ACP-2017-079

SHETLAND SPACECENTRE LIMITED/SAXAVORD SPACEPORT AIRSPACE CHANGE PROPOSAL

CAP1616 STAGE 2 DEVELOP & ASSESS SUBMISSION

(INCORPORATING STAGE 2A AND STAGE 2B)

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OVERVIEW

1. Introduction

1.1. Shetland Space Centre Limited (trading and hereinafter referred to as "SaxaVord Spaceport" and "SaxaVord") seeks to conduct vertical launch operations for orbital and sub-orbital activities from SaxaVord Spaceport on Lamba Ness, Unst. A suitable airspace reservation of defined dimensions is required to ensure the safety of other airspace users from SaxaVord launch activities and to ensure the safety of SaxaVord launch activities from other airspace users. The proposed airspace reservation would be activated for the minimum specified periods necessary to support nominated launch operations and would extend from surface (SFC) to unlimited (UNLTD).

1.2. Accordingly, SaxaVord initiated an airspace change proposal (ACP) (ACP-2017-079) through the UK Civil Aviation Authority's (CAA's) ACP portal on 18 October 2018. The ACP was "Paused" in August 2020, before recommencing in February 2022.

1.3. As part of the CAP1616 Stage 1 process, SaxaVord considered and engaged relevant aviation and airspace user stakeholders to discuss the outline of the proposal and establish and share the proposed airspace design principles (DPs), which are set out later in this document.

1.4. Additionally, SaxaVord has engaged aviation stakeholders relating to a temporary airspace design (ACP-2021-090); despite the similarities between the proposed launch operations, airspace and associated activities, engagement related to that application continues to be treated as a separate activity to stakeholder engagement associated with this application (ACP-2017-079). Furthermore, ACP-2017-079 is a separate application to ACP-2021-058.

2. CAP1616 Overarching Process Requirements

The CAP1616 Stage 2 process requires that airspace change sponsors develop options for their proposed airspace change.

2.1. *CAP1616 Step 2A - Develop & Assess.* CAP1616 Step 2A requires the change sponsor to develop a first comprehensive list of options - to the extent that a list is possible - that addresses the Statement of Need and aligns with the Design Principles (DPs) from Stage 1. CAP 1616 acknowledges that "[s]ometimes there will only be limited scope for multiple design options, with few realistic options available ... Where this is the case, change sponsors must explain to stakeholders and the CAA why this is the case, with appropriate evidence".[1]

2.2. Limited Options. For this ACP there are limited options available. The options are limited by being tied to the location of the launch site, the launch trajectories available and the safety requirements as detailed in the following sections.

2.3. *CAP1616 Step 2B - Options Appraisal.* CAP1616 Step 2B requires the change sponsor to carry out an 'Initial' appraisal of the impacts of each of the viable options identified in Step 2A using the design criteria against which the options are being assessed (the first of three iterative phases of options appraisal […]). The Initial appraisal should, as a minimum, contain qualitative assessments of the different options. This highlights to change sponsors, stakeholders and the CAA the relative differences between the impacts, both positive and negative, of each option. The change sponsor assesses each option against a 'do nothing' scenario (the 'counterfactual'), even where there is only a single change option, to understand these impacts.[2]

1. CAP1616 (4th Ed, 2021), CAA (online), Para 127. Accessed online on 12 Jul 22.
2. *id*, Para 133. Accessed online on 25 Jul 22.

3. Aims

3.1. The aim of this submission, and the corresponding elements herein, is to demonstrate how SaxaVord has:

- Developed its airspace change design options that address the application's Statement of Need and align with the DPs from Stage 1.
- Engaged with stakeholders to test the design options against the Statement of Need and DPs.
- Received and analysed stakeholder feedback, where appropriate using the same to refine design options.
- Assessed the developed options against the Stage 1 DPs and produced a corresponding DP Evaluation (i.e. the Initial Options Appraisal).

It must also be noted that the airspace design options contained within this document might be subject to change as the ACP process continues and options are matured and refined in accordance with - *inter alia* - safety requirements, design principles and, most importantly, stakeholder engagement and consultation at Stage 3. Similarly, as the space industry and launch vehicle (LV) designs mature, further design evolution may occur, supported by robust empirical data.

BACKGROUND AND CONTEXT

4. UK Space Innovation and Growth Strategy

The UK Space Innovation and Growth Strategy (IGS)[3] sets out ambitious targets for the growth of the UK space sector, with 'Access to Space' a key IGS theme. The UK has clearly stated its ambition to become a launching state, with the long-term goal of being able to support sub-orbital operations and orbital delivery of small satellites. Accordingly, in 2017, the Centre for Earth Observation Instrumentation and Space Technology (CEOI-ST) and UK Space Agency (UKSA) commissioned the SCEPTRE Project, which investigated the challenges associated with the introduction and operation of commercially viable small-satellite launch services from the UK; in 2017, the Project delivered its final report.[4]

5. The SCEPTRE Project Final Report

The SCEPTRE (Project Final) Report offered that commercial space launch operations are driven by two questions: which orbits are accessible from a prospective launch site, and what payload mass can be delivered from those sites to desired orbits at a viable price?

The Report contended that commercially-desirable orbits can be achieved from a number of sites in the north of Scotland, both on the mainland and the islands. For many combinations of launch site and desired orbit, however, it may be necessary to perform manoeuvres (i.e. "dog-legs") to ensure the safety of people, effectively flying around the populated area. Any such manoeuvre would reduce the payload that can be placed in a given orbit; consequently, launch sites that require significant manoeuvres would incur a payload penalty. The Report identified that, for any given launch site, the optimal trajectory is one that does not manoeuvre to avoid overflying populated areas.[5]

3. *"A UK Space Innovation and Growth Strategy 2010 to 2030"* (online). Accessed 25 Jul 22.
4. Sceptre Report (2017), Demios Space UK Ltd (online). Accessed 12 Jul 22.
5. *id*, Executive Summary (online). Accessed 12 Jul 22.

The Report concluded that, considering only the payload mass deliverable to orbit, the site offering the maximum payload mass to orbit is SaxaVord in the Shetland Islands, from where launch is possible to both SSO and Polar orbits[6], avoiding the populations in the Faroe Islands and Iceland.[5]

Consequently, the SCEPTRE Report's outputs and recommendations have determined the development of SaxaVord's proposed airspace design options.

6. SaxaVord Location and Surrounding Airspace Context

The Shetland Islands is a sub-Arctic archipelago in the Northern Atlantic, between Great Britain, the Faroe Islands and Norway and is the northernmost part of the United Kingdom. SaxaVord Spaceport is located on the Lamba Ness peninsula on Unst, the most northerly of the Shetland Islands. Situated in the north of the UK's airspace, SaxaVord Spaceport is 11nm south of the northern boundary of the Scottish Flight Information Region (FIR) and 22nm west of the FIR's eastern boundary.

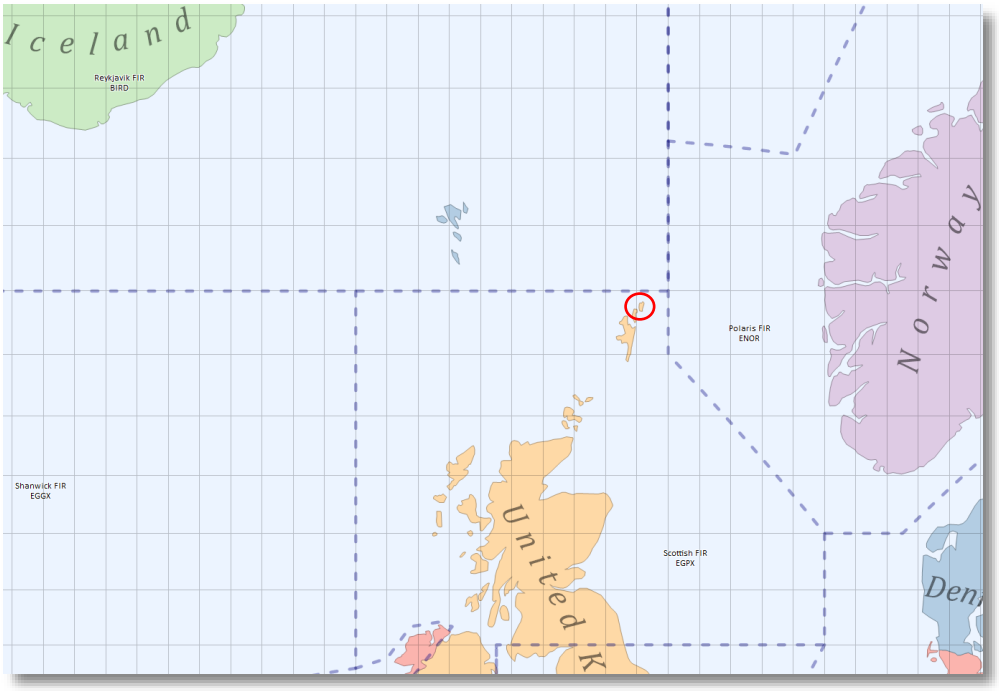


Figure 1 - SaxaVord Location

The SaxaVord site (and its immediate surroundings) resides wholly within UK Class G airspace, which in turn sits underneath Class C airspace. Proposed launch activities and airspace design would, therefore, extend from SFC to UNLTD, through Classes G and C airspace, for specific notified periods and beyond the lateral limits of the UK FIR and Upper Information Region (UIR). Above FL195 (i.e. 19,500ft AMSL), commercial air traffic operates under the principle of "Free Route Airspace", which allows flights to route direct, *vice* following prescribed routes (i.e. airways and upper air routes) along pre-determined navigation points.

Consequently, any proposed airspace design must consider the operating and operational requirements of local, national and international stakeholders and airspace users.

6. *id*, Page 12.

STAGE 2A - AIRSPACE CHANGE DESIGN OPTIONS DEVELOPMENT

7. Introduction

Unlike an airspace change at a UK aerodrome, there is no extant operation to refer to as an operational baseline; thus, there is no operational *status quo* to maintain. In addition, SaxaVord recognises that entertaining any airspace design option that does not include a proportionate airspace reservation to protect airspace users from the proposed launch operations at SaxaVord (and *vice versa*) is untenable; consequently, a "do nothing" option was not presented to stakeholders, as it neither addressed the Statement of Need, nor did it align with the DPs from Stage 1.

8. Overarching Principles on Airspace Design Options

Airspace design options have been developed around recommended trajectories based on assessment criteria contained within the UKSA (*et al*)-sponsored SCEPTRE (Project Final) Report. The Project assessed that, geographically, the UK is well situated for launches to Polar and Sun-synchronous Orbits (SSO), which are in high demand from the growing communications and Earth observation markets, respectively.[7] In considering launch trajectories and, therefore, airspace design options, an immutable safety principle of the SCEPTRE project was that LVs cannot overfly populated areas.

The Project considered an exemplar space launch operation: the vertical launch of an imported (US) LV carrying payloads of up to 500kg. The Project then considered potential launch sites and operations with this model, concluding that, whilst many potential sites could be utilised, those that required a variation in azimuth during the launch (i.e. a "dog-leg") to avoid the overflight of populated areas would incur a corresponding payload weight trade-off.

The expansion of these arguments is outlined within Section 5 of the report, which sets out the criteria against which proposed locations were assessed.[8] The report opined that the North of Scotland is the only feasible launch region in the British Isles, proffering 3 of the most promising sites.[9]

The report concluded that, "[c]onsidering only the payload mass deliverable to orbit, a site in the Shetland Isles was determined as the best location in the UK to launch from as the trajectory avoids the populations in the Faroe Islands and Iceland".[10]

It must be emphasised that the SaxaVord Spaceport requires an airspace design that will deliver a suitable launch area that can accommodate multiple (and future) users and the fullest identified range of orbital and sub-orbital launch operations and LVs. Of equal importance is that the space industry and, in turn, LVs continue to mature, which could have a corresponding impact on the evolution of SaxaVord's airspace design. The current identified safe launch azimuths from SaxaVord are orbital 330-030° True and suborbital 360° True.

Accordingly, SaxaVord will present options that address the Statement of Need and align with the Stage 1 DPs, acting on the constraints identified by both the Change Sponsor and the SCEPTRE Report and the recommendations of the latter to ensure that current and future launch operation requirements can be accommodated. This approach aligns with the requirements of CAP1616, Para 127.

7. Sceptre Report (2017), Demios Space UK Ltd, Page 2 (online). Accessed online on 12 Jul 22.
8. *id*, Pages 20 & 21.
9. *ibid.*
10. *id*, Page 27.

9. Design Options Development

As a result of the foregoing, the following design options were taken forward to be tested with the application's identified stakeholders; each option has a description of what it seeks to achieve:

9.1. Design Option 1 - *Airspace Reservation (Non-segmented)*

Description.

An "Airspace Reservation (Non-segmented)" design option seeks to establish an airspace reservation of defined dimensions to encompass the fullest identified range of orbital and sub-orbital launch operations The whole airspace volume would be activated by NOTAM for the minimum period necessary to facilitate spaceport launch operations.

9.2. Design Option 2 - *Airspace Reservation (Segmented)*

Description.

An "Airspace Reservation (Segmented)" design option seeks to establish an airspace reservation of defined and proportionate dimensions that could be tailored to the performance characteristics of any specific LV seeking to utilise the SaxaVord Spaceport for a specific launch. Such airspace would be activated by NOTAM for the minimum period necessary to facilitate spaceport launch operations.

ACP-2017-079 STAKEHOLDERS

10. Identification of Application's Stakeholders.

Building on its earlier stakeholder engagement activity, SaxaVord established a list of local, national and international aviation stakeholders likely to be impacted by the airspace change application and its subsequent activation and operation. This stakeholder identification activity was augmented by data and information supplied by CAA.

Acknowledging the geographical location of the launch site relative to the mainland of the UK, no assumptions were made over the probability of direct or indirect impact on national UK stakeholder groups; all stakeholders were considered equally. For each stakeholder, a primary point of contact (POC) was established and, where possible, this has included a name and email address, as a minimum.

CAA, although recognised as a principal stakeholder, was not engaged directly, *per se*, in the CAP1616 process requirements.

MODUK (DAATM) confirmed that they would act as the lead stakeholder, engaging on behalf of all elements of MODUK.

NATO Air Command was added as a stakeholder who were not engaged in Stage 1.

EUROCONTROL (Network Management (Space)), also recognised as a principal stakeholder, were not engaged directly, but copied into all unilateral emails to stakeholders. Informal discussions with EUROCONTROL were also undertaken at a number of points across Stage 2, and they undertook to be ready to support SaxaVord in international stakeholder consultation at Stage 3 ("Consult").

The complete list of the application's stakeholders is provided at Appendix 1.

11. Stakeholder Engagement Materials.

A common set of engagement materials was created to inform all stakeholders of the proposed airspace change and was accompanied by a corresponding questionnaire to elicit responses; engagement materials included:

- Introduction - Background, Context and Location.
- Stage 2 Engagement - Context & Purpose.
- Initial Airspace Design Options.
- Statement of Need and Design Principles (DPs).
- Request for Stakeholder Response (including a reminder that any questions pertinent to the Stage 2 engagement process and the proposed airspace design could be directed to SaxaVord).
- Conclusion.

On 1st September 2022, the engagement materials were lodged on the application's ACP portal with a corresponding stakeholder response proforma to facilitate stakeholder Stage 2 responses.

A copy of the engagement materials is at Appendix 2.

12. Stakeholder Response Proforma.

CAP1616 Stage 2 requires sponsor to test their proposed airspace design options against the agreed Stage 1 DPs. Accordingly, questions contained within the corresponding stakeholder response proforma were offered as "closed questions", specifically to elicit binary responses. SaxaVord was keen to highlight to stakeholders that the opportunity for more interrogative dialogue would be available in Stage 3.

SaxaVord remains acutely aware of the risk of stakeholders becoming "fatigued" by repeated requests for engagement and consultation - from ACP-2021-058, ACP-2021-090 and this application. Indeed, dialogue with some stakeholders reinforced this observation.

SaxaVord was keen to ensure that all parties were aware of the application to which the Stage 2 process applied and that discussions and engagement did not become confused with other ACP applications.

The response proforma also reminded stakeholders that any questions pertinent to the Stage 2 engagement process and the proposed airspace design could be directed to SaxaVord at any point in the engagement timeline.

A copy of the Stage 2 response proforma is at Appendix_3.

13. Stakeholder Engagement.

All stakeholders (aviation and non-aviation) were sent an initial email, outlining - *inter alia* - the reason for SaxaVord's engagement and containing links to the engagement materials and response proforma. SaxaVord also highlighted in this email (and in the corresponding engagement materials) that all stakeholders would be afforded the opportunity of more detailed consultation in Stage 3 ("Consult") of the CAP1616 process.

In addition, the email to all stakeholders reminded them that any questions pertinent to the Stage 2 engagement process and the proposed airspace design could be directed to SaxaVord at any point in the engagement timeline.

A copy of this initial email is at Appendix_4.

"Priority" Stakeholders.

Drawing upon its engagement associated with a concurrent ACP application (ACP-2021-090), SaxaVord identified a sub-set of aviation stakeholders with whom SaxaVord sought to conduct more proactive engagement at Stage 2 of this application.

Whilst this "follow-on" engagement with this sub-set of stakeholders might be seen to be straying beyond CAP1616's Stage 2 engagement requirements, SaxaVord considered it prudent to engage this cohort subsequently and proactively, identifying that many of them would seek to discuss related matters in more detail than that required - *nominally* - at Stage 2.

In addition, the email to all stakeholders reminded them that any questions pertinent to the Stage 2 engagement process and the proposed airspace design could be directed to SaxaVord at any point in the engagement timeline.

A copy of the follow-up email to this cohort of stakeholders is at Appendix_5.

14. Management of Stakeholder Responses.

All stakeholders were afforded the opportunity to refer questions pertinent to Stage 2 of the ACP to a dedicated email address, and stakeholder responses and completed proformas were requested by 1200 on Friday 23rd September 2022.

In managing stakeholder responses, SaxaVord:

- Employed MS Outlook tracking tools to monitor delivery and read notifications and recorded the same in MS Excel.
- Responded to non-delivery notifications, following-up with the relevant organisation and a subsequent point of contact sought with whom SaxaVord could engage.
- Logged the receipt of response proformas, sending an acknowledgement email to the respondent; responses without a corresponding proforma were actioned similarly.
- Stored response proformas within the AVISU file management system (secured by 2FA).
- Collated data from response proformas into a corresponding spreadsheet for subsequent analysis.

15. Summary of Stakeholder Feedback.

Six completed response proformas were received, logged and recorded. Stakeholder response data is provided at Appendix 6 and copies of the received response proformas are contained at Appendix 7.

Some respondents included narrative comments accompanying their completed proformas, which added both context and amplification. It was felt that a number of "Unsure" responses to individual proforma questions from respondents should be clarified. SaxaVord undertook this latter activity across the period 4-11 November 2022.

15.1. Danish Ministry of Transport (Encompassing Danish CAA)

The response proforma from the Danish Ministry of Transport (encompassing the Danish CAA) included "Unsure" responses to all questions set.

Supplementary commentary in the corresponding email cited that "it [was] not possible for us to know if the two options [satisfied] the need for airspace reservation", but that "[a]ll the design principles [seemed] common and should apply to both options. The email opined further that "[f]rom a flexible

use of [*sic*] airspace perspective "[Design O]ption two" should be preferred as it establishes the minimum airspace reservation relevant for an individual launch".

Despite the prevalence of "Unsure" responses submitted, the supporting narrative offered sufficient detail upon which to analyse the response for the purposes of Stage 2. A subsequent telephone call between SaxaVord and the Danish Ministry of Transport reinforced that the latter looked forward to further detail and associated discussion(s) at Stage 3.

The completed Danish Ministry of Transport response proforma is at Appendix 7.

15.2. Loganair.

The response proforma from Loganair included a "Disagree" response to Design Option 1 DP3 and an "Unsure" response for DP2 and DP4; for Design Option 2, an "Unsure" response for DP9 and DP10.

A subsequent telephone conversation between SaxaVord and Loganair POC clarified the following:

Design Option 1. Loganair sought more information about operating characteristics of LVs to offer a more considered response to DP2 and required more information and discussion (acknowledged that would come with Stage 3) for DP4. Loganair's "Disagree" at DP3 reflected the fact that a segmented and more flexible airspace design was proffered at Design Option 2.

Design Option 2. The "Unsure" at DP9 and DP10 reflected Loganair's belief that Design Option 2 was more flexible, but potentially could be more intricate to notify and coordinate than Design Option 1. Loganair felt that this could lead to involved LOA/MOUs and liaison with ongoing and continuing airspace management and policies.

Stage 3. The Loganair POC was familiar with the CAP1616 process and looked forward to further detail and discussing these and related matters in Stage 3.

The completed Loganair response proforma is at Appendix 7.

15.3. MOD - Defence Airspace and Air Traffic Management (DAATM).

The response proforma from MOD(DAATM) included a "Disagree" response to Design Option 1 DP2 and "Unsure" response for DP7 and DP10; for Design Option 2, an "Unsure" response for DP7.

Subsequent dialogue between SaxaVord and MOD(DAATM) POC clarified the following:

Design Option 1. MOD(DAATM) confirmed that DP2 had been annotated "Disagree", when this should have been DP3; MOD(DAATM)'s (now) "Disagree" at DP3 reflected the fact that a segmented and more flexible airspace design was proffered at Design Option 2. The "Unsure" at DP7 reflected MOD's lack of sight of the ongoing activities and discussions between SaxaVord and international partners.

Design Option 2. The "Unsure" at DP7 reflected MOD's lack of sight of the ongoing activities and discussions between SaxaVord and international partners. SaxaVord offered MOD(DAATM) POC an overview of those international airspace agencies with whom SaxaVord was discussing the ACP and associated design options. The change of DP10 from "Unsure" to "Agree" between Design Options 1 and 2 reflected MOD(DAATM)'s acknowledgement that a flexible segmented airspace construct could impact less on the wider UK airspace construct and associated management policies. On the latter point, MOD(DAATM) offered that this should indeed be the topic of further discussions with the UK's Airspace Management Cell (AMC).

Stage 3. MOD(DAATM) POC indicated their familiarity with the CAP1616 process and looked forward to further detail and discussing these and related matters in Stage 3, in particular,

ongoing discussions associated with notification, coordination and LOAs and MOUs between the relevant parties.

The completed MOD(DAATM) response proforma is at Appendix 7.

15.4. NATS.

The response proforma from NATS included "Unsure" responses across all questions set for both Design Options.

The accompanying email offered further narrative comments against both Statement of Need and individual DPs. Whilst their comments indicated broad support for the aim of the individual DPs, NATS felt that more information was required before offering more definitive responses.

In addition, NATS stated that they "[…] need assurance via the CAA approvals processes that the airspace structure is sized appropriately for the rocket(s) so as to provide the necessary levels of safety while avoiding unnecessary disruption to other airspace users".

Despite the prevalence of "Unsure" responses submitted, the supporting narrative offered sufficient detail upon which to analyse the response for the purposes of Stage 2.

The completed NATS response proforma and accompanying email are at Appendix 7.

15.5. NHS Scottish Ambulance Service.

The response proforma from the NHS Scottish Ambulance Service included no individual responses to the questions set; thus, it was a notated as a "Nil Response".

Supplementary comments to their proforma indicated that whilst they did not feel suitably qualified to answer, "the [DPs appeared] to cover most things" and that Scottish Ambulance Service"[could] get into more detail around land ambulance access and RVPs etc in [S]tage 3".

Throughout Stage 2 - and, indeed, ACP-2021-090 stakeholder engagement activities - establishing a fixed and consistent POC within the NHS Scottish Ambulance Service organisation has been a challenge.

A request for clarification was sent by email and a number of telephone calls were attempted; neither was answered. This served as a salient reminder for subsequent consultation activities at Stage 3.

The completed NHS Scottish Ambulance Service response proforma is at Appendix 7.

15.6. Unst Partnership Ltd.

The Unst Partnership Ltd response proforma cited agreement to both options meeting all of the DPs.

The completed Unst Partnership Ltd response proforma is at Appendix 7.

15.7. Non-response Proforma Feedback.

Summary of respondents offering feedback by email without a completed proforma.

British Gliding Association.

A completed response proforma was not received from the British Gliding Association; in an email response, however, they cited that "[they did] not anticipate that this proposal will have an impact on gliding activity and operations in the UK".

Iceland (ICETRA & Isavia).

A completed response proforma was not received from ICETRA and Isavia. Informal discussion between SaxaVord and ICETRA and Isavia, however, took place on Tue 20 Sep 22.

During that discussion, ICETRA and Isavia POCs opined that they had no direct input into Stage 2 and that they would be more interested in Stage 3 ("Consult"), where they hoped to be able to discuss the concomitant ASM notification and coordination and associated memoranda of understanding and letters of agreement.

Northern Lighthouse Board.

A completed response proforma was not received from the Northern Lighthouse Board (NLB); in an email response, however, they cited that they "[were] supportive of the proposed activities and [had] forwarded [SaxaVord's] consultation request to [NLB's] aircraft supplier (PDG Helicopters) to ensure [NLB were] appropriately represented.

NLB concluded by offering that "[they looked] forward to [SaxaVord's] Stage 3 stakeholder consultation in due course".

PDG Aviation were a bilateral stakeholder on the initial email tranche; no response was received.

NATO (Air Comd) - CAOC Uedem.

A completed response proforma was not received from NATO (Air Comd (CAOC Uedem)); in an email response, however, they cited that they would "reach out internally to [their] various departments to ensure [NATO provides] a complete response". NATO further opined that discussion between NATO and SaxaVord POCs would be appropriate.

A subsequent email exchange between SaxaVord and NATO POC confirmed both the availability of SaxaVord POCs for a bilateral discussion on the Stage 2 materials and confirmed the MOD contacts with whom SaxaVord had been engaging.

A subsequent response was not received.

16. Analysis of Stakeholder Feedback.

In broad terms, both proffered options were viewed as acceptable when tested with relevant stakeholders; however, some respondents were unsure about each design's ability to address the Statement of Need and align with the defined DPs.

From the proformas received, SaxaVord was able to extract associated data for analysis; this data is provided at Appendix 6. Where provided, empirical response proforma data was augmented by supporting narrative comments from certain stakeholders, as outlined in Para 15, above.

Statistically, the following data was collated:

	Agree	Disagree	Unsure	Nil Response	Total
Design Option 1	40.91%	3.03%	39.39%	16.67%	100.00%
Design Option 2	45.45%	0.00%	37.88%	16.67%	100.00%

Table 1 - Stakeholder Response Data

The received data indicated that both design options received a majority agreement, when tested with relevant stakeholders; moreover, the data demonstrated greater stakeholder support for Design Option 2. The latter point can be further evidenced by those "Disagree" responses (one for DP2 (Environment) and one for DP3 (Airspace Management) moving to "Agree").

Whilst an observed reduction in "Unsure" responses from Design Option 1 to Design Option 2 was welcomed, the corresponding shift placement of those responses appeared irregular; one response offered "Agree" to DP9 and DP10 for Design Option 1, but moved to "Unsure" for the same DPs for Design Option 2. DP9 and DP10 can be seen to reflect the forthcoming discussion in Stage 3

("Consult") and, indeed, the wider consideration for the UK space industry within the UK existing airspace construct, *vice* clear determinants for the viability of the proposed design options, *per se*.

As can be seen from the foregoing summaries of stakeholder narrative comments at Para 15, above, those stakeholders responding during Stage 2 are keen to become not only exposed to more detail surrounding the related air traffic and safety analyses that continue to inform the evolving proposed airspace design, but also the notification, coordination and airspace management procedures and processes essential to the pragmatic management of the airspace volume and its influence on the behaviour of the wider airspace network.

Direct engagement with stakeholders, prompted either by the offer of dialogue[11] or through their established relationship with the SaxaVord team, highlighted a level of frustration on the part of some stakeholders with Stage 2 of the CAP1616 process and not being able to get into the requisite detail associated with the application (see Para 15.7, above).

It is clear that the application's stakeholders are ready to engage in more detailed discussion and consultation associated with the notification, coordination and airspace management procedures and processes relative to the proposed airspace design, which SaxaVord is ready to embark upon at Stage 3 - where SaxaVord anticipates a greater level of stakeholder engagement and response.

The analysis of stakeholder feedback indicates that the outcome of Stage 2A is that, at this stage of the CAP1616 process, the proffered design options did not need further refinement and could progress to Stage 2B - Initial Options Appraisal

11. SaxaVord offered all stakeholders the opportunity to submit questions pertinent to Stage 2 of the application in Stage 2 engagement materials, response proforma and in related email correspondence. See Appendices 2, 3, 4 and 5.

DESIGN PRINCIPLE EVALUATION

17. ACP-2017-079 Design Principles.

The ACP-2017-079 DPs were agreed following engagement with representative stakeholder groups as part of CAP1616 Stage 1. DPs and their relative priorities are shown in Table 2, below.

DP	Category	Design Principle	Priority
1	Safety	The safety of other airspace users and the public is the paramount DP to be used in this ACP.	A
2	Environment	The environmental and noise effects of rocket launch should be minimised by the design of the airspace change.	A
3	Airspace Management (ASM)	The airspace volume should be as small as possible to minimise the impact on and ensure the safety of other airspace users.	B
4	ASM	The duration of the airspace activation should be the minimum required to minimise the impact on and ensure the safety of other airspace users. The possible impact of concurrent operations of other airspace should be considered.	B
5	ASM	Airspace notification should be timely and accurate within an established method of rapid notification.	A
6	ASM	A process to allow some special airspace users to enter the airspace safely and halt operations should be established.	A
7	ASM	Other international airspace agencies should be included in the airspace design process.	B
8	Regulation	Airspace design should meet duties and requirements of other public agencies placed upon SSC.	B
9	ASM	Letters of agreement and memoranda of understanding will be developed, if required, between relevant parties.	A
10	ASM	The airspace change will take account of ongoing and continuing airspace management and policies.	B

Table 2 - ACP-2017-079 Design Principles

18. DP Evaluation Methodology.

Design Principle		How the DP is to Be Evaluated	Met	Partially Met	Not Met
			The text contained within the cells below corresponds to the summary qualitative assessment for the relevant DP in Tables 3 and 4, below.		
DP1	Safety	The airspace design is sufficient to protect launch operations from other airspace users and *vice versa*.	No safety concerns at this Stage.	Additional work might be required to generate acceptable safety argument(s), but this is believed to be achievable.	Acceptable safety assurances unlikely to be met and therefore option must be reconsidered.
DP2	Environment (Including Noise)	The airspace design minimises environmental and noise effects associated with launch and spaceport operations.	Minimal environmental and noise effects.	Additional evidence required to support assessment of environmental and noise effects associated with launch operations.	Unacceptable level(s) of environmental and noise effects.
DP3	Airspace Management (ASM) - Volume	The airspace design volume is the minimum possible, thereby reducing potential impact on other airspace users.	Airspace design volume is the minimum possible.	Airspace design could be further tailored to reduce impacts on other airspace users.	Unacceptable impact on other airspace users.
DP4	ASM - Duration	The airspace design is such that it enables the activation duration to be the minimum required to support launch and spaceport operations.	Airspace design minimises the duration of activation.	Airspace design could be further tailored to reduce the duration of activation.	The airspace design is such that it does not enable an acceptable minimum activation to support launch operations.
DP5	ASM - Notification	The airspace design is such that it enables the timely and accurate notification of activation (e.g. NOTAMs).	Airspace design is such that it enables timely and accurate.	Airspace design could be further tailored to support the timely and accurate notification of activation.	The airspace design is such that it does not enable the timely and accurate notification of activation.
DP6	ASM - Coordination of Access	The airspace design is such that it enables procedures to support access to agreed special users under appropriately managed and specified conditions (e.g. processes to permit halt/check-fire of launch operations for specific priority access to the airspace volume).	Airspace design is such that it supports managed access to agreed special users under prescribed and agreed circumstances.	Airspace design could be further tailored to support managed access to agreed special users under prescribed and agreed circumstances.	The airspace design is such that it does not enable managed access to agreed special users under prescribed and agreed circumstances.

Design Principle		How the DP is to Be Evaluated	Met	Partially Met	Not Met
DP7	ASM - International Coordination	The airspace design process includes relevant international aviation authorities and air navigation service provider (ANSP) organisations.	The airspace design process includes relevant international aviation authorities and ANSPs.	Airspace design process could be further tailored to include relevant international aviation authorities and ANSPs.	The airspace design process is such that it does not include relevant international aviation authorities and ANSPs.
DP8	Regulation - Process	The airspace design process enables SaxaVord to meet the relevant duties and requirements placed on them by other public agencies.	The airspace design process enables SaxaVord to meet the relevant duties and requirements placed on them by other public agencies.	Airspace design process could be further tailored to enable SaxaVord to meet the relevant duties and requirements placed on them by other public agencies.	The airspace design process is such that it does not enable SaxaVord to meet the relevant duties and requirements placed on them by other public agencies.
DP9	ASM - Operational Coordination	The airspace design process enables the development and signature of letters of agreement (LOAs) and memoranda of understanding (MOUs) between SaxaVord and the relevant parties.	The airspace design process enables the development and signature of LOAs and MOUs between SaxaVord and the relevant parties.	Airspace design process could be further tailored to enable the development and signature of LOAs and MOUs between SaxaVord and the relevant parties.	The airspace design process is such that it does not enable the development and signature of LOAs and MOUs between SaxaVord and the relevant parties.
DP10	ASM - National ASM Planning	The airspace design considers extant relevant airspace management policies and processes and the potential impact on concurrent airspace activities.	The airspace design considers extant relevant airspace management policies and processes and the potential impact on concurrent airspace activities.	Airspace design process could be further tailored to consider extant relevant airspace management policies and processes and the potential impact on concurrent airspace activities.	The airspace design process is such that it does not consider extant relevant airspace management policies and processes and the potential impact on concurrent airspace activities.

Table 3 - ACP-2017-079 DP Evaluation Methodology

19. Design Principle Evaluation

Design Option 1 - Airspace Reservation (Non-segmented)				
An "Airspace Reservation (Non-segmented)" design option seeks to establish an airspace reservation of defined dimensions to encompass the fullest identified range of orbital and sub-orbital launch operations. The whole airspace volume would be activated by NOTAM for the minimum period necessary to facilitate spaceport launch operations.				
		Met	Partially Met	Not Met
DP1	Safety	✓		
DP2	Environment (Including Noise)	✓		
DP3	Airspace Management (ASM) - Volume		✓	
DP4	ASM - Duration	✓		
DP5	ASM - Notification	✓		
DP6	ASM - Coordination of Access	✓		
DP7	ASM - International Coordination	✓		
DP8	Regulation - Process	✓		
DP9	ASM - Operational Coordination	✓		
DP10	ASM - National ASM Planning	✓		

Table 4 - ACP-2017-079 Design Option 1 DP Evaluation

Design Option 2 - Airspace Reservation (Segmented)				
An "Airspace Reservation (Segmented)" design option seeks to establish an airspace reservation of defined and proportionate dimensions that could be tailored to the performance characteristics of any specific LV seeking to utilise the SaxaVord Spaceport for a specific launch. Such airspace would be activated by NOTAM for specified periods.				
		Met	Partially Met	Not Met
DP1	Safety	✓		
DP2	Environment (Including Noise)	✓		
DP3	Airspace Management (ASM) - Volume	✓		
DP4	ASM - Duration	✓		
DP5	ASM - Notification	✓		
DP6	ASM - Coordination of Access	✓		
DP7	ASM - International Coordination	✓		
DP8	Regulation - Process	✓		
DP9	ASM - Operational Coordination	✓		
DP10	ASM - National ASM Planning	✓		

Table 5 - ACP-2017-079 Design Option 2 DP Evaluation

STAGE 2B - INITIAL OPTIONS APPRAISAL

20. Initial Options Appraisal Requirements

As defined in CAP1616[12], Step 2B requires the change sponsor to carry out an 'Initial' appraisal of the impacts of each of the viable options identified in Step 2A, using the design criteria (i.e. the DPs) against which the options are being assessed. The initial options appraisal should, as a minimum, contain qualitative assessments of the different options, which highlights to change sponsors, stakeholders and the CAA the relative differences between the impacts, both positive and negative, of each option. The change sponsor assesses each option against a 'do nothing' scenario (the 'counterfactual'), even where there is only a single change option, to understand these impacts.

SaxaVord recognises that considering any airspace design option that does not include a proportionate airspace reservation to protect airspace users from the proposed launch operations at SaxaVord (and *vice versa*) is untenable; consequently, a "do nothing" option was not presented to stakeholders, as it neither addressed the Statement of Need, nor did it align with the DPs.

20.0. Extant Baseline.

Unlike an airspace change at a UK aerodrome, there is no extant operation to refer to as an operational baseline; thus, there is no operational *status quo* to maintain. The baseline "position", therefore, is the identified prevailing traffic/network situation at a given time.

The SaxaVord site (and its immediate surroundings) resides wholly within UK Class G airspace, which in turn sits underneath UK Class C airspace. Proposed launch activities and airspace design would, therefore, extend from SFC to UNLTD, through Classes G and C airspace, for specific notified periods and beyond the lateral limits of the UK FIR and Upper Information Region UIR. Above FL195 (i.e. 19,500ft AMSL), commercial air traffic operates under the principle of "Free Route Airspace", which allows flights to route direct, *vice* following prescribed routes (i.e. airways and upper air routes) along pre-determined navigation points.

SaxaVord analysed a year's ADS-B surveillance data to establish a pre-COVID-19 baseline traffic assessment; the data covered the period January to December 2019 and represented the last whole-year data set prior to the observed impact of the pandemic on global aviation.

The area of interest (AOI), shown at Figure 2, below, allowed SaxaVord to consider a wide airspace and air traffic movements context, before considering the potential impacts of the proposed airspace designs in a more focused AOI. The comparison between the 2 and the subsequent assessment of potential impacts are expanded upon in Appendix 8.

12. CAP1616, Page 41, Para 133.

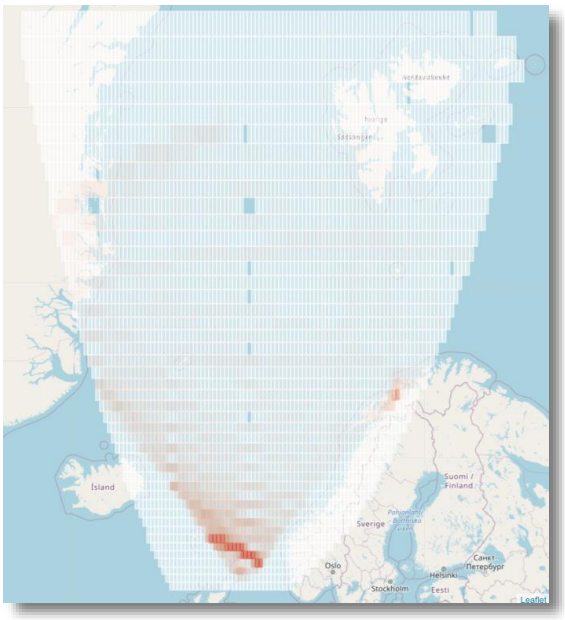


Figure 2 - ADS-B 2019 AOI Traffic Heat Map

The data covered all three ADS-B out transponder versions (0, 1 and 2). Additionally, Eurocontrol traffic monitoring data showed that, overall, the aircraft fleet operating within the EU with at least one of these ADS-B versions is approximately >90% of all its monitored traffic. Furthermore, related discussions with NATS confirmed the low incidence of visual flight rules (VFR)/general aviation (GA) traffic within the area around the Shetland Islands. As such, the data sample can be seen to be of sufficiently high fidelity for the purpose of establishing a baseline position.

Over the year, approximately 30,000 aircraft transited the AOI (Figure 2), predominantly in an east-west orientation. Unsurprisingly, the traffic analysis identified seasonal variations, i.e. higher traffic levels in summer months and reduced levels in winter months. SaxaVord identified that the majority of traffic within the wider AOI operated at FL200 and above.

Analysing daily traffic data within the wider sample, SaxaVord identified that for each 24-hour period that a maximum of 191 flights transited the AOI in Figure 2; within this daily data set, SaxaVord identified that the maximum no of flights within any one hour was 28.

Superimposing the proposed airspace design area onto the wider AOI produced a more local AOI, depicted by the reddened area in Figure 3, below.

Figure 3 - Proposed Design Option Area (in Red) Compared With the Traffic Assessment Area (in White)

More detailed analysis of this local AOI, identified a peak day and hour, during which a maximum of 10 flights could be impacted by the activation of the proposed design options. These 10 flights were identified to be at or above FL320 and there was no re-route noise impact at 7,000ft or below and no material change to routes and/or traffic patterns below 7,000ft.

The subsequent assessments of the proposed design options and their potential traffic, noise and environmental impacts, therefore, assume 10 potentially impacted flights as a baseline position.

A quantitative summary of the complete baseline traffic assessment and the potential traffic and environmental impacts is provided at Appendix 8.

20.1. Design Option 1 - *Airspace Reservation (Non-segmented)*

Description.

An "Airspace Reservation (Non-segmented)" design option seeks to establish an airspace reservation of defined dimensions to encompass the fullest identified range of orbital and sub-orbital launch operations. The whole airspace volume would be activated by NOTAM for the minimum period necessary to facilitate spaceport launch operations.

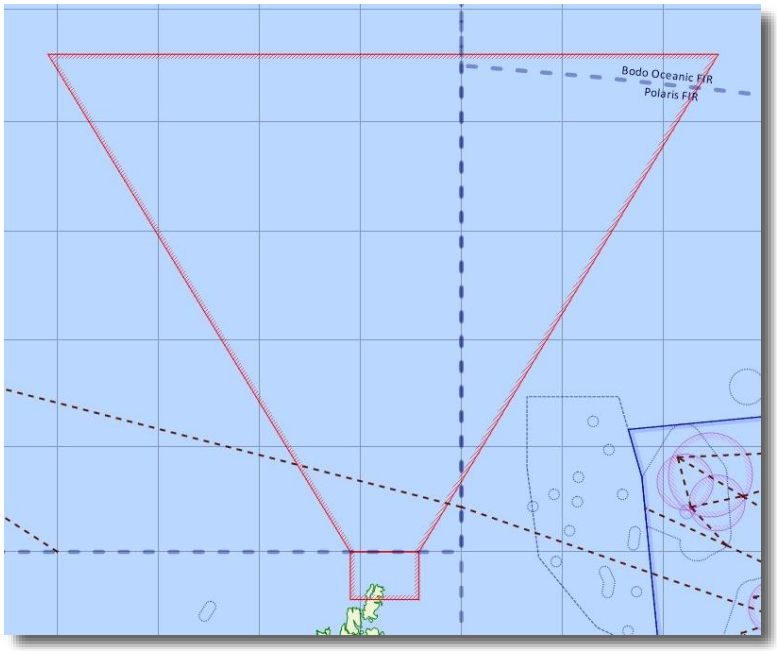


Figure 4 - Design Option 1 - Airspace Reservation (Non-segmented)

Table-top Analysis of Potential Impacts.

Design Option 1 meets the overarching Statement of Need and, as set out at Table 4, above, meets all but one of the DPs in full; Design Option 1 meets DP3 partially.

Design Option 1 offers a large and fixed volume of airspace for the conduct of vertical space launch operations at SaxaVord.

Design Option 1 would see the whole of the airspace volume closed to other airspace users, regardless of any reduced airspace requirement associated with a specific launch profile or LV.

SaxaVord analysed a year's ADS-B surveillance data to establish a pre-COVID-19 baseline traffic assessment, from which to identify potential impacts of Design Option 1 on the network. Impacted traffic in the vicinity of Design Option 1 was observed to be at FL320 and above and there was no re-route noise impact and no material change to routes and/or traffic patterns at and below 7,000ft

A peak hour of a peak day was identified and, during that epoch, 10 flights could be impacted by Design Option 1. Within that sample, flight route variations were observed to be between -19km and +31km and the combined variation across all 10 flights was observed to be +18km; +31km could translate to a variation of +4.929 tonnes of CO2 emissions.[13] The flight distance from Athens to Newark is approximately 8000km; an extension of 31km would, therefore, correspond to an increase of <0.4%, which could be considered negligible.

To establish a baseline position, from which to assess potential impacts of the activation of the airspace, SaxaVord assumed all 10 flights were a distance of 8,000km on 30 instances (i.e. SaxaVord proposed launches per annum) and that SaxaVord selected the peak hour of the peak day. The baseline flight distance and tonnage of CO2 emissions for these 10 flights was established as 2,4000,000km and 305,280tonnes, respectively.

SaxaVord observed the worst-case route extension of 31km for one flight, but assumed a 30km route extension (for ease of interpretation) to ALL flights and extrapolated this across 30 instances (i.e. SaxaVord launches); the annual impacts for flight distance and CO2 emissions could be shown to

13. CAP1616a, Page 24, Para 1.8 (online). Accessed on 2 Dec 22. Defined further at Appendix 8.

increase by 9,000km and 1,145tonnes, respectively, representing a 0.375% increase in both metrics above the measured baseline calculations.

The potential environmental impact of flight re-routes associated with the activation of Design Option 1 is provided at Appendix 8; further commentary is also provided at Appendix 11. The analysis did not, however, consider Eurocontrol modelling and the identification of suitable launch window(s) to minimise impact on the airspace/ATM network, while satisfying specific launch requirements.

SaxaVord, therefore, concludes that, in even the most limiting case, the wider network could incorporate the activation of the proposed airspace design with minimal/negligible impact on the baseline prevailing traffic scenario.

Operational management, notification and coordination procedures would be discussed with the relevant parties during Stage 3 and beyond and reviewed and, where necessary, revised post-implementation.

Initial Safety Analysis.

The Initial Safety Statement is at Appendix 9. The initial safety assessment and corresponding arguments for ACP-2017-079 Design Option 1 have concluded that:

- All identified hazards could be mitigated to as low as reasonably practicable (ALARP).
- Given airspace analysis and proposed duration of launches, any impact to airspace users is minimal and manageable.

In line with CAP1616 requirements, detailed safety requirements continue to be developed, supported and informed by parallel activities associated with SaxaVord's temporary airspace reservation application (ACP-2021-090); once matured, these detailed safety requirements will be articulated more fully during Stages 3 and 4.

Initial Option Assessment.

Design Option 1:

- Addresses the Statement of Need.
- In principle, aligns with the DPs.
- Notwithstanding the foregoing, Design Option 1 could be seen to have more impact on other airspace users than Design Option 2 by only partially meeting DP3.
- A corresponding version of CAP1616 Table E2 for Design Option 1 is at Appendix 11.

20.2. Design Option 2 - Airspace Reservation (Segmented)

Description.

An "Airspace Reservation (Segmented)" design option seeks to establish an airspace reservation of defined and proportionate dimensions that can be tailored to the performance characteristics of any specific LV seeking to utilise the SaxaVord Spaceport for a specific launch. Such airspace would be activated by NOTAM for the minimum period necessary to facilitate spaceport launch operations.

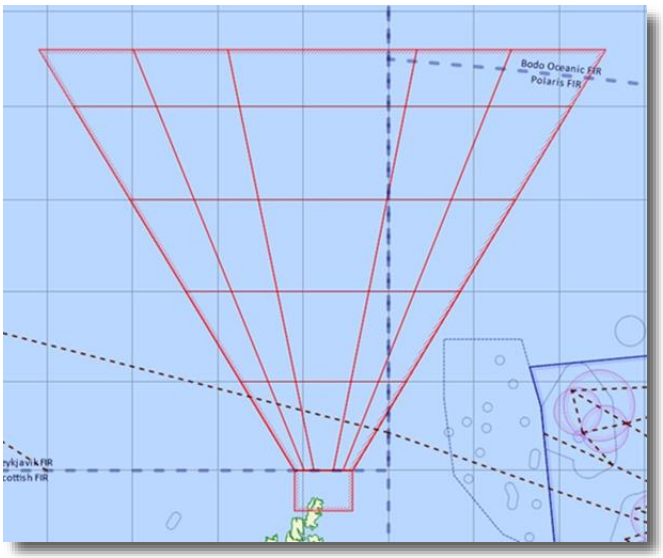


Figure 5 -Design Option 2 - Airspace Reservation (Segmented)

Table-top Analysis of Potential Impacts.

Design Option 2 meets the overarching Statement of Need and, as set out at Table 5, above, meets all DPs in full.

When the whole (i.e. non-segmented) airspace construct of Design Option 2 is activated, the traffic, environmental and safety impacts are identical to those of Design Option 1; however, Design Option 2 offers the flexibility to tailor an airspace volume to a specific LV's operating characteristics and/or orbital trajectory requirements. As such, Design Option 2 reduces - to as a low as reasonably practicable - the airspace requirements for individual launch operations, in turn, minimising impact on the network and other airspace users.

In even the most limiting case, the wider network could incorporate the activation of the proposed large and fixed airspace volume of Design Option 1; therefore, it follows that the largest combination of Design Option 2 could be accommodated similarly.

Critically, however, the flexibility to reduce the airspace volume of Design Option 2, commensurate with the specific LV characteristics and/or orbital requirements could deliver a reduced impact on the wider network and, therefore, traffic re-routes CO2 emissions.

The potential environmental impact of flight re-routes associated with the activation of Design Option 2 is discussed at Appendix 8; further commentary is also provided at Appendix 12

Operational management, notification and coordination procedures would be discussed with the relevant parties during Stage 3 and beyond and reviewed and, where necessary, revised post-implementation.

Initial Safety Analysis.

The Initial Safety Statement is at Appendix 9. When the whole airspace construct is activated, the safety impact of Design Option 2 is identical to that of Design Option 1. The initial safety assessment and corresponding arguments for ACP-2017-079 Design Option 2 have concluded that:

- All identified hazards could be mitigated to as low as reasonably practicable (ALARP).
- Given airspace analysis and proposed duration of launches, any impact to airspace users is minimal and manageable.

In line with CAP 1616 requirements, detailed safety requirements continue to be developed, supported and informed by parallel activities associated with SaxaVord's temporary airspace reservation application (ACP-2021-090); once matured, these detailed safety requirements will be articulated more fully during Stages 3 and 4.

Initial Option Assessment.

Design Option 2:

- Addresses the Statement of Need.
- Aligning with the defined DPs.
- Moreover, compared with Design Option 1, Design Option 2 could be seen to have a reduced impact on other airspace users, meeting the requirement of DP3 more fully.
- A corresponding version of CAP1616 Table E2 for Design Option 1 is at Appendix 12.

20.3. Comparison of Design Options

Table 6, below, offers a rudimentary comparison between the baseline position and Design Options 1 and 2.

Ser	Group	Impact	Baseline	Design Option 1	Design Option 2
1	Communities	Noise impact on health and quality of life	No change	Negligible	Negligible
2	Communities	Air quality	No change	Negligible	Negligible
3	Wider Society	Greenhouse gas impact	No change	Negligible	Potentially less negligible
4	Wider Society	Capacity/resilience	No change	No change	No change
5	General Aviation	Access	No change	No change	No change
6	General Aviation/ commercial airlines	Economic impact from increased effective capacity	No change	No change	No change
7	General Aviation/ commercial airlines	Fuel burn	No change	Negligible	Potentially less negligible
8	Commercial airlines.	Training costs	No change	No change	No change
9	Commercial airlines	Other costs	No change	No change	No change
10	Airport/ Air navigation service provider	Infrastructure costs	No change	No change	No change
11	Airport/ Air navigation service provider	Operational costs	No change	No change	No change
12	Airport/ Air navigation service provider	Deployment costs	No change	No change	No change

Table 6 - ACP-2017-079 Design Option Comparison Table

On inspection of the data, it can be drawn that any reduction in airspace volume afforded by the increased flexibility of Design Option 2 would offer a reduction in impact on the airspace network and, in turn, the traffic therein, producing corresponding reductions in fuel cost and burn and CO2 emission associated with any variance in flight tracks as a result of Design Option 2's activation.

20.4. Preferred Option

As a result of the foregoing, the initial options appraisal identifies that the design option that could be taken forward to Stage 3 is Design Option 2 - Airspace Reservation (Segmented).

Analysis of stakeholder feedback could be seen to favour a segmented airspace design; indeed, formal responses and related dialogue during Stage 2 engagement indicated strongly that stakeholders are

keen to engage in the Stage 3 consultation process and, in many cases, the associated discussion around airspace notification, coordination and management of the selected design.

It must be noted that the airspace design options contained within this document might evolve as the ACP process continues and options are matured and refined in accordance with - *inter alia* - safety requirements, design principles and, most importantly, stakeholder engagement and consultation at Stage 3.

As a result, and in line with the requirements of CAP1616, a full options appraisal will be undertaken at Stage 3 of the process, with the final appraisal being completed for Stage 4.

SUMMARY

21. The CAP1616 Stage 2 process requires that airspace change sponsors develop options for their proposed airspace change through a 2-stage approach. In line with this approach, at Stage 2A, SaxaVord developed 2 design options (Option 1 - Non-segmented and Option 2 - Segmented) and tested them with stakeholders to confirm that the options addressed the Statement of Need and aligned with the DPs from Stage 1.

22. At Stage 2B, SaxaVord carried out an initial option appraisal of the impacts of each of the viable options identified in Step 2A, using the design criteria (i.e. the DPs) against which the options were to be assessed. SaxaVord then undertook table-top analyses of both options to understand the potential impacts of each.

23. SaxaVord analysed surveillance data to establish a pre-COVID-19 baseline traffic assessment, from which to identify potential impacts of the proposed airspace design options on the network. Considering macro and micro levels of airspace volumes enabled context and comparisons to be drawn and the maximum potential number of flights that could be impacted by the designs were identified; this enabled the subsequent analyses of the potential impacts of re-routing flights and an initial assessment on environmental considerations.

24. A peak day and hour were identified and, during that epoch, 10 flights could be seen to be impacted by the activation of the proposed airspace design. The baseline flight distance and tonnage of CO2 emissions for these 10 flights was established as 2,4000,000km and 305,280tonnes, respectively.

25. Flight distances were observed to be impacted by between -19 and +31km. SaxaVord assumed an absolute worst-case scenario of an additional 30km for each flight. Extrapolating this extended flight distance across 10 flights and 30 instances (i.e. SaxaVord launches), the annual impacts for flight distance and CO2 emissions could be shown to increase by 9,000km and 1,145tonnes, respectively, representing a 0.375% increase in both metrics above the baseline. This analysis did not consider Eurocontrol modelling and the identification of suitable launch window; however, SaxaVord views these latter activities as key mitigation measures in minimising impact on the network.

26. SaxaVord, therefore, concludes that, even in a most limiting case, the wider network could incorporate the activation of the proposed airspace design with minimal/negligible impact on the baseline prevailing traffic scenario. Moreover, a proposed airspace design that enabled a reduced volume, commensurate with the launch profile and LV requirements, could be incorporated more readily, reducing impact further

27. As a result of the foregoing, the preferred design option to be taken forward to Stage 3 is Design Option 2 - Airspace Reservation (Segmented).

28. Finally, it must be noted that the airspace design options contained within this document might be subject to change as the ACP process continues and options are matured and refined in

accordance with - *inter alia* - safety requirements, design principles and, most importantly, stakeholder engagement and consultation at Stage 3.

List of Appendices

1. List of Stakeholders.
2. Stage 2 Engagement Materials.
3. Stage 2 Stakeholder Response Proforma.
4. Stage 2 Introductory Email to Stakeholders.
5. Stage 2 Follow-up Email to Priority Aviation Stakeholders.
6. Stage 2 Stakeholder Response Data.
7. Stage 2 Stakeholder Responses.
8. Stage 2 Network Traffic Analysis.
9. Environmental Metrics and Assessment Requirements.
10. Stage 2 Initial Safety Statement.
11. Table E2 - Design Option 1.
12. Table E2 - Design Option 2.

ATTACHMENTS

1. ITPEnergised (2022), "*SaxaVord Spaceport (ITPEnergised) AEE*", V2.1, dated 30 Sep 22. Chapter 8 ("*Noise and Vibration*").
2. ITPEnergised (2022), "*SaxaVord Spaceport (ITPEnergised) AEE*", V2.1, dated 30 Sep 22. Non-Technical Summary, Chapters 11 & 16.
3. ITPEnergised (2021), Shetland Space Centre, EIAR Chapter 15 ("Climate Change").

Appendix 1 to
ACP-2017-079 Stage 2 Submission
Dated 5 December 2022

ACP-2017-079 LIST OF STAKEHOLDERS

Avn/ Non-Avn	Organisation	Role/Title	Name	Email Address
Aviation	Aircraft Owners and Pilots Association (AOPA)			
Aviation	Airlines for Europe (A4E)	Generic Contact		
Aviation	Airport Operators Association (AOA)			
Aviation	Airspace Change Organising Group (ACOG)			
Aviation	Airspace4All (A4A)			
Aviation	Airtask (includes Direct Flight Ltd)	Head of Business Development and Safety		
Aviation	Association of Remotely Piloted Aircraft Systems UK (ARPAS-UK)			
Aviation	Aviation Environment Federation (AEF)			
Aviation	Avinor			
Aviation	Babcock International	Head of Flight Operations		
Aviation	Bristows Helicopters - Sumburgh			
Aviation	British Airways (BA)			
Aviation	British Balloon and Airship Club (BBAC)			
Aviation	British Business and General Aviation Association (BBGA)			
Aviation	British Glider Assoc (BGA)			
Aviation	British Hang-glider & Paraglider Assoc. (BHPA)			
Aviation	British Helicopter Association (BHA)	CEO		
Aviation	British Microlight Association (BMAA)			
Aviation	British Model Flying Association (BMFA)			

Avn/ Non-Avn	Organisation	Role/Title	Name	Email Address
Aviation	British Skydiving (BPA - Parachute Assoc)			
Aviation	CAA	Airspace Change Account Manager		
Aviation	Danish Armed Forces	Staff Officer Air Traffic Management		
Aviation	Danish Ministry of Transport			
Aviation	Eurocontrol			
Aviation	Flylogix	Ops Director		
Aviation	GAMA Aviation			
Aviation	General Aviation Alliance (GAA)			
Aviation	Helicopter Club of Great Britain (HCGB)			
Aviation	Highland & Islands Airports Limited (HIAL)			
Aviation	Honourable Company of Air Pilots (HCAP)	Generic Contact		
Aviation	Icelandic CAA			
Aviation	Isavia			
Aviation	Large Model Association (LMA)	LMA Secretary		
Aviation	Light Aircraft Association (LAA)			
Aviation	Loganair			
Aviation	MOD - Defence Airspace and Air Traffic Management (DAATM)	SO2 Airspace Plans, DAATM		
Aviation	NATO Air Comd	Static Air Defence Centre, CAOC UEDEM		
Aviation	NATS	Swanwick/Prestwick		
Aviation	Noordzee Helikopters Vlaanderen (NHV)			
Aviation	Norway CAA	Senior Inspector ATM		
Aviation	PDG Aviation			
Aviation	Shetland Flyer			
Aviation	Tingwall Airfield	AFISO		

Avn/ Non-Avn	Organisation	Role/Title	Name	Email Address
Aviation	UK Space Agency	Intl Space Flight Policy Advisor		
Non-Aviation	Compass Rose Charters			
Non-Aviation	Danish Ministry of Environment	Ocean Office/Mads Thelander, EU and International Office		
Non-Aviation	Govt of the Faroe Islands	Ministry of Environment, Industry and Trade		
Non-Aviation	Lamba Ness Common Grazings			
Non-Aviation	Lerwick Port Authority			
Non-Aviation	Maritime Coastguard Agency (MCA)	Station Cdr Shetland		
Non-Aviation	Met Office			
Non-Aviation	Ministry of Foreign Affairs of the Government of Greenland			
Non-Aviation	Natural Environment Research Council (NERC)	Generic Contact		
Non-Aviation	Northern Lighthouse Board	Generic Contact		
Non-Aviation	Norway - Royal Ministry of Trade, Industry and Fisheries, Research and Innovation Department (initially sole NOR POC)	Coordinator of response on future airspace and maritime activities		
Non-Aviation	Ocean Kinetics			
Non-Aviation	Offshore Petroleum Regulator for Environment & Decommissioning (OPRED)	Generic Contact		
Non-Aviation	North Sea Transition Authority (previously the Oil & Gas Authority)	Generic Contact		
Non-Aviation	Oil & Gas UK			
Non-Aviation	Police Scotland	Police Constable		
Non-Aviation	PURE Energy Centre			
Non-Aviation	RNLI	Generic Contact		
Non-Aviation	RSPB	Generic Contact		
Non-Aviation	NHS Scottish Ambulance Service	Lerwick Ambulance Service		

Avn/ Non-Avn	Organisation	Role/Title	Name	Email Address
Non-Aviation	NHS Scottish Ambulance Service (Air Ambulance)	NHS Health Scotland (Service Head of Air Ambulance)		
Non-Aviation	Scottish Govt (MSP Highland & Islands)	Wider Local MSP		
Non-Aviation	Scottish Govt (MSP Shetland)	Local MSP		
Non-Aviation	Scottish Natural Heritage			
Non-Aviation	Scottish Ornithologists' Club (SOC)	President		
Non-Aviation	Scottish Wildlife Trust			
Non-Aviation	Scottish Environmental Protection Agency (SEPA)			
Non-Aviation	Shetland Amenity Trust			
Non-Aviation	Shetland College/NAFC			
Non-Aviation	Shetland Fishermen's Association			
Non-Aviation	Shetland Islands Council	Ferries, airports and port engineering		
Non-Aviation	Shetland Oil Terminal Environmental Advisory Group (SOTEAG)			
Non-Aviation	UK Govt (MP Orkney & Shetland)			
Non-Aviation	UK Research & Innovation (UKRI)			
Non-Aviation	Unst Community Council	Clerk		
Non-Aviation	Unst Partnership Ltd	Chairman		

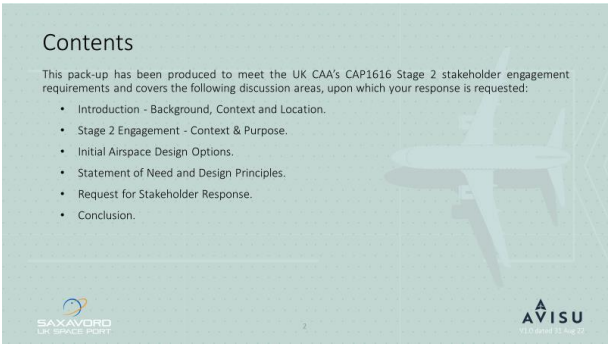
Table 7 - ACP-2017-079 Stakeholders

Appendix 2 to
ACP-2017-079 Stage 2 Submission
Dated 5 December 2022

STAGE 2 STAKEHOLDER ENGAGEMENT MATERIALS

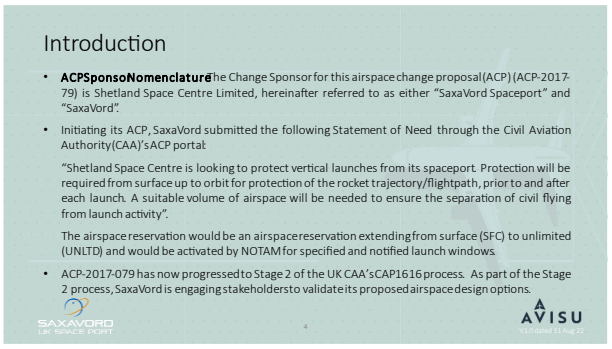
Slide 1

Slide 2



Slide 3

Slide 4



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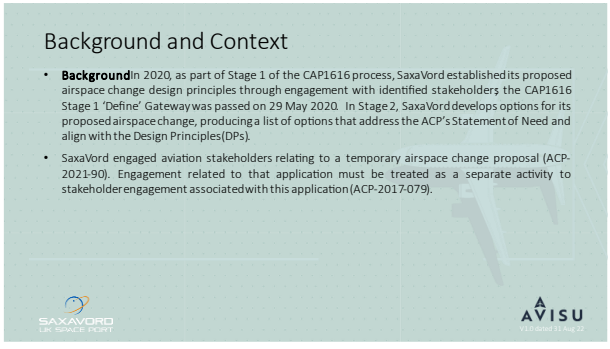

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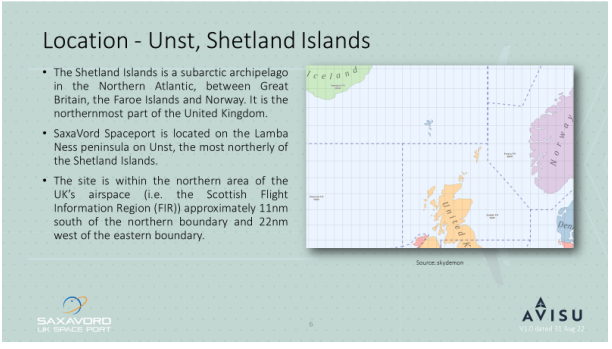

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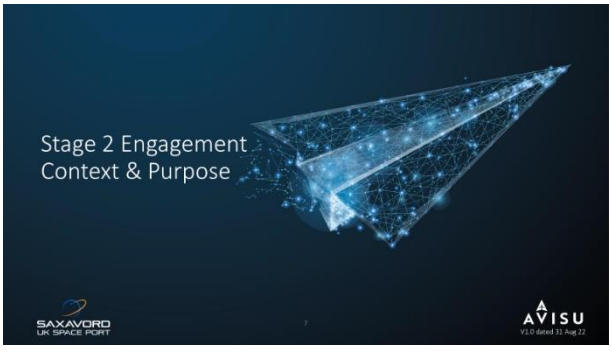
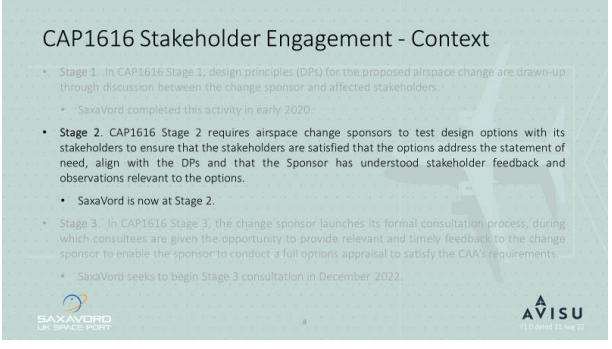


Slide 8



Slide 9

Purpose of CAP1616 Stage 2 Engagement

- CAP1616 Stage 2 requires airspace change sponsors to test design options with its stakeholders.
- Accordingly, these engagement materials set out SaxaVord's initial airspace design options and seek to confirm that stakeholders are satisfied that the options address the statement of need, align with the agreed DPs and that SaxaVord has understood stakeholder feedback and observations from Stage 1.
- SaxaVord will use stakeholders' Stage 2 responses to inform the subsequent Initial Options Appraisal.

Slide 10

Slide 11

Initial Airspace Design Options - Overview

- SaxaVord remains cognisant of stakeholder feedback from Stage 1. Since Stage 1, SaxaVord continues to discuss and progress with the relevant national and international organisations:
  - Letters of agreement/memoranda of understanding, including airspace notification and coordination and emergency and airborne security-related short-notice access procedures.
  - Identification of suitable launch windows of the minimum duration required (in the order of a few hours), ensuring that any impact on the wider airspace network is minimised.

  The notification, management and coordination of airspace-related activities will be the subjects of more detailed and considered discussion. These aspects of the design and its proposed operation will underpin Stage 3 stakeholder consultation, scheduled to begin in December 2022.
- SaxaVord's Stage 2 engagement, therefore, requests that stakeholders principally consider the geometric shape of the airspace design options when completing their respective responses, which SaxaVord will use to inform the subsequent Initial Options Appraisal.

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Current Airspace Scenario

Situated in the north of the UK's airspace, SaxaVord Spaceport is 11nm south of the northern boundary of the Scottish FIR and 22nm west of the FIR's eastern boundary.

The SaxaVord site (and its immediate surroundings) resides wholly within UK Class G airspace.

The proposed launch activities and airspace design would extend from SFC to UNLTD, through UK airspace Classes G and C, for the notified specified periods and beyond the lateral limits of the UK Flight and Upper Information Regions (FIR and UIR). Above FL195 (i.e. 19,500ft AMSL), commercial air traffic operates under the principle of "Free Route Airspace", which allows flights to route direct, *vice* following prescribed routes along pre-determined navigation points.

SaxaVord recognises that entertaining any airspace design option that does not include a proportionate airspace reservation to protect airspace users from the proposed launch operations at SaxaVord (and *vice versa*) is untenable.

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Design Option - 1 "Airspace Reservation (Most Limiting)"

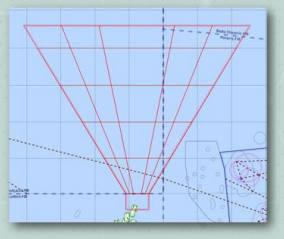
- **Description**. An "Airspace Reservation (Most Limiting)" design option seeks to establish an airspace reservation of defined dimensions to encompass the fullest identified range of orbital and sub-orbital launch operations.
- The whole airspace volume would be activated by NOTAM for the minimum period necessary to facilitate spaceport launch operations.
- Operational management, notification and coordination procedures will be discussed with the relevant parties during Stage 3 and beyond.

Source: skydemon

Slide 14

Design Option - 2 "Airspace Reservation (Segmented)"

- **Description**. An "Airspace Reservation (Segmented)" design option seeks to establish an airspace reservation of defined and proportionate dimensions that could be tailored to the performance characteristics of the specific launch vehicle (LV) seeking to utilise the SaxaVord Spaceport for a specific launch.
- The tailored airspace volume would be activated by NOTAM for the minimum period necessary to facilitate spaceport launch operations.
- Operational management, notification and coordination procedures will be discussed with the relevant parties during Stage 3 and beyond.



Slide 15

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ACP-2017-079 Statement of Need

- Stakeholders are requested to consider each proposed design option and offer their respective assessment of each option's alignment to following statement of need, using the response proforma:

  "[SaxaVord] is looking to protect vertical launches from its spaceport. Protection will be required from surface up to orbit for protection of the rocket trajectory/flight path, prior to and after each launch. A suitable volume of airspace will be needed to ensure the separation of civil flying from launch activity"

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ACP-2017-079 Design Principles

- The table below contains the DPs agreed following Stage 1 engagement. Stakeholders are requested to consider each proposed design option and offer their respective assessment of each option's alignment to the individual DPs, using the response proforma.

DP	Category	Design Principle	Priority
1	Safety	The safety of other airspace users and the public is the paramount DP to be used in this ACP.	A
2	Environment	The environmental and noise effects of rocket launch should be minimised by the design of the airspace change.	A
3	Airspace Management (ASM)	The airspace volume should be as small as possible to minimise the impact on and ensure the safety of other airspace users.	B
4	ASM	The duration of the airspace activation should be the minimum required to minimise the impact on and ensure the safety of other airspace users. The possible impact of concurrent operations of other airspace should be considered.	B
5	ASM	Airspace notification should be timely and accurate within an established method of rapid notification.	A
6	ASM	A process to allow some special airspace users to enter the airspace safely and halt operations should be established.	A
7	ASM	Other international airspace agencies should be included in the airspace design process.	B
8	Regulation	Airspace design should meet duties and requirements of other public agencies placed upon SSC.	B
9	ASM	Letters of agreement and memoranda of understanding will be developed, if required, between relevant parties.	A
10	ASM	The airspace change will take account of ongoing and continuing airspace management and policies.	B

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Request for Stakeholder Response

- In line with CAP1616's Stage 2 requirements, SaxaVord seeks to engage its stakeholders on the two proposed design options.
- An engagement response proforma for your attention is available on the Shetland Spacecentre/SaxaVord Spaceport ACP portal on the CAA's website at the following link.
- For each of the proposed design options, SaxaVord requests that stakeholders respond to the statements set out in the accompanying response proforma.
- Once completed, your organisation's response proforma should be submitted by email to saxavordpacp@avisu.co.uk. "Nil Return" responses are also requested.
- Stakeholder responses are requested by 1200BST on Friday 23rd September 2022.
- In the interim, questions related to this stage of the ACP-2017-079 process may also be directed to saxavordpacp@avisu.co.uk.

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Slide 21

Conclusion

This pack-up has been produced to meet the UK CAA's CAP1616 Stage 2 stakeholder engagement requirements and covered the following discussion areas:

- Introduction - Background, Context and Location.
- Stage 2 Engagement - Context & Purpose.
- Initial Airspace Design Options.
- Statement of Need and Design Principles.
- Request for Stakeholder Response.
- Conclusion.

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Appendix 3 to
ACP-2017-079 Stage 2 Submission
Dated 5 December 2022

STAGE 2 STAKEHOLDER RESPONSE PROFORMA

PROTECT
(When Either Wholly or Partly Completed)

CAP1616 STAGE 2 STAKEHOLDER ENGAGEMENT RESPONSE PROFORMA

Shetland Space Centre Limited (SaxaVord Spaceport) Airspace Change Proposal

Airspace change ID: ACP-2017-079

Responding Organisation: _____

Introduction

Shetland Space Centre Limited (SaxaVord Spaceport) seeks to conduct vertical launch operations for orbital and sub-orbital activities from SaxaVord Spaceport on Lamba Ness, Unst, Shetland Islands.

An airspace reservation of defined and proportionate dimensions will be required to ensure the safety of other airspace users from SaxaVord Spaceport launch activities and to ensure the safety of SaxaVord Spaceport launch activities from other airspace users. The airspace reservation would be activated for specified periods before, during and after nominated launch activities and would extend from surface to unlimited.

SaxaVord remains cognisant of stakeholder feedback from Stage 1. Since Stage 1, SaxaVord continues to discuss and progress the following with the relevant national and international organisations:

- Letters of agreement/memoranda of understanding, including airspace notification and coordination and emergency and airborne security-related short-notice access procedures.
- Identification of suitable launch windows of the minimum duration required, ensuring that any impact on the wider airspace network is minimised.

Purpose

CAP1616 Stage 2 requires SaxaVord to test design options with identified stakeholders to ensure that the stakeholders are satisfied that the options address the statement of need, align with the Design Principles (DPs) and that the Sponsor has understood stakeholder feedback and observations relevant to the options.

Accordingly, SaxaVord seeks to confirm that its stakeholders are satisfied that the proposed options address the statement of need, align with the agreed DPs and that SaxaVord has understood stakeholder feedback and observations from Stage 1 of the CAP1616 process.

SaxaVord will use stakeholders' Stage 2 responses to inform the subsequent Initial Options Appraisal prior to Stage 3, where the notification, management and coordination of airspace-related activities will underpin the associated formal stakeholder consultation.

Stage 2 Stakeholder Engagement Materials

SaxaVord's Stage 2 stakeholder engagement materials are provided on the CAA's ACP portal for ACP-2017-079.

Responding to the Survey

SaxaVord's Stage 2 engagement requests that stakeholders principally consider the geometric shape of the airspace design options when completing their respective responses. Stakeholders are requested to consider and respond to the statements within the proforma.

To enable SaxaVord to collate as many stakeholder responses as possible, responses are requested by no later than 1200BST Friday 23rd September 2022. Completed proformas should be returned to the following email address: saxavordpacp@avisu.co.uk.

Stakeholders are reminded that there will be the opportunity for more detailed and interactive consultation on this matter in the application's CAP1616 Stage 3 ("Consult"), which is anticipated to begin in December 2022.

PROTECT
(When Either Wholly or Partly Completed)

Response Proforma

ACP-2017-079 Stage 2 Design Option 1 - "Airspace Reservation (Most Limiting)"

1. The proposed airspace design option satisfies the ACP statement of need.			
Your Response:	Agree *	Disagree *	Unsure *
2. The proposed airspace design option satisfies DP1.			
Your Response:	Agree *	Disagree *	Unsure *
3. The proposed airspace design option satisfies DP2.			
Your Response:	Agree *	Disagree *	Unsure *
4. The proposed airspace design option satisfies DP3.			
Your Response:	Agree *	Disagree *	Unsure *
5. The proposed airspace design option satisfies DP4.			
Your Response:	Agree *	Disagree *	Unsure *
6. The proposed airspace design option satisfies DP5.			
Your Response:	Agree *	Disagree *	Unsure *
7. The proposed airspace design option satisfies DP6.			
Your Response:	Agree *	Disagree *	Unsure *
8. The proposed airspace design option satisfies DP7.			
Your Response:	Agree *	Disagree *	Unsure *
9. The proposed airspace design option satisfies DP8.			
Your Response:	Agree *	Disagree *	Unsure *
10. The proposed airspace design option satisfies DP9.			
Your Response:	Agree *	Disagree *	Unsure *
11. The proposed airspace design option satisfies DP10.			
Your Response:	Agree *	Disagree *	Unsure *

* Delete as appropriate

PROTECT
(When Either Wholly or Partly Completed)

Response Proforma

ACP-2017-079 Stage 2 Design Option 2 - "Airspace Reservation (Segmented)"

1. The proposed airspace design option satisfies the ACP statement of need.			
Your Response:	Agree *	Disagree *	Unsure *
2. The proposed airspace design option satisfies DP1.			
Your Response:	Agree *	Disagree *	Unsure *
3. The proposed airspace design option satisfies DP2.			
Your Response:	Agree *	Disagree *	Unsure *
4. The proposed airspace design option satisfies DP3.			
Your Response:	Agree *	Disagree *	Unsure *
5. The proposed airspace design option satisfies DP4.			
Your Response:	Agree *	Disagree *	Unsure *
6. The proposed airspace design option satisfies DP5.			
Your Response:	Agree *	Disagree *	Unsure *
7. The proposed airspace design option satisfies DP6.			
Your Response:	Agree *	Disagree *	Unsure *
8. The proposed airspace design option satisfies DP7.			
Your Response:	Agree *	Disagree *	Unsure *
9. The proposed airspace design option satisfies DP8.			
Your Response:	Agree *	Disagree *	Unsure *
10. The proposed airspace design option satisfies DP9.			
Your Response:	Agree *	Disagree *	Unsure *
11. The proposed airspace design option satisfies DP10.			
Your Response:	Agree *	Disagree *	Unsure *

* Delete as appropriate

PROTECT
(When Either Wholly or Partly Completed)

Thank you for your engagement. Your response will provide valuable input to aid the development of the Application.

UK CAA requires that all completed forms must be retained as evidence of the Applicant's engagement with stakeholders and other interested parties. Personal Data supplied by respondents will be retained confidentially and managed under the principles of the UK Data Protection Act (DPA) (2018) and the UK General Data Protection Regulation.

Signed .....
INITIALS AND SURNAME .....
Role/Position .....
Organisation .....
Email Address .....
Telephone No .....
Date .....

* Delete as appropriate

Appendix 4 to
ACP-2017-079 Stage 2 Submission
Dated 5 December 2022

STAGE 2 INTRODUCTORY EMAIL TO STAKEHOLDERS

SAXAVORD SPACEPORT AIRSPACE RESERVATION APPLICATION (ACP-2017-079) - REQUEST FOR STAKEHOLDER ENGAGEMENT ...

Reply | Reply All | Forward | ...

SP SaxaVord Permanent ACP
To SaxaVord Permanent ACP
Thu 01/09/2022 15:44
Bcc [redacted]

You replied to this message on 14/09/2022 11:50.

Good afternoon,

Introduction. Shetland Spacecentre Limited (hereinafter referred to as "SaxaVord Spaceport" or "SaxaVord") seeks to conduct vertical launch operations for orbital and sub-orbital activities from SaxaVord Spaceport on Lamba Ness, Unst, Shetland Islands. A corresponding airspace change proposal (ACP) was initiated (ACP-2017-079) with the UK's Civil Aviation Authority (CAA) under the UK CAA's CAP1616 process. The Application has now progressed to the "Develop and Assess" stage (i.e. Stage 2), prompting our engagement with you as an identified stakeholder.

Airspace Reservation. To enable scheduled launch operations at SaxaVord, a suitable airspace reservation of defined and proportionate dimensions will be required to ensure the safety of other airspace users from launch activities and to ensure the safety of launch activities from other airspace users. The airspace reservation would be activated by routine aeronautical notification process (i.e. NOTAM) for the minimum duration required to support spaceport launch activities and would extend from surface to unlimited.

CAP1616 Stage 2 – Develop and Assess. In Stage 2 of the CAP1616 process, the airspace change sponsor (SaxaVord) develops one or more options that address the application's Statement of Need and align with the defined airspace design principles; the latter were developed following feedback from SaxaVord's earlier engagement with stakeholders at Stage 1 of the process. Your organisation has been identified as one of the aviation stakeholders with whom SaxaVord seeks to engage as part of the Stage 2 Stakeholder Engagement.

CAP1616 Stage 2 Stakeholder Engagement. CAP1616 Stage 2 requires SaxaVord to test design options with identified stakeholders to ensure that the stakeholders are satisfied that the options address the statement of need, align with the Design Principles (DPs) and that the Sponsor has understood stakeholder feedback and observations relevant to the options. Accordingly, SaxaVord seeks to confirm that its stakeholders are satisfied that the proposed options address the statement of need, align with the agreed DPs and that SaxaVord has understood stakeholder feedback and observations from Stage 1 of the CAP1616 process.

Application information, stakeholder engagement materials and a corresponding response proforma can be found on the Shetland Spacecentre (SaxaVord Spaceport)'s ACP-2017-079 page of the UK CAA's Portal at the following links:

ACP-2017-079 Stage 2 Stakeholder Materials.

ACP-2017-079 Stage 2 Stakeholder Response Proforma.

SaxaVord will use stakeholders' Stage 2 responses to inform the subsequent Initial Options Appraisal prior to Stage 3, where the notification, management and coordination of airspace-related activities will underpin the associated formal stakeholder consultation.

Timeline. To enable SaxaVord to collate as many stakeholder responses as possible, request that your completed proforma is returned to the following email address: saxavordpacp@avisu.co.uk; responses are requested by **1200BST on Friday 23rd September 2022**. The short suspense date reflects both the stage in the CAP1616 process and that the response proforma is designed for ease of completion.

Stakeholders should note that their completed responses will pave the way for more detailed and considered stakeholder consultation at Stage 3 of the CAP1616 process, which is anticipated to begin in December 2022.

In anticipation, thank you for your engagement. Your response will provide valuable input to aid the subsequent development of the application and will be held and managed in the strictest confidence and in accordance with extant UK Data Protection guidance.

In the interim, please feel free to contact us if you have any further questions relating to this stage of ACP-2017-079's CAP1616 process.

On behalf of the Shetland Spacecentre Ltd (SaxaVord Spaceport), for the purposes of ACP-2017-079's CAP1616 application and engagement processes.

http://www.avisu.co.uk/ https://saxavord.com/

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Appendix 5 to
ACP-2017-079 Stage 2 Submission
Dated 5 December 2022

STAGE 2 FOLLOW-UP EMAIL TO PRIORITY AVIATION STAKEHOLDERS

FW: SAXAVORD SPACEPORT AIRSPACE RESERVATION APPLICATION (ACP-2017-079) - REQUEST FOR STAKEHOLDER ENGAGEM...

Reply | Reply All | Forward | ...

SP SaxaVord Permanent ACP
To
Cc [redacted]

Fri 02/09/2022 16:45

Follow up.
Recipients received: Follow up by 22 September 2022 12:00.

Good afternoon, [redacted]

Shetland Spacecentre Limited (SaxaVord Spaceport) recently sent an email to your organisation outlining the UK CAA's CAP1616 Stage 2 stakeholder engagement requirements, with a request for your organisation's participation in the requisite stakeholder engagement process. That email was a generic request distributed to all identified stakeholders associated with the application (ACP-2017-079). SaxaVord Spaceport recognises that [redacted] may have more than a generic interest in the application and associated activities therein and, as such, is acknowledged as a priority stakeholder in the Stage 2 engagement process.

We would understand if you wished to discuss this matter in more detail; two of our team members, [redacted] are very happy to meet with you (virtually) at your convenience. Such a meeting could also be a useful opportunity for us to update you on the progress of our temporary airspace reservation application (ACP-2021-090), which we discussed with you earlier this year.

We look forward to hearing from [redacted] in due course and to discussing these and related matters further.

In anticipation, very many thanks.

On behalf of the Shetland Spacecentre Ltd (SaxaVord Spaceport), for the purposes of ACP-2017-079's CAP1616 application and engagement processes.

http://www.avisu.co.uk/ https://saxavord.com/

From: SaxaVord Permanent ACP
Sent: 01 September 2022 15:44
To: SaxaVord Permanent ACP <saxavordpacp@avisu.co.uk>
Subject: SAXAVORD SPACEPORT AIRSPACE RESERVATION APPLICATION (ACP-2017-079) - REQUEST FOR STAKEHOLDER ENGAGEMENT RESPONSE

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Appendix 6 to
ACP-2017-079 Stage 2 Submission
Dated 5 December 2022

STAGE 2 STAKEHOLDER RESPONSE DATA

Figures 4 and 5, below, summarise the stakeholder responses received during the Stage 2 engagement.

Design Option 1 - Airspace Reservation (Non-segmented)

Respondent	SoN	DP1	DP2	DP3	DP4	DP5	DP6	DP7	DP8	DP9	DP10
Danish Ministry of Transport	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure
Loganair	Agree	Agree	Unsure	Disagree	Unsure	Agree	Agree	Agree	Agree	Agree	Agree
MOD - Defence Airspace and Air Traffic	Agree	Agree	Disagree	Agree	Agree	Agree	Agree	Unsure	Agree	Agree	Unsure
NATS	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure
NHS Scottish Ambulance Service	*Nil Response*	*Nil Response*	*Nil Response*	*Nil Response*	*Nil Response*	*Nil Response*	*Nil Response*	*Nil Response*	*Nil Response*	*Nil Response*	*Nil Response*
Unst Partnership Ltd	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree

Figure 6 - Design Option 1 Responses

Design Option 2 - Airspace Reservation (Segmented)

Respondent	SoN	DP1	DP2	DP3	DP4	DP5	DP6	DP7	DP8	DP9	DP10
Danish Ministry of Transport	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure
Loganair	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Unsure	Unsure
MOD - Defence Airspace and Air Traffic	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Unsure	Agree	Agree	Agree
NATS	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure
NHS Scottish Ambulance Service	*Nil Response*	*Nil Response*	*Nil Response*	*Nil Response*	*Nil Response*	*Nil Response*	*Nil Response*	*Nil Response*	*Nil Response*	*Nil Response*	*Nil Response*
Unst Partnership Ltd	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree

Figure 7 - Design Option 2 Responses

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Appendix 7 to
ACP-2017-079 Stage 2 Submission
Dated 5 December 2022

STAGE 2 STAKEHOLDER RESPONSES

MOD (DAATM)

PROTECT
(When Either Wholly or Partly Completed)

CAP1616 STAGE 2 STAKEHOLDER ENGAGEMENT RESPONSE PROFORMA

Shetland Space Centre Limited (SaxaVord Spaceport) Airspace Change Proposal

Airspace change ID: ACP-2017-079

Responding Organisation: DAATM, on behalf of MOD

Introduction

Shetland Space Centre Limited (SaxaVord Spaceport) seeks to conduct vertical launch operations for orbital and sub-orbital activities from SaxaVord Spaceport on Lamba Ness, Unst, Shetland Islands.

An airspace reservation of defined and proportionate dimensions will be required to ensure the safety of other airspace users from SaxaVord Spaceport launch activities and to ensure the safety of SaxaVord Spaceport launch activities from other airspace users. The airspace reservation would be activated for specified periods before, during and after nominated launch activities and would extend from surface to unlimited.

SaxaVord remains cognisant of stakeholder feedback from Stage 1. Since Stage 1, SaxaVord continues to discuss and progress the following with the relevant national and international organisations:

- Letters of agreement/memoranda of understanding, including airspace notification and coordination and emergency and airborne security-related short-notice access procedures.
- Identification of suitable launch windows of the minimum duration required, ensuring that any impact on the wider airspace network is minimised.

Purpose

CAP1616 Stage 2 requires SaxaVord to test design options with identified stakeholders to ensure that the stakeholders are satisfied that the options address the statement of need, align with the Design Principles (DPs) and that the Sponsor has understood stakeholder feedback and observations relevant to the options.

Accordingly, SaxaVord seeks to confirm that its stakeholders are satisfied that the proposed options address the statement of need, align with the agreed DPs and that SaxaVord has understood stakeholder feedback and observations from Stage 1 of the CAP1616 process.

SaxaVord will use stakeholders' Stage 2 responses to inform the subsequent Initial Options Appraisal prior to Stage 3, where the notification, management and coordination of airspace-related activities will underpin the associated formal stakeholder consultation.

Stage 2 Stakeholder Engagement Materials

SaxaVord's Stage 2 stakeholder engagement materials are provided on the CAA's ACP portal for ACP-2017-079.

Responding to the Survey

SaxaVord's Stage 2 engagement requests that stakeholders principally consider the geometric shape of the airspace design options when completing their respective responses. Stakeholders are requested to consider and respond to the statements within the proforma.

To enable SaxaVord to collate as many stakeholder responses as possible, responses are requested by no later than 1200BST Friday 23rd September 2022. Completed proformas should be returned to the following email address: saxavordpacp@avisu.co.uk.

Stakeholders are reminded that there will be the opportunity for more detailed and interactive consultation on this matter in the application's CAP1616 Stage 3 ("Consult"), which is anticipated to begin in December 2022.

PROTECT
(When Either Wholly or Partly Completed)

Response Proforma

ACP-2017-079 Stage 2 Design Option 1 - "Airspace Reservation (Most Limiting)"

1. The proposed airspace design option satisfies the ACP statement of need.			
Your Response:	Agree *	~~Disagree *~~	~~Unsure *~~
2. The proposed airspace design option satisfies DP1.			
Your Response:	Agree *	~~Disagree *~~	~~Unsure *~~
3. The proposed airspace design option satisfies DP2.			
Your Response:	~~Agree *~~	Disagree *	~~Unsure *~~
4. The proposed airspace design option satisfies DP3.			
Your Response:	Agree *	~~Disagree *~~	~~Unsure *~~
5. The proposed airspace design option satisfies DP4.			
Your Response:	Agree *	~~Disagree *~~	~~Unsure *~~
6. The proposed airspace design option satisfies DP5.			
Your Response:	Agree *	~~Disagree *~~	~~Unsure *~~
7. The proposed airspace design option satisfies DP6.			
Your Response:	Agree *	~~Disagree *~~	~~Unsure *~~
8. The proposed airspace design option satisfies DP7.			
Your Response:	~~Agree *~~	~~Disagree *~~	Unsure *
9. The proposed airspace design option satisfies DP8.			
Your Response:	Agree *	~~Disagree *~~	~~Unsure *~~
10. The proposed airspace design option satisfies DP9.			
Your Response:	Agree *	~~Disagree *~~	~~Unsure *~~
11. The proposed airspace design option satisfies DP10.			
Your Response:	~~Agree *~~	~~Disagree *~~	Unsure *

* Delete as appropriate

PROTECT
(When Either Wholly or Partly Completed)

Response Proforma

ACP-2017-079 Stage 2 Design Option 2 - "Airspace Reservation (Segmented)"

1. The proposed airspace design option satisfies the ACP statement of need.			
Your Response:	Agree *	~~Disagree *~~	~~Unsure *~~
2. The proposed airspace design option satisfies DP1.			
Your Response:	Agree *	~~Disagree *~~	~~Unsure *~~
3. The proposed airspace design option satisfies DP2.			
Your Response:	Agree *	~~Disagree *~~	~~Unsure *~~
4. The proposed airspace design option satisfies DP3.			
Your Response:	Agree *	~~Disagree *~~	~~Unsure *~~
5. The proposed airspace design option satisfies DP4.			
Your Response:	Agree *	~~Disagree *~~	~~Unsure *~~
6. The proposed airspace design option satisfies DP5.			
Your Response:	Agree *	~~Disagree *~~	~~Unsure *~~
7. The proposed airspace design option satisfies DP6.			
Your Response:	Agree *	~~Disagree *~~	~~Unsure *~~
8. The proposed airspace design option satisfies DP7.			
Your Response:	~~Agree *~~	~~Disagree *~~	Unsure *
9. The proposed airspace design option satisfies DP8.			
Your Response:	Agree *	~~Disagree *~~	~~Unsure *~~
10. The proposed airspace design option satisfies DP9.			
Your Response:	Agree *	~~Disagree *~~	~~Unsure *~~
11. The proposed airspace design option satisfies DP10.			
Your Response:	Agree *	~~Disagree *~~	~~Unsure *~~

* Delete as appropriate

PROTECT
(When Either Wholly or Partly Completed)

Thank you for your engagement. Your response will provide valuable input to aid the development of the Application.

UK CAA requires that all completed forms must be retained as evidence of the Applicant's engagement with stakeholders and other interested parties. Personal Data supplied by respondents will be retained confidentially and managed under the principles of the UK Data Protection Act (DPA) (2018) and the UK General Data Protection Regulation.

Signed	
INITIALS AND SURNAME	
Role/Position	SO2 Airspace Ops & Plans 2
Organisation	DAATM (MOD)
Email Address	
Telephone No	
Date	22 Sep 22

* Delete as appropriate

PROTECT
(When Either Wholly or Partly Completed)

CAP1616 STAGE 2 STAKEHOLDER ENGAGEMENT RESPONSE PROFORMA

Shetland Space Centre Limited (SaxaVord Spaceport) Airspace Change Proposal

Airspace change ID: ACP-2017-079

Responding Organisation: CAA Denmark

Introduction

Shetland Space Centre Limited (SaxaVord Spaceport) seeks to conduct vertical launch operations for orbital and sub-orbital activities from SaxaVord Spaceport on Lamba Ness, Unst, Shetland Islands.

An airspace reservation of defined and proportionate dimensions will be required to ensure the safety of other airspace users from SaxaVord Spaceport launch activities and to ensure the safety of SaxaVord Spaceport launch activities from other airspace users. The airspace reservation would be activated for specified periods before, during and after nominated launch activities and would extend from surface to unlimited.

SaxaVord remains cognisant of stakeholder feedback from Stage 1. Since Stage 1, SaxaVord continues to discuss and progress the following with the relevant national and international organisations:

- Letters of agreement/memoranda of understanding, including airspace notification and coordination and emergency and airborne security-related short-notice access procedures.
- Identification of suitable launch windows of the minimum duration required, ensuring that any impact on the wider airspace network is minimised.

Purpose

CAP1616 Stage 2 requires SaxaVord to test design options with identified stakeholders to ensure that the stakeholders are satisfied that the options address the statement of need, align with the Design Principles (DPs) and that the Sponsor has understood stakeholder feedback and observations relevant to the options.

Accordingly, SaxaVord seeks to confirm that its stakeholders are satisfied that the proposed options address the statement of need, align with the agreed DPs and that SaxaVord has understood stakeholder feedback and observations from Stage 1 of the CAP1616 process.

SaxaVord will use stakeholders' Stage 2 responses to inform the subsequent Initial Options Appraisal prior to Stage 3, where the notification, management and coordination of airspace-related activities will underpin the associated formal stakeholder consultation.

Stage 2 Stakeholder Engagement Materials

SaxaVord's Stage 2 stakeholder engagement materials are provided on the CAA's ACP portal for ACP-2017-079.

Responding to the Survey

SaxaVord's Stage 2 engagement requests that stakeholders principally consider the geometric shape of the airspace design options when completing their respective responses. Stakeholders are requested to consider and respond to the statements within the proforma.

To enable SaxaVord to collate as many stakeholder responses as possible, responses are requested by no later than **1200BST Friday 23rd September 2022**. Completed proformas should be returned to the following email address: saxavordpacp@avisu.co.uk

Stakeholders are reminded that there will be the opportunity for more detailed and interactive consultation on this matter in the application's CAP1616 Stage 3 ("Consult"), which is anticipated to begin in December 2022.

PROTECT
(When Either Wholly or Partly Completed)

Response Proforma

ACP-2017-079 Stage 2 Design Option 1 - "Airspace Reservation (Most Limiting)"

1. The proposed airspace design option satisfies the ACP statement of need.			
Your Response:	Agree * X	Disagree * X	Unsure *
2. The proposed airspace design option satisfies DP1.			
Your Response:	Agree * X	Disagree * X	Unsure *
3. The proposed airspace design option satisfies DP2.			
Your Response:	Agree * X	Disagree * X	Unsure *
4. The proposed airspace design option satisfies DP3.			
Your Response:	Agree * X	Disagree * X	Unsure *
5. The proposed airspace design option satisfies DP4.			
Your Response:	Agree * X	Disagree * X	Unsure *
6. The proposed airspace design option satisfies DP5.			
Your Response:	Agree * X	Disagree * X	Unsure *
7. The proposed airspace design option satisfies DP6.			
Your Response:	Agree * X	Disagree * X	Unsure *
8. The proposed airspace design option satisfies DP7.			
Your Response:	Agree * X	Disagree * X	Unsure *
9. The proposed airspace design option satisfies DP8.			
Your Response:	Agree * X	Disagree * X	Unsure *
10. The proposed airspace design option satisfies DP9.			
Your Response:	Agree * X	Disagree * X	Unsure *
11. The proposed airspace design option satisfies DP10.			
Your Response:	Agree * X	Disagree * X	Unsure *

* Delete as appropriate

PROTECT
(When Either Wholly or Partly Completed)

Response Proforma

ACP-2017-079 Stage 2 Design Option 2 - "Airspace Reservation (Segmented)"

1. The proposed airspace design option satisfies the ACP statement of need.			
Your Response:	X Agree *	X Disagree *	Unsure *
2. The proposed airspace design option satisfies DP1.			
Your Response:	X Agree *	X Disagree *	Unsure *
3. The proposed airspace design option satisfies DP2.			
Your Response:	X Agree *	X Disagree *	Unsure *
4. The proposed airspace design option satisfies DP3.			
Your Response:	X Agree *	X Disagree *	Unsure *
5. The proposed airspace design option satisfies DP4.			
Your Response:	X Agree *	X Disagree *	Unsure *
6. The proposed airspace design option satisfies DP5.			
Your Response:	X Agree *	X Disagree *	Unsure *
7. The proposed airspace design option satisfies DP6.			
Your Response:	X Agree *	X Disagree *	Unsure *
8. The proposed airspace design option satisfies DP7.			
Your Response:	X Agree *	X Disagree *	Unsure *
9. The proposed airspace design option satisfies DP8.			
Your Response:	X Agree *	X Disagree *	Unsure *
10. The proposed airspace design option satisfies DP9.			
Your Response:	X Agree *	X Disagree *	Unsure *
11. The proposed airspace design option satisfies DP10.			
Your Response:	X Agree *	X Disagree *	Unsure *

* Delete as appropriate

PROTECT
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Thank you for your engagement. Your response will provide valuable input to aid the development of the Application.

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Signed	[redacted]
INITIALS AND SURNAME	
Role/Position	ATM expert
Organisation	CAA Denmark
Email Address	[redacted]
Telephone No	
Date	23. september 2022

* Delete as appropriate

Email Response from Danish Ministry of Transport

[redacted]
To: SaxaVord Permanent ACP [redacted]
You replied to this message on 23/09/2022 12:06.
Scannet fra TBST-CNG-MF-009.pdf 405 KB

Reply | Reply All | Forward | ...
Fri 23/09/2022 11:51

Good afternoon all

Attached you find our reply to your questionnaire.

All replies are filed in as "unsure" as it is not possible for us to know if the two options satisfies the need for airspace reservation.

All the design principles seem common and should apply to both options.

From a flexible use og airspace perspective "option two" should be preferred as it establishes the minimum airspace reservation relevant for an individual launch.

Med venlig hilsen/Best regards

[redacted]
ATM-expert

Trafikstyrelsen
Danish Civil Aviation and Railway Authority
Carsten Niebuhrs Gade 43
1577 Copenhagen V

[redacted]
www.trafikstyrelsen.dk

Loganair Ltd

CAP1616 STAGE 2 STAKEHOLDER ENGAGEMENT RESPONSE PROFORMA

Shetland Space Centre Limited (SaxaVord Spaceport) Airspace Change Proposal

Airspace change ID: ACP-2017-079

Responding Organisation: **Loganair, Ltd**

Introduction

Shetland Space Centre Limited (SaxaVord Spaceport) seeks to conduct vertical launch operations for orbital and sub-orbital activities from SaxaVord Spaceport on Lamba Ness, Unst, Shetland Islands.

An airspace reservation of defined and proportionate dimensions will be required to ensure the safety of other airspace users from SaxaVord Spaceport launch activities and to ensure the safety of SaxaVord Spaceport launch activities from other airspace users. The airspace reservation would be activated for specified periods before, during and after nominated launch activities and would extend from surface to unlimited.

SaxaVord remains cognisant of stakeholder feedback from Stage 1. Since Stage 1, SaxaVord continues to discuss and progress the following with the relevant national and international organisations:

- Letters of agreement/memoranda of understanding, including airspace notification and coordination and emergency and airborne security-related short-notice access procedures.
- Identification of suitable launch windows of the minimum duration required, ensuring that any impact on the wider airspace network is minimised.

Purpose

CAP1616 Stage 2 requires SaxaVord to test design options with identified stakeholders to ensure that the stakeholders are satisfied that the options address the statement of need, align with the Design Principles (DPs) and that the Sponsor has understood stakeholder feedback and observations relevant to the options.

Accordingly, SaxaVord seeks to confirm that its stakeholders are satisfied that the proposed options address the statement of need, align with the agreed DPs and that SaxaVord has understood stakeholder feedback and observations from Stage 1 of the CAP1616 process.

SaxaVord will use stakeholders' Stage 2 responses to inform the subsequent Initial Options Appraisal prior to Stage 3, where the notification, management and coordination of airspace-related activities will underpin the associated formal stakeholder consultation.

Stage 2 Stakeholder Engagement Materials

SaxaVord's Stage 2 stakeholder engagement materials are provided on the CAA's ACP portal for ACP-2017-079.

Responding to the Survey

SaxaVord's Stage 2 engagement requests that stakeholders principally consider the geometric shape of the airspace design options when completing their respective responses. Stakeholders are requested to consider and respond to the statements within the proforma.

To enable SaxaVord to collate as many stakeholder responses as possible, responses are requested by no later than **1200BST Friday 23rd September 2022**. Completed proformas should be returned to the following email address: saxavordpacp@avisu.co.uk.

Stakeholders are reminded that there will be the opportunity for more detailed and interactive consultation on this matter in the application's CAP1616 Stage 3 ("Consult"), which is anticipated to begin in December 2022.

PROTECT
(When Either Wholly or Partly Completed)

Response Proforma

ACP-2017-079 Stage 2 Design Option 1 - "Airspace Reservation (Most Limiting)"

1. The proposed airspace design option satisfies the ACP statement of need.			
Your Response:	**Agree** *	*	*
2. The proposed airspace design option satisfies DP1.			
Your Response:	**Agree** *	*	*
3. The proposed airspace design option satisfies DP2.			
Your Response:	*	*	**Unsure** *
4. The proposed airspace design option satisfies DP3.			
Your Response:	*	**Disagree** *	*
5. The proposed airspace design option satisfies DP4.			
Your Response:	*	*	**Unsure** *
6. The proposed airspace design option satisfies DP5.			
Your Response:	**Agree** *	*	*
7. The proposed airspace design option satisfies DP6.			
Your Response:	**Agree** *	*	*
8. The proposed airspace design option satisfies DP7.			
Your Response:	**Agree** *	*	*
9. The proposed airspace design option satisfies DP8.			
Your Response:	**Agree** *	*	*
10. The proposed airspace design option satisfies DP9.			
Your Response:	**Agree** *	*	*
11. The proposed airspace design option satisfies DP10.			
Your Response:	**Agree** *	*	*

* Delete as appropriate

PROTECT
(When Either Wholly or Partly Completed)

Response Proforma

ACP-2017-079 Stage 2 Design Option 2 - "Airspace Reservation (Segmented)"

1. The proposed airspace design option satisfies the ACP statement of need.			
Your Response:	**Agree** *	*	*
2. The proposed airspace design option satisfies DP1.			
Your Response:	**Agree** *	*	*
3. The proposed airspace design option satisfies DP2.			
Your Response:	**Agree** *	*	*
4. The proposed airspace design option satisfies DP3.			
Your Response:	**Agree** *	*	*
5. The proposed airspace design option satisfies DP4.			
Your Response:	**Agree** *	*	*
6. The proposed airspace design option satisfies DP5.			
Your Response:	**Agree** *	*	*
7. The proposed airspace design option satisfies DP6.			
Your Response:	**Agree** *	*	*
8. The proposed airspace design option satisfies DP7.			
Your Response:	**Agree** *	*	*
9. The proposed airspace design option satisfies DP8.			
Your Response:	**Agree** *	*	*
10. The proposed airspace design option satisfies DP9.			
Your Response:	*	*	**Unsure** *
11. The proposed airspace design option satisfies DP10.			
Your Response:	*	*	**Unsure** *

* Delete as appropriate

PROTECT
(When Either Wholly or Partly Completed)

Thank you for your engagement. Your response will provide valuable input to aid the development of the Application.

UK CAA requires that all completed forms must be retained as evidence of the Applicant's engagement with stakeholders and other interested parties. Personal Data supplied by respondents will be retained confidentially and managed under the principles of the UK Data Protection Act (DPA) (2018) and the UK General Data Protection Regulation.

Signed	[redacted]
INITIALS AND SURNAME	
Role/Position	Manager, Flight Support
Organisation	Loganair
Email Address	[redacted]
Telephone No	
Date	06/09/2022

* Delete as appropriate

PROTECT
(When Either Wholly or Partly Completed)

CAP1616 STAGE 2 STAKEHOLDER ENGAGEMENT RESPONSE PROFORMA

Shetland Space Centre Limited (SaxaVord Spaceport) Airspace Change Proposal

Airspace change ID: ACP-2017-079

Responding Organisation: NATS

Introduction

Shetland Space Centre Limited (SaxaVord Spaceport) seeks to conduct vertical launch operations for orbital and sub-orbital activities from SaxaVord Spaceport on Lamba Ness, Unst, Shetland Islands.

An airspace reservation of defined and proportionate dimensions will be required to ensure the safety of other airspace users from SaxaVord Spaceport launch activities and to ensure the safety of SaxaVord Spaceport launch activities from other airspace users. The airspace reservation would be activated for specified periods before, during and after nominated launch activities and would extend from surface to unlimited.

SaxaVord remains cognisant of stakeholder feedback from Stage 1. Since Stage 1, SaxaVord continues to discuss and progress the following with the relevant national and international organisations:

- Letters of agreement/memoranda of understanding, including airspace notification and coordination and emergency and airborne security-related short-notice access procedures.
- Identification of suitable launch windows of the minimum duration required, ensuring that any impact on the wider airspace network is minimised.

Purpose

CAP1616 Stage 2 requires SaxaVord to test design options with identified stakeholders to ensure that the stakeholders are satisfied that the options address the statement of need, align with the Design Principles (DPs) and that the Sponsor has understood stakeholder feedback and observations relevant to the options.

Accordingly, SaxaVord seeks to confirm that its stakeholders are satisfied that the proposed options address the statement of need, align with the agreed DPs and that SaxaVord has understood stakeholder feedback and observations from Stage 1 of the CAP1616 process.

SaxaVord will use stakeholders' Stage 2 responses to inform the subsequent Initial Options Appraisal prior to Stage 3, where the notification, management and coordination of airspace-related activities will underpin the associated formal stakeholder consultation.

Stage 2 Stakeholder Engagement Materials

SaxaVord's Stage 2 stakeholder engagement materials are provided on the CAA's ACP portal for ACP-2017-079.

Responding to the Survey

SaxaVord's Stage 2 engagement requests that stakeholders principally consider the geometric shape of the airspace design options when completing their respective responses. Stakeholders are requested to consider and respond to the statements within the proforma.

To enable SaxaVord to collate as many stakeholder responses as possible, responses are requested by no later than **1200BST Friday 23rd September 2022**. Completed proformas should be returned to the following email address: saxavordpacp@avisu.co.uk.

Stakeholders are reminded that there will be the opportunity for more detailed and interactive consultation on this matter in the application's CAP1616 Stage 3 ("Consult"), which is anticipated to begin in December 2022.

PROTECT
(When Either Wholly or Partly Completed)

Response Proforma

ACP-2017-079 Stage 2 Design Option 1 - "Airspace Reservation (Most Limiting)"

1. The proposed airspace design option satisfies the ACP statement of need.			
Your Response:	**Agree**	**Disagree**	**Unsure ***
2. The proposed airspace design option satisfies DP1.			
Your Response:	**Agree**	**Disagree**	**Unsure ***
3. The proposed airspace design option satisfies DP2.			
Your Response:	**Agree**	**Disagree**	**Unsure ***
4. The proposed airspace design option satisfies DP3.			
Your Response:	**Agree**	**Disagree**	**Unsure ***
5. The proposed airspace design option satisfies DP4.			
Your Response:	**Agree**	**Disagree**	**Unsure ***
6. The proposed airspace design option satisfies DP5.			
Your Response:	**Agree**	**Disagree**	**Unsure ***
7. The proposed airspace design option satisfies DP6.			
Your Response:	**Agree**	**Disagree**	**Unsure ***
8. The proposed airspace design option satisfies DP7.			
Your Response:	**Agree**	**Disagree**	**Unsure ***
9. The proposed airspace design option satisfies DP8.			
Your Response:	**Agree**	**Disagree**	**Unsure ***
10. The proposed airspace design option satisfies DP9.			
Your Response:	**Agree**	**Disagree**	**Unsure ***
11. The proposed airspace design option satisfies DP10.			
Your Response:	**Agree**	**Disagree**	**Unsure ***

* Delete as appropriate

PROTECT
(When Either Wholly or Partly Completed)

Response Proforma

ACP-2017-079 Stage 2 Design Option 2 - "Airspace Reservation (Segmented)"

1. The proposed airspace design option satisfies the ACP statement of need.			
Your Response:	**Agree ***	**Disagree**	**Unsure ***
2. The proposed airspace design option satisfies DP1.			
Your Response:	**Agree**	**Disagree**	**Unsure ***
3. The proposed airspace design option satisfies DP2.			
Your Response:	**Agree**	**Disagree**	**Unsure ***
4. The proposed airspace design option satisfies DP3.			
Your Response:	**Agree**	**Disagree**	**Unsure ***
5. The proposed airspace design option satisfies DP4.			
Your Response:	**Agree**	**Disagree**	**Unsure ***
6. The proposed airspace design option satisfies DP5.			
Your Response:	**Agree**	**Disagree**	**Unsure ***
7. The proposed airspace design option satisfies DP6.			
Your Response:	**Agree ***	**Disagree**	**Unsure ***
8. The proposed airspace design option satisfies DP7.			
Your Response:	**Agree ***	**Disagree**	**Unsure ***
9. The proposed airspace design option satisfies DP8.			
Your Response:	**Agree ***	**Disagree**	**Unsure ***
10. The proposed airspace design option satisfies DP9.			
Your Response:	**Agree**	**Disagree**	**Unsure ***
11. The proposed airspace design option satisfies DP10.			
Your Response:	**Agree**	**Disagree**	**Unsure ***

* Delete as appropriate

PROTECT
(When Either Wholly or Partly Completed)

Thank you for your engagement. Your response will provide valuable input to aid the development of the Application.

UK CAA requires that all completed forms must be retained as evidence of the Applicant's engagement with stakeholders and other interested parties. Personal Data supplied by respondents will be retained confidentially and managed under the principles of the UK Data Protection Act (DPA) (2018) and the UK General Data Protection Regulation.

Signed	
INITIALS AND SURNAME	
Role/Position	NATS Policy Team
Organisation	NATS
Email Address	
Telephone No	
Date	22/09/2022

* Delete as appropriate

Email Response from NATS

NATS_RESPONSE

[redacted]

ACP_2017_079_stage_2_stakeholder_response_V1_0_NATS.pdf
182 KB

Reply | Reply All | Forward

Fri 23/09/2022 11:14

Good Morning

Please find attached the NATS responses as requested.

We are aware that they may not be as helpful to you as you had hoped, so have provided some further explanation below.

Please note that we do not expect (or wish) to know the detailed characteristics of the rockets which will be launching from Saxa Vord. Instead, we need assurance via the CAA approvals processes that the airspace structure is sized appropriately for the rocket(s) so as to provide the necessary levels of safety while avoiding unnecessary disruption to other airspace users.

NATS would be happy to discuss these points with you in more detail. Please do not hesitate to contact me if you wish to organise a meeting.

SoN	As we do not know the performance characteristics of the anticipated rocket(s), we cannot tell if the proposed airspace volumes are suitable to protect both the rockets and other airspace users.
DP1	We support the aim of this DP, but without knowing the performance characteristics of the anticipated rocket(s) we cannot tell if the proposed airspace volumes will provide the desired level of safety. We therefore cannot assess the presented Options against this DP on the information provided.
DP2	We support the aim of this DP but while the proposed airspace volumes look to minimise the noise impacts to local residents, as we do not know the anticipated rocket characteristics, we cannot tell if the proposed airspace volumes are excessive and thus will potentially cause excessive fuel burn (and CO2 production) for the airlines who will have to divert around them. We therefore cannot assess the presented Options against this DP on the information provided.
DP3	We support the aim of this DP but as we do not know the anticipated rocket characteristics, we cannot tell if the proposed airspace volumes are as small as possible. We therefore cannot assess the presented Options against this DP on the information provided. Additionally, it is not clear whether the subdivisions shown in Option 2 to customise the affected airspace to each mission are indicative (and thus expected to be subject to detailed interactive development work with the relevant stakeholders) or a firm proposal. Nor is it clear on what basis the subdivisions have been determined.
DP4	We support the aim of this DP but it is about the duration of the Danger Area activation, not the volume of airspace it occupies, so we cannot assess the presented Options against it on the information provided.
DP5	We support the aim of this DP but it is about the activation and notification process for the Danger Area, not the volume of airspace it occupies, so we cannot assess the presented Options against it on the information provided.
DP6	We support the aim of this DP but it is about the operation of the Danger Area, not the volume of airspace it occupies, so we cannot assess the presented Options against it on the information provided.
DP7	We support the aim of this DP but it is about the Sponsor's implementation of the ACP process, not the airspace volume itself. We therefore cannot assess the presented Options against it.
DP8	We support the aim of this DP but it is not for us to assess if/how the presented airspace design Options meet non-aviation regulatory obligations.
DP9	We support the aim of this DP but these are about process not the airspace design, and in some cases are already a direct legal obligation on the Sponsor. We therefore cannot assess the presented Options against it.
DP10	We support the aim of this DP but we cannot assess how the presented Options will take account of future airspace policies.

Kind Regards

NATS

[redacted]

Manager, ATM Portfolio - Design & Benefits

[redacted]

www.nats.co.uk

Scottish Ambulance Service

PROTECT
(When Either Wholly or Partly Completed)

CAP1616 STAGE 2 STAKEHOLDER ENGAGEMENT RESPONSE PROFORMA

Shetland Space Centre Limited (SaxaVord Spaceport) Airspace Change Proposal

Airspace change ID: ACP-2017-079

Responding Organisation: Scottish Ambulance Service

Introduction

Shetland Space Centre Limited (SaxaVord Spaceport) seeks to conduct vertical launch operations for orbital and sub-orbital activities from SaxaVord Spaceport on Lamba Ness, Unst, Shetland Islands.

An airspace reservation of defined and proportionate dimensions will be required to ensure the safety of other airspace users from SaxaVord Spaceport launch activities and to ensure the safety of SaxaVord Spaceport launch activities from other airspace users. The airspace reservation would be activated for specified periods before, during and after nominated launch activities and would extend from surface to unlimited.

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- Letters of agreement/memoranda of understanding, including airspace notification and coordination and emergency and airborne security-related short-notice access procedures.
- Identification of suitable launch windows of the minimum duration required, ensuring that any impact on the wider airspace network is minimised.

Purpose

CAP1616 Stage 2 requires SaxaVord to test design options with identified stakeholders to ensure that the stakeholders are satisfied that the options address the statement of need, align with the Design Principles (DPs) and that the Sponsor has understood stakeholder feedback and observations relevant to the options.

Accordingly, SaxaVord seeks to confirm that its stakeholders are satisfied that the proposed options address the statement of need, align with the agreed DPs and that SaxaVord has understood stakeholder feedback and observations from Stage 1 of the CAP1616 process.

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Stage 2 Stakeholder Engagement Materials

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Responding to the Survey

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Stakeholders are reminded that there will be the opportunity for more detailed and interactive consultation on this matter in the application's CAP1616 Stage 3 ("Consult"), which is anticipated to begin in December 2022.

PROTECT
(When Either Wholly or Partly Completed)

Response Proforma

ACP-2017-079 Stage 2 Design Option 1 - "Airspace Reservation (Most Limiting)"

1. The proposed airspace design option satisfies the ACP statement of need.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
2. The proposed airspace design option satisfies DP1.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
3. The proposed airspace design option satisfies DP2.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
4. The proposed airspace design option satisfies DP3.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
5. The proposed airspace design option satisfies DP4.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
6. The proposed airspace design option satisfies DP5.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
7. The proposed airspace design option satisfies DP6.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
8. The proposed airspace design option satisfies DP7.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
9. The proposed airspace design option satisfies DP8.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
10. The proposed airspace design option satisfies DP9.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
11. The proposed airspace design option satisfies DP10.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***

* Delete as appropriate

Response Proforma

ACP-2017-079 Stage 2 Design Option 2 - "Airspace Reservation (Segmented)"

1. The proposed airspace design option satisfies the ACP statement of need.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
2. The proposed airspace design option satisfies DP1.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
3. The proposed airspace design option satisfies DP2.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
4. The proposed airspace design option satisfies DP3.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
5. The proposed airspace design option satisfies DP4.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
6. The proposed airspace design option satisfies DP5.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
7. The proposed airspace design option satisfies DP6.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
8. The proposed airspace design option satisfies DP7.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
9. The proposed airspace design option satisfies DP8.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
10. The proposed airspace design option satisfies DP9.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
11. The proposed airspace design option satisfies DP10.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***

* Delete as appropriate

PROTECT
(When Either Wholly or Partly Completed)

Thank you for your engagement. Your response will provide valuable input to aid the development of the Application.

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Signed	[redacted]
INITIALS AND SURNAME	
Role/Position	Head of Service, North Region (Islands)
Organisation	Scottish Ambulance Service
Email Address	[redacted]
Telephone No	
Date	15/09/2022

I have had a look at the survey and don't feel we are qualified to answer if they meet the needs of design options one or two, however the design principles seem to cover most things I could think of when reading the paper especially DP1,2 and 6, when thinking about the SAS strategies around staff welfare, Air Ambulance movements and our environmental contribution.
I am sure we can get onto more detail around land Ambulance access and RVPs etc in stage 3

* Delete as appropriate

PROTECT
(When Either Wholly or Partly Completed)

CAP1616 STAGE 2 STAKEHOLDER ENGAGEMENT RESPONSE PROFORMA

Shetland Space Centre Limited (SaxaVord Spaceport) Airspace Change Proposal

Airspace change ID: ACP-2017-079

Responding Organisation: _____

Introduction

Shetland Space Centre Limited (SaxaVord Spaceport) seeks to conduct vertical launch operations for orbital and sub-orbital activities from SaxaVord Spaceport on Lamba Ness, Unst, Shetland Islands.

An airspace reservation of defined and proportionate dimensions will be required to ensure the safety of other airspace users from SaxaVord Spaceport launch activities and to ensure the safety of SaxaVord Spaceport launch activities from other airspace users. The airspace reservation would be activated for specified periods before, during and after nominated launch activities and would extend from surface to unlimited.

SaxaVord remains cognisant of stakeholder feedback from Stage 1. Since Stage 1, SaxaVord continues to discuss and progress the following with the relevant national and international organisations:

- Letters of agreement/memoranda of understanding, including airspace notification and coordination and emergency and airborne security-related short-notice access procedures.
- Identification of suitable launch windows of the minimum duration required, ensuring that any impact on the wider airspace network is minimised.

Purpose

CAP1616 Stage 2 requires SaxaVord to test design options with identified stakeholders to ensure that the stakeholders are satisfied that the options address the statement of need, align with the Design Principles (DPs) and that the Sponsor has understood stakeholder feedback and observations relevant to the options.

Accordingly, SaxaVord seeks to confirm that its stakeholders are satisfied that the proposed options address the statement of need, align with the agreed DPs and that SaxaVord has understood stakeholder feedback and observations from Stage 1 of the CAP1616 process.

SaxaVord will use stakeholders' Stage 2 responses to inform the subsequent Initial Options Appraisal prior to Stage 3, where the notification, management and coordination of airspace-related activities will underpin the associated formal stakeholder consultation.

Stage 2 Stakeholder Engagement Materials

SaxaVord's Stage 2 stakeholder engagement materials are provided on the CAA's ACP portal for ACP-2017-079.

Responding to the Survey

SaxaVord's Stage 2 engagement requests that stakeholders principally consider the geometric shape of the airspace design options when completing their respective responses. Stakeholders are requested to consider and respond to the statements within the proforma.

To enable SaxaVord to collate as many stakeholder responses as possible, responses are requested by no later than **1200BST Friday 23rd September 2022**. Completed proformas should be returned to the following email address: saxavordpacp@avisu.co.uk.

Stakeholders are reminded that there will be the opportunity for more detailed and interactive consultation on this matter in the application's CAP1616 Stage 3 ("Consult"), which is anticipated to begin in December 2022.

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Response Proforma

ACP-2017-079 Stage 2 Design Option 1 - "Airspace Reservation (Most Limiting)"

1. The proposed airspace design option satisfies the ACP statement of need.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
2. The proposed airspace design option satisfies DP1.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
3. The proposed airspace design option satisfies DP2.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
4. The proposed airspace design option satisfies DP3.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
5. The proposed airspace design option satisfies DP4.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
6. The proposed airspace design option satisfies DP5.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
7. The proposed airspace design option satisfies DP6.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
8. The proposed airspace design option satisfies DP7.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
9. The proposed airspace design option satisfies DP8.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
10. The proposed airspace design option satisfies DP9.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
11. The proposed airspace design option satisfies DP10.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***

* Delete as appropriate

PROTECT
(When Either Wholly or Partly Completed)

Response Proforma

ACP-2017-079 Stage 2 Design Option 2 - "Airspace Reservation (Segmented)"

1. The proposed airspace design option satisfies the ACP statement of need.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
2. The proposed airspace design option satisfies DP1.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
3. The proposed airspace design option satisfies DP2.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
4. The proposed airspace design option satisfies DP3.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
5. The proposed airspace design option satisfies DP4.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
6. The proposed airspace design option satisfies DP5.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
7. The proposed airspace design option satisfies DP6.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
8. The proposed airspace design option satisfies DP7.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
9. The proposed airspace design option satisfies DP8.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
10. The proposed airspace design option satisfies DP9.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***
11. The proposed airspace design option satisfies DP10.			
Your Response:	**Agree ***	**Disagree ***	**Unsure ***

* Delete as appropriate

PROTECT
(When Either Wholly or Partly Completed)

Thank you for your engagement. Your response will provide valuable input to aid the development of the Application.

UK CAA requires that all completed forms must be retained as evidence of the Applicant's engagement with stakeholders and other interested parties. Personal Data supplied by respondents will be retained confidentially and managed under the principles of the UK Data Protection Act (DPA) (2018) and the UK General Data Protection Regulation.

Signed	[redacted]
INITIALS AND SURNAME	
Role/Position	Chair
Organisation	Unst Partnership Ltd.
Email Address	[redacted]
Telephone No	
Date	13th Sept 2022

* Delete as appropriate

Appendix 8 to
ACP-2017-079 Stage 2 Submission
Dated 5 December 2022

ACP-2017-079 NETWORK TRAFFIC ANALYSIS

Baseline Description

1. This appendix provides a summary of the complete baseline traffic assessment report[14] relative to the potential traffic impacted by the activation of the proposed airspace design for ACP-2017-079.

Approach

2. The airspace analysis approach has been to apply a macro air traffic flow perspective to various micro assessments.

Objective

3. The objective of the traffic assessment and analysis was to obtain an appreciation of the lifecycle of air traffic movements in relation to the anticipated launch operations trajectories from the SaxaVord site, as defined by the supplied Area of Interest (AOI) (Figure 8); this traffic capture was chosen to be deliberately larger than the Range Analysis AOI (Figure 9).[14]

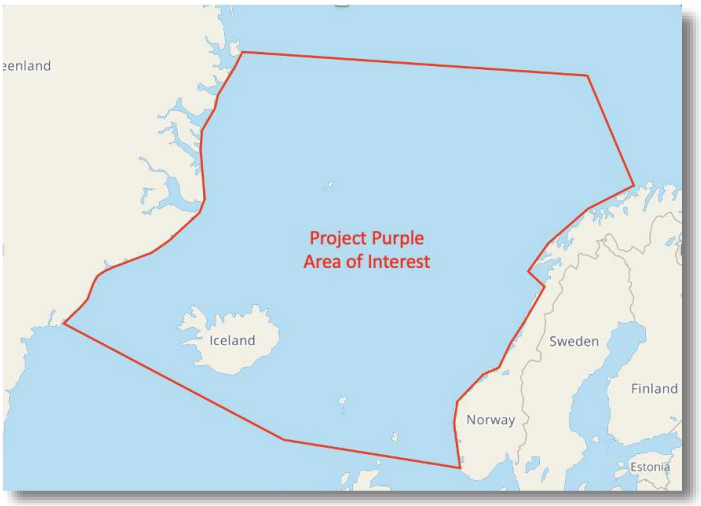

Figure 8 - Range Licence AOI

14. AVISU (2021), "*Shetland Space Centre Airspace Analysis*", Edition 1.0, dated 20 April 2021.

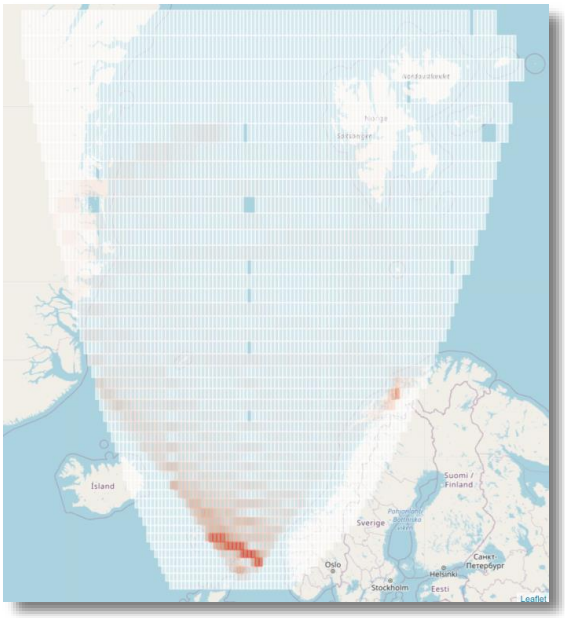

Figure 9 - ADS-B 2019 AOI Traffic Heat Map

Traffic Sample Data

4. The assessment obtained a year's ADS-B surveillance data for the period January to December 2019, selected specifically for pre-COVID-19 traffic levels. The data covers all three ADS-B out transponder versions (0, 1 and 2). Additionally, Eurocontrol traffic monitoring data shows that, overall, the aircraft fleet operating within the EU with at least one of these ADS-B versions is approximately 90% of all its monitored traffic. This percentage will be significantly higher in the SaxaVord range AOI (Figure 8), given that Eurocontrol monitoring includes traffic operating at low levels across the continent. Furthermore, related discussions with NATS confirmed the low incidence of visual flight rules (VFR)/general aviation (GA) traffic. As such, the data sample can be seen to be of sufficiently high fidelity for this assessment's purposes.

5. Over the year, approximately 30,000 aircraft transited the AOI (Figure 9), predominantly in an east-west orientation. Unsurprisingly, the traffic analysis identified seasonal variations, i.e. higher traffic levels in summer months and reduced levels in winter months.

6. Within the sample traffic data, the peak day was identified as 2nd August 2019, when a total of 191 aircraft passed through the larger (Figure 8) AOI; peak periods were observed between 1300 and 1500 hrs, when 28 aircraft per hour passed through the (Figure 8) AOI.

7. Continuing to consider the peak day, the proposed airspace design could be seen to impact a maximum of 10 flights per hour of activation.[15]

15. This data is based on traffic number counting within the AVISU AVISIM analytics tool (Avisim - Simulation and Analytics - AVISU).

Design Option Traffic Impact Assessment

Design Option Area of Interest

8. The proposed design options are significantly smaller when compared with the original (and larger) traffic assessment as illustrated in Figure 10, below, where the design options are depicted in the reddened are of the figure. Traffic re-route impact assessment focus on those flights transiting the reddened area of Figure 10, below.

Figure 10 - Proposed Design Option Area (in Red) Compared With the Traffic Assessment Area (in White)

9. Although CAP1616 Stage 2 seeks qualitative statements on the options assessment and environmental impacts, given the availability of surveillance data, a quantitative impact assessment on re-route of airspace users was performed. The following data and illustrations present the potential impacts of the proposed design.

Re-route Extension and Emission Impact from Activation of the Proposed Airspace

10. A peak day 13th August 2019 and peak hour of 1300-1400 UTC was identified and selected for the assessment and during which 10 flights could be impacted. The result was that actually the aircraft currently plan longer distances than the great circles (given SaxaVord's AOI) most likely due to wind effects (i.e. normally to avoid headwinds). All traffic is traveling *broadly* east-west and is depicted in Figure 11, below.

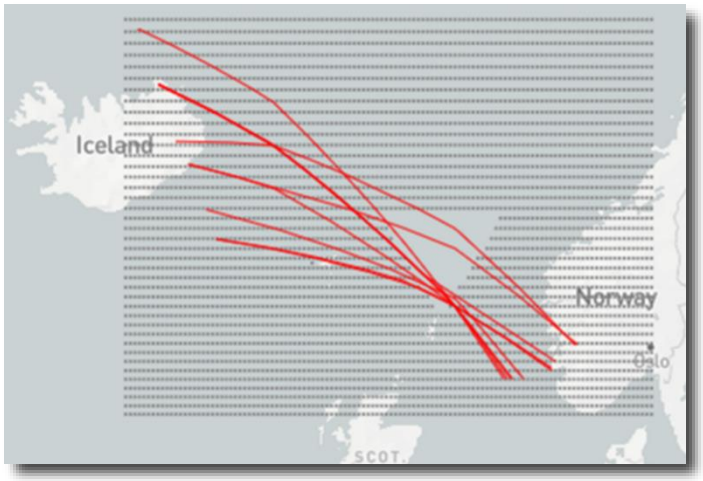

Figure 11 - Potential Peak Day Peak Hour Traffic Impacted By Airspace Activation -Original Route Segments

Re-route Methodology

11. The following simple re-route methodology was applied: flights that entered the assessment area south of the latitude of SaxaVord Spaceport launch site were re-routed to avoid the airspace design to the south; those entering north of the launch site were re-routed to the north of the airspace design. Only one aircraft was routed to the north. Re-routed flight tracks are depicted in Figure 12, below.

Figure 12 - Potential Peak Day Peak Hour Traffic Impacted By Activation - Simulated Re-route Segments

Analysis of Re-routed Traffic

12. Table 8, below, shows the comparison between the original route and a re-route option.

Ser	Callsign	Original Route (km)	Re-route (km)	Δ (km)	*CO2 Emissions (kg)*
1	UAL125	1210	1241	31	*1550*
2	SWR40	1272	1266	-6	*-300*
3	TSC701	1066	1047	-19	*-950*
4	SWR38	1275	1277	2	*100*
5	AAL759	1268	1284	15	*800*
6	RJA12B	1063	1054	-9	*-450*
7	N324CH	1054	1054	1	*0*
8	ACA845	1376	1370	-6	*-300*
9	ACA891	1116	1100	-16	*-800*
10	UAL47	1333	1358	25	*1250*
			Total Difference	+18km	*+900kg*

Table 8 - 13 Aug 19 Peak Day, Peak Hour Traffic Re-route Calculation

Table 8 concludes that the total re-route for the traffic sample of 10 flights is a cumulative additional 18km; however, analysing the most impacted flight would offer a scale of the greatest potential impact at a peak period within that portion of the network.

13. The most impacted flight can be seen to be UAL125 (Athens to Newark NJ), at Serial 1 in Table 8, above, which could be subjected to a 31km route extension. The flight distance from Athens to Newark is approximately 8000km; an extension of 31km would, therefore, correspond to an increase of <0.4%, which could be considered negligible.

14. Were a 30km extension to be applied to all flights in the sample, this could result in a total route extension of 300km for the impacted flights. This working assumption is explored further, below.

15. It is also important to note that the data in Table 8 assumes a full one-hour airspace volume activation and makes no provision for a tactical hand-back of the airspace to the network, which in turn would allow for ANSPs to apply a subsequent tactical re-route, potentially reducing extensions to impacted flights' tracks.[16]

Potential Fuel Burn and Emissions Impact

16. The analysis shows that, today, airlines often adopt slightly longer routes for wind, which may result in faster flight times. SaxaVord is unable to predict business decisions on airlines' routing as these are firmly the purview of individual operators.

17. The demonstrably negligible re-route impacts, therefore, show that the activation of the proposed airspace design does not have a significant impact on fuel burn and CO2 emissions, as, in some cases, the potential re-route could produce either a shorter or equivalent flight distance.

18. An accepted industry measure of CO2 per kg of aviation fuel burned is 3.18kg of CO2 per kg of fuel.[17] A commercial passenger flight burns approximately 40kg of fuel per km, which translates to

16. The subject of tactical notification and coordination procedures is an ongoing topic of discussion associated with LOAs and MOUs between SaxaVord and the relevant national and international parties.
17. CAP1616a, Page 24, Para 1.8 (online). Accessed on 2 Dec 22.

approximately 127.2kg of CO2 per kilometre. Thus, a 31km extension on a flight's route could produce an additional 5 (4.929) tonnes of CO2.

19. Returning to the most impacted flight profile in the data sample from Table 8, above: the flight distance from Athens to Newark is estimated to be in the region of 8000km. The flight could produce in the region of 1,017.6tonnes of CO2 (i.e. 8000 x 127.2kg CO2/km). Thus, a 5-tonne increase in CO2 emissions associated with a re-route of 31km is <0.4% increase in the flight's overall CO2 emissions.

Annual Traffic Re-route and CO2 Impact Assessment

20. An annual traffic re-route impact could be derived to quantify a worst-case scenario associated with the activation of the most limiting design, i.e. Design Option 1.

Assumptions.

21. To quantify an annual re-route impact, the following assumptions have been made:

- Launch Window Duration. The launch window duration is one hour.
- Traffic Sample. The traffic sample is 10 flights, highlighted at Table 8, above.
- Flight Distance. The flight distance for each flight is 8000km.
- CO2 Emissions. Flights will emit 3.18kg CO2 per kg fuel.
- Re-route Extension. The re-route extension for each flight is 30km. Whilst SaxaVord observed the worst-case route extension of 31km for one flight, a 30km route extension (for ease of interpretation) was applied to ALL flights.
- No of Instances. The no of instances of activation is 30 times (i.e. SaxaVord launches) per annum.

Annual Re-route and CO2 Impact Calculations.

No Flights	10				a
Flight Distance (km)	8000			km	b
Total Baseline Distance Flown (km) Per Instance		80,000		km	c = a x b
CO2 (kg)/kg of Fuel	3.18			kg	d
Fuel Burn(kg)/km	40			kg	e
CO2 (kg)/km	127.2			kg	f = d x e
Total Baseline CO2 Emissions (tonnes) Per Instance		10,176		tonnes	g = c x f
No of Instances Per Annum	*30*				h
Total Baseline Distance Flown (km) Per Annum			***2,400,000***	km	i = h x c
Total Baseline CO2 Emissions (tonnes) Per Annum			***305,280***	tonnes	j = h x g
Re-route per Flight (km)	*30*				k
Potential Re-route Distance (km) Per Instance		*300*		km	l = k x a
Potential Re-route CO2 (tonnes) Per Instance		38.16		tonnes	m = l x f
Potential Re-route Distance (km) Per Annum			***9,000***	km	n = k x l
Potential Re-route CO2 (tonnes) Per Annum			***1,145***	tonnes	o = k x m
Potential Total Distance Flown (km)			*2,409,000*	km	p = i + n
Potential Impacted CO2 Emissions (tonnes)			*306,425*	tonnes	q = j + o

Table 9 - Traffic Re-route and CO2 Impact Calculations

22. The analysis of potential impacts and the calculations offered in Table 9, above, demonstrate that the activation of the most limiting proposed design option (Design Option 1) at the peak hour of the peak day in the traffic sample on 30 instances (i.e. SaxaVord launches) per annum could

precipitate an impact of an additional 9,000km flight distance and an additional 1,145tonnes of CO2 to the 10 flights in the exemplar instance at Table 8. These figures must, however, be viewed in comparison with their respective baseline calculations, 2,400,000km and 305,280tonnes, respectively; the potential impact of a worst-case scenario represents an uplift of 0.375% in both flight distance and CO2 emissions.

Most importantly, these calculations do not consider Eurocontrol modelling and the identification of suitable launch windows to minimise impact on the airspace/ATM network, while satisfying specific launch orbit requirements. These latter activities could do much to further reduce the calculated impacts of the proposed airspace activation on the wider airspace network.

Forecast Traffic Levels

23. An extract from Eurocontrol's Traffic Forecast Update for Europe 2022-2028, dated October 2022, is offered at Figure 13, below.

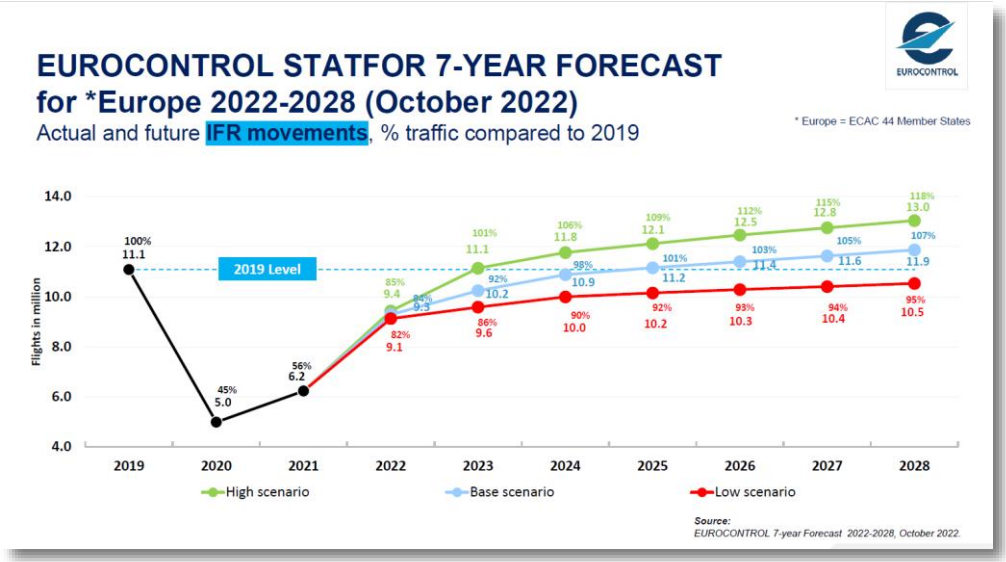

Figure 13 - Extract from Eurocontrol 7-year Forecast for Europe 2022-2028

Forecast Assumptions

24. For this element of the traffic assessment and analysis, the following assumptions have been made:

- The 10 impacted flights, as set out in Table 8, above, is the datum.
- The "Base Scenario" forecast (depicted in blue in Figure 13, above) is considered the measure for extrapolating data to 2028.
- The percentage forecast growth of the Baseline Scenario from 2024 to 2025 is 3%; thereafter, it reduces to 2% annually. Accordingly, when extrapolating the Baseline Scenario beyond 2028, 2% is assumed to be the annual forecast growth for the years 2029-2031.
- Given the infinite combinations of airspace activation time(s) and routes/destinations of the prevailing flights potentially impacted, the traffic sample in Table 8, above, applies across all years in Table 10, below.
- Forecast meteorological conditions cannot be considered in this analysis.

Forecast Analysis

25. Eurocontrol do not forecast a return to 2019 Base Scenario traffic levels until 2025; accordingly, the assumed datum of 10 flights is an overestimation for 2022-2024 (incl).

26. The assumed datum and application of percentage variance by year is set out in Table 10, below, and accompanied by an estimate on the potential number of flights impacted by the airspace activation. Although the Base Scenario is assumed, Low and High scenarios are offered for comparison; annual percentage growth for Low and High Scenarios were 1% and 3%, respectively, relative to the 2019 traffic; accordingly, these growth figures are extrapolated beyond 2028. In addition, numbers of impacted flights have been rounded up to ensure that a most limiting figure can be achieved.

Ser	Year	2022 Datum	Traffic Variance (%) (From Figure 13)			Potential Impacted Flights (Rounded Up to Nearest Whole No)		
			Low	Base	High	Low	Base	High
1	2019		-	-	-	-	10	-
2	2020		-55	-55	-55	-	10	-
3	2021		-44	-44	-44	-	10	-
4	2022	10	-15	-16	-18	-	10	-
5	2023		-14	-8	+1	-	10	11
6	2024		-10	-2	+6	-	10	11
7	2025		-8	+1	+9	10	10	11
8	2026		-7	+3	+12	10	10	12
9	2027		-6	+5	+15	10	11	12
10	2028		-5	+7	+18	10	11	12
11	2029		-4	+9	+21	10	11	13
12	2030		-3	+11	+24	10	12	13
13	2031		-2	+13	+27	10	12	13

Table 10 - Variance in Forecast Traffic Levels and Potential Impacted Flights

27. Drawing upon Eurocontrol's traffic forecast at Figure 13 and the analysis offered at Table 10, it can be shown that there is not a marked increase in the number of potential flights impacted by the activation of the proposed airspace design(s). A further 2 flights potentially impacted in 10 years' time, whilst an increase in relative terms, may not be seen to constitute a significant further increase.

28. Additionally, the analysis assumed the most limited airspace design, Design Option 1. It could, therefore, be posited that the proposed segmented airspace design (Design Option 2), subject to the segmentation required for the specific LV and the proposed time and routes of the flights, could either impact a smaller number of flights, or produce a lesser impact on the same number of flights.

29. Finally, the analysis here does not consider the Eurocontrol modelling and suitable launch window selection, which would seek to identify and select the appropriate launch window to minimise impact on the airspace/ATM network, while satisfying specific launch orbit requirements.

Re-route Indirect Noise Impact from Airspace Activation

30. For the sample peak day and hour, (i.e. 19 Aug 19 and 1300-1400UTC), the data shows that there was no re-route requirement and, therefore, no impact on flights below FL320 (see Figure 14, below). As a result, there was no re-route noise impact at 7,000ft or below.

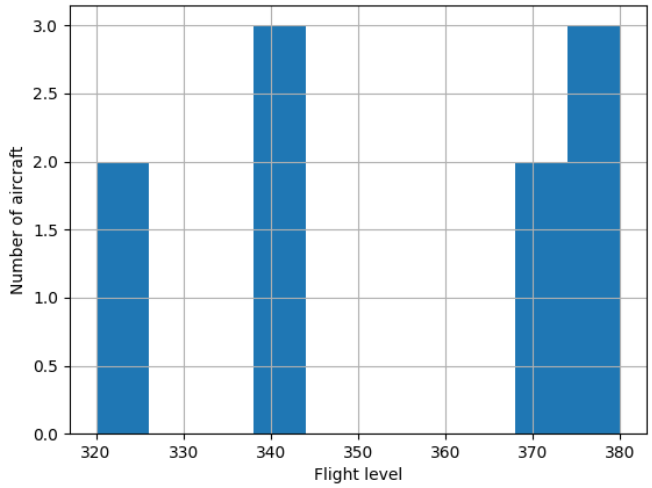

Figure 14 - Peak Day and Peak Hour traffic Flight Levels

31. However, when looking at the year's traffic data, solely for aircraft passing through 7000ft or below within the area, the most impacted day and hour is the 2nd August with at most 6 low level aircraft throughput the whole day (see Figure 15, below).

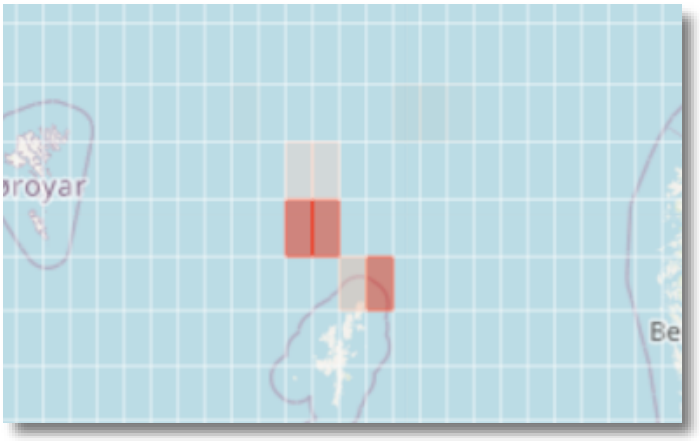

Figure 15 - Traffic Below 7000ft AMSL

32. When focussing on a single operating hour, at most only 2 aircraft are impacted and these would be over the sea.

33. The surveillance data does not have flight plan information on these aircraft, so a re-route analysis is not possible; however, it is reasonable to assume that these could be local GA aircraft that could adjust their flight profiles and schedules to deconflict with the activation of the proposed airspace design and corresponding aeronautical restriction. Moreover, flights below 7000ft AMSL in the areas depicted in Figure 15, above, would be conducted without ATC surveillance-based support (i.e. day VFR only).

34. Thus, the activation of the proposed airspace designs is not considered a material change to "routes and/or traffic patterns … below 7,000 feet (above mean sea level)"; similarly, this does not precipitate a corresponding change in either emissions or noise impacts.

Network Traffic Analysis Summary

35. SaxaVord analysed a year's ADS-B surveillance data to establish a pre-COVID-19 baseline traffic assessment, from which to identify potential impacts of SaxaVord's proposed airspace design options on the network. The AOIs considered macro and micro levels of airspace volumes, to enable context and comparisons to be drawn and identify the maximum potential number of flights that could be impacted were the proposed airspace design to be activated, i.e. a most limiting scenario. In turn, this enabled the subsequent analyses of the potential impacts of re-routing flights to avoid the airspace reservation, consider the associated impacts on individual flights routes (both positive and negative) and offer an initial assessment on environmental considerations.

36. A peak day and hour were identified and during that epoch 10 flights could be impacted by the activation of the proposed airspace design; using Eurocontrol traffic forecast data, this could increase to 12 flights in 10 years.

37. Flight distances were observed to be impacted by between -19 and +31km. Despite an observed cumulative variation of +18km across the whole flight sample, SaxaVord assumed an absolute worst-case scenario of an additional 30km for each flight. Extrapolating this extended flight distance across 10 flights and 30 instances (i.e. SaxaVord launches), the annual impacts for flight distance and CO2 emissions could be shown to increase by 9,000km and 1,145tonnes, respectively, representing a 0.375% increase in both metrics above the measured baseline calculations.

38. The analysis did not consider Eurocontrol modelling and the identification of suitable launch window that sought to select the most appropriate launch window to minimise impact on the airspace/ATM network, while satisfying specific launch orbit requirements. SaxaVord views these latter activities as key mitigation measures in minimising impact on the network.

39. SaxaVord, therefore, concludes that, even in a most limiting case, the wider network could incorporate the activation of the proposed airspace design with minimal/negligible impact on the baseline prevailing traffic scenario. Moreover, a proposed airspace design that enabled a reduced volume, commensurate with the launch profile and LV requirements, could be incorporated more readily, reducing impact further.

Appendix 9 to
ACP-2017-079 Stage 2 Submission
Dated 5 December 2022

ENVIRONMENTAL METRICS AND ASSESSMENT REQUIREMENTS

CAP1616, Page 162, Appendix B, Summary of Environmental Assessment Requirements for Level 1 Proposals.

Ser	Assessment Areas	CAP1616 Assessment Requirement	ACP-2017-079 Assessment
1	Noise	"Changes that affect routes and/or traffic patterns below 4,000 feet (above mean sea level)"	The proposed airspace design options do not drive changes that affect routes and/or traffic patterns below 4,000 feet (above mean sea level (AMSL)). See Appendix 8, Paras 32-36.
		"Changes that affect routes and/or traffic patterns at or above 4,000 feet and below 7,000 feet (above mean sea level)"	The proposed airspace design options do not drive changes that affect routes and/or traffic patterns at or above 4,000 feet and below 7,000 feet AMSL. See Appendix 8, Paras 32-36.
2	Overflight	"Overflight contours or swathes. These are a means of defining and portraying the pattern and dispersion of aircraft below 7,000 feet, and the frequency that they occur. They are based upon a perception of overflight - they do not illustrate noise impacts"	The proposed airspace design options do not impact the pattern and/or dispersion of aircraft below 7,000 feet AMSL. See Appendix 8, Paras 32-36.
3	CO2 Emissions	"An assessment of fuel and CO2 impacts of the proposed change using WebTAG. This will include annual totals for each option and the changes on a per-flight basis. Longer-term CO2 emissions (a 10-year forecast scenario) will also be required"	See Appendix 8, Paras 32-36. Annual totals for potential traffic impacts and CO2 emissions are offered at Appendix 8, Table 9. A more detailed assessment of fuel and CO2 impacts of the proposed airspace design options will be provided to support Stage 3.
4	Local Air Quality	"Explicit consideration of, and assessment using WebTAG where necessary. A full local air quality assessment is required if there are any changes to traffic dispersion or total aircraft emissions below 1,000 feet"	Not applicable, as the proposed airspace design options do not change traffic dispersion or total aircraft emissions below 1,000 feet AMSL.
5	AONBs and National Parks - Impacts Upon Tranquillity	"Explicit consideration of any changes to routes and/or traffic patterns that may affect either an Area of Outstanding Natural Beauty (AONB) or a	CAP1616 (Paras B76-78) states that the impact upon tranquillity need only be considered with specific reference to Areas of Outstanding Natural Beauty (AONBs) and National Parks unless other areas for consideration are identified through community engagement. To date, no such

Ser	Assessment Areas	CAP1616 Assessment Requirement	ACP-2017-079 Assessment
		National Park, with specific regard to impacts upon tranquillity"	consideration has been identified through the ACP-2017-079 stakeholder engagement, and there are no AONBs or national parks in the vicinity of the proposed airspace change. CAP1616 does not, however, ask sponsors to consider National Scenic Areas (NSAs) of Scotland, which may be considered broadly comparable. DIRECT - See Table E2 noise direct impact in Appendices 11 and 12. Although some noise will reach the Herma Ness NSA as a result of a launch it is at a level and duration (a few minutes) that is not considered to be significant when considered in the context of 30 or fewer launches per year. INDIRECT - The Herma Ness NSA is approximately 5km west of the SaxaVord Spaceport launch site. It is within the proposed volume of airspace immediately around the launch site. When the airspace is active no aircraft will be permitted to overfly or fly adjacent to the Herma Ness NSA. Hence, the indirect impact of aircraft on the Herma Ness NSA due to the proposed airspace change will be no worse than the baseline condition.
6	Biodiversity	"Explicit consideration of, and assessment where necessary. This requirement will typically be captured and considered as a specific factor in the design principles for each proposal. Most airspace change proposals are unlikely to have an effect upon biodiversity and therefore the inclusion within the design principles is expected to be the full extent of any consideration in most instances"	In satisfying the requirement of CAP1616 (Paras B79-80), reference is made to "SaxaVord Spaceport AEE V2.1 Assessment of Environmental Effects", dated 30th September 2022, submitted to the CAA as part of Space Industry Act (2018) licensing activities. Chapter 16 Summary of Environmental Effects of this AEE has been submitted in parallel to support this Stage 2 submission. See Attachment 2, Shetland Space Centre AEE Non-technical Summary, Chapter 11 and Chapter 16, specifically, Para 1.7.4 "The conclusion of this AEE is that there are no significant operational effects of concern from the Proposed Project and that the proposed activities will comply with statutory requirements and environmental policy objectives. As described in each of the technical chapters, this takes into consideration international, national and local legislation and objectives." The AEE assesses the impact of the whole SaxaVord Spaceport operation, not just the proposed airspace design, and thus includes direct and indirect impacts. It is being consulted on separately to this ACP.

Table 11 - Environmental Metrics and Assessment Requirements

Appendix 10 to
ACP-2017-079 Stage 2 Submission
Dated 5 December 2022

STAGE 2 INITIAL SAFETY STATEMENT

Introduction - Initial Safety Statement.

Launch activities by launch operators will be regulated and licenced by the CAA in accordance with the UK SIA 2018 and associated SIR. The flight safety analysis of the individual licenced launch will dictate the need for a specific airspace reservation in the launch area. This airspace reservation is likely to be a Danger Area and this ACP seeks to provide a suitable multi-use and multi-user design.

The design has been informed by representative orbital and suborbital cases that it is believed will encompass all anticipated launch vehicles likely to use the launch site. The sub-orbital case considered was a large, single-stage, passive fin guidance LV with no flight termination system (FTS) and a conservative impact dispersion area analysis. The orbital cases considered were sun-synchronous and polar trajectories; both instances were two-stage LVs.

Safety Approach.

Safety in the launch area will be by exclusion and the overall level of risk of an individual launch will be set by the regulator in granting a Launch Operator licence.

In managing the launch area airspace, SaxaVord will adopt the safety approach set out below.

In line with the SaxaVord SMS, the safety process for the proposed airspace design complies with the risk management and hazard identification procedures as depicted in Figure 16, below.

Figure 16 - SaxaVord SMS Safety Lifecycle

The risk management process will include both quantified and qualified approaches to meeting ALARP.

Initial Hazards Identified for Stage 2

The following initial hazards have been identified as part of the SaxaVord SMS and will be further elaborated and mitigated as appropriate in the upcoming safety assessment in future stage activities. This list is not exhaustive but provides an indication of the status of the hazard identification.

Ser	Scenario	Hazard	Hazard Description
1	Orbital and Sub-orbital Trajectory DA Design	DA dimensions are not sufficient to contain the normal and failure modes of the LV.	If DA is not big enough, there is a risk to airspace users outside the DA. Safety in the launch area will be by exclusion and the overall level of risk of an individual launch will be set by the regulator in granting a Launch Operator licence.
2	DA Notification/Publication	DA coordinates entered incorrectly in the corresponding NOTAM.	As a result, penetration of the DA could be possible, which could result in a risk to aviation users and the operation.
3	Activation of DA	Incorrect launch/reserve date or times entered in NOTAM.	DA not activated therefore possible no airspace protection for launch vehicle or aircraft/object entering the airspace.
		Coordination of launch activity is not completed correctly.	Notification of activation in a timely and staged fashion is not progressed. This could be human, procedural or external failure. This may result in air traffic not being re-routed around the DA ahead of time (note tactical penetration risk is under a separate hazard during the launch phase) as such the effect for this hazard is limited to workload/nuisance.
4	Penetration of the DA	Last minute notified airspace penetration by Emergency or ADP Flight.	Unavoidable penetration of DA by emergency or ADP flights could delay the launch and exceed the launch window OR Immediately after launch. If the "Go for Launch" is performed without final coordination with tactical stakeholders there is a risk that it is too late to stop the launch when access through the DA is required.
		Undetected penetration of the DA.	Unplanned accidental penetration activity affects the launch and potentially causes a collision with the LV. The probability accounts for the likelihood of an external party making the mistake of not knowing the launch details from the notifications (NOTAM).
5	Deactivation of DA	Deactivation notification is performed in error.	Due to a procedural failure the DA is deactivated when launch operation is still ongoing.

Table 12 - Initial Stage 2 Hazard Identification Output

Appendix 11 to
ACP-2017-079 Stage 2 Submission
Dated 5 December 2022

ACP-2017-079 CAP1616 TABLE E2 - DESIGN OPTION 1

Group	Impact	Level of Analysis	SaxaVord Response
Communities	Noise impact on health and quality of life	Monetise and quantify	DIRECT - The direct impact of noise due to vertical launch spaceflight activities at SaxaVord Spaceport was assessed in SaxaVord Spaceport AEE V2.1 Assessment of Environmental Effects dated 30/09/22 submitted to the CAA as part of Space Industry Act 2018 licensing activities. Volume II Chapter 8[18] considers noise and vibration. In addition, Volume IV Appendix 8.1 contains a copy of a report commissioned by SaxaVord from Blue Ridge Research and Consulting LLC (BRRC) titled "Noise Study for Launch Vehicle Operations at Shetland Space Centre" dated 02/10/20. The parts of the AEE related to noise (including the BRRC report) are external to this document but have been submitted in parallel to support this Stage 2 document [See SaxaVord AEE Noise Chapter 8]. Prediction of noise associated with launch vehicles (LVs), including static engine tests and launches, has been undertaken by BRRC. BRRC is an acoustical engineering consultancy focused on critical noise and vibration challenges for aerospace, aviation, and US Department of Defense projects. With experience from more than 250 civilian and military noise studies, BRRC's team of acoustical engineers is recognised as a trusted advisor to public, private, and academic clients in the space industry around the world. BRRC utilise RUMBLE noise modelling software as recognised in CAP1766. In advance of the CAA publishing a guidance document on environmental assessment requirements for space ACPs, SaxaVord has referred to the following: - Guidance to the regulator on environmental objectives relating to the exercise of its functions under the Space Industry Act 2018. • *"Guidance to the regulator on environmental objectives relating to the exercise of its functions under the Space Industry Act 2018"*. - Air Navigation Guidance 2017. • UK Air Navigation Guidance 2017. - Additional guidance under s70(2)(ca) Transport Act 2000: Carrying out air navigation functions for the purpose of spaceflight activities. Date 16 Sep 2021.

18. ITPEnergised (2022), "*SaxaVord Spaceport (ITPEnergised) AEE*", V2.1, dated 30 Sep 22. Chapter 8 (Noise and Vibration) of the AEE document has been extracted and submitted to CAA to support with this Stage 2 submission.

Group	Impact	Level of Analysis	SaxaVord Response
Communities (contd)	Noise impact on health and quality of life (contd)		• *"Additional guidance under s70(2)(ca) Transport Act 2000: Carrying out air navigation functions for the purpose of spaceflight activities"*. The following analysis is, therefore, presented: - "When assessing distinct and infrequent noise, such as rocket noise, measures of single events such as the maximum noise level (LAmax) and the sound exposure level (SEL or LAE) are most appropriate". See AEE section 8.8. • The closest residence highest predicted level occurs during launches with a predicted level of 102 dBL_{Amax} [AEE 8.8.14]. Limit 110 dBL_{Amax} • There are no residences within the predicted level contour 120 dBL_{max} [AEE 8.8.27]. Limit 120 dBL_{max} • The highest predicted level at Herma Ness NSA occurs during a launch from Launch Pad 1 and is 87 dBL_{Amax} - Where the rocket launch noise footprint could result in exposures in excess of 80, 85, 90, 95 and 100 dBLASmax, these areas will be published on suitable maps and used to communicate with local stakeholders. • This will be done based on individual launch operator's launch vehicle data. - Sonic booms. • The sonic boom from launches is predicted to occur 60 km out to sea, away from populated areas; therefore, further consideration of air overpressure effects on structures and human receptors is not made [AEE 8.1.7]. - Sleep disturbance. See AEE 8.8.17-18. • On any one night, it is anticipated that there will be only one launch event of short duration. Even if this event awakens an individual (probability of awakening of 1.0) this is not considered to be detrimental to health. Furthermore, due to the low number of night launches expected across a year (approximately 10) this will further reduce the likelihood of any adverse effects on health due to night time awakening. • Therefore, the probability of awakening formula given in "Guidance to the regulator on environmental objectives relating to the exercise of its functions under the Space Industry Act 2018" is not used. INDIRECT - When the airspace is active no aircraft will be permitted to overfly or fly adjacent to the communities local to the spaceport. Hence, the indirect impact of aircraft noise on the local community due to the proposed airspace change will be no worse than the baseline condition. See Appendix 8, Paras 30-34 for assessment of "Re-route Indirect Noise Impact from Airspace Activation". The activation of the proposed airspace design is not considered a material change to "routes and/or traffic patterns … below 7,000 feet (above mean sea level)"; similarly, this does not precipitate a corresponding change in noise impacts. There is no requirement to monetise noise impacts as per the "Additional guidance under s70(2)(ca) Transport Act 2000".

Group	Impact	Level of Analysis	SaxaVord Response
Communities	Air quality	Qualitative or monetise and quantify, depending on the scope of the proposal	DIRECT - See SaxaVord Spaceport AEE V2.1 Assessment of Environmental Effects dated 30/09/22 submitted to the CAA as part of Space Industry Act 2018 licensing activities. The Non-Technical Summary (NTS) of this AEE has been submitted in parallel to support this Stage 2 submission. See Attachment 2, Shetland Space Centre AEE Non-technical Summary, Chapter 11 and Chapter 16, specifically, Para 1.7.4: "Launch event emissions are predicted to have no perceptible impact at any identified receptors under prevailing wind directions. The maximum predicted impact at a sensitive receptor is predicted to occur with north-easterly winds which occur typically for less than 10% of the year. The maximum predicted 8-hour concentration of CO is 28% of the AQS. Emissions from launch events are therefore considered to have an effect of negligible significance on air quality, therefore resulting in no likely significant effect." INDIRECT - Not applicable; traffic data shows that there is negligible flying activity at or below 1000ft AMSL on the Shetland islands. Design Option 1 does not, therefore, impact either traffic dispersion or total aircraft emissions below 1,000 feet AMSL. Consequently, there is no corresponding impact on air quality associated with the activation of Design Option 1. Given the negligible traffic operating at 1,000ft or below within the vicinity of the SaxaVord site, the extensive modelling required to monetise any variance in such a negligible number of aircraft movements is disproportionate.
Wider Society	Greenhouse gas impact	Monetise and quantify	DIRECT - A planning application for the Proposed Project was lodged with Shetlands Islands Council in January 2021 and planning permission granted on 30 March 2022 (document reference 2021/005/PPF). An environmental impact assessment was undertaken as part of the planning application for the Proposed Project and an Environmental Impact Assessment Report (EIAR) produced. Document reference: ITPEnergised (January 2021) *"Shetland Space Centre Environmental Impact Assessment Report (3148_1)"*. EIAR available (with the rest of the planning documents) at: https://pa.shetland.gov.uk/online-applications/applicationDetails.do?activeTab=summary&keyVal=QMI5QYOAGFC00 The chapter of the EIAR related to climate change (Chapter 15) has been submitted in parallel to support this Stage 2 submission. See Attachment 3, specifically, Para 15.8.18: "Launch campaigns will directly result in up to 764 tCO2e of emissions annually, as the rocket engines consume RP-1 fuel which has a high carbon content. The site will have capacity to support 30 launches per year, each generating an average of 25.45 tCO2e" This is based on a typical liquid oxygen and kerosene low earth orbit capable launch vehicle that may launch from SaxaVord. This is a limiting case as it is expected that not all of the 30 launches in a year will be of launch vehicles this large. INDIRECT - The analysis at Appendix 8 shows that, today, airlines often adopt slightly longer routes for wind, which may result in faster flight times. SaxaVord is unable to predict business decisions on airlines' routing as these are firmly the purview of individual operators. *A qualitative prediction on the tactical actions of individual airline crews and ANSPs cannot be offered.*

Group	Impact	Level of Analysis	SaxaVord Response
			Appendix 8 demonstrates that the negligible re-route impacts associated with activation of the Design Option 1 has an equally negligible impact on fuel burn and CO2 emissions; in some cases, the potential re-route could produce either a shorter or equivalent flight distance. Activation of Design Option 1 at the peak hour of the peak day in the traffic sample on 30 instances (i.e. SaxaVord launches) per annum could precipitate an impact of an additional 9,000km flight distance and an additional 1,145tonnes of CO2 to the 10 flights in the exemplar instance at Appendix 8, Table 8. Monetisation of this data will be provided for Stage 3.
Wider Society	Capacity/resilience	Monetise and quantify	Not applicable; Design Option 1 would not impact the capacity/resilience of the wider UK society and its overall infrastructure.
General Aviation	Access	Monetise and quantify	Not applicable; Design Option 1 would have a negligible impact on the minimal general aviation operations in Unst.
General Aviation/ commercial airlines	Economic impact from increased effective capacity	Quantify	Not applicable; Design Option 1 would not impact forecast increase in air transport movements and estimated passenger numbers or cargo tonnage carried.
General Aviation/ commercial airlines	Fuel burn	Monetise and quantify	Activation of Design Option 1 at the peak hour of the peak day in the traffic sample on 30 instances (i.e. SaxaVord launches) per annum could precipitate an impact of an additional 9,000km flight distance to the 10 flights in the exemplar instance at Appendix 8, Table 8. At 40kg per km flown, this equates to an additional 360tonnes of aviation fuel. Monetisation of this data will be provided for Stage 3.
Commercial airlines.	Training costs	Monetise and quantify	Not applicable. Airspace reservations and their management, by both pilots and ANSPs are a routine occurrence in aviation; Design Option 1 would not impose an additional training burden on commercial airline operations.
Commercial airlines	Other costs	Qualitative	Not applicable; Design Option 1 would not impose quantifiable other costs on commercial aviation.
Airport/ Air navigation service provider	Infrastructure costs	Monetise and quantify	Not applicable. Airspace reservations and their management, by both pilots and ANSPs are a routine occurrence in aviation. Design Option 1 would not impose a change in ANSPs' infrastructure.
Airport/ Air navigation service provider	Operational costs	Monetise and quantify	Not applicable. Airspace reservations and their management are a routine occurrence for ANSPs. Design Option 1 would not impose a change in ANSP operational costs.
Airport/ Air navigation service provider	Deployment costs	Monetise and quantify	Not applicable. Airspace reservations and their management are a routine occurrence for ANSPs. Design Option 1 would not impose a retraining and deployment cost burden on ANSPs.

Table 13 - Guide to Expected Approach to Key Analysis for a Typical Airspace Change

Appendix 12 to
ACP-2017-079 Stage 2 Submission
Dated 5 December 2022

ACP-2017-079 CAP1616 TABLE E2 - DESIGN OPTION 2

Group	Impact	Level of Analysis	SaxaVord Response
Communities	Noise impact on health and quality of life	Monetise and quantify	DIRECT - The direct impact of noise due to vertical launch spaceflight activities at SaxaVord Spaceport was assessed in SaxaVord Spaceport AEE V2.1 Assessment of Environmental Effects dated 30/09/22 submitted to the CAA as part of Space Industry Act 2018 licensing activities. Volume II Chapter 8[19] considers noise and vibration. In addition, Volume IV Appendix 8.1 contains a copy of a report commissioned by SaxaVord from Blue Ridge Research and Consulting LLC (BRRC) titled "Noise Study for Launch Vehicle Operations at Shetland Space Centre" dated 02/10/20. The parts of the AEE related to noise (including the BRRC report) are external to this document but have been submitted in parallel to support this Stage 2 document [See SaxaVord AEE Noise Chapter 8]. Prediction of noise associated with launch vehicles (LVs), including static engine tests and launches, has been undertaken by BRRC. BRRC is an acoustical engineering consultancy focused on critical noise and vibration challenges for aerospace, aviation, and US Department of Defense projects. With experience from more than 250 civilian and military noise studies, BRRC's team of acoustical engineers is recognised as a trusted advisor to public, private, and academic clients in the space industry around the world. BRRC utilise RUMBLE noise modelling software as recognised in CAP1766. In advance of the CAA publishing a guidance document on environmental assessment requirements for space ACPs, SaxaVord has referred to the following: - Guidance to the regulator on environmental objectives relating to the exercise of its functions under the Space Industry Act 2018. • *"Guidance to the regulator on environmental objectives relating to the exercise of its functions under the Space Industry Act 2018"*. - Air Navigation Guidance 2017. • UK Air Navigation Guidance 2017. - Additional guidance under s70(2)(ca) Transport Act 2000: Carrying out air navigation functions for the purpose of spaceflight activities. Date 16 Sep 2021.

19. ITPEnergised (2022), "*SaxaVord Spaceport (ITPEnergised) AEE*", V2.1, dated 30 Sep 22. Chapter 8 (Noise and Vibration) of the AEE document has been extracted and submitted to CAA to support with this Stage 2 submission.

Group	Impact	Level of Analysis	SaxaVord Response
Communities	Noise impact on health and quality of life (contd)		• *"Additional guidance under s70(2)(ca) Transport Act 2000: Carrying out air navigation functions for the purpose of spaceflight activities"*. The following analysis is, therefore, presented: - "When assessing distinct and infrequent noise, such as rocket noise, measures of single events such as the maximum noise level (LAmax) and the sound exposure level (SEL or LAE) are most appropriate". See AEE section 8.8. • The closest residence highest predicted level occurs during launches with a predicted level of 102 dBL_{Amax} [AEE 8.8.14]. Limit 110 dBL_{Amax} • There are no residences within the predicted level contour 120 dBL_{max} [AEE 8.8.27]. Limit 120 dBL_{max} • The highest predicted level at Herma Ness NSA occurs during a launch from Launch Pad 1 and is 87 dBL_{Amax} - Where the rocket launch noise footprint could result in exposures in excess of 80, 85, 90, 95 and 100 dBLASmax, these areas will be published on suitable maps and used to communicate with local stakeholders. • This will be done based on individual launch operator's launch vehicle data. - Sonic booms. • The sonic boom from launches is predicted to occur 60 km out to sea, away from populated areas; therefore, further consideration of air overpressure effects on structures and human receptors is not made [AEE 8.1.7]. - Sleep disturbance. See AEE 8.8.17-18. • On any one night, it is anticipated that there will be only one launch event of short duration. Even if this event awakens an individual (probability of awakening of 1.0) this is not considered to be detrimental to health. Furthermore, due to the low number of night launches expected across a year (approximately 10) this will further reduce the likelihood of any adverse effects on health due to night time awakening. • Therefore, the probability of awakening formula given in "Guidance to the regulator on environmental objectives relating to the exercise of its functions under the Space Industry Act 2018" is not used. INDIRECT - When the airspace is active no aircraft will be permitted to overfly or fly adjacent to the communities local to the spaceport. Hence, the indirect impact of aircraft noise on the local community due to the proposed airspace change will be no worse than the baseline condition. See Appendix 8, Paras 30-34 for assessment of "Re-route Indirect Noise Impact from Airspace Activation". The activation of the proposed airspace design is not considered a material change to "routes and/or traffic patterns … below 7,000 feet (above mean sea level)"; similarly, this does not precipitate a corresponding change in noise impacts. There is no requirement to monetise noise impacts as per the "Additional guidance under s70(2)(ca) Transport Act 2000".

Group	Impact	Level of Analysis	SaxaVord Response
Communities	Air quality	Qualitative or monetise and quantify, depending on the scope of the proposal	DIRECT - See SaxaVord Spaceport AEE V2.1 Assessment of Environmental Effects dated 30/09/22 submitted to the CAA as part of Space Industry Act 2018 licensing activities. The Non-Technical Summary (NTS) of this AEE has been submitted in parallel to support this Stage 2 submission. See Attachment 2, Shetland Space Centre AEE Non-technical Summary, Chapter 11 and Chapter 16, specifically, Para 1.7.4: "Launch event emissions are predicted to have no perceptible impact at any identified receptors under prevailing wind directions. The maximum predicted impact at a sensitive receptor is predicted to occur with north-easterly winds which occur typically for less than 10% of the year. The maximum predicted 8-hour concentration of CO is 28% of the AQS. Emissions from launch events are therefore considered to have an effect of negligible significance on air quality, therefore resulting in no likely significant effect." INDIRECT - Not applicable; traffic data shows that there is negligible flying activity at or below 1000ft AMSL on the Shetland islands. Design Option 1 does not, therefore, impact either traffic dispersion or total aircraft emissions below 1,000 feet AMSL. Consequently, there is no corresponding impact on air quality associated with the activation of Design Option 1. Given the negligible traffic operating at 1000ft or below within the vicinity of the SaxaVord site, the extensive modelling required to monetise any variance in such a negligible number of aircraft movements is disproportionate.
Wider Society	Greenhouse gas impact	Monetise and quantify	The analysis at Appendix 8 shows that, today, airlines often adopt slightly longer routes for wind, which may result in faster flight times. SaxaVord is unable to predict business decisions on airlines' routing as these are firmly the purview of individual operators. DIRECT - A planning application for the Proposed Project was lodged with Shetlands Islands Council in January 2021 and planning permission granted on 30 March 2022 (document reference 2021/005/PPF). An environmental impact assessment was undertaken as part of the planning application for the Proposed Project and an Environmental Impact Assessment Report (EIAR) produced. Document reference: ITPEnergised (January 2021) *"Shetland Space Centre Environmental Impact Assessment Report (3148_1)"*. EIAR available (with the rest of the planning documents) at: https://pa.shetland.gov.uk/online-applications/applicationDetails.do?activeTab=summary&keyVal=QMI5QYOAGFC00 The chapter of the EIAR related to climate change (Chapter 15) has been submitted in parallel to support this Stage 2 submission. See Attachment 3, specifically, Para 15.8.18: "Launch campaigns will directly result in up to 764 tCO2e of emissions annually, as the rocket engines consume RP-1 fuel which has a high carbon content. The site will have capacity to support 30 launches per year, each generating an average of 25.45 tCO2e" This is based on a typical liquid oxygen and kerosene low earth orbit capable launch vehicle that may launch from SaxaVord. This is a limiting case as it is expected that not all of the 30 launches in a year will be of launch vehicles this large.

Group	Impact	Level of Analysis	SaxaVord Response
			INDIRECT - The analysis at Appendix 8 shows that, today, airlines often adopt slightly longer routes for wind, which may result in faster flight times. SaxaVord is unable to predict business decisions on airlines' routing as these are firmly the purview of individual operators. *A qualitative prediction on the tactical actions of individual airline crews and ANSPs cannot be offered.* Appendix 8 demonstrates that the negligible re-route impacts associated with activation of the Design Option 1 can be further reduced as a result of the flexibility of being able to tailor the activation of Design Option 2 to the specific characteristics of the LV. Design Option 2's impact on the network will sit somewhere between Baseline and Design Option 1; the ability to quantify all the many variations of Design Option 2 is neither possible, nor proportionate. Monetisation of Design Option 2 is, therefore, not possible, and will be between the extremities of Baseline and Design Option 1.
Wider Society	Capacity/resilience	Monetise and quantify	Not applicable; Design Option 1 would not impact the capacity/resilience of the wider UK society and its overall infrastructure.
General Aviation	Access	Monetise and quantify	Not applicable; Design Option 1 would have a negligible impact on the minimal general aviation operations in Unst.
General Aviation/ commercial airlines	Economic impact from increased effective capacity	Quantify	Not applicable; Design Option 1 would not impact forecast increase in air transport movements and estimated passenger numbers or cargo tonnage carried.
General Aviation/ commercial airlines	Fuel burn	Monetise and quantify	Activation of Design Option 1 at the peak hour of the peak day in the traffic sample on 30 instances (i.e. SaxaVord launches) per annum could precipitate an impact of an additional 9,000km flight distance to the 10 flights in the exemplar instance at Appendix 8, Table 8. At 40kg per km flown, this equates to an additional 360tonnes of aviation fuel. Design Option 2's impact on fuel burn will sit somewhere between Baseline and Design Option 1; the ability to quantify all the many variations of Design Option 2 is neither possible, nor proportionate. Monetisation of Design Option 2 is, therefore, not possible, and will be between the extremities of Baseline and Design Option 1.
Commercial airlines.	Training costs	Monetise and quantify	Not applicable. Airspace reservations and their management, by both pilots and ANSPs are a routine occurrence in aviation; Design Option 1 would not impose an additional training burden on commercial airline operations.
Commercial airlines	Other costs	Qualitative	Not applicable; Design Option 1 would not impose quantifiable other costs on commercial aviation.
Airport/ Air navigation service provider	Infrastructure costs	Monetise and quantify	Not applicable. Airspace reservations and their management, by both pilots and ANSPs are a routine occurrence in aviation. Design Option 1 would not impose a change in ANSPs' infrastructure.
Airport/ Air navigation service provider	Operational costs	Monetise and quantify	Not applicable. Airspace reservations and their management are a routine occurrence for ANSPs. Design Option 1 would not impose a change in ANSP operational costs.

Group	Impact	Level of Analysis	SaxaVord Response
Airport/ Air navigation service provider	Deployment costs	Monetise and quantify	Not applicable. Airspace reservations and their management are a routine occurrence for ANSPs. Design Option 1 would not impose a retraining and deployment cost burden on ANSPs.

Table 14 - Guide to Expected Approach to Key Analysis for a Typical Airspace Change