Step 1b Design Principles

Second Gateway Submission

Document Details

Reference	Description
Document Title	**SSC Design Principles Second Gateway Submission**
Stage	Step 1B
Document Reference	SSC-CAA120520GS1B
Issue	Issue 1
Date	12 May 2020

Issue	Amendment	Date
Issue 1		12 May 2020

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Glossary of Terms

Acronym	Meaning	Acronym	Meaning
ACP	Airspace Change Process	LOA	Letter of Agreement
AFUA	Advanced Flexible Use of Airspace	MOD	Ministry of Defence
ALARP	As Low as Reasonably Practicable	NATS	National Air Traffic Services
AMS	Airspace Modernisation Strategy	NOTAM	Notice to Airmen
ASM	Airspace Management	OCA	Oceanic Control Area
ATS	Air Traffic Services	SAR	Search and Rescue
AUP	Airspace Usage Plan	SIA	Space Industries Act
CAA	Civil Aviation Authority	SIC	Shetland Islands Council
FBZ	Flight Planning Buffer Zones	SSC	Shetland Space Centre
FIR	Flight Information Region	UKSA	United Kingdom Space Agency
FRA	Free Route Airspace	UAS	Unmanned Air System
GATCO	Guild of Air Traffic Control Officers	UIR	Upper Flight information Region

Development of Airspace Change Design Principles

Introduction

The Design Principles step of the Airspace Change Process (ACP) is when the change sponsor, in this case Shetland Space Centre (SSC), develops those Design Principles that will underpin the airspace change. These principles will be a mix of safety, environmental, operational and strategic (adhering to government policies relating to airspace use). They are developed after consultation and engagement with stakeholders, not just those directly involved in aviation but anybody who could be affected by the proposed change. Once established these principles can be used to assess design options.

This document outlines how SSC has undertaken the public engagement to support our ACP proposal, in accordance with the Civil Aviation Authority's (CAA) publication CAP 1616, Stage 1B.

Statement of Need - 147315.DAP1916-166 V2 was submitted to the CAA on 20/09/2019.

SSC is developing a vertical launch spaceport on the island of Unst, Shetland. The spaceport will launch small rockets into space from Lamba Ness on Unst in a Northerly direction over the sea. To ensure that other airspace users and the public are protected from rocket launches SSC are undertaking an Airspace Change with the CAA. The ACP is only one part of the regulatory engagement that SSC will have to undertake, some of the others being a planning application (Shetland Islands Council SIC) and grant of a Spaceport operator's license (United Kingdom Space Agency UKSA). All of the regulatory engagements have some overlap and also call for regular public and community engagement.

Issue 1 of this document was submitted to the CAA on 14 Feb 2020 (SSC-CAA140220GS). At the Gateway the CAA assessed that the Non-Aviation Stakeholder engagement was not robust enough and that the Design Principles were not adequately formed. Between 16 Mar 2020 and 8 May 2020 a further round of Non-Aviation Stakeholder engagement was conducted. This document provides details on the First Stakeholder Engagement, the Second Stakeholder Engagement and the subsequent development of revised Design Principles.

First Stakeholder Engagement

Introduction

Stage 1 of the ACP requires the sponsor to establish a statement of need and a list of Design Principles. These principles can only be developed post a two-way engagement with affected stakeholders, be they aviation related or members of the public.

SSC identified and contacted a range of groups and organisations that could be impacted by the ACP; however, SSC were keen to ensure that they reached out to a wider group, particularly the local population and the wider public. To this end SSC undertook two public sessions in Shetland. These sessions were publicised in the local press and during a radio interview with BBC Shetland and allowed SSC to explain that an ACP was ongoing and hand out hard-copy questionnaires (SSC-CAA140220GS Appendix 1):

- Lerwick (Mareel Cinema), 19 Dec 2019 1600 – 1900. Fifteen people given hard-copy questionnaires.
- Unst (Saxa Vord Resort), 08 Jan 2020 1500-1800. Three people given hard-copy questionnaires.

SSC also placed announcements on their Twitter feed, Facebook page and website, all of which contained links to a web page where respondents could share their views.

SSC also contacted those organisations that would be using the airspace to gather their views and perhaps gain an idea of "best practice" from their experience in other parts of the world.

SSC offered the following contact methods to affected stakeholders:

- Direct email

- Web site link
- Facebook link
- Twitter link
- Public Sessions offering questionnaires in hard copy

The questionnaire was also uploaded independently to the website of some of the stakeholders we had contacted such as GATCO and Rocketeers.
A full list of those contacted and who responded is at SSC-CAA140220GS Appendix 2.

Questionnaires

The questionnaires were distributed by the above methods and tried to outline why SSC were looking for an airspace change, what the process was and how people could reply with their views. The questionnaire also sought to set a number of outline questions through which SSC could begin to craft Design Principles. The questionnaires were distributed by email between 10 and 17 December 2019 and asked for a reply by 10 January 2020. However, during this process some respondents suggested other organisations and individuals, who were then contacted subsequently and the reply deadline was extended.

There were a limited number of responses, only 13 in total. The reasons for this limited response may be the low population numbers in Shetland and particularly Unst, plus the fact that the airspace in and around Unst is fairly quiet. Another reason may be the ACP running concurrently with the Sutherland Space Hub. They had sent out their questionnaires a few weeks before and some organisations may have believed that the questionnaire was a duplicate sent in error and that they had already responded. One of the respondents did mistake Sutherland for Shetland.

We also received a reply from Isavia, Iceland Air Navigation Service Provider, stating that they had no comments to make at this stage of the process but asked to be kept informed.

A full copy of the responses is at SSC-CAA140220GS Appendix 3.

Focus Groups

SSC had intended to hold focus groups, however, the paucity of responses suggested that these would not be productive and would not add to the views already gathered by the questionnaire. Nevertheless, as the ACP progresses it is hoped that more stakeholders will make themselves known and SSC intend to listen to all views throughout the ongoing process.

Review of Design Principles

The responses to the questionnaires were assessed and added to further analysis by SSC after which a list of potential Design Principles was established. These were then sent out as a second round of engagement for comment. Stakeholders were asked to say whether they agreed with a Design Principle and to rank those principles in order of importance. These potential Design Principles were sent out on 04 February 2020. A copy of the potential principles as sent out is at SSC-CAA140220GS Appendix 4.

Comment on First Stakeholder Engagement

The stakeholder contact list (SSC-CAA140220GS Appendix 2) did not identify stakeholders by type or category. The Design Principles Questionnaire (SSC-CAA140220GS Appendix 1) was sub-titled "Aviation Stakeholders" and the questions were focused on aviation aspects. All stakeholders received the same questionnaire. Therefore, it is likely that non-aviation stakeholders were disadvantaged during the consultation. The information received from aviation stakeholders with respect to the questionnaire is assessed to be valid by SSC. The Design Principles arrived at in SSC-CAA140220GS were not based on complete information and are superseded by those of this document after assessment of both the first and second stakeholder engagement responses.

Second Stakeholder Engagement

Introduction

To ensure that a sufficiently broad base of stakeholders had been engaged, the stakeholder contact list used in the first stakeholder engagement (SSC-CAA140220GS Appendix 2) was split into the following sub-categories for analysis:

- Aviation-
  - Commercial Aviation
  - National Bodies
  - Unmanned Aerial Systems
  - Non-commercial Aviation
  - Rocket and Space Operations
- Non-Aviation-
  - Local Bodies
  - National Bodies
  - Commercial
  - Elected Representatives
  - Other

Inspection of this list showed a generally good coverage of stakeholders. However, elected representatives were under represented on the contact list and a further MP and MSP were added to ensure adequate stakeholder engagement. As the second round of stakeholder engagement progressed this contact list was amended as new stakeholders were identified. This Second Stakeholder Engagement Contact List is at Appendix 1 to this document.

SSC placed announcements on their Twitter feed, LinkedIn page, Facebook page and website, all of which contained links to a web page where respondents could share their views. In total, the following methods were used to elicit responses to the Design Principles Questionnaire – Non-Aviation Stakeholders:

- Direct email
- SSC web site link
- Facebook link and focused Facebook advertising
- LinkedIn link
- Twitter link
- Public Sessions offering questionnaires in hard copy were planned for the week of 16-20 Mar 2020. However, due to the Coronavirus public health situation these were cancelled. The availability of hard-copy questionnaires on request was highlighted via the other contact methods. One hard copy was delivered by mail.
- BBC Radio Shetland, Shetland Islands Broadcasting Company
- Shetland News, Shetland Times

Design Principles Questionnaires (Non-Aviation Stakeholders)

The Design Principles questionnaire for Non-Aviation Stakeholders, is at Appendix 2 to this document. The questionnaires were distributed to Non-aviation Stakeholders on 17 Mar 2020 with responses requested by 3 Apr 2020. Although this was a shorter consultation period than used in the First Stakeholder Engagement phase, the majority of the stakeholders were being contacted for a second time so it was considered that their familiarity with the process would facilitate a suitably prompt response.

In total 17 responses were received:

- Online questionnaires via the SSC web site – 14
- Hardcopy questionnaires – one
- Email questionnaires – 2
- Facebook. Numerous comments and discussion

The questionnaire responses were compiled into the document Questionnaire Responses at Appendix

3 to this document.

The 17 Non-Aviation Stakeholder responses and 13 Aviation Stakeholder responses (from the first round of stakeholder engagement) were considered by SSC to be of sufficient number to meaningfully inform the Design Principles derivation. Some of the answers to individual questions were not relevant to the ACP but will be considered by SSC at the relevant planning process.

Focus Groups

Due to the Coronavirus public health situation at the time of the second stakeholder engagement no Focus Groups were able to be conducted. Careful consideration in the compilation of the Second Stakeholder Engagement List was given to ensuring that suitable Island Community Groups were included. These Community Groups play an important role in influencing Island life, particularly on Unst, the proposed location of the launch site, where the small population is well represented by Community Groups. Due to the good number of responses to the questionnaires, it is doubtful that a Focus Group attended by only one or two attendees would add value to the process beyond that achieved by the questionnaires. Nevertheless, as the ACP progresses it is hoped that more stakeholders will make themselves known and SSC intend to listen to all views throughout the ongoing process.

Design Principles

The responses to the Non-Aviation Stakeholder questionnaires were assessed in conjunction with the responses received from the Aviation Stakeholder questionnaires. In other words, both the first and second stakeholder engagement responses were subject to further analysis after which a list of potential Design Principles was established.

Review of Design Principles

The potential Design Principles were then sent out as a further round of engagement for comment to both Aviation and Non-Aviation Stakeholders. The following methods were used to elicit responses to the potential Design Principles review:

- Direct email
- SSC web site link
- Facebook link
- LinkedIn link
- Twitter link

Stakeholders were asked to say whether they agreed with a potential Design Principle, to rank the principles in order of importance on a scale of A to E (with A being the highest importance) and to add further comment if desired. The potential Design Principles review was initiated on 14 Apr 2020 with returns requested by 8 May 2020. The Design Principle review questionnaire is at Appendix 4 to this document.

A total of 22 responses were received:

- Online via the SSC website – 14
- Emails – 8

These responses are recorded in Design Principle Review Responses at Appendix 5 to this document.

Design Principles

Potential Design Principles

All of the stakeholder questionnaires and feedback gathered were subject to analysis by SSC to derive the potential Design Principles given in Table 1. These are the Design Principles that were sent to all stakeholders for comment during the second round of engagement. These Design Principles already include feedback from the first round of engagement. In the following discussion of the derivation of the potential Design Principles the original analysis from the first round of stakeholder engagement has been retained for audit trail purposes and analysis from the second round of stakeholder engagement added.

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

Table 1 Potential Design Principles

DP 1. The safety of other airspace users and the public is the paramount Design Principle to be used in the ACP.

The Statement of Need proposed that a safety area was required to "provide protection during launch". One respondent stated:

"If segregated airspace is required it is not the launch vehicle that requires protection but rather other airspace users from that vehicle. This must be the premis under which airspace is designed and should guide the principles under which this ACP is conducted."

The Space Industries Act (SIA) 2018 Section 5, Range, states that:

In this Act "range" means a zone which (or two or more zones each of which) is subject to restrictions, exclusions or warnings for keeping it clear, at the relevant times, of—

(a)persons or things that might pose a hazard to spaceflight activities, and

(b)persons or things to which spaceflight activities might pose a hazard.

"Zone" here means a volume of airspace or an area of land or sea.

After assessment SSC believe that the Design Principle should take heed of the stakeholder comment and, indeed, go further by also adding the public.

The safety of other airspace users and the public is of paramount importance. Rocket launches will be conducted under strict safety procedures, taking account of both the potential and kinetic energy of the rocket. The safety procedures are expected to be laid out in the secondary legislation to the SIA 2018 and will form part of the spaceport license. SSC will ensure that a safety case, adhering to the "as low as reasonably practicable" (ALARP) principles, is developed.

Other Airspace Users are commercial air traffic, military and general aviation, consisting of both fixed and rotary wing. Unmanned Air systems are also included.

The public refers to members of the public who are not involved in the rocket launch.

DP 2. The environmental and noise effects of rocket launch should be minimised by the design of the airspace change.

Noise and the environment were of particular concern:

> *"I would be opposed the proposed rocket launching site because of its impact on the very special eco system that exists in this area".*
>
> *"Health of local community.....air, land and sea pollution considerations"*

Whilst space and small satellites are of great use in the combatting and monitoring of climate change, e.g. illegal logging monitoring, sea temperature etc, SSC appreciate that the launch of rockets will have an environmental cost. This cost will potentially include re-routing of commercial air traffic resulting in increased fuel burn and CO2 output to avoid the initial launch plus the re-entry of spent stages. CO2 will also be produced by the rockets launched; therefore, the most direct/efficient trajectory should be flown to reduce fuel requirements.

Additionally, SSC may need to consider the environmental impact of spent stages being deposited in the sea both in UK waters and in other countries Exclusive Economic Zones during the ACP. This environmental impact is expected to be relevant in the grant of a spaceport license and also a license to the rocket provider to launch from the UK. It will also no doubt be part of a Marine Scotland license.

Rocket launches will also generate increased noise in and around the launch site, mainly caused by the exhaust gasses and the rocket becoming supersonic when it is at altitude. The noise will have an effect upon the local population and wildlife. As part of the planning and spaceport licensing processes SSC will have to produce a noise analysis report. This report, and any other relevant environmental impact assessments from other planning processes associated with SSC will also be used in the airspace design process. The geographic location of the proposed launch site, in conjunction with the expected trajectories of the rockets, will help to minimise the environmental impact in the immediate vicinity of the launch site.

SSC intend to use best practice from other spaceports, mainly in the USA, and employ analysis tools developed for the space industry e.g. RUMBLE. SSC will also use lessons learned at other spaceports in how to mitigate the effect of noise on the public and local wildlife.

DP 3. The airspace volume should be as small as possible to minimize the impact on and ensure the safety of other airspace users.

The size of the airspace was mentioned by a number of existing airspace users or organisations directly involved in commercial aviation. The comments concentrated on restricting the volume of airspace to the minimum required to provide safety to other airspace users and the public:

> *"The airspace construct should be the minimum required to safely accommodate the*

activity being undertaken"

"the airspace should be designed in a mosaic such that only the area required for a given launch is requested rather than a single larger area as a default"

Other comments concentrated on minimising the effects upon existing airspace in and around Shetland:

"The designated airspace must not affect Shetland Mainland so as to interfere with SIC Inter Island flights. At present only to Fair Isle, Foula and Papa Stour."

"Consideration should be given to the Class D Controlled Airspace surrounding Sumburgh Airport and any impact the launches would have on operations around Sumburgh."

Many of the Non-Aviation comments made reference to the proximity of various population centres and wildlife areas to the launch site.

All orbital and sub-orbital launches are expected to be in a northerly direction. Orbital launches will be to sun synchronous and high inclination orbits in the Low earth orbit altitude range. Exact ground tracks will vary with orbit targeted, altitude and inclination, and rocket type e.g. two or three stage. Initially these orbital launches will be almost directly upwards, in the area of the launch site, before beginning to arc northwards to achieve orbit. The rockets will spend the vast majority of their flight well above air breathing aircraft, only passing through this lower airspace during initial launch and the subsequent re-entry of spent stages and fairings. The initial launch is expected to be directly above Unst with the spent stages and fairings coming down well to the North in the North Norwegian Sea and Arctic Ocean. As individual launches will fly different ground tracks the airspace should reflect this and only activate the minimum of airspace required.

The geographic location of the proposed launch site and the use of vertical launch rockets, in conjunction with the expected trajectories of the rockets, will help to minimise the size of the overland airspace in the immediate vicinity of the launch site.

Although the airspace above Unst and to the North is fairly quiet there are active commercial airfields to the South, namely Scatsta, Tingwall and Sumburgh, all on the mainland of Shetland. There is also the unlicensed airfield of Baltasound on Unst some 5nms South of the launch site, which may, as part of the spaceport development, be brought back into use. The airspace volume should be as small as possible to have as little impact as possible upon existing airfields in Shetland.

DP 4. The duration of the airspace activation should be the minimum required to minimize the impact on and ensure the safety of other airspace users. The possible impact of concurrent operations of other airspace should be considered.

Many of the respondents stressed the need for the airspace activation duration to be kept to a minimum and that consideration should be taken of other nearby airspace and what the effect would be of concurrent activation.

"Dependant on size, NATS would expect the activation of segregated airspace to be co-ordinated with both QinetiQ and the MOD to ensure that the overall effect of multiple segregated airspace requirements do not overly impact upon the UK Upper Airspace networks ability to maintain a viable solution for commercial aviation."

"To ensure that segregated airspace is only instigated for the minimum time necessary"

Both Orbital and Sub-Orbital launches last only a few minutes, however, the preparation e.g. fuelling etc begins some hours before with a multitude of technical checks being carried out prior to launch. For this reason, launches are normally planned within a "launch window", generally about 3 hours, during which the rocket may be launched. Once the rocket has been successfully launched and the spent stages have returned to earth the special use airspace can be de- activated.

Clearly the duration that any special use airspace is active has a direct impact upon other airspace users, therefore the duration should be kept to a minimum and the airspace returned to other airspace users as soon as possible.

Unst is some 180nm from the Cape Wrath danger area, Scotland, and 270nm from the Benbecula missile ranges. If both Benbecula and Cape Wrath areas are active at the same time

trans-Atlantic commercial air traffic is affected. Whilst Unst is some distance from both pieces of special use airspace consideration should be made of the possible effect on trans-Atlantic traffic if Unst was active concurrently with either of the other areas. SSC should look at the possible impact of concurrent activation of Unst special use airspace and other airspace.

DP 5. Airspace notification should be timely and accurate with an established method for rapid notification.

Methods of notification and the accuracy of that notification was particularly mentioned by those organisations responsible for air traffic or those planning air tasks.

> *"would expect initial notification of any segregated airspace requirements for the campaign to be provided by at least D-21 for a launch to the UK Airspace Management Cell. With confirmatory airspace segregation activation provided no later than D-1."*

> *"would expect notification of cancellations and early completion of activity"*

Rocket launches are normally planned many months in advance. Initially the "launch window" may be as large as a month to cater for many potential delays e.g. payloads not being ready etc. However, as the launch comes closer a more definitive "window" becomes clear and is reduced to a week. This then becomes further defined to a specified day and time (3-hour window), often being driven by weather forecasts.

Other airspace users require as much notification as possible of any restrictions in airspace to minimize the impact upon their operations. However, activating airspace so early that the timing and duration are unsure would lead to disruption that could be avoided.

Some of the launches may be required at short notice, for instance to provide an observation or communications satellite to support a Non-Governmental Organisation during a humanitarian emergency.

During the design phase the ideal notification timing between early notice but accurate "windows" should be established, whilst developing a method for rapid notification if required.

DP 6. A process to allow some special airspace users to enter the airspace safely and halt launch operations should be established.

The requirement for entry into the airspace for priority air traffic was mentioned by a number of respondents, all of whom asked for a method by which this entry could be done safely and swiftly.

> *"Search and Rescue Operations will always take precedence over launch. Please ensure that any NOTAM or ERF (R) reflects that aircraft operating on behalf of the Maritime and Coastguard Agency have dispensation to enter any ERF (R) for the purposes of search and rescue and lifesaving operations."*

> *"In the event of aeronautical SAR requirement either fixed wing or rotary there will be an expectation that the planned launch is delayed until it is deemed safe for air operations to take place within the projectiles intended flight path. SAR and lifesaving must take precedence over commercial space activities in all cases"*

> *"management of priority aircraft (e.g. CAT A, Emergency or on a Defence Operational Tasking)"*

> *"What will happen if there's the need for an air or sea rescue in the area or close proximity"*

Other airspace users e.g. MoD or Coast Guard may require to enter any special use airspace at short notice, meaning that launch operations will need to be halted. These airspace users will need to be able to communicate their intentions and receive notice that launch operations have been halted.

DP 7. Other International airspace agencies should be included in the airspace design process.

Whilst CAP 1616 is a UK publication and process, the nature of space launch is that it is a truly global undertaking and will require international agreements between the UK and its neighbours. Much of this work will be done by the UKSA and the Department for International Trade, nevertheless the need to include international bodies in the ACP was raised by a few respondents.

> *"Iceland and Norway aviation regulatory bodies are considered key international stakeholders."*
>
> *"The location of Unst and the intended northerly direction of launches, coupled with the expected size of any danger area to segregate such activity, also introduces an international aspect to this potential ACP. The Reykjavik Flight and Upper Information region exists north of 61N and the Norway Flight and Upper Information Region exists to the East of 000W. In each case these respective airspace volumes are not the responsibility of the UK CAA and as a result additional processes beyond CAP 1616 will undoubtedly be required."*
>
> *"All adjacent FIR's/UIR's"*

The Reykjavik FIR is only about 11nms North of the launch site; however, Area IV of the UK ATS lies in a wedge from Surface to FL85 for about another 60nms North from the FIR boundary.
Any spent stages would be returning through Reykjavik OCA and FIR and possibly the Nuuk FIR.

SSC did contact both airspace authorities, however, as the ACP was in such an early stage neither felt they could comment at this stage. SSC do though intend to keep them both appraised of progress and plans. It is worthy of note that the Space Industry Act (SIA) 2018 placed a duty on the regulator, in this case the UKSA, to take "account of any international obligations of the UK." Therefore, SSC will also keep the UKSA updated on plans and progress.

DP 8. Airspace design should meet duties and requirements of other public agencies placed upon SSC.

None of the respondents made a comment about other duties and responsibilities that would fall upon SSC during the development of the spaceport. This is not considered surprising as, although the SIA was passed into law in 2018 the secondary legislation is still being crafted by the UKSA, due for public consultation in the Spring of 2020. It is the UKSA who will license SSC to operate a spaceport and part of this licensing process is expected to include safety of the public during launch. In this instance the public is defined as anyone not directly involved in the launch. Therefore, the design of the airspace will have a direct impact upon the grant of a spaceport operator's license.

The development of a Spaceport on Unst will require the approval or licensing of several other UK public agencies e.g. the UKSA and Shetland Islands Council, each of whom will have their own process to follow. Nevertheless, each process will have many of the same requirements e.g. Environmental impact analysis and place similar duties upon SSC e.g. safety. The airspace should be designed to meet these other duties and use the same reports, where appropriate, to create a common understanding and transparency within these agencies.

DP 9. Letters of Agreement and Memoranda of Understanding will be developed, if required, between relevant parties.

Many respondents brought up the need for local agreements, in many cases offering help in crafting such agreements. In addition, respondents from the wider aviation community expressed a need for agreements and co-ordination.

> *"Animal welfare during launch, which would need to be covered by a management agreement"*
>
> *"we would need a LoA drafting and agreeing to give us access in a controlled and expeditious manner, like other emergency services"*

"NATS is working with the UK Space Agency and CAA to provide them with a template LOA as NATS expects that due to the anticipated dimensions and activation cycles that all ranges as defined by the SIA will require LOAs in respect of notification principles and methodologies. Dependant on size, precedent agreements for airspace activation may be required."

"If co-ordination is necessary between the Met Office station at Lerwick and SSC regarding radiosonde launches or any other matters, then I would expect the requirements of each party to be laid out and how any co-ordination should be managed to enable the operational activities of both to be carried out while minimising risk to both."

"The MOD anticipate that some formal agreements may be required to cover, but not limited to, primacy/priority of airspace and activities, notification, activation and deactivation protocols, management of priority aircraft (e.g. CAT A, Emergency or on a Defence Operational Tasking)"

SSC acknowledge that we are part of a greater Shetland community and wish to limit the impact of the spaceport upon our neighbours. The best way to do this will be by the negotiation of local agreements with our neighbours during the design process.

Beyond the confines of Shetland, SSC are also part of the wider UK aviation community and fully understand the need for agreements between parties to ensure that airspace is managed in the most equitable manner.

DP 10. The airspace change will take account of ongoing and continuing airspace management and policies.

Unsurprisingly the question of adherence to ongoing airspace changes and policies was only raised by those directly involved in air operations and once again all of the points were raised in a positive manner.

"The introduction of Free Route Airspace as set out in CAP 1711 will impact upon the design of associated Flight Planning Buffer Zones (FBZ) and subsequent notification requirements."

"The MOD believe that SSC should consider the initiatives within the AMS a part of their airspace development. In particular, Free Route Airspace and Advanced Flexible Use of Airspace. Although not part of the AMS, UAS proliferation and in particular UAS operations from ships may also be relevant."

"Of the 15 AMS initiatives, the most relevant here would be:

1. Free Route Airspace (FRA)

2. Advanced Flexible Use of Airspace

For FRA, consideration will need to given to the complexities introduced by permitting airspace users to file and fly flight specific user-preferred trajectories (UPR) as opposed to a predictable trajectory in a fixed route environment. This means that there will be specific requirements to analyse potential trajectories and the interactions with any restricted areas and manage flight plan buffer zones accordingly.

For AFUA, principles around activation and deactivation of applicable areas, particularly when planned activities are delayed or cancelled, must be adhered to and follow principles laid out in CAP740."

The airspace change should comply with existing and planned UK airspace management as specified in CAP 740 *UK Airspace Management Policy* and associated documents e.g. CAP 1711 Airspace Modernisation Strategy. SSC recognise that the UK ASM policy is "to achieve the most efficient use of airspace through dynamic time sharing and, at times, the segregation of airspace amongst various categories of airspace users on the basis of short-term needs".

SSC Design Principles with Ranking

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

Table 2 Design Principles

The responses to the second round of Design Principles stakeholder review were analysed to formulate the final Design Principles. In the following paragraphs the analysis presented addresses all of the responses that said *No* they didn't consider a Design Principle to be relevant. In addition, any response that allocated a ranking of E (the lowest ranking on a scale of A to E) is discussed. In allocating an overall ranking, only ranks of A – E are considered, any other rankings are excluded. There were many useful comments made by the respondents and these will be taken into account in the subsequent phases of the ACP.

DP 1. The safety of other airspace users and the public is the paramount Design Principle to be used in the ACP.

- Twenty responses were *Yes* – 11 ranked A, 9 with no ranking.
- Two responses were No –
    - One *No* response gave a ranking of C. The No response gave no reason for the negative response and no reason for allocating a ranking of C to a negative response.
    - One *No* response gave the following reason – "*There is a lack of information coming from the SSC*". The comment gives no insight into how the Design Principle might be changed to allay any concerns of the respondent.

- Due to the majority of the respondents being in favour of the proposed Design Principle, and no adequate reasons being given to amend it by the negative respondents, the Design Principle was not changed. A ranking of A was given.

DP 2. The environmental and noise effects of rocket launch should be minimised by the design of the airspace change.

- Eighteen responses were *Yes* – 2 ranked A, 6 ranked B, 2 ranked C, 8 with no ranking.
- Four responses were *No* –
    - One *No* response gave a ranking of E. No reason was given for the negative response and no reason for allocating a ranking of E to a negative response.
    - One *No* response gave the following reason – "*This questionnaire is all leading to positive responses rather addressing the real issues of the space port to the both people in the isles and the natural environment*". The comment gives no insight into how the Design Principle might be changed to allay any concerns of the respondent.
    - One *No* response gave the following reason – "*Airspace design should be employed principally to mitigate against physical dangers. Airspace design is not a primary means of offsetting environmental or noise effects"*. Although it may not be the primary mechanism to minimise the environmental and noise effects of rocket launch, it is still a valid and viable method to be employed in this area.
    - One *No* response gave a ranking of A. No reason was given for the negative response and no reason for allocating a ranking of A to a negative response.
- Due to the majority of the respondents being in favour of the proposed Design Principle, and no adequate reasons being given to amend it by the negative respondents, the Design Principle was not changed. A ranking of B was given.

DP 3. The airspace volume should be as small as possible to minimize the impact on and ensure the safety of other airspace users.

- Seventeen responses were *Yes* – 5 ranked A, 6 ranked B, 6 with no ranking.
- Two responses were *No* –
    - One *No* response gave a ranking of C. No reason was given for the negative response and no reason for allocating a ranking of C to a negative response.
    - One *No* response gave the following reason – "*This questionnaire is all leading to positive responses rather addressing the real issues of the space port to the both people in the isles and the natural environment*". The comment gives no insight into how the Design Principle might be changed to allay any concerns of the respondent.
- One response was *N/A*. Two responses were blank.
- Due to the majority of the respondents being in favour of the proposed Design Principle, and no adequate reasons being given to amend it by the negative respondents, the Design Principle was not changed. A ranking of B was given.

DP 4. The duration of the airspace activation should be the minimum required to minimize the impact on and ensure the safety of other airspace users. The possible impact of concurrent operations of other airspace should be considered.

- Seventeen responses were *Yes* – 5 ranked A, 6 ranked B, 6 with no ranking.
- Two responses were *No* –
    - One *No* response gave no reason for the negative response.
    - One *No* response gave the following reason – "*The exclusion zone could mean that that the area can not be entered for days. The Weather window might change. In New Zealand the Zone could be closed for up to 12 days. The Zone in New Zealand was 5miles and 12 miles out to sea"*. This comment is believed to refer to the Rocket Lab Mahia launch site in New Zealand. The respondent appears to be concerned about the duration of airspace activation at the Mahia launch site but has disagreed with the SSC Design Principle that seeks to use the "minimum required" duration. The SSC airspace design process is independent of the airspace solution at the Mahia launch site. The comment

gives no insight into how the Design Principle might be changed to allay any concerns of the respondent.

- One response was *N/A*. Two responses were blank.
- Due to the majority of the respondents being in favour of the proposed Design Principle, and no adequate reasons being given to amend it by the negative respondents, the Design Principle was not changed. A ranking of B was given.

DP 5. Airspace notification should be timely and accurate with an established method for rapid notification.

- Fifteen responses were *Yes* – 6 ranked A, 3 ranked B, 6 with no ranking.
- Four responses were *No* –
  - One *No* response gave the following reason – "*This questionnaire is all leading to positive responses rather addressing the real issues of the space port to the both people in the isles and the natural environment*". The comment gives no insight into how the Design Principle might be changed to allay any concerns of the respondent.
  - One *No* response gave the following reason – "*The notifications methods regarding airspace has already been established by ICAO and EASA. You need to follow those rules"*. The Design Principle doesn't exclude this.
  - One *No* response gave a ranking of C. No reason was given for the negative response and no reason for allocating a ranking of C to a negative response.
  - One *No* response gave the following reason – "*Fishing boats use the area all times of the year. How long will the area be closed? New Zealand are gearing up for 100 launches a year*". This comment is believed to refer to the Rocket Lab Mahia launch site in New Zealand. The respondent appears to be concerned about the frequency of airspace activation at the Mahia launch site and the subsequent duration of the activation of the airspace. The SSC airspace design process is independent of the airspace solution at the Mahia launch site. The specific question of "How long will the area be closed" is best considered in the context of Design Principle 5. The comment gives no insight into how the Design Principle might be changed to allay any concerns of the respondent.
- One response was *N/A*. Two responses were blank.
- Due to the majority of the respondents being in favour of the proposed Design Principle, and no adequate reasons being given to amend it by the negative respondents, the Design Principle was not changed. A ranking of A was given.

DP 6. A process to allow some special airspace users to enter the airspace safely and halt launch operations should be established.

- Seventeen responses were *Yes* – 7 ranked A, 2 ranked B, one ranked C, 7 with no ranking.
- Two responses were *No* –
  - One *No* response gave the following reason – "*This questionnaire is all leading to positive responses rather addressing the real issues of the space port to the both people in the isles and the natural environment*". The comment gives no insight into how the Design Principle might be changed to allay any concerns of the respondent.
  - One *No* response gave the following reason – "*The notifications methods regarding airspace has already been established by ICAO and EASA. You need to follow those rules"*. The Design Principle doesn't exclude this.
- One response was *N/A*. Two responses were blank.
- Due to the majority of the respondents being in favour of the proposed Design Principle, and no adequate reasons being given to amend it by the negative respondents, the Design Principle was not changed. A ranking of A was given.

DP 7. Other International airspace agencies should be included in the airspace design process.

- Eighteen responses were *Yes* – 4 ranked A, 3 ranked C, one ranked E, 10 with no ranking.
  - The response with an E ranking gave the following reason – "*It would be the MOD's*

belief that national requirements should be considered a priority. The MOD would be interested to understand if this would imply any reciprocal airspace access?". It is not clear if the ranking of E is a reflection of the respondent's concern about potential reciprocal airspace access, or something else. Due to the possible location of any proposed special use airspace it is essential to include other International airspace agencies in the design process and, therefore, the Design Principle should be retained.
    - One response gave the following comment – "*Given the location, it would be difficult, if not impossible, to achieve DP1 without the involvement of non-national aviation agencies. However, rather than simply state, "International airspace agencies" it might be better to change this to "Other National and International airspace agencies should be included in the airspace design process"*. The use of International to reflect non-national is felt to be sufficient and that no change to the Design Principle is required.
- One response was *No* and gave the following reason – "*This questionnaire is all leading to positive responses rather addressing the real issues of the space port to the both people in the isles and the natural environment*". The comment gives no insight into how the Design Principle might be changed to allay any concerns of the respondent.
- One response was *N/A*. Two responses were blank.
- Due to the majority of the respondents being in favour of the proposed Design Principle, and no adequate reasons being given to amend it by the negative respondent, the Design Principle was not changed. A ranking of B was given.

DP 8. Airspace design should meet duties and requirements of other public agencies placed upon SSC.

- Sixteen responses were *Yes* – 4 ranked A, 4 ranked B, one ranked C, one ranked E, 6 with no ranking.
    - The response with an E ranking gave no further comment. Therefore, the Design Principle has been retained.
- Four responses were *No* –
    - One *No* response gave the following reason – "*This questionnaire is all leading to positive responses rather addressing the real issues of the space port to the both people in the isles and the natural environment*". The comment gives no insight into how the Design Principle might be changed to allay any concerns of the respondent.
    - One *No* responses gave a ranking of C. No reason was given for the negative response and no reason for allocating a ranking of C to a negative response.
    - One *No* response gave the following reason – "*Whilst it is understood that SSC will have regulatory obligations placed on them by other bodies, the CAA remains the regulatory body responsible for airspace usage and changes within the UK. Should a conflict in regulatory requirements become apparent during the ACP process this should be clearly articulated to the CAA for consideration; therefore, this proposed principle could be more clearly articulated as a potential constraint. As set out in DP 7, engagement with other airspace regulatory bodies responsible for adjacent FIRs may also elicit constraining factors. However, the primary design principle: "The safety of other airspace users and the public is the paramount design principle to be used in the Airspace Change Process," would allow SSC to set out its requirements associated to any other regulatory obligations that impact upon the airspace dimensions required to achieve this principle*". This Design Principle does not attempt to circumvent the CAA as the regulatory body for the ACP, and only intends that any other regulatory requirements will be included for consideration in the airspace design. Therefore, the Design Principle has been retained.
    - One *No* response gave the following reason – "*The designated airspace must meet the needs of the airspace regulatory authority. We would expect the whole operation to be viable from a safety and local community/non-aviation regulatory perspective. Therefore, rather than specify airspace design directly from other local requirements (e.g. building regulations) it would be more logical to ensure the intended mode of*

operation met those requirements then design airspace that would accommodate the operation". This Design Principle does not attempt to circumvent the CAA as the regulatory body for the ACP, and only intends that any other regulatory requirements will be included for consideration in the airspace design. Therefore, the Design Principle has been retained.

- Two responses were blank.
- Due to the majority of the respondents being in favour of the proposed Design Principle, and no adequate reasons being given to amend it by the negative respondents, the Design Principle was not changed. A ranking of B was given.

DP 9. Letters of Agreement and Memoranda of Understanding will be developed, if required, between relevant parties.

- Sixteen responses were *Yes* – 6 ranked A, 2 ranked B, 8 with no ranking.
- Three responses were *No* –
    - One *No* response gave the following reason – "*I would want to see a full, independent environmental impact study, which if anything like Viking Energy, cannot be classified as "independent"*. The respondent would like to see consultation with other bodies, in this case for an environmental study, but does not consider Letters of Agreement and Memoranda of Understanding to be a possible outcome. The response would appear to be a request for a general environmental impact study, rather than commenting on the environmental impact of a possible airspace change. Thus, although on the face of it the comment would sit better against Design Principle 2, it is assessed in the context that it was given by the respondent i.e. Design Principle 9. The comment gives no insight into how the Design Principle might be changed to allay any concerns of the respondent. [SSC will follow all relevant planning processes, including environmental impact studies].
    - One *No* response gave the following reason – "*Whilst the CAP1616 process may involve agreements, MOD do not believe that this specifically a design principle in its own right. However, the MOD do acknowledge the potential requirement for LoA/MoU and anticipate that some formal agreements may be required to cover, but not limited to, primacy/priority of airspace and activities, notification, activation and deactivation protocols, management of priority aircraft (e.g. CAT A, Emergency or on a Defence Operational Tasking) and co-ordination with adjacent units"*. Although the respondent does not consider this to be a Design Principle, they also accept that Letters of Agreement and Memoranda of Understanding may be required. The Design Principle does not mandate Letters of Agreement and Memoranda of Understanding it is "if required". In addition, "relevant parties" allows for local level agreements, as well as higher level agreements such as those referred to by the respondent. Therefore, it is considered that it is a Design Principle and should be retained.
    - One *No* response gave the following reason – "*To meet DP1, the airspace design must take account of the needs of adjacent ANSP (and other airspace users). LoA and MoU will be required to define the interfaces/interdependencies. It would be better to change DP7 to "Other National and International airspace agencies should be included in the airspace design process" then delete DP9"*. Although the respondent does not consider this to be a Design Principle, they also state that Letters of Agreement and Memoranda of Understanding will be required. Therefore, it is considered that it is a Design Principle and should be retained. The comment about DP7 is discussed at that Design Principle.
- One response was *N/A*. Two responses were blank.
- Due to the majority of the respondents being in favour of the proposed Design Principle, and no adequate reasons being given to amend it by the negative respondents, the Design Principle was not changed. A ranking of A was given.

DP 10. The airspace change will take account of ongoing and continuing airspace management and policies.

- Nineteen responses were *Yes* – 4 ranked A, 4 ranked B, one ranked C, 10 with no ranking.
- One response was *N/A*. Two responses were blank.
- The Design Principle was not changed. A ranking of B was given.

Next Steps

Currently, the estimated timeline for subsequent stages of the SSC ACP are shown below:

CAP 1616 Stage	Status	Target Completion Date
Define Gateway	Expected	29 May 2020
Develop & Assess Gateway	Expected	28 August 2020
Consult gateway	Expected	27 November 2020
Formal ACP Submission	Expected	02 July 2021
Decide Gateway	Expected	07 January 2022
Target AIRAC	Expected	May 2022

Appendices

Appendix 1 – SSC- CAA1404DP1B– Second Stakeholder Contact List
Appendix 2 – SSC-CAA1012DPQNA-Design Principles Questionnaire
Appendix 3 – SSC-CAA1012DPQNA- Questionnaire Responses
Appendix 4 – SSC-CAA1404DP1B -Design Principles
Appendix 5 – SSC-CAA1404DP1B - Design Principles Review Responses