Design Principles

Step 1B

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1. Safety.

The safety of other air 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 Space Industries Act (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 Air 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 1. The Safety of other air users and the public is the paramount design principle to be used in the ACP.

Do you agree that constitutes a design principle? If you do not, please provide comments in the box below
YES/NO
Please rank this in order of importance , 'A' being highest and 'E' being lowest. If you wish to give more detail, please use the box below.

2. Environment.

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 short 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.

Rocket launches will also generate increased noise in and around the launch site, mainly caused by the exhaust gasses and the rocket becoming supersonic. 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 will also be used in the airspace design process.

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 2. SSC will produce a report detailing the environmental and noise effects of rocket launch from Unst.

Do you agree that constitutes a design principle? If you do not, please provide comments in the box below
YES/NO
Please rank this in order of importance , 'A' being highest and 'E' being lowest. If you wish to give more detail, please use the box below.

3. Volume.

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.

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 3. The airspace volume should be as small as possible to minimize the impact on existing air users.

Do you agree that constitutes a design principle? If you do not, please provide comments in the box below
YES/NO
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4. Duration and timing

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 airspace can be de-activated.

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

Unst is some 180 nms from the Cape Wrath danger area, Scotland, and 270 nms from the Benbecula missile ranges. If both, Benbecula and Cape Wrath, are active at the same time trans-Atlantic commercial air traffic is affected. Whilst Unst is some distance from both pieces of airspace consideration should be made of the possible effect on trans-Atlantic traffic if Unst was active concurrently with either of the others. SSC should look at the possible impact of concurrent activation of Unst airspace and these other areas.

DP 4. The duration of the airspace activation should be kept to a minimum and SSC should look at the possible impact of concurrent operations of other airspace e.g. Cape Wrath.

Do you agree that constitutes a design principle? If you do not, please provide comments in the box below
YES/NO

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5. Notification.

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 air 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 though be required at short notice, for instance to provide an observation or communications satellite to support an NGO 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 5. Airspace notification should be timely and accurate with an established method for rapid notification.

Do you agree that constitutes a design principle? If you do not, please provide comments in the box below
YES/NO
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6. Communications.

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

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

Do you agree that constitutes a design principle? If you do not, please provide comments in the box below
YES/NO
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7. International.

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.

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

Do you agree that constitutes a design principle? If you do not, please provide comments in the box below
YES/NO
Please rank this in order of importance , 'A' being highest and 'E' being lowest. If you wish to give more detail, please use the box below.

8. Other Regulations.

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

Do you agree that constitutes a design principle? If you do not, please provide comments in the box below
YES/NO
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9. Local Agreements.

Whilst the airspace above and around Unst is relatively quiet 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 negotiating local agreements with our neighbours during the design process.

DP 9. Local agreements to minimize the impact of the space port on its neighbours will have to be negotiated.

Do you agree that constitutes a design principle? If you do not, please provide comments in the box below
YES/NO

Please rank this in order of importance , 'A' being highest and 'E' being lowest. If you wish to give more detail, please use the box below.

10. Ongoing and Continuing Airspace management and policies.

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".

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

Do you agree that constitutes a design principle? If you do not, please provide comments in the box below
YES/NO
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