Consultation on revised hold and link routes in Scottish TMA

Issue 1.8
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Issue	**Month/ Year**	**Changes in this issue**
Issue 1.0	April 2018	Draft issued to CAA for comment
Issue 1.8	May 2018	Revised in accordance with CAA comments including minor editorials

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1 Executive Summary

NATS is proposing some changes to the ATS route structure in the Scottish Terminal Manoeuvring Area. These changes are necessary to support the changes proposed (in separate proposals) by Edinburgh and Glasgow Airports.

We propose to introduce the following changes:

- Move the position of the hold for flights inbound for Glasgow (currently the LANAK hold)
- Establish link routes to connect proposed Edinburgh SIDs to the enroute network
- Establish RNAV5 STARs realigned to the new Glasgow hold

The changes proposed herein will only affect flights above 7000ft.

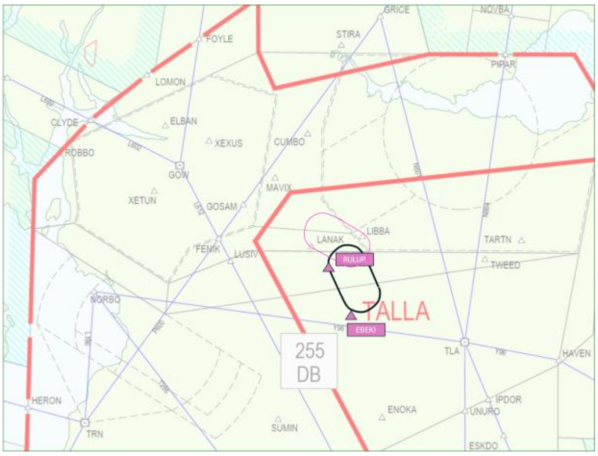

Figure 1 Proposal to move the LANAK hold

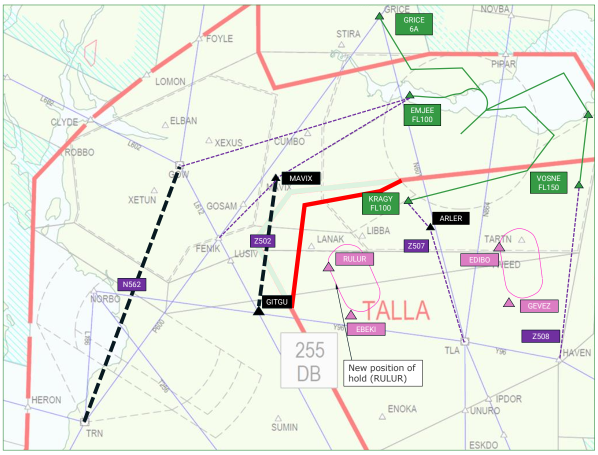

Figure 2 Proposed ATS link routes to EGPH SIDs

(Note a larger version of Figure 2 is provided on page 14)

These proposed changes are forecast to improve flight efficiency in the ScTMA. The combined airport and network changes, if approved, would result in a reduction in average fuel burn and CO_2 emissions per flight.

The consultation begins on 30 May 2018 and ends on 26 July 2018, a period of 8 weeks.
This consultation document is available via the CAA airspace change consultation portal at:

https://**consultations.airspacechange.co.uk/nats/nats-fasin-sctma**

If the proposal is approved by the CAA, implementation of the airspace change will occur not before 28th February 2019.

2 Introduction

2.1 About this consultation

This consultation relates to changes to ATS routes which will change aircraft flight profiles above 7000ft. We are seeking feedback from any stakeholders who may be affected by the proposal. Primarily this is likely to be users of the airspace and other aviation stakeholders. Nonetheless we welcome feedback from any interested parties.

The 8 week duration of the consultation is considered to be proportionate, due to the altitude of the proposed changes (above 7000ft) and the target group of stakeholders who are primarily aviation professionals (NATMAC, Airlines and Airports). There has also been prior engagement with some of the main stakeholders.

Your feedback at this stage will help us explore the potential impacts of the changes proposed to be made to the ScTMA airspace. We invite considered responses supported by evidence where possible.

2.2 The Scottish Terminal Manoeuvring Area (ScTMA)

The ScTMA provides controlled airspace for managing all air traffic transitioning between Edinburgh, Glasgow and Prestwick airports ("the airports") and the enroute network. NATS Prestwick Centre (PC) manages the enroute air traffic in the region and interfaces with each airport ATC unit. The controlled airspace of the ScTMA is depicted in Figure 3. The ScTMA is divided into two ATC sectors, TALLA and GALLOWAY, as shown in Figure 4.

In 2017 the ScTMA handled a total of 256,338 flights and 24 million passengers to/from Edinburgh, Glasgow and Prestwick airports (average of over 700 flights/65,700 passengers per day).

Each of the three major airports in the ScTMA are currently in different stages of the process of proposing new Performance Based Navigation (PBN) arrival and departure routes (SIDs & STARs). These changes are in accordance with the CAA Future Airspace Strategy (FAS) guidelines for the implementation of PBN (see reference 6 and link at footnote[1]), which is part of a UK-wide initiative to modernise our air navigation infrastructure.

Information on the individual airports' proposals is available at the links below:

Edinburgh Airport	http://www.letsgofurther.com/
Glasgow Airport	https://www.glasgowairport.com/airspace/ (Statement of Need linked here)
Glasgow Prestwick Airport	http://www.glasgowprestwick.com/corporate/airspace-change-consultation/

(note this is the most up to date information available but may be subject to change)

Information on the current status of each proposal is available on the CAA website:
https://www.caa.co.uk/Commercial-industry/Airspace/Airspace-change/Decisions/FASI(N)/

Edinburgh Airport's proposals are relatively mature, have been consulted upon, and an ACP was submitted to the CAA in August 2017. The CAA required that changes were made to the design submitted. Hence changes have been made and a revised ACP submission to the CAA is anticipated with final designs in July 2018.

Glasgow Airport's proposals were started under the CAP725 airspace change process, and a 12 week consultation was undertaken under that process. However the CAA has required that CAP1616 governance is followed. Hence it is assumed herein that any of the Glasgow designs (as previously consulted upon) may be subject to change, or may not be approved.

[1] CAA Future Airspace Strategy for the United Kingdom 2011 to 2030

Prestwick Airport's proposals are relatively mature, have been consulted upon, and an ACP was submitted to the CAA in October 2017.

Figure 3 ScTMA Controlled Airspace (CAA VFR chart 500K)

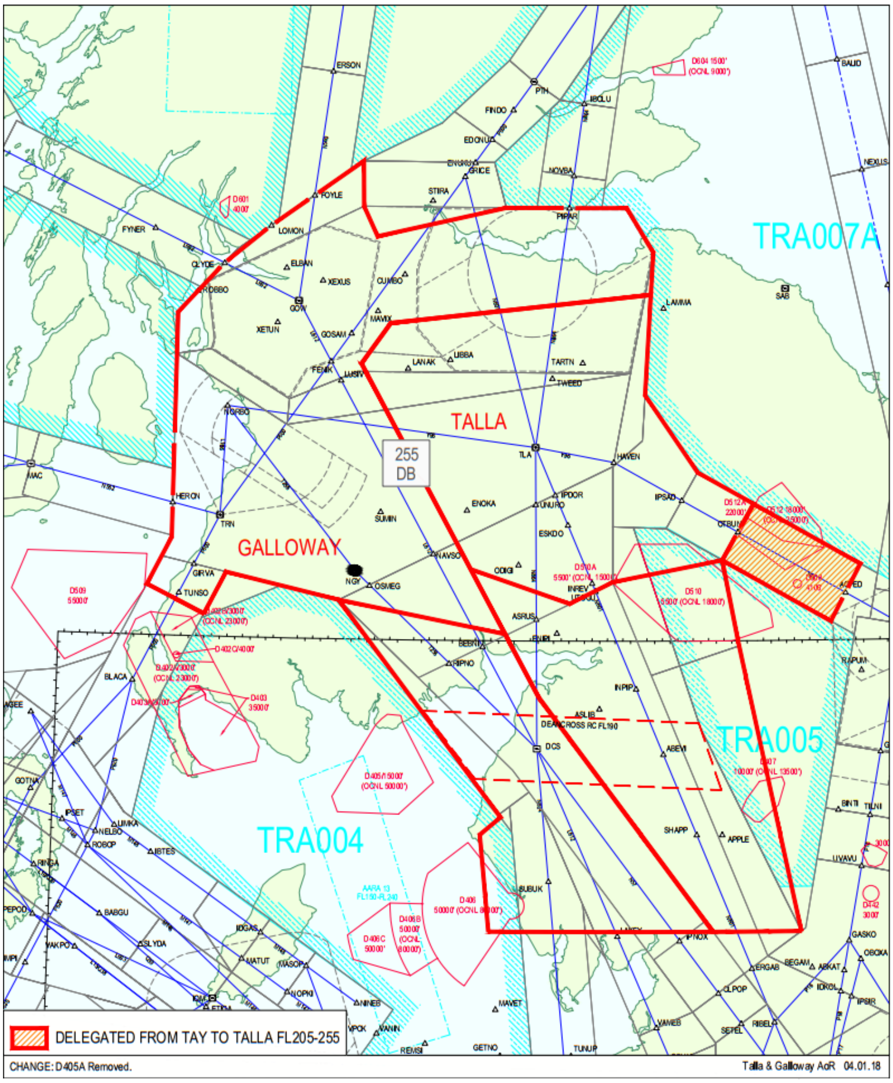

Figure 4 Prestwick Centre's TALLA and GALLOWAY sectors.

Summary of changes included in this Consultation

Related to Edinburgh Airport's changes

Introduction of two ATS routes (for details see section 5):

N562 GOW – TRN
Z502 MAVIX - GITGU
T256 realigned NORBO-OSMEG

Related to Glasgow Airport's proposals

Due to the early stage at which Glasgow are in the process, no changes related to Glasgow's ACP are included in this proposal.

The changes to the LANAK hold are independent of the Glasgow proposals and are being progressed in this ACP. As a result small realignment of STARs (and conversion to RNAV5) to route to the proposed RULUR hold are included.

Related to Prestwick Airport's changes

Prestwick airport's proposed changes does not require any further changes to the route network. Hence changes in this consultation do not have dependencies on the Prestwick Airport proposals.

3 Justification and Objectives for this proposal

3.1 Justification

Edinburgh, Glasgow and Prestwick Airports are at various stages of proposing changes to their SIDs and STARs; and Edinburgh & Prestwick are introducing arrival transitions[2]. The proposed procedures will be to RNAV1 (SIDs) or RNAV5 (STARs & ATS routes) PBN specification. This is being done in accordance with the CAA FAS which is a UK wide initiative to modernise our air navigation infrastructure. It is further being precipitated by the withdrawal from service of several key conventional navigation beacons (VORs: GOW PTH & TRN; NDBs: NGY) which are used for the conventional procedures. The deadline for the removal of procedures using these VORs is December 2019. Each airport is responsible for the SIDs from their airport, and they are engaged in proposing changes to them. NATS Prestwick Centre (PC) is responsible for the efficient operation of the ScTMA and wider enroute airspace network. As such it is responsible for integration of the airports' SIDs with the enroute network. NATS is also responsible for changes to STARs.

The aim of the proposals herein is to be integrated and aligned with the proposals of Edinburgh Airport.

It should be stressed that that changes to routes which impact flight paths below 7,000ft are the responsibility of Edinburgh and Prestwick Airports, and impacts related to these proposed changes are addressed in their respective consultations.

3.2 Objectives

Objectives for these proposals are to:

- maximise efficiency in the ScTMA airspace;
- minimise CO_2 emissions and fuel burn per flight;
- enable smooth transition to a PBN environment for Edinburgh, Glasgow and Prestwick airports.

3.3 Alignment with the CAA's Future Airspace Strategy (FAS) Principles

The CAA's Future Airspace Strategy (FAS) is the UK's strategy for modernising the air navigation infrastructure, see para 4.2 (p8) for more information. The FAS recommends that the ATS route network is improved, to take advantage of available PBN technology such as RNAV.
The changes proposed herein will provide an integrated RNAV PBN route structure as recommended by the FAS. The proposed contiguous integrated design of routes in the ScTMA will improve efficiency in the airspace.

[2] Detailed information relating to each of the airports proposals is available in the consultation documents listed in section 2.2 and on the CAAs airspace change portal (https://www.caa.co.uk/Commercial-industry/Airspace/Airspace-change/Decisions/FASI(N)/)

4 Current Airspace

4.1 Current Conventional Navigation

SIDs and STARs at the ScTMA airfields are currently defined with reference to the conventional VOR and NDB navigation beacons. These are now out-dated and many VORs & NDBs are being withdrawn from service (see Table 1).

4.2 Modernising the air route infrastructure

The UK enroute ATS route infrastructure is still mainly based on the RNAV5 navigation standard. This is safe, and more efficient than older 'conventional' navigation standards[3].

Most commercial aircraft already have the ability to conform to a more efficient standard known as RNAV1. The equipage rate for aircraft which are RNAV1 capable in the ScTMA is currently 92%[4]. The CAA's Future Airspace Strategy (FAS)[5] also recommends that the ATS route network is improved, to take advantage of available technology such as RNAV.

This proposal is based on utilising RNAV5 for new ATS routes.

Edinburgh, Glasgow and Prestwick Airports propose to replace the extant conventional SIDs with RNAV1 procedures. The STARs will be RNAV5.

The proposed change to RNAV PBN procedures is targeted to be complete before the withdrawal of the VORs listed in Table 1 below.

VOR/NDB being decommissioned	Used by current conventional procedures	Deadline for procedures to be removed	Proposed date of decommissioning
Glasgow – GOW	EGPH GOSAM 1D SID, EGPH STIRA STAR EGPF NORBO SID EGPF LUSIV SID EGPF TALLA SID EGPF TRN SID EGPF FOYLE SID EGPF LOMON SID EGPF ROBBO SID EGPF CLYDE SID EGPF PERTH SID EGPF GOW STAR EGPF STIRA STAR EGPF TRN STAR	Dec 2019	May 2020
Perth – PTH	EGPH STIRA STAR EGPF FOYLE SID EGPF ROBBO SID EGPF CLYDE SID EGPF PERTH SID EGPF STIRA STAR EGPF GLW NDB STAR	Dec 2019	May 2020

[3] RNAV5 requires that the aircraft can navigate within +/- 5nm of a route centreline for at least 95% of the time, whereas RNAV1 requires +/- 1nm accuracy for at least 95% of the time.
[4] NATS PBN equipage survey Jan-May 2017.
[5] Civil Aviation Authority, Future Airspace Strategy for the United Kingdom 2011 to 2030
www.caa.co.uk/FAS

VOR/NDB being decommissioned	Used by current conventional procedures	Deadline for procedures to be removed	Proposed date of decommissioning
Turnberry – TRN	EGPH GOSAM 1D SID, EGPH GOSAM 1C SID, EGPH TWEED STAR EGPF NORBO SID EGPF LUSIV SID EGPF TRN SID EGPF TRN STAR EGPK TRN SID EGPK NGY SID EGPK TRN STAR	Dec 2019	May 2020
New Galloway – NGY	EGPK NGY SID	Dec 2019	May 2020

Table 1 VOR rationalisation – conventional procedures affected.

The changes proposed in the airports' separate proposals are intended to remove the dependency on the conventional navigation beacons. The conventional procedures will be withdrawn when the new RNAV procedures are implemented. .

Figure 5 and Figure 6 below show the existing lower and upper route structure in the region.

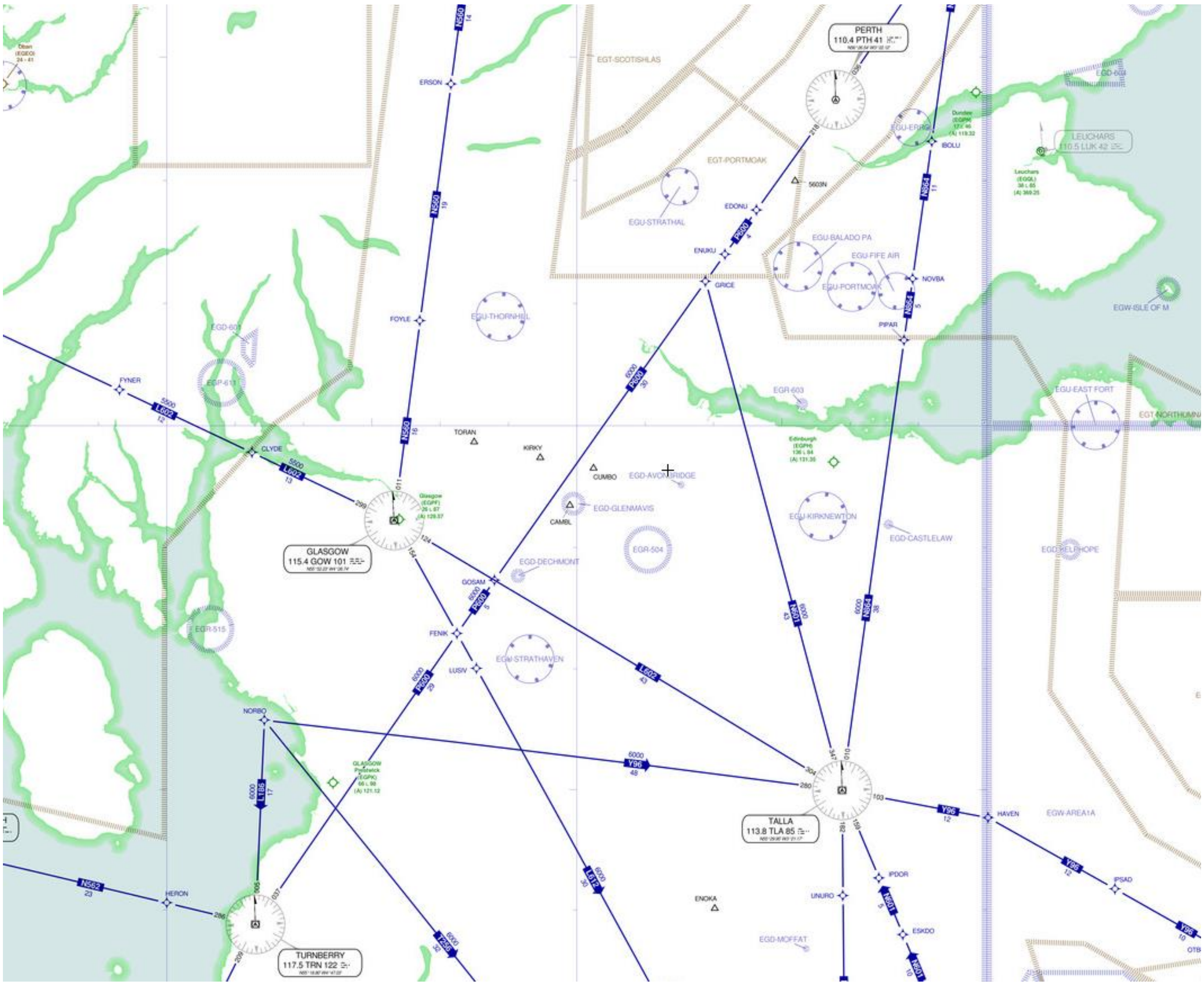

Figure 5 ScTMA Lower ATS Routes.

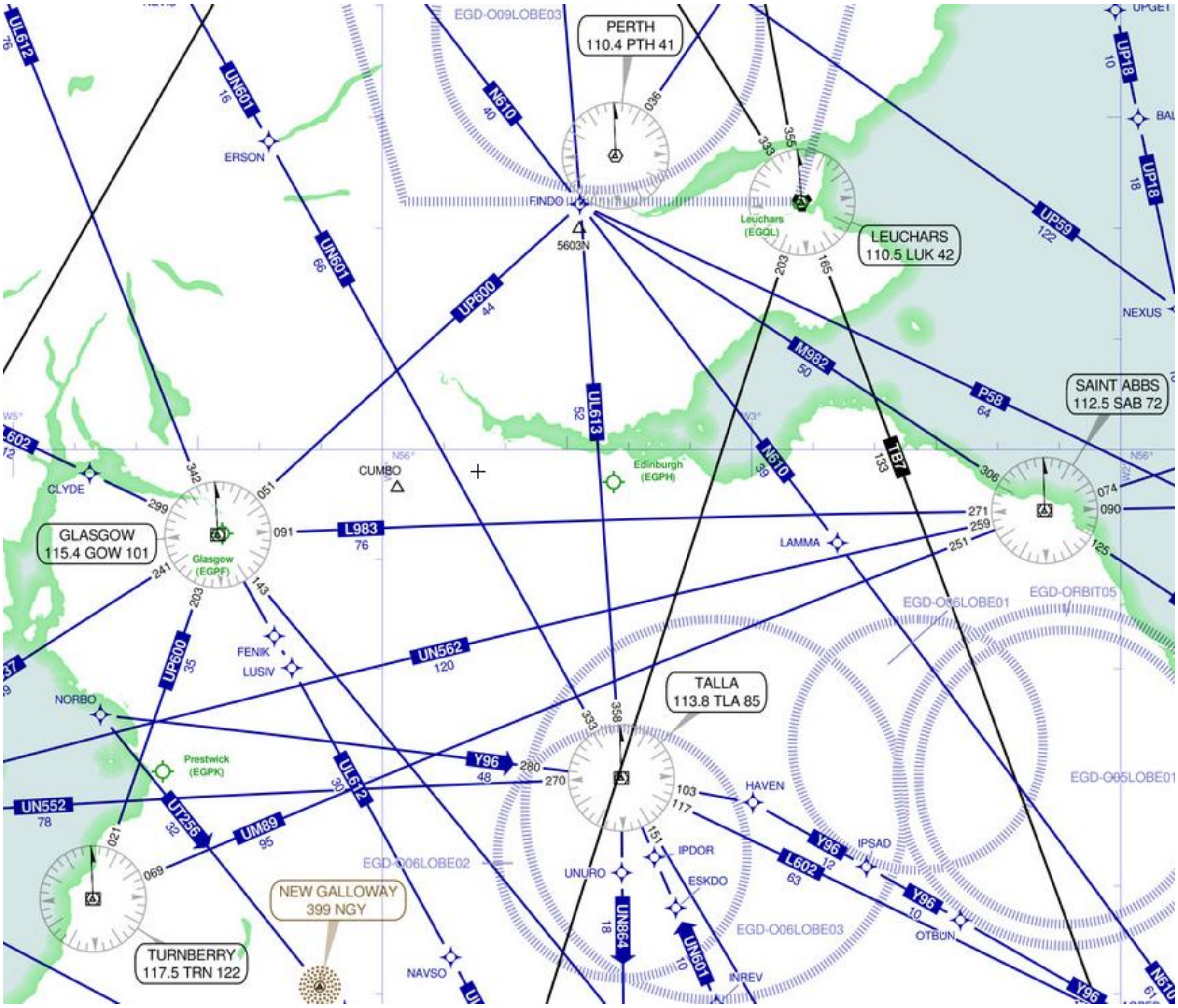

Figure 6 ScTMA Upper ATS Routes.

5 Proposed Airspace

5.1 Requirements

The main requirements can be summarized as follows:-

- Facilitate efficient integration of the SIDs proposed by Edinburgh Airport into the UK enroute ATS route structure;
- Facilitate efficient integration of the SIDs proposed by Prestwick Airport into the UK enroute ATS route structure;
- Maintain or improve the level of safety in the affected and neighbouring sectors;
- Maintain or reduce ATC workload (per flight);
- Maintain or Increase sector capacity (measured by sector monitor value);
- Minimise additional controlled airspace required for changes;
- Have negligible/no impact on military operations.

5.2 Design Principles

The proposed routes have been designed in accordance with the design principles as detailed in Ref 1 "Design Principles for PLAS Dep5 ScTMA".

5.3 New Routes Required

The ATS routes proposed in this consultation are listed below in Table 2 highlighted in yellow. The routes proposed in the Edinburgh and Prestwick proposals are also listed (no colour). The ACP which they are proposed in is listed in the 5th column.

ATS Route	Routing	RAD Restrictions			Notes
		Upper /Lower Cruise Limit	Direction	Airspace Change Proposal (ACP)	
Z507	KRAGY – ARLER – TLA	FL250/ FL110	EASTBOUND ONLY	Edinburgh ACP	EGPH Connectivity from KRAGY and ARLER SID to Y96, N864 and TRN
N537	EMJEE – BEMAS - LIKLA – GOW – MAC	FL240/ FL100	WESTBOUND ONLY	Edinburgh ACP	EGPH Connectivity from EMJEE SID to L602 and N560
Z500	EMJEE – MAVIX – FENIK	FL240/ FL100	WESTBOUND ONLY	Edinburgh ACP	EGPH Connectivity from EMJEE SID to L612, P600
Z502	MAVIX – GITGU	FL240/ FL100	WESTBOUND ONLY	This ACP	EGPH Connectivity from EMJEE SID to L612
Z506	VOSNE – HAVEN	FL240/ FL160	WESTBOUND ONLY	Edinburgh ACP	EGPH Connectivity from VOSNE SID to Y96
Z509	EVTOL – TLA	FL250/ FL70	EASTBOUND ONLY	Edinburgh ACP	EGPH Connectivity from EVTOL SID to Y96, N864 and TRN
Z250	LUCCO – SUMIN – BULLY - ODLIP –- HAVEN	FL250/ FL70	EASTBOUND ONLY	Prestwick ACP	EGPK Connectivity from LUCCO SID to Y96
Z248	LUCCO – OSMEG	FL250/ FL70	EASTBOUND ONLY	Prestwick ACP	EGPK Connectivity from LUCCO SID to T256
Z249	SUDBY –- OSMEG	FL250/ FL70	EASTBOUND ONLY	Prestwick ACP	EGPK Connectivity from SUDBY SID to T256
Z246	DAUNT –- HERON	FL240/ FL80	WESTBOUND ONLY	Prestwick ACP	EGPK Connectivity from DAUNT SID to N562
Z247	OKNOB –- HERON	FL240/ FL80	WESTBOUND ONLY	Prestwick ACP	EGPK Connectivity from OKNOB SID to N562
N562	TRN – GOW – PTH	FL450/ FL70	BI-DIRECTIONAL	This ACP	EGPH Connectivity from LIKLA SID to TRN
T256	NORBO - OSMEG	FL450/ FL70	EASTBOUND ONLY	This ACP	EGPK Connectivity (T256 Realigned)

Table 2 ATS Routes being proposed

5.4 Change to the Glasgow hold

The extant LANAK hold for inbounds to Glasgow is proposed to be moved to RULUR (see Figure 1). The position of RULUR was selected in order to place it further upstream along the extant arrival traffic flow, such that the usual vectoring patterns for arrivals remain unchanged. This option was tested during real-time simulations and was proved to be a safe and effective ATC solution. Note the proposed new position of the hold has been agreed with Glasgow and Edinburgh; and was constrained by the Edinburgh departure routes (as proposed in their separate ACP).

Inbounds to Glasgow are routed via EBEKI which improves the management of inbound and outbound traffic. This also ensures that aircraft enter the RULUR hold using a direct entry procedure which results in improved containment, and hence a smaller protected area. The proposed distribution of flight paths of the arrivals in the vicinity of RULUR will be unchanged from extant patterns from LANAK. Figure 7 shows flight path densities for current day arrivals via LANAK.

Arrivals to runway 23 from RULUR will generally continue to pass over LANAK in a swathe as they are vectored to final approach (as per today).

Arrivals to runway 05 will be routed as per today by being turned on a ~290° heading between EBEKI and RULUR as they are vectored to final approach. The proposed future vectoring pattern will be as per today and the position of arrivals below 7000ft will be unchanged.

See Appendix B for more levels.

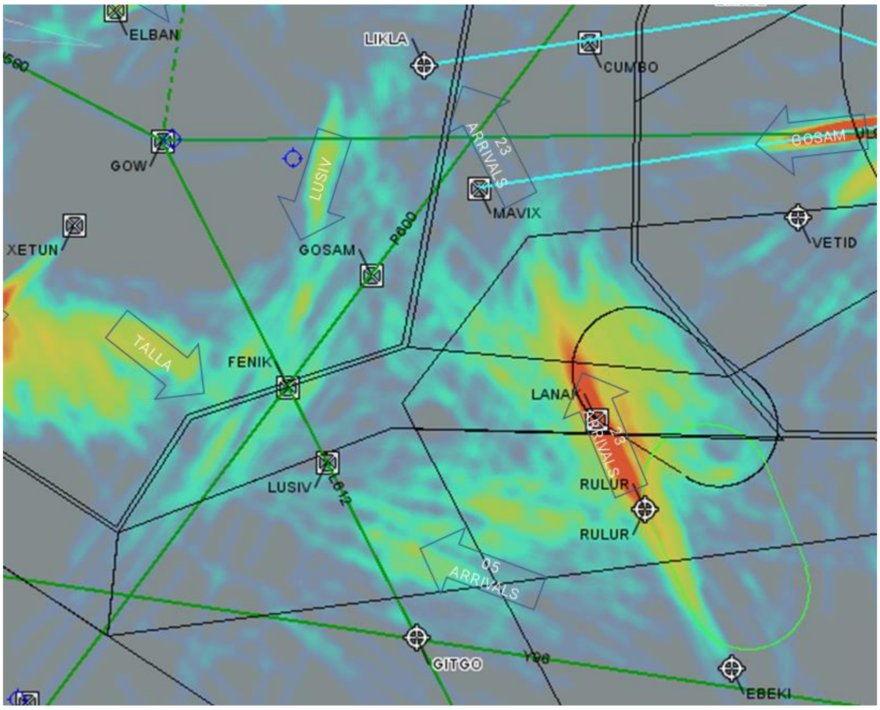

Figure 7 Vectoring patterns from the LANAK vs RULUR holds (7000-8000ft) (excerpt from Appendix B)

5.5 Changes related to Edinburgh's (EGPH) proposed SIDs

Edinburgh is proposing several link routes within its own ACP which link the ends of their proposed SIDs with the enroute network.

The following additional link routes are required in order to assure adequate systemisation of the Edinburgh SIDs and separation from the proposed Glasgow SIDs.

These are:

N562 GOW, TRN
Z502 MAVIX, GITGU

These are shown in bold in Figure 8.

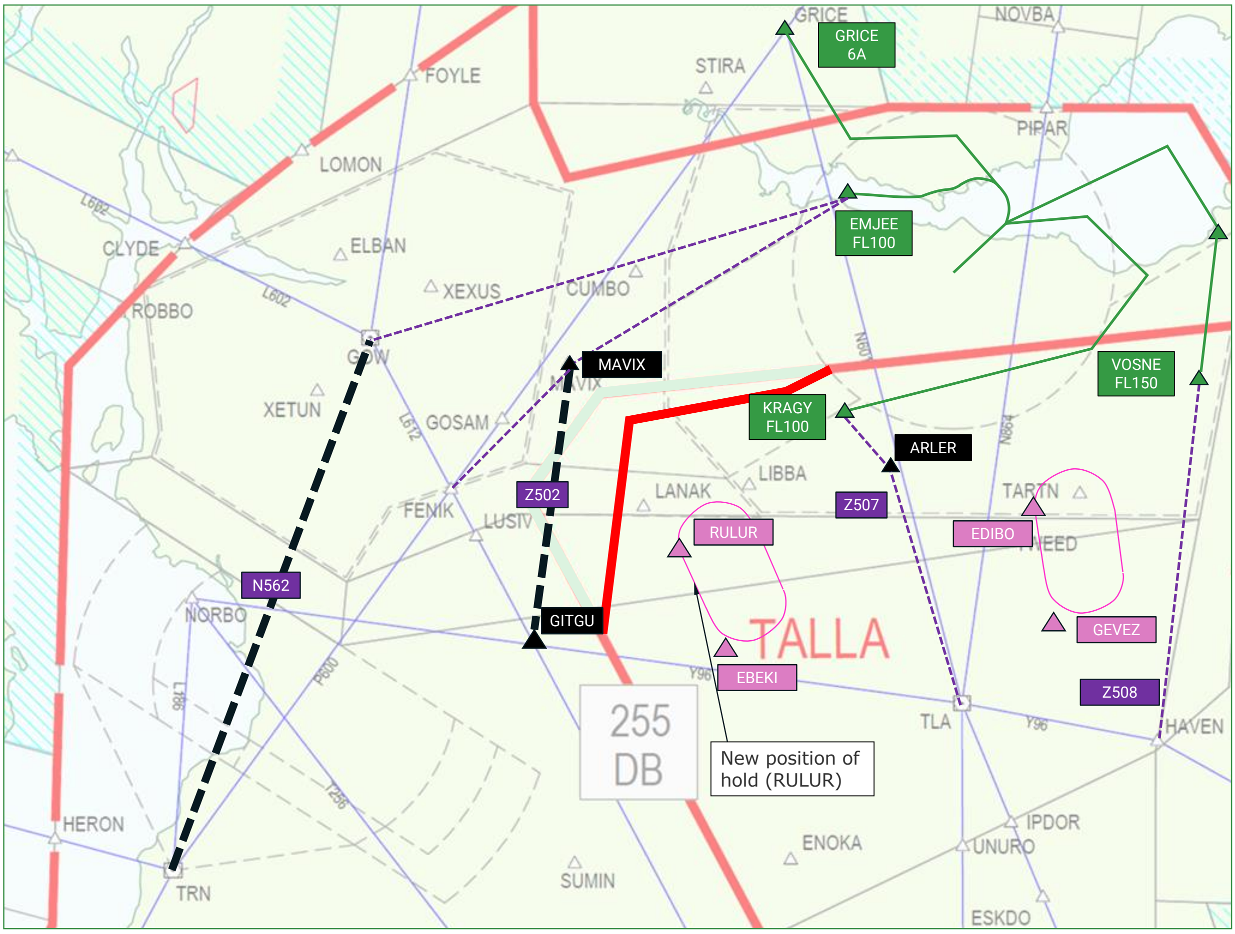

Figure 8 Link routes proposed in this ACP related to the proposed EGPH SIDs.

Note: changes related to the EGPH STARs are incorporated in the Edinburgh Airport ACP.

5.6 Glasgow proposed STARs

Due to the proposed move of the hold for arrivals to Glasgow from LANAK to RULUR, STARs which currently terminate at LANAK will be replaced with equivalent RNAV5 STARs to RULUR. The introduction of these new STARs is part of this consultation. Note that in accordance with revised CAA policy STARs will be named according to the ICAO convention using the start point.

New STAR Name	Old STAR Name	ATS Route Connectivity	Route	Expected Level Restriction	Usage
RIBEL1G	LANAK2A	RIBEL	RIBEL-EBEKI-RULUR	FL80 level RULUR, actual level to be determined by ATC	
APPLE1G	LANAK1B	APPLE	APPLE-ASLIB-ENIPI-EBEKI-RULUR	FL80 level RULUR, actual level to be determined by ATC	FL285+
TUNSO1G	TRN1A	P600	TUNSO – BAVRO – EBEKI – RULUR	FL80 level RULUR, actual level to be determined by ATC	FL150L BAVRO
GIRVA1G		P600	GIRVA – EBEKI – RULUR	FL80 level RULUR, actual level to be determined by ATC	
HAVEN1G	LANAK2D	Y96	HAVEN-TLA-EBEKI-RULUR	FL80 level RULUR, actual level to be determined by ATC	

Note the STAR names above are 'working' names and may be subject to change when they are carried forward into operation.

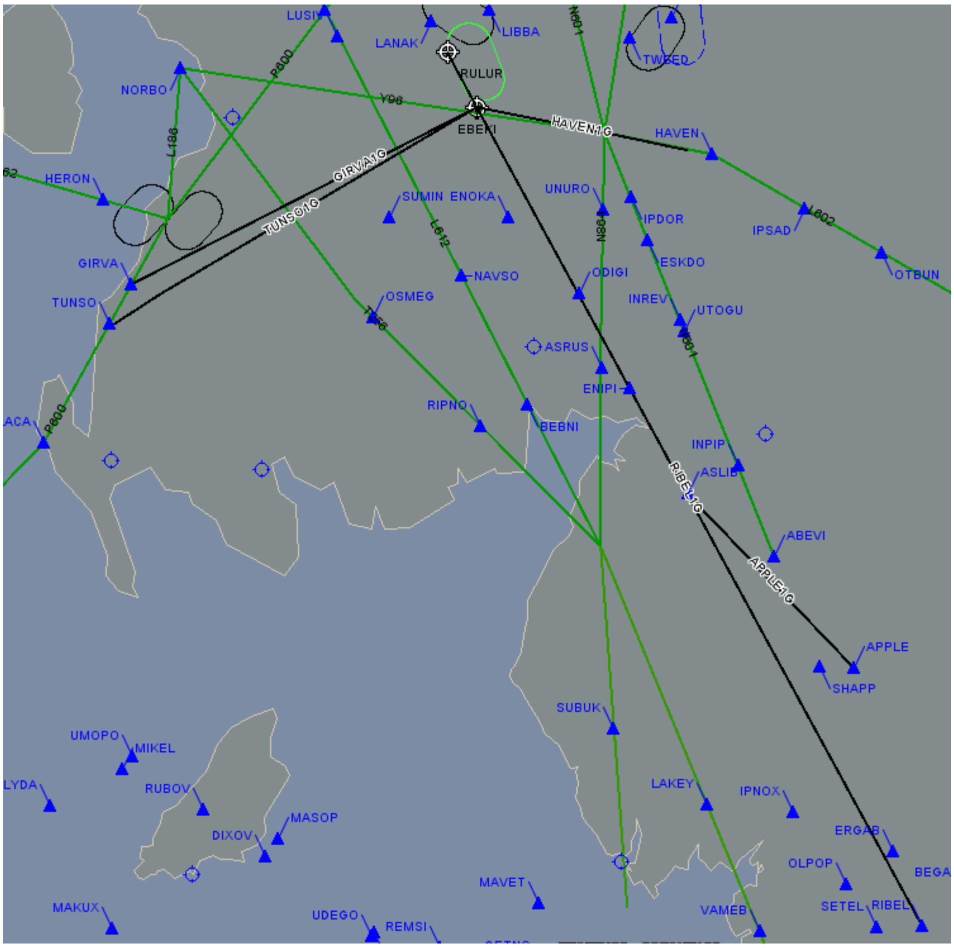

Figure 9 Proposed EGPF RNAV5 STARs to RULUR.

5.7 RNAV equipage

The equipage rate for aircraft which are RNAV1 capable in the Talla and Galloway sectors is currently 92%[6]. RNAV5 is mandated for flight above FL100, hence the equipage rate for RNAV5 is close to 100%.

Aircraft not suitably equipped or certified to fly RNAV1 SIDs would flight-plan an omnidirectional departure. This takes the aircraft straight out to a point (e.g. 3nm from the runway end) from where the aircraft is directed by ATC to join the enroute structure.

Non-RNAV5 arrivals would be vectored by ATC from the hold to the appropriate instrument approach IAF. All non-RNAV5 aircraft will be radar monitored by ATC to ensure separation is maintained from all other traffic.

5.8 Route allocation

The allocation of traffic to each SID is dependent on the airport's use of each SID.

The route allocation system and traffic volumes are described in the individual airports' consultation material. This would not preclude controllers from vectoring flights if they perceive an advantage in flexibility or efficiency.

5.9 Systemisation and route separation

The proposed ATS routes and holds will be tactically managed by NATS Prestwick Centre ATC. Flights will be monitored by ATC and do not rely on PBN reduced route separations (as described in CAP1385 PBN Enhanced Route Spacing Guidance (ref 4)).

5.10 Other Design Options Considered (but not progressed)

Full assessment of design options which were considered but not progressed is given in Ref 2 (Design Principle Evaluation and Options Appraisal).

5.11 Full options assessment

The "Options Appraisal (Phase II – Full) including safety assessment" (Ref 3) as required by CAP1616, accompanies this document and is published on the CAA portal for this airspace change.

5.12 Implementation Timetable

The earliest implementation of any of the changes proposed herein would be 28th Feb 2019.

5.13 Reversion Statement

Should the proposal be approved and implemented, a post implementation review will be undertaken after the airspace has been in operation for 12 months. At this point whether the airspace change has achieved its design objectives will be evaluated. Due to the interdependencies between these changes and those proposed by Edinburgh (which are planned to be operational during this time frame); if the proposed changes do not meet the objectives, reversion to the pre-implementation state would have to take account of the related airports' changes.

[6] NATS PBN equipage survey Jan-May 2017.

6 Impacts of this proposal

6.1 Noise, visual intrusion, the general public, stakeholders on the ground

The changes proposed herein impact flights above 7000ft. Some of the EGPH SIDs have published end altitudes of 6000ft. However flights would only level at 6000ft in the rare situations such as a radio failure. Appendix B shows radar trajectories which illustrate the typical levels flown. Table 4 below summarises the altitudes at which aircraft will typically pass the end points of the SIDs.

Airport/ Runway	SID	End Point	Published end altitude	Altitude Expected at SID end point/ start of link route
EGPH/24	EVTOL 1C	EVTOL	6000ft	FL90
EGPH/24	ARLER 1C	ARLER	6000ft	FL90
EGPH/24	LIKLA 1C	LIKLA	FL100	FL100
EGPH/24	MAVIX 1C	MAVIX	FL100	FL100
EGPH/24	GRICE 4C	GRICE	6000ft	FL100
EGPH/24	VOSNE 1C	VOSNE	FL150	FL150
EGPH/06	EMJEE 1D	EMJEE	FL100	FL100
EGPH/06	GRICE 5D	GRICE	6000ft	FL100
EGPH/06	VOSNE 1D	VOSNE	FL150	FL150
EGPH/06	KRAGY 1D	KRAGY	FL100	FL100

Table 3 Typical altitudes at the start of link routes (based on current day performance radar data)

Impacts due to noise of aircraft overflights occur at the specific locations associated with routes/flights and are considered significant (according to the DfT guidance) when the aircraft in question are below 7000ft. Since flights flying on the portions of the routes proposed in this ACP will be above 7000ft, we assess that there would be no significant noise or visual intrusion impact to stakeholders on the ground due to the proposed routes. For information regarding the noise impact related to flight paths below 7,000ft please refer to the airports' individual consultation material.

6.2 CO_2 emissions & fuel burn

CO_2 emissions & fuel burn analysis has been performed, modelling the entire ScTMA airspace including the changes proposed by Edinburgh and Prestwick airports. When performing CO_2 emissions & fuel burn analysis common start/finish points must be used so that comparison can be made between extant and proposed scenarios. Many of the link routes connect to SIDs proposed by the airports (in separate proposals). It is not possible to analyse the link routes in isolation. The results have been broken down by individual route and by airport so that the impact of each route proposed can be assessed. The results of this modelling indicate that the proposed changes will result in a reduction in average fuel burn and CO_2 emissions per flight. The total annual reduction in fuel burn (2019 traffic level) is forecast to be 5,550 tonnes, and the reduction in CO_2 emissions forecast is 17,651 tonnes.

The overall impacts are summarised Tables 4 to 6 below.

				2019			2029		
ATS Route	Routing	Departure Airport	Average Fuel Change Per Flight (kg)	Yearly Flights	Yearly CO2 Change (T)	Yearly Fuel Burn Change (T)	Yearly Flights	Yearly CO2 Change (T)	Yearly Fuel Burn Change (T)
Z507	KRAGY-ARLER-TLA	EGPH	-23	18,297	-1,339	-421	20,735	-1,518	-477
N537	EMJEE-BEMAS-LIKLA-GOW-MAC	EGPH	-49	6,297	-981	-308	7,137	-1,111	-350
Z502	EMJEE-MAVIX-GITGO	EGPH	-103	26,413	-8,615	-2709	29,934	-9,763	-3070
Z506	VOSNE-HAVEN	EGPH	-67	5,823	-1,241	-390	6,600	-1,407	-442
Z509	EVTOL-TLA	EGPH	-19	3,210	-198	-62	3,638	-224	-71
T256	NORBO-OSMEG	EGPH	-19	320	-20	-6	363	-22	-7
N562	TRN-GOW-PTH	EGPH	-13	7,993	-337	-106	9,058	-382	-120
Z250	LUCCO-SUMIN-BULLY-ODLIP-HAVEN	EGPK	-167	73	-39	-12	83	-44	-14
Z248	LUCCO-OSMEG	EGPK	-59	2,456	-459	-144	2,783	-521	-164
Z249	SUDBY-OSMEG	EGPK	-33	819	-86	-27	928	-97	-31
Z246	DAUNT-HERON	EGPK	-77	491	-120	-38	557	-136	-43
Z247	OKNOB-HERON	EGPK	-16	164	-8	-3	186	-9	-3
ATS link routes Total			**-58**	**72,356**	**-13,443**	**-4227**	**82,002**	**-15,236**	**-4791**

Table 4 Departures CO_2 emissions & fuel burn impacts (by link route usage)

				2019			2029		
Airport	Runway	SID	Average Fuel Change Per Flight (kg)	Yearly Flights	Yearly CO2 Change (T)	Yearly Fuel Change (T)	Yearly Flights	Yearly CO2 Change (T)	Yearly Fuel Change (T)
EGPH	06	EMJEE	-112	7,994	-3,012	-947	9,060	-3,414	-1074
		GRICE	6	1,376	20	6	1,559	22	7
		KRAGY	-19	3,944	-222	-70	4,469	-252	-79
		VOSNE	-133	3,072	-1,287	-405	3,482	-1,458	-459
	24	EVTOL	-20	3,210	-198	-62	3,638	-224	-71
		ARLER	-25	14,353	-1,117	-351	16,266	-1,266	-398
		GRICE	-26	4,127	-330	-104	4,677	-375	-118
		LIKLA	2	4,723	-529	-166	5,353	-600	-189
		MAVIX	-56	19,993	-6,054	-1904	22,658	-6,861	-2158
		VOSNE	2	2,751	45	14	3,118	52	16
EGPH total			**-46**	**65,544**	**-12,685**	**-3989**	**74,279**	**-14,376**	**-4521**
EGPK	12	OKNOB	-16	164	27	8	186	30	10
		SUDBY	-33	819	-244	-77	928	-277	-87
		SUMIN	-159	18	-1,298	-408	21	-1,471	-463
		TRN	-46	127	-200	-63	144	-227	-71
	30	LUCCO	-61	2,511	-1,127	-354	2,845	-1,277	-402
		DAUNT	-77	491	-337	-106	557	-382	-120
		TRN	-64	382	36	11	433	41	13
EGPK total			**-56**	**4,512**	**-3,549**	**-1116**	**5,113**	**-4,023**	**-1265**
SIDs Total			**-73**	**70,056**	**-16,235**	**-5105**	**79,392**	**-18,399**	**-5786**

Table 5 Departures CO_2 emissions & fuel burn impacts (by SID usage)

Note that the difference between the totals in Table 4 and Table 5 are due to those flights which depart on a SID but do not then use one of the proposed new ATS routes. For example flights departing on GRICE SIDs from Edinburgh do not use any of the new ATS link routes.

Impacts due to CO_2 emissions can only be assessed by analysing the existing route vs the proposed route between common start/end points, hence where the SIDs are part of the route these must be part of the analysis. Please see Appendix C for examples.

			2019			2029		
Category		**Average Fuel Change per Flight (kg)**	**Yearly Flights**	**Yearly CO_2 Change (T)**	**Yearly Fuel Change (T)**	**Yearly Flights**	**Yearly CO_2 Change (T)**	**Yearly Fuel Change (T)**
Departures	EGPH	-46	65,544	-12,685	-3,989	74,279	-14,377	-4,521
	EGPK	-56	4,512	-808	-254	5,113	-916	-288
All Departures		-51	70,056	-13,493	-4,243	79,392	-15,293	-4,809
Arrivals	EGPH	1	65,544	248	78	74,279	280	88
	EGPK	5	4,512	76	24	5,113	86	27
All Arrivals		-1	70,056	324	102	79,392	366	115
Overflights		0	24,030	-10	-3	27,198	-10	-3
All ScTMA flights		**-23**	**164,142**	**-13,178**	**-4,144**	**185,982**	**-14,936**	**-4,697**

Table 6 All ScTMA flights fuel burn impacts (by Airport arrival/departure/overflights)

Note only the emissions benefits due to route Y96 and N562 (outlined in table 5 above) can be considered to be *exclusively* due to the changes herein. Hence as directed by the CAA the WebTAG analysis for this consultation only considers the benefit due to these two routes.

Results from WebTAG are given in Appendix B of the Full Options Analysis (ref 3). The reduction in CO_2 emissions due changes solely incorporated in this ACP equates to a WebTAG calculated Net Present Value CO_2 benefit of £255,910 (non-traded sector[7]).

The proposals as outlined herein serve as an enabler for some enhanced benefits when coupled with the proposed airports' routes. An example of this is given in Appendix C which explains how efficiencies are enabled by the combined SID + link route which cannot accrue without both sets of changes being approved.

6.3 Delays to air traffic and airspace capacity

The objective of this proposal is to integrate the routes proposed by the airports efficiently into the enroute network. The ScTMA enroute airspace network is not capacity constrained currently and delays are not an issue in the ScTMA at current-day traffic levels. Analysis has indicated that the network as proposed herein could cope with forecast future traffic levels at least to 2025 (traffic levels beyond that were not tested).

Further route enhancements in the ScTMA were considered, however these have not been progressed since at current and forecast traffic levels up to 2025 they are not required.

Hence no change in delays is claimed in relation to this ACP.

6.4 MoD

The proposed routes are not expected to have any impact on MoD operations.

6.5 General Aviation (GA) airspace users

The proposed routes are all contained within existing controlled airspace. There is no requirement for new controlled airspace as part of this ACP. Hence there is not expected to be any impact on general aviation or sport aviation airspace users.

6.6 Impact on Aviation Safety

The proposed new routes take advantage of the precise navigation technology available on modern aircraft. By promulgating the routes using the RNAV navigation standard, aircraft will be flying according to a systemised route structure with less reliance on air traffic control for tactical intervention.

ATC monitors the track keeping of all aircraft and where an unauthorised deviation from centreline occurs it is Air Traffic Control's responsibility to monitor, and if necessary intervene and prevent a loss of separation from occurring. Implementation of RNAV routes typically results in improved track-keeping; this has an associated safety benefit.

The proposed position of the RULUR hold represents a safety benefit (compared to LANAK) since it gives improved separation of traffic flows with less requirement for ATC tactical intervention.

The proposed SIDs for Edinburgh and Glasgow are designed to improve systemised separation, and hence also represent a safety benefit.

6.7 Stakeholder pre-engagement

The proposed changes are inter-related to the airports' proposals. There has been significant pre-engagement with key stakeholders to ensure that there is minimal impact on their operations and that they are content with the proposals. The engagement has been via the following fora :

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[7] WebTAG Results for traded sector have been calculated; however these give a result of £0 regardless of input scenario.

Stakeholder Group	Forum	Engagement
Airlines	Lead Carrier Forum, Operational Partnership Agreement (OPA), Flight Efficiency partnership (FEP)	- Periodic updates to canvass feedback and design input - Via airports and base captains for local input - Airline Economic/Flight Planning Teams to ensure considerations of airspace design vs economic benefits are aligned. - Involvement in flight simulations of proposed procedures
Scottish Airports	Scottish TMA Working Group	- Regular meetings (at least quarterly) to review design developments, agree participation in simulation and design activities and gain feedback from consultation/ regulatory decision making
FASI-N Steering Group (formerly SDDG – Scottish Design Development Group)	FASI-N Steering Group	- Regular meetings (at least quarterly) to update progress against deliverables and raise issues for strategic intervention and resolution.
Military	FASI-N Steering Group	- Some involvement in FASI-N Steering Group - ScTMA Working Group - Direct contact with airports via their consultations
Coding Houses	RNDSG	- Periodic updates to provide oversight of planned changes, timescales and lessons learnt from across the industry
General Aviation	FASVIG	- Updated via FASVIG

7 How to respond to this consultation

This consultation commences on 30 May 2018 and ends on 26 July 2018, a period of 8 weeks.

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

https://consultations.airspacechange.co.uk/nats/nats-fasin-sctma

The list of stakeholders targeted for this consultation is given in Appendix A. These stakeholders have been directly informed of this consultation.

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

A feedback questionnaire is provided on the consultation portal. On submission this is submitted direct to the CAA. Supporting documents may also be submitted via the portal.

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

- Your name, and your role if you are responding on behalf of an organisation.
- Your contact details (email)
- One of the following: SUPPORT OBJECT NO COMMENT AMBIVALENT
- Your reasons for supporting or objecting to the proposal.

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

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

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

8 Compliance with process, and what happens next

8.1 Compliance

If you have questions or comments regarding the conduct of the airspace change process (e.g. adherence to CAP1616), please contact the CAA:

Airspace Business Coordinator
Ref: NATS FASI-N ScTMA
Safety and Airspace Regulation Group
CAA House
45-59 Kingsway
London, WC2B 5TE

Form FCS 1521 can be used for this purpose

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

8.2 What happens next?

When the consultation period closes, we will publish a report summarising the feedback received.

We will then submit an Airspace Change Proposal to the CAA based on this consultation document and the feedback report.

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

If the CAA approves this proposal, we plan to implement the changes not before February 2019.

9 References

1. FASI (North) Scottish Terminal Manoeuvring Area - Design Principle & Engagement Process
2. FASI (North) Scottish Terminal Manoeuvring Area - Design Principle Evaluation and Options Appraisal
3. FASI (North) Scottish Terminal Manoeuvring Area - Options Appraisal (Phase II – Full) including safety assessment
4. CAP1385 PBN Enhanced Route Spacing Guidance
5. CAP1616 Airspace Design: CAA Guidance on regulatory process for changing airspace design.
6. CAA Future Airspace Strategy for the United Kingdom 2011 to 2030.

Appendix A List of Stakeholders

Airlines

Aer Lingus
Air Berlin
Air Canada
Air France
Air New Zealand
UK Air Tanker
American Airlines
Austrian Airlines
BA Cityflyer
BAR
BMI
Bristow Helicopters
British Airways
Cityjet
CargoLux
Delta Airways
DHL
Eastern Airways
EasyJet
Emirates
Etihad
FedEx
FinnAir
VLM
FlyBe
Gamma Aviation
German Wings
Gulf Air
Iberia
Jet2
KLM
Logan Air
Lufthansa
Novair
Qatar Airways
RyanAir
Sabre
SAS
Saudia
Stobart Air
Tag Aviation
Thomas Cook
Thomson/TUI
Turkish Airlines
United Airlines
Virgin Airlines
WizzAir

National Air Traffic Management Advisory Committee (NATMAC) Members

Aviation Environment Federation (AEF)
Airport Operators Association (AOA)
Aircraft Owners & Pilots Association (AOPA UK)
Association of Remotely Piloted Aircraft Systems (ARPAS UK)
British Airways (BA)
British Aerospace Systems (BAE Systems)
British Airline Pilots Association (BALPA)
British Air Transport Association (BATA)
British Balloon & Airship Club (BBAC)
British Business & General Aviation Assoc (BBGA)
British Gliding Association (BGA)
British Hang Gliding & Paragliding Assoc (BHPA)
British Microlight Aircraft Association (BMAA)
British Model Flying Association (BMFA)
British Parachute Association (BPA)
British Helicopter Association (BHA)
European UAV Systems Centre Ltd
General Aviation Safety Council (GASCo)
General Aviation Alliance (GAA)
Guild of Air Traffic Control Officers (GATCO)
Helicopter Club of Great Britain (HCGB)
Heathrow Airport Ltd
Heavy Airlines
Honourable Company of Air Pilots
Light Aircraft Association (LAA)
Light Airlines
Low Fares Airlines (LFA)
Ministry of Defence (MoD)
PPL/IR

Airports

Edinburgh Airport Ltd
Glasgow Airport Ltd
Glasgow Prestwick Airport
Cumbernauld Airport
Strathaven Airfield

Appendix B Typical Flight Profiles

Please see separate accompanying document

Appendix C Example Fuel/CO_2 Analysis

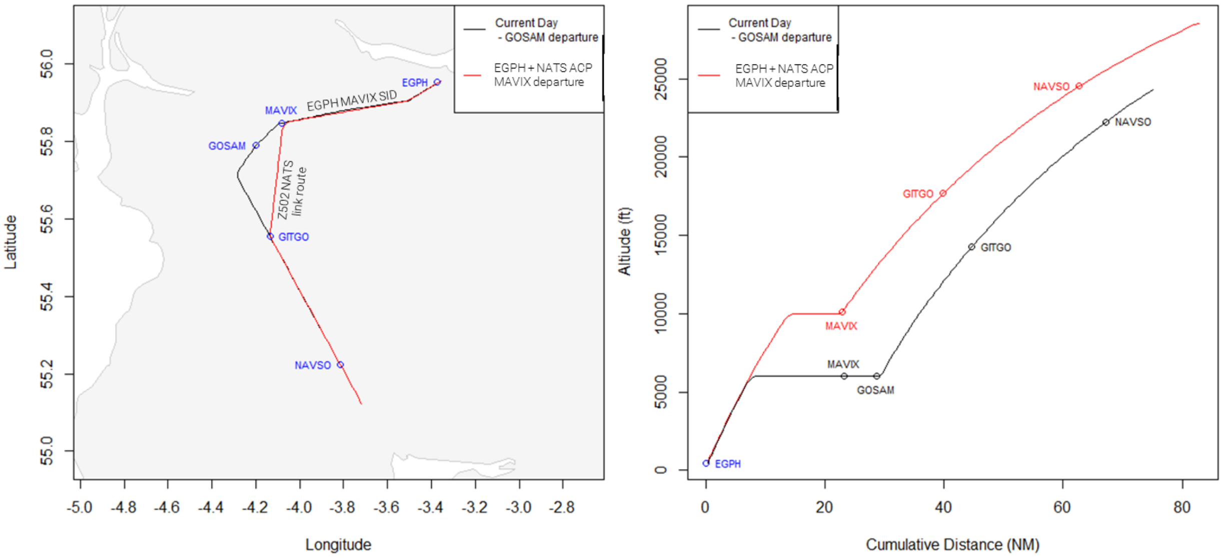
Below is an example showing how some of the fuel/CO_2 benefits occur for flights using the new ScTMA SIDs and ATS routes.

- The analysis models the trajectory/ fuel burn & CO_2 emissions for a particular existing vs proposed SID + onward route combination.
- Both the path length and the altitude profile of the flight are compared between the proposed design and the current day flight plan.
- A valid analysis requires that common start point (the airport) and end points are used and that the flights are at the same altitude at those common points. In the example below this requires that the route up to cruise level is considered.

EGPH 24 – MAVIX SID benefit example

SID used:	Current Day: GOSAM	ACP: MAVIX
Network joined at:	Current Day: FENIK	ACP: GITGU

Current Day and ACP routes converge at: GITGU



- The link route Z502 MAVIX-GITGU (proposed in this ACP), links with the MAVIX SID (proposed in EGPH ACP).
- The link route Z502 MAVIX-GITGU shortens the track mileage by 4.8nm.
- The altitude of flights on the proposed route Z502 MAVIX-GITGU will be FL100 climbing to ~FL180. The extant flight profile would be 6000ft climbing to ~FL140. Hence the old route is half below 7000ft and the new route is above 7000ft. (hence it can be seen that it is not practical/valid to attempt to isolate changes by an arbitrary altitude cut off (such as 7000ft).
- As a result, the combined proposed route has an improved climb profile, and shorter track mileage (both made possible by the NATS proposed link route)

The above example shows that the NATS proposed link route from MAVIX to GITGU cuts down track mileage but more significantly removes the need for a 'level at 6000ft' segment (since it de-conflicts from the Glasgow hold (LANAK/ RULUR)). This proposed NATS change reduces fuel burn and CO_2 emissions and enhances the efficiency of the MAVIX SID which is part of the separate EGPH ACP.