consequence of this airspace change proposal; the proposed changes are only technical changes. This means that there would be no change to pilot or controller behaviour (apart from designation changes), and no change to lateral or vertical traffic dispersion, nor any impact on adjacent IFPs. The proposed changes will also not alter route usage or traffic mix within the associated airspace.

A new waypoint is added on the RIBEL 1G on the ATC sector boundary between the Galloway and Talla sectors that provides an option, subject to other traffic, to tactically route aircraft from the south west direct to NISKA to join the STAR there rather than at RIBEL, saving on track mileage. This would be a tactical routing only.

A full summary of all the proposed changes and associated impacts can be found in Appendix Sections 15.3 to 15.5 below. This document details the impact assessment which was completed for all of the IFPs where GOW DVOR is material to the procedure, or they feature on the same chart as GOW DVOR (summarised below):

18 procedures, 10 of which are dependent on GOW DVOR:

- Edinburgh/Glasgow: STIRA Hold and STIRA STAR (2 individual IFPs, both of which have a dependency on GOW DVOR)
- Edinburgh: EDN STAR (1 individual IFP, which has a dependency on GOW DVOR)
- Glasgow: LANAK Hold and LANAK STARs; GOW Hold and GOW STARs; FOYLE Hold, FYNER Hold, LIBBA STARs and GLW STARs (15 individual IFPs, 7 of which have a dependency on GOW)

This document includes a full list of all IFPs: their current connectivity, the proposed connectivity and the impact of the proposed change for each IFP. Some of the proposed changes are re-designations of STARs (already RNAV5) in line with ICAO policy. Charts and technical notes on the above individual IFPs can be found in the assessment meeting slide pack (Ref 2). The impact assessment can also be found in the Stages 2-3 multi-gateway document (Ref 3).

The proposed changes will not change the connectivity of the procedures from today, due to RNAV5 replication. This means no change to route usage or traffic patterns over the ground. Sections 15.3-15.5 below summarise the impact assessment of all STARs and Holds which are part of this proposal.

The location of GOW DVOR/ DME would stay the same however, the description would be amended as GOW DME to denote the removal of the DVOR reference. This change will not introduce any changes to traffic patterns.

The relevant airspace structures, and related AIP sections, which are associated with the STAR and Hold changes, are listed in Table 2 below.

Airspace Structure	Comment	AIP Section
Aerodrome AIP changes	Individual airport charts, coding tables and text updated to reflect STAR and Hold changes	AD 2.EGPH-7-1, AD 2.EGPF-7-1, AD 2.EGPF-7-2, AD 2.EGPF-7-3, AD 2.EGPF-7-4, AD 2.EGPF-7-5, AD 2.EGPF-7-6, AD 2.EGPF-7-7, AD 2.EGPF-7-8, AD 2.EGPF-7-9

Table 2: Current Relevant Airspace Structures associated with Administrative Changes

The summary of the proposed changes is that changing the procedures will not alter the traffic patterns or route usage, due to the replication of STARs.

The following technical documents provide further information on the proposed designs:

- A PDG report detailing the GOW STAR AIP changes (Ref 4).
- A technical definition document which contains the aeronautical data in excel format (Ref 6).

7. Impacts and Consultation

7.1 Net impacts summary for proposed route

Category	Impact	Evidence
Safety/Complexity	No impact on safety or complexity.	See Section 0 and Section 10
Capacity/Delay	No impact on capacity/ usage or delay	See Sections 4.2 and 4.3
Fuel Efficiency/CO_2	No impact, there will be no change to lateral or vertical tracks, nor to impact adjacent IFPs	See Section 7.6
Noise – Leq/ SEL	No impact, this is a Level 2C[2] change	See Section 7.7
Tranquillity, visual intrusion (AONBs & National Parks)	No impact, this is a Level 2C change	See Section 7.7
Local Air Quality	No impact, this is a Level 2C change	See Section 7.7
Other Airspace Users	No impact, no changes to volume or classification of CAS	See Sections 7.3 to 7.5

7.2 Units affected by the proposal

The following airports have been engaged throughout the project (Ref 7):

- Glasgow
- Edinburgh

The airports have been fully briefed on the proposed changes and the justification behind why the en-route DVOR dependencies are being removed. The proposed changes have all been designed to be invisible from an airport' perspective, asides from the AIP changes described below.

The proposed changes will alter nomenclature in the aerodrome AIP pages for both airports. Asides from these technical changes, there are no other impacts anticipated for airports or relevant activities; the scope of these changes is just for en-route procedures, not airports. Airports will complete their own airspace change proposals if they wish to remove dependencies from other airport-specific local procedures, such as SIDs and approaches.

No unit or airport operator stakeholders were identified as being impacted by the proposed changes. The changes are purely technical changes which will not lead to any material change to the current operation.

In order to provide full transparency, NATS has positively engaged with all relevant airports which will need to administratively update their AIP sections. Appropriate airport representatives have been informed about these changes prior to submission of the ACP; as summarised in Section 1.1. Assuming approval of this ACP, the affected airports will be advised. Airports AIP will continue to refer to the VOR and DME as both will be required to support the airfield procedures.

[2] The CAA agreed that this proposal falls under the airspace change process as a Level 2C proposal. This is a proposal which reflects the current use of airspace concerned and does not alter traffic patterns below 7,000ft. The Government's Air Navigation Guidance states that below 7,000ft is the maximum height at which noise is a priority for consideration; therefore, noise analysis has not been completed for this proposal.

If this ACP is approved, the CAA will also organise appropriate coordination with ICAO prior to implementation. Relevant Air Navigation Service Providers (ANSPs) in Ireland (IAA) have also been informed; and will be formally notified when the proposal is approved.

7.3 Military impact and consultation

A CAA-led consultation was held with NATMAC in 2009, with a NATMAC Informative produced on 7th October 2010. Airlines were broadly supportive, with the NATS reduction in expenditure as a favourable item.
No military airspace user stakeholders were identified as being impacted by the proposed changes. The changes are purely technical changes which will not lead to any material change to the current operation.

7.4 General Aviation airspace users impact and consultation

No General Aviation/ VFR airspace user stakeholders have been identified as being impacted by the proposed changes.

7.5 Commercial air transport impact and consultation

There would only be technical changes for commercial air transport such as nomenclature and RNAV5 route replication. There would be no impact to connectivity or flight behaviour, as there would be no change to lateral or vertical tracks, nor to impact adjacent IFPs.

No commercial air transport/ IFR stakeholders were identified as being impacted by the proposed changes; other than the nomenclature changes mentioned.

7.6 CO_2 environmental analysis impact and consultation

There would be no change in fuel or CO_2 greenhouse gas emissions as a result of the proposed changes because there would no change to lateral or vertical tracks, or to impact adjacent IFPs. Fuel uplift changes are unlikely to occur. The actual fuel uplift is very difficult to quantify, however there is an established relationship between distance flown and the amount of fuel uplift. As this proposal will not impact the distance flown, we can deduce that the fuel uplift should not change. As mentioned above, there has not been a consultation as part of these proposed changes.

This aligns with the design principle (DP1) which is driving this change, of ensuring that none of the proposed technical changes to IFP definitions result in any change to actual flight behaviours.

7.7 Local environmental impacts and consultation

There would be no change in environmental impacts, such as noise or tranquillity, as a result of the proposed changes because there would be no change to lateral or vertical tracks, nor any impact to adjacent IFPs. As mentioned above, there has not been a consultation as part of these proposed changes.

This aligns with the design principle (DP1) which is driving this change, of ensuring that none of the proposed technical changes to IFP definitions result in any change to actual flight behaviours.

7.8 Economic impacts

The cost to the ANSP (NATS) for implementation of the change and adaptation of systems is estimated to be approx. £65,000.

Removal of the en-route dependency enables decommissioning of the VOR (once airfields have removed their dependencies i.e. SIDs). This will yield an annual cost saving of circa £10,000 per VOR. However, the development of this airspace change proposal has not been motivated by economic constraints or opportunities.

8. Analysis of Options

8.1 Airspace Change Design Options

In order to remove the en-route IFP dependencies on GOW DVOR, NATS developed four separate options on how best to adapt the UK airspace in support of this. These are known as Option 0 – do nothing, Option 1, Option 2 and Option 3. They are also summarised in the Stages 2-3 multi-gateway document (Ref 3).

The first considered option, of doing nothing, would retain all of the current STARs and Holds unchanged from today's AIP definition. Options 1, 2 and 3 involve making changes to today's AIP definition. Option 1 would replicate each STAR and Hold with a dependency on GOW DVOR, as defined today. Option 2 would individually evaluate each STAR and Hold as used in practice and how the network may be improved by rationalising/ truncating/ replicating them in a considered manner. Finally, Option 3 would remove all existing STARs and Holds that refer to, or use, GOW DVOR.

8.2 Design Options Assessment

8.2.1 Design Principles

Design principles have been created in order to assess the four options, described in Section 8.1 above. They have been constructed around the general objectives for this airspace change proposal, such as removing the en-route dependencies from GOW DVOR and reviewing the relevance of existing procedures. For example, this ACP is proposing to withdraw a number of STARs after reviewing them and concluding that they are not needed once other STARs have been replicated to an RNAV5 specification.

The analogy of a toolbox was used to describe potential methods of removing the en-route dependencies from GOW DVOR, with each tool having a particular function, in combination with other tools when appropriate. This analogy has been used to construct the design principles.

The overriding design principle (DP0), with the highest priority, for this airspace change is that the proposed airspace change must "maintain or enhance the current level of safety".

All of the design principles for this proposal are:

Design Principle	Description
DP0 Safety	The airspace change must maintain or enhance the current level of safety
DP1 Flight behaviour	None of the proposed technical changes to the definition of STARs/ Holds would result in a change to actual flight behaviours – laterally, vertically or in dispersal.
DP2 Admin	Remove unnecessary references to GOW DVOR which are not material to the procedure
DP3 Withdraw	Some STARs are rarely used, some do the same job, some have segments in common with other STARs
DP4 Replicate	PBN Replication – replace conventional STARs/Holds with RNAV STARs/Holds
DP5 Technical amendment	Minor changes to a STAR/ Hold which currently cannot be flown as it is formally defined, for legacy reasons – these changes always reflect what would actually happen in practical terms.

The six design principles summarised above have been detailed fully in the Stages 2-3 multi-gateway document (Ref 3), which includes a contextual example of each design principle being put into practice.

8.2.2 Options Assessment using the Design Principles

The four options outlined in Section 8.1 above were assessed against the following six design principles:

- Design Principle 0: maintain or enhance the current level of safety
- Design Principle 1: no change to flight behaviours
- Design Principle 2: administrative change
- Design Principle 3: withdraw unnecessary STARs
- Design Principle 4: replicate using RNAV replication policies
- Design Principle 5: technical amendment

Each of the four options was qualitatively assessed against each design principle in order to evaluate whether the principle had been met, partially met or not at all. The first Option 0, of doing nothing, did not meet any of the design principles except for DP0 and DP1: maintain/ enhance the current level of safety and introduce no changes to flight behaviours. Option 0 therefore does not achieve the removal of dependencies from GOW DVOR nor improves the network in any way; and has therefore been rejected.

Option 1, concerning the replication of each STAR/ Hold, fully met four design principles: maintain/ enhance the current level of safety; introduce no changes to flight behaviours, withdraw unnecessary STARs and replicate using RNAV replication policies. However, it did not meet either of the final two design principles. Although Option 1 removes the GOW DVOR dependency, it does not improve the network connectivity; does not account for current usage levels and it leaves route duplication in place. Therefore Option 1 has also been rejected.

Although Option 3 removes dependencies from GOW DVOR, as a consequence of removing all IFPs, it does not fully meet five of the six design principles; offering no network improvements but significant disruption. Option 3 was therefore rejected.

Option 2 involves an individual evaluation of each STAR and Hold. As this option focused on a flexible approach for removing the DVOR dependencies, it was able to fully meet all of the proposed design principles.

The conclusion of this assessment was to reduce the number of design options to one, known as Option 2 which best meets all the design principles. This option removes the DVOR dependencies whilst also improving the overall network connectivity, reducing duplication and taking into consideration the current usage levels. A full summary of the above options assessment can be found in Section 2 of the Stages 2-3 multi-gateway document (Ref 3).

9. Airspace Description Requirements

	The proposal should provide a full description of the proposed change including the following:	Description for this proposal
a	The type of route or structure; for example, airway, UAR, Conditional Route, Advisory Route, CTR, SIDs/ STARs, holding patterns etc.	STARs and en-route/ terminal holding patterns - see Section 6.
b	The hours of operation of the airspace and any seasonal variations	H24
c	Interaction with domestic and international en-route structures, TMAs or CTAs with an explanation of how connectivity is to be achieved. Connectivity to aerodromes not connected to CAS should be covered	This proposal would not have any impact on current connectivity - see Section 6.2 and Appendix Sections 15.3-15.5. One STAR and two holds with containment outside CAS; these are to be replicated as today.
d	Airspace buffer requirements (if any). Where applicable describe how the CAA policy statement on 'Special Use Airspace – Safety Buffer Policy for Airspace Design Purposes' has been applied.	N/A – this proposal does not change any existing/ introduce new buffers.
e	Supporting information on traffic data including statistics and forecasts for the various categories of aircraft movements (passenger, freight, test and training, aero club, other) and terminal passenger numbers	This proposal would have no impact on airspace usage - see Sections 4.2 and 6.2.
f	Analysis of the impact of the traffic mix on complexity and workload of operations	This proposal would have no impact on the traffic mix - see Sections 4.2 and 6.2.
g	Evidence of relevant draft Letters of Agreement, including any arising out of consultation and/or airspace management requirements	N/A – this proposal does not change any existing/ introduce new LoAs; cross-border elements are not impacted.
h	Evidence that the airspace design is compliant with ICAO Standards and Recommended Practices (SARPs) and any other UK policy or filed differences, and UK policy on the Flexible Use of Airspace (or evidence of mitigation where it is not)	STAR Replication policy and PANS-OPS compliance – see design reports (Ref 4).
i	The proposed airspace classification with justification for that classification	No change to existing airspace classification.
j	Demonstration of commitment to provide airspace users equitable access to the airspace as per the classification and where necessary indicate resources to be applied or a commitment to provide them in line with forecast traffic growth. 'Management by exclusion' would not be acceptable	N/A - this proposal does not change any existing/ introduce new airspace user access.
k	Details of and justification for any delegation of ATS	No change to the delegation of ATS.

10. Controlled Airspace Containment

As identified above (4.4) there is one STAR and two holds related to this airspace change proposal which are not completely contained within controlled airspace (ERSON 1G STAR, FOYLE and FYNER Holds). This proposal is not seeking to change the volume of controlled airspace and these procedures will be flown as today. Airspace containment will therefore not change from extant but will replicate the current day operation which is demonstrably safe.

11. Safety Assessment

11.1 There is an overriding safety design principle for the proposed changes which states that safety should be at least maintained, or improved, as an impact of the changes.

11.2 The safety of the IFP changes has been assured by NATS Design who have worked alongside the CAA SARG IFP Regulator.

11.3 Prior to implementation, NATS will also undertake a formal Hazard Analysis in order to prove that the proposed changes are safe to be implemented into the operational environment.

11.4 The Option 2 concept would take full account of existing usage and connectivity needs. It would ensure that all IFPs are designed and checked by a suitably qualified APD, as regulated by CAA SARG.

11.5 There would be a qualitative improvement in safety because each remaining IFP would use improved navigation specifications and be defined/promulgated in an official manner. Today's conventional IFPs are known to be flown using FMS overlays, which are not state-regulated and hence not subject to regulatory oversight and quality control.

11.6 Where IFPs have been withdrawn as part of this proposal, we have ensured that appropriate/ safe connectivity is still provided and that there are no impacts.

11.7 Therefore, there would be a positive impact on safety whilst also improving the overall network connectivity. This is dependent on the satisfactory completion of the hazard analysis.

12. Operational Impact

	An analysis of the impact of the change on all airspace users, airfields and traffic levels must be provided, and include an outline concept of operations describing how operations within the new airspace will be managed. Specifically, consideration should be given to:	Evidence of compliance/ proposed mitigation
a	Impact on IFR general air traffic and operational air traffic or on VFR General Aviation (GA) traffic flow in or through the area	No impact to air traffic (technical change only) – see Sections 7.4 - 7.5.
b	Impact on VFR operations (including VFR routes where applicable);	No impact on VFR operations. See Section 7.4.
c	Consequential effects on procedures and capacity, i.e. on SIDs, STARs, and/or holding patterns. Details of existing or planned routes and holds	No impact on procedures or capacity (technical change only) - see Section 6.2.

d	Impact on aerodromes and other specific activities within or adjacent to the proposed airspace	No impact on aerodromes or other relevant activities – see Section 7.2.
e	Any flight planning restrictions and/or route requirements	No impact – technical changes only.

13. Supporting Infrastructure/ Resources

	General requirements	Evidence of compliance/ proposed mitigation
a	Evidence to support RNAV and conventional navigation as appropriate with details of planned availability and contingency procedures	N/A – current RNAV5 coverage is demonstrably adequate
b	Evidence to support primary and secondary surveillance radar (SSR) with details of planned availability and contingency procedures	Traffic uses the same regions as today in a similar manner from a surveillance point of view. Demonstrably adequate for the region.
c	Evidence of communications infrastructure including R/T coverage, with availability and contingency procedures	Traffic uses the same regions as today in a similar manner from a comms infrastructure point of view. Demonstrably adequate for the region.
d	The effects of failure of equipment, procedures and/or personnel with respect to the overall management of the airspace must be considered	Existing contingency procedures, based on the conventional navigation DVOR GOW, would no longer be required and will be withdrawn. RNAV replication removes the dependency from GOW DVOR. Other existing contingency procedures and management protocol will continue to apply as today.
e	Effective responses to the failure modes that will enable the functions associated with airspace to be carried out including details of navigation aid coverage, unit personnel levels, separation standards and the design of the airspace in respect of existing international standards or guidance material	As above (12d).
f	A clear statement on SSR code assignment requirements	No change to SSR code allocation.

g	Evidence of sufficient numbers of suitably qualified staff required to provide air traffic services following the implementation of a change	No training or additional qualifications required.

14. Airspace and Infrastructure

	General requirements	Evidence of compliance/ proposed mitigation
a	The airspace structure must be of sufficient dimensions with regard to expected aircraft navigation performance and manoeuvrability to fully contain horizontal and vertical flight activity in both radar and non-radar environments	As today - no proposed changes to the airspace structure (technical changes only). See Section 6.2.
b	Where an additional airspace structure is required for radar control purposes, the dimensions shall be such that radar control manoeuvres can be contained within the structure, allowing a safety buffer. This safety buffer shall be in accordance with agreed parameters as set down in CAA policy statement 'Safety Buffer Policy for Airspace Design Purposes Segregated Airspace'. Describe how the safety buffer is applied, show how the safety buffer is portrayed to the relevant parties, and provide the required agreements between the relevant ANSPs/ airspace users detailing procedures on how the airspace will be used. This may be in the form of Letters of Agreement with the appropriate level of diagrammatic explanatory detail.	As today - no proposed changes to the airspace structure (technical changes only).
c	The Air Traffic Management system must be adequate to ensure that prescribed separation can be maintained between aircraft within the airspace structure and safe management of interfaces with other airspace structures	As today - no proposed changes to the existing airspace structure (technical changes only).
d	Air traffic control procedures are to ensure required separation between traffic inside a new airspace structure and traffic within existing adjacent or other new airspace structures	As today – no proposed changes to the existing ATC procedures.
e	Within the constraints of safety and efficiency, the airspace classification should permit access to as many classes of user as practicable	As today - no proposed changes to existing airspace classifications.
f	There must be assurance, as far as practicable, against unauthorised incursions. This is usually done through the classification and promulgation	As today– no proposed changes to airspace classification or volume.
g	Pilots shall be notified of any failure of navigational facilities and of any suitable alternative facilities available and the method of identifying failure and notification should be specified	Existing contingency procedures would continue to apply.
h	The notification of the implementation of new airspace structures or withdrawal of redundant airspace structures shall be adequate to allow interested parties sufficient time to comply with user requirements. This is normally done through the AIRAC cycle	No proposed new structures.
i	There must be sufficient R/T coverage to support the Air Traffic Management system within the totality of proposed controlled airspace	No change from today's Controlled Airspace. R/T coverage demonstrably adequate as per current day.

j	If the new structure lies close to another airspace structure or overlaps an associated airspace structure, the need for operating agreements shall be considered	No proposed new structures.
k	Should there be any other aviation activity (low flying, gliding, parachuting, microlight site, etc.) in the vicinity of the new airspace structure and no suitable operating agreements or air traffic control procedures can be devised, the change sponsor shall act to resolve any conflicting interests	No proposed new airspace structures.

	ATS route requirements	Evidence of compliance/ proposed mitigation
a	There must be sufficient accurate navigational guidance based on in-line VOR/DME or NDB or by approved RNAV derived sources, to contain the aircraft within the route to the published RNP value in accordance with ICAO/ Eurocontrolstandards	RNAV5 navaid coverage is demonstrably adequate. DME coverage is adequate and demonstrated in the coverage plots in Reference 5.
b	Where ATS routes adjoin terminal airspace there shall be suitable link routes as necessary for the ATM task	As today – there are no new link routes required as part of this proposal.
c	All new routes should be designed to accommodate P-RNAV navigational requirements	Confirmed - RNAV5 will be used.

	Terminal airspace requirements	Evidence of compliance/ proposed mitigation
a	The airspace structure shall be of sufficient dimensions to contain appropriate procedures, holding patterns and their associated protected areas	As today - no proposed changes to the airspace structure.
b	There shall be effective integration of departure and arrival routes associated with the airspace structure and linking to designated runways and published instrument approach procedures (IAPs)	As today - no proposed changes to the airspace structure.
c	Where possible, there shall be suitable linking routes between the proposed terminal airspace and existing en-route airspace structure	As today - the revised STARs will end in the same locations as they do currently.
d	The airspace structure shall be designed to ensure that adequate and appropriate terrain clearance can be readily applied within and adjacent to the proposed airspace	As today - no change to the airspace structure.
e	Suitable arrangements for the control of all classes of aircraft (including transits) operating within or adjacent to the airspace in question, in all meteorological conditions and under all flight rules, shall be in place or will be put into effect by the change sponsor upon implementation of the change in question (if these do not already exist)	As today - no change to the airspace structure.

f	The change sponsor shall ensure that sufficient visual reference points are established within or adjacent to the subject airspace to facilitate the effective integration of VFR arrivals, departures and transits of the airspace with IFR traffic	As today - no change to visual reference points.
g	There shall be suitable availability of radar control facilities	As today - no change to radar control facilities.
h	The change sponsor shall, upon implementation of any airspace change, devise the means of gathering (if these do not already exist) and of maintaining statistics on the number of aircraft transiting the airspace in question. Similarly, the change sponsor shall maintain records on the numbers of aircraft refused permission to transit the airspace in question, and the reasons why. The change sponsor should note that such records would enable ATS managers to plan staffing requirements necessary to effectively manage the airspace under their control	As today - there are no proposed changes to the airspace structure.
i	All new procedures should, wherever possible, incorporate Continuous Descent Approach (CDA) profiles after aircraft leave the holding facility associated with that procedure	As today – no new procedures.

	Off-route airspace requirements	Evidence of compliance/ proposed mitigation
a	This proposal contains three procedures which have sections outside of controlled airspace (ERSON 1G STAR, FOYLE and FYNER Holds). This is unchanged from the current day situation which is being replicated.	

15. Environmental Assessment

	Theme	Content	Evidence of compliance/ proposed mitigation
a	WebTAG analysis	Output and conclusions of the analysis (if not already provided elsewhere in the proposal)	N/A – no change in greenhouse gas emissions. See Section 7.6.
b	Assessment of noise impacts (Level 1/M1 proposals only)	Consideration of noise impacts, and where appropriate the related qualitative and/or quantitative analysis If the change sponsor expects that there will be no noise impacts, the rationale must be explained	N/A – this is a Level 2C change.
c	Assessment of CO_2 emissions	Consideration of the impacts on CO_2 emissions, and where appropriate the related qualitative and/or quantitative analysis If the change sponsor expects that there will be no impact on CO2 emissions impacts, the rationale must be explained	N/A – no change in greenhouse gas emissions. See Section 7.6.
d	Assessment of local air quality (Level 1/M1 proposals only)	Consideration of the impacts on local air quality, and where appropriate the related qualitative and/or quantitative analysis If the change sponsor expects that there will be no impact on local air quality, the rationale must be explained	N/A – this is a Level 2C change
e	Assessment of impacts upon tranquillity (Level 1/M1 proposals only)	Consideration of any impact upon tranquillity, notably on Areas of Outstanding Natural Beauty or National Parks, and where appropriate the related qualitative and/or quantitative analysis If the change sponsor expects that there will be no tranquillity impacts, the rationale must be explained	N/A – this is a Level 2C change.
f	Operational diagrams	Any operational diagrams that have been used in the consultation to illustrate and aid understanding of environmental impacts must be provided	See the Assessment meeting slide pack (Ref 2) No change to environmental impacts, as covered in Section 7.6.
g	Traffic forecasts	10-year traffic forecasts, from the anticipated date of implementation, must be provided (if not already provided elsewhere in the proposal)	No changes to capacity or usage - see Section 4.3.
h	Summary of environmental impacts and conclusions	A summary of all of the environmental impacts detailed above plus the change sponsor's conclusions on those impacts	No environmental impact - see Section 7.6.

15.1 Reversion Statement

Should the proposal be approved and implemented, reversion to the pre-implementation state would only be possible if the conventional navaid is kept in operation. Once the navaid is removed it would not be possible to revert to the pre-implementation state.

GOW DVOR is scheduled to be decommissioned and physically removed in 2022.

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

16. Appendices

16.1 References

Ref No	Name	Hyperlink
1	Statement of Need for GOW DVOR, DAP1916 #3359	Link
2	GOW DVOR CAP1616 Stage 1 Assessment Meeting Slide Pack	Link
3	GOW DVOR CAP1616 Stages 2-3 Multi-Gateway V1.2	Link
4	NATS Design Ltd. GOW DVOR Design Report (IFP Report)	Supplied direct to CAA
5	SARG Policy: Policy for the replication of conventional SIDs, STARs and Holds using PBN	Link
6	GOW DVOR AeroData Technical Definition Document v2	Supplied direct to CAA
7	Evidence of Stakeholder Engagement	Link

16.2 Statement of Need for GOW ACP (DAP1916 ref 3359)

The GOW DVOR is designated as one of the navigational aids to be removed as part of the DVOR Rationalisation Project. This change will remove the remaining en-route procedures, specifically RNAV'ing the Edinburgh and Glasgow STARs / associated Holds from the GOW DVOR.

16.3 Impact assessment – Edinburgh/Glasgow Holds and STARs

See the redacted Stage 1 Assessment Meeting Presentation (Ref 2) for charts and technical notes for current IFPs. See Annex B of Stage 2-3 Gateway document (Ref 3) for the proposed changes.

Current IFP	Current route connectivity/STAR	Design Principle	How	Proposed route Connectivity/STAR	Impact of proposed change on connectivity Impact of proposed change on flight behaviour
STIRA HOLD	*N/A*	4 Replicate	RNAV5 replication	Not Applicable	Same, no impact to connectivity. No predicted change to flight behaviour beyond improved track keeping.
STIRA 1A	P600: *PTH – GRICE - STIRA*	4 Replicate 2 Admin	RNAV5 replication	*P600: PTH – GRICE – STIRA Redesignated as PTH 1S*	Same, no impact to connectivity. No predicted change to flight behaviour beyond improved track keeping. 'S' Identifier used in order to adhere to the CAA request of naming the Route Indicator after a common point (STIRA) where STAR goes to multiple airports.

16.4 Impact assessment – Edinburgh Holds and STARs

See the redacted Stage 1 Assessment Meeting Presentation (Ref 2) for charts and technical notes for current IFPs. See Annex B of Stage 2-3 Gateway document (Ref 3) for the proposed changes.

Current IFP	Current route connectivity/STAR	Design Principle	How	Proposed route Connectivity/STAR	Impact of proposed change on connectivity Impact of proposed change on flight behaviour
EDN 1D	P600: *PTH – GRICE – NDB(L) – NDB(L) EDN*	3 Withdraw	Not required	Not Applicable	This STAR is currently for when GOW DVOR is OOS so is no longer required. No predicted change to flight behaviour.

16.5 Impact assessment – Glasgow Holds and STARs

See the redacted Stage 1 Assessment Meeting Presentation (Ref 2) for charts and technical notes for current IFPs. See Annex B of Stage 2-3 Gateway document (Ref 3) for the proposed changes.

Current IFP	Current route connectivity/STAR	Design Principle	How	Proposed route Connectivity/STAR	Impact of proposed change on connectivity Impact of proposed change on flight behaviour
LANAK Hold	*N/A*	4 Replicate	RNAV5 replication	Not Applicable	Same, no impact to connectivity. No predicted change to flight behaviour beyond improved track keeping.
GOW Hold	*N/A*	3 Withdraw	Withdrawn from 6,000ft, removed from STAR chart but kept in AD 2.22 for inbounds.	Not Applicable	The GOW Hold is not being withdrawn at all levels, only within NERL airspace. It will still exist at 6,000 ft and below for Glasgow procedures that require it. With this ACP there are no NERL procedures that require the GOW Hold. No predicted change to flight behaviour beyond improved track keeping.
FOYLE Hold	*N/A*	4 Replicate	RNAV5 replication	Not Applicable	Same, no impact to connectivity. As per extant operation No predicted change to flight behaviour beyond improved track keeping and consistency of holding.
FYNER Hold	*N/A*	4 Replicate	RNAV5 replication	Not Applicable	Same, no impact to connectivity. As per extant operation No predicted change to flight behaviour beyond improved track keeping and consistency of holding.
LANAK 2D STAR	Y96: *HAVEN – TLA - LANAK*	2 Admin 4 Replicate	RNAV5 replication, extend STAR to start at AGPED to accommodate level restrictions.	Y96: *AGPED – HAVEN – TLA – LANAK Redesignated as AGPED 1G*	Same, no impact to connectivity. No predicted change to flight behaviour beyond improved track keeping. 'G' Identifier used in order to adhere to the CAA request of naming the Route Indicator after the destination airport (G - Glasgow).

Current IFP	Current route connectivity/STAR	Design Principle	How	Proposed route Connectivity/STAR	Impact of proposed change on connectivity Impact of proposed change on flight behaviour
GOW 1A STAR	L602, Y958: *FYNER – CLYDE – GOW*	2 Admin 6 Technical	Replace with RNAV5 STAR to start at BRUCE.	L602, Y958: *BRUCE – FYNER Redesignated as BRUCE 1G*	Same, no impact to connectivity. No predicted change to flight behaviour beyond improved track keeping. 'G' Identifier used in order to adhere to the CAA request of naming the Route Indicator after the destination airport (G – Glasgow).
GOW 1D STAR	N560: *FOYLE – GOW VOR*	2 Admin 6 Technical	Replace with RNAV5 STAR to start at ERSON.	N560: *ERSON – FOYLE Redesignated as ERSON 1G*	Same, no impact to connectivity. No predicted change to flight behaviour beyond improved track keeping. 'G' Identifier used in order to adhere to the CAA request of naming the Route Indicator after the destination airport (G – Glasgow).
LANAK 1B	(U)N590: *APPLE – ASLIB – ENIPI – ODIGI – PFS30 - LANAK*	2 Admin	Same (already RNAV5), with new 5LNC VAPPI for PFS30	Same – redesignated as APPLE 1G	Same, no impact to connectivity. No predicted change to flight behaviour beyond improved track keeping. 'G' Identifier used in order to adhere to the CAA request of naming the Route Indicator after the destination airport (G – Glasgow).
LANAK 2A	(U)N601: *RIBEL – ASLIB – ENIPI – ODIGI – PFS30 - LANAK*	2 Admin	Same (already RNAV5), with new 5LNC VAPPI for PFS30; additional waypoint NISKA[3] added.	Same – redesignated as RIBEL 1G	Same, no impact to connectivity. No predicted change to flight behaviour beyond improved track keeping. 'G' Identifier used in order to adhere to the CAA request of naming the Route Indicator after the destination airport (G – Glasgow).
LIBBA 1B	(U)N590: *APPLE – ASLIB – ENIPI – ODIGI – PFS30 – LANAK - LIBBA*	3 Withdraw	Not Required	Not Required	This STAR is currently for when GOW is OOS so is no longer required. No predicted change to flight behaviour beyond improved track keeping.

[3] Waypoints on STARs should be designated as unique 5 letter name-codes (5LNC) for ATC purposes such as speed control or tactical short cuts; allowing controllers and pilots to easily pronounce them. 5LNCs will also be published in ENR4.4, Name-code Designators for Significant Points, of the Aeronautical Information Publication (AIP),

Current IFP	Current route connectivity/STAR	Design Principle	How	Proposed route Connectivity/STAR	Impact of proposed change on connectivity Impact of proposed change on flight behaviour
LIBBA 2A	(U)N601: *RIBEL – ASLIB – ENIPI – ODIGI – PFS30 – LANAK - LIBBA*	3 Withdraw	Not Required	Not Required	This STAR is currently for when GOW is OOS so is no longer required. No predicted change to flight behaviour beyond improved track keeping.
GLW 1A	L602, Y958: *FYNER – CLYDE –GLW*	3 Withdraw	Not Required	Not Required	This STAR is currently for when GOW is OOS so is no longer required. No predicted change to flight behaviour beyond improved track keeping.
GLW 1D	N560: *FOYLE –GLW*	3 Withdraw	Not Required	Not Required	This STAR is currently for when GOW is OOS so is no longer required. No predicted change to flight behaviour beyond improved track keeping.
LIBBA 1D	Y96, Y958: *FYNER – CLYDE –GLW*	3 Withdraw	Not Required	Not Required	This STAR is currently for when GOW is OOS so is no longer required. No predicted change to flight behaviour beyond improved track keeping.
GLW 1E	P600: *PTH – GRICE – GLW NDB*	3 Withdraw	Not Required	Not Required	This STAR is currently for when GOW is OOS so is no longer required. No predicted change to flight behaviour beyond improved track keeping.

16.6 Airport Engagement Evidence (Ref 7)

Ref	Stakeholder	Type of engagement	Date	Notes
1	Edinburgh Airport ATC	Email	05/04/2019	Email outlining need to RNAV STARs/Holds as part of DVOR Rationalisation
2	Glasgow Airport ATC	Email	08/05/2019	Email outlining need to RNAV STARs/Holds as part of DVOR Rationalisation
3	Ryanair	Email	03/06/2019	Email showing engagement with Ryanair
4	EasyJet	Email	17/05/2019	Email showing engagement with Easyjet
5	Edinburgh Airport ATC	FLOPSC	09/09/2019	Minutes show presentation of DVOR project at this meeting
6	Glasgow Airport ATC	FLOPSC	04/09/2019	Minutes showing presentation of DVOR project at this meeting

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