



Department
for Transport



Department
for Business
Innovation & Skills



SUPPORTING COMMERCIAL SPACEPLANE OPERATIONS IN THE UK

Consultation on criteria to determine the location of a UK spaceport

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Executive summary

Introduction

The Government's Space Innovation and Growth Strategy 2014-2030 and Space Growth Action Plan both include an ambition to "establish a Space Port in the UK by 2018 and identify further reforms to regulation needed to allow commercial space flights in the UK". In August 2012, the Department for Transport and UK Space Agency tasked the Civil Aviation Authority (CAA) to undertake a detailed review of what would be required from an operational and regulatory perspective to enable spaceplanes to operate from the UK by 2018, pending demonstration of feasibility and a decision to do so.

The CAA's findings include key operational, safety, meteorological, environmental and economic criteria for selecting a suitable site for a spaceport. These include:

- an existing civil or military aerodrome which has a runway which is, or is capable of being extended to, over 3000m in length;**
- could accommodate segregated areas of airspace to manage spaceflights safely; and,**
- is located away from densely populated areas in order to protect the uninvolved general public.**

Based on its criteria, the CAA has identified eight existing coastal aerodromes which are potentially feasible locations for a UK spaceport.

This consultation seeks views on the criteria identified by the CAA as key and whether there are any other factors or criteria that should be considered in supporting a site for a spaceport in the UK.

We are also seeking views on the eight potentially feasible locations which the CAA has identified based on its criteria. In particular, whether any of these locations should be disregarded and why? And also, whether other locations should be considered further.

At this stage we are not consulting on local communities' and stakeholders' preferences regarding a potential spaceport in any of these locations; we will ensure that the views of local people are taken into account and seek their buy-in to any proposed location that may be identified before any decisions are taken to proceed with a UK spaceport.

We are not consulting on the highly technical aspects of the CAA's report. Rather, we are seeking views on the strategic position to be adopted by government on the location of a spaceport.

Prior to any decision supporting development at a preferred location, the Government will be inviting submissions from interested parties whose locations meet the criteria identified.

How to respond

1. The consultation period began on 15 July 2014 and will run until 6 October 2014. Please ensure that your response reaches us before the closing date. If you would like further copies of this consultation document, it can be found on the Gov.UK website or you can contact Jeremy Ketley at the address below if you need alternative formats (Braille, audio CD, etc.).
2. Please send consultation responses to:
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3. When responding, please state whether you are responding as an individual or representing the views of an organisation. If responding on behalf of a larger organisation, please make it clear who the organisation represents and, where applicable, how the views of members were assembled.
4. A list of those consulted is Annexed to this consultation paper. If you have any suggestions of others who may wish to be involved in this process please contact us.

Freedom of Information

5. Information provided in response to this consultation, including personal information, may be subject to publication or disclosure in accordance with the Freedom of Information Act 2000 (FOIA) or the Environmental Information Regulations 2004.

6. If you want information that you provide to be treated as confidential, please be aware that, under the FOIA, there is a statutory Code of Practice with which public authorities must comply and which deals, amongst other things, with obligations of confidence.
7. In view of this it would be helpful if you could explain to us why you regard the information you have provided as confidential. If we receive a request for disclosure of the information, we will take full account of your explanation, but we cannot give an assurance that confidentiality can be maintained in all circumstances. An automatic confidentiality disclaimer generated by your IT system will not, of itself, be regarded as binding on the Department.

The Department will process your personal data in accordance with the Data Protection Act (DPA) and in the majority of circumstances this will mean that your personal data will not be disclosed to third parties.

1. Introduction

Why a UK Spaceport?

- 1.1** In its Plan for Growth (2011), the Government identified the space industry as one of eight key sectors: an acknowledgement of the contribution that the sector makes to driving economic growth and creating jobs.
- 1.2** By 2030, the global space economy is expected to be worth £400billion per annum.
- 1.3** The Government's ambition is that the United Kingdom's space economy should account for 10% of the global economy by 2030 - worth some £40 billion per year.
- 1.4** A key part of this ambition is for the UK to be the European centre for sub-orbital spaceflight.
- 1.5** By the end of 2014, we might see the first paying participants on a sub-orbital spaceflight experience launching from the US. We anticipate that other commercial space flight operations will be ready to begin operations in the US by 2016 and elsewhere over the following 5-10 years. Spaceplanes are widely acknowledged as the most likely means of enabling commercial spaceflight experience and scientific payloads in the near future. In the longer term, they also have the potential to transform the costs and flexibility of satellite launches, and for the delivery of cargo to space.
- 1.6** Potential spaceflight operators have expressed a strong interest in conducting sub-orbital spaceplane operations from the UK by 2018.
- 1.7** If spaceplanes are operated from the UK, then there is strong potential for operators to base themselves here – which would provide knock on benefits for a range of related industries. As space is a research and development-intensive sector, there could also be significant benefits for UK science and innovation. These benefits could include research and development using spaceplanes, a strengthened supply base for the space sector, increased education and training resulting in high value

employment and other local spin-off benefits such as increased tourism or related jobs and growth activity.

Civil Aviation Authority (CAA) Review

- 1.8** The Space Innovation and Growth Strategy 2014-2030 and Space Growth Action Plan both include an ambition to “establish a Space Port in the UK by 2018 and identify further reforms to regulation needed to allow commercial space flight in the UK”.
- 1.9** In 2012, the Department for Transport and UK Space Agency tasked the UK Civil Aviation Authority (CAA) with undertaking a detailed review of what would be required – from an operational and regulatory perspective – to enable spaceplanes to operate from the UK within the timescales that operators have proposed, should a decision be taken to do so.
- 1.10** The CAA has completed their review. This Consultation seeks views on the CAA’s conclusions and recommendations on potentially feasible locations for a UK spaceport. This will feed into the Government’s considerations into the feasibility and benefits of a UK Spaceport. It should be noted that the CAA, in identifying potentially feasible locations for a spaceport, did not consider the willingness of any civil or military aerodrome to host spaceplane operations; it considered only whether aerodromes met a set of criteria identified by the CAA.
- 1.11** The Government mandate to the CAA included:
- an analysis and recommendations regarding the appropriate regulatory requirements for spaceport operations; and
 - recommendations as to the most suitable locations for a spaceport in the UK.
- A Summary of the review and conclusions and the full Technical Report can be found alongside this consultation paper.
- 1.12** In their review, the CAA have identified that in the US the regulatory framework places the protection of the uninvolved general public as its highest safety priority – and propose that this should also be the case as it works towards enabling spaceflight operations to commence from the UK by 2018.
- 1.13** One of the most important factors in protecting the uninvolved general public is the choice of launch site for spaceplanes - the spaceport.

- 1.14** Although there is an ambition to have a spaceport in the UK, no decision has yet been taken and the location has not been determined. The necessary infrastructure for spaceplane operations does not yet exist (though the infrastructure in place for aviation can provide the basis). Furthermore, spaceplane technology is still comparatively in its infancy and, compared to civil aviation activities, largely unproven. Airspace in the UK is both busy and complex – and any future spaceplane flights would need to be safely accommodated with present and future levels of commercial, recreational and military flights.
- 1.15** For the purposes of this consultation, we envisage that a spaceport would be developed at an existing aerodrome and would initially be for sub-orbital flights, of short duration, taking off and landing from the same runway.
- 1.16** As part of its review, the CAA has identified what it considers to be key operational, safety, meteorological, environmental and economic criteria for determining a suitable site for a spaceport. Based on these, the CAA has identified 8 potentially feasible locations for a UK spaceport, should a decision be taken to develop one.
- 1.17** This consultation paper seeks views on the criteria identified by the CAA and whether there are any other factors or criteria that should also be considered in determining a site for a spaceport.
- 1.18** In addition, we are seeking views on the eight potentially feasible locations which the CAA identified based on its criteria – whether any of these locations should be disregarded and why? And also, whether other locations should be considered further.

2. Criteria for a UK Spaceport

Spaceplanes

- 2.1** Chapter 2 of the CAA's Summary and Conclusions provide an overview of the development of current and emerging sub-orbital spaceplane operations.
- 2.2** If spaceplane operations were to take place by 2018, the spaceplanes most likely to be able to launch from UK at this time would be of US design, which has implications for the model of regulation that the UK should adopt and also will have implications arising from US export control laws.
- 2.3** In the US, space regulation is the responsibility of the Federal Aviation Administration Office of Commercial Space Transportation (FAA AST). The FAA AST issues licenses and permits for the operation of commercial space vehicles, including sub-orbital spaceplanes. Commercial space launches can only take place from sites licenced by the FAA AST.
- 2.4** Launch of US designed spaceplanes in the UK would require an FAA AST license, in addition to any UK-developed regulations. Therefore, the FAA AST site licence requirements will be a key factor in determining the location of UK spaceport.
- 2.5** This consultation assumes that the necessary export licences would be in place to allow US sub-orbital operations in the UK and is not seeking views on this.

Safety of Spaceplanes

- 2.6** The CAA's analysis is that the prevailing body of civil aviation regulation would apply to spaceplanes. However, at this stage in their development, commercial spaceplanes cannot comply with many of these regulations. Spaceplanes cannot currently demonstrate the same safety standards as commercial aviation – and it might not be possible for them ever to do so.

- 2.7** Therefore, to enable spaceplane operations in the foreseeable future, the CAA view them as “experimental aircraft” under the European Aviation Safety Agency (EASA) Basic Regulation which takes them out of core EU-wide civil aviation safety regulation and allows the UK to regulate them at a national level.
- 2.8** Experimental aircraft do not typically conduct public transport operations (i.e. carrying fare-paying passengers). However, space tourism or spaceflight experience for fee-paying participants is a key goal for spaceplane operators. The UK is therefore considering what regulatory changes or measures would need to take place to enable spaceplane operations.
- 2.9** It envisaged that a key part of such a regulatory framework will entail crew and flight participants being informed of the inherent risks of spaceplane operations before the flight and acknowledging receipt of this information in writing. This concept is known as informed consent. In doing so, participants will acknowledge and accept that they will not benefit from the normal safeguards expected of public transport operations. In so far as this requires regulatory change, that approach will be developed and consulted upon separately.
- 2.10** The CAA conclude that if the inherent greater risk associated with spaceplane flight is accepted by law-makers, crew and participants – then the highest safety priority of regulatory oversight should be protecting the uninvolved general public. One of the most important factors in protecting the uninvolved general public would be the choice of a launch site for spaceplanes.

Criteria for identifying suitable locations for a Spaceport

- 2.11** The CAA review identified five key criteria for identifying a suitable location for a UK spaceport:

1. Essential Operating Criteria

Based on current spaceplane designs and known operating requirements a spaceport will need to be established on a large site with a runway that is at least, or is capable of being extended to, 3000m (9,800 feet) in length. Spaceplane operations would also need to be conducted in

segregated special use airspace, to manage them safely in line with the underlying priority of protecting the uninvolved general public.¹

2. Safety Factors

To protect the uninvolved general public, spaceports should be located away from densely populated areas. Relevant health and safety legislation, including for example the safe storage of any hazardous materials involved in spaceplane operations, will also have to be considered when choosing a site. The CAA has therefore recommended a coastal location be used for any spaceplane operation, given the population density of most areas in the United Kingdom.

3. Meteorological Considerations

Strong crosswinds could restrict spaceplane operations and, from information received to date, they are expected to operate clear of cloud under visual meteorological flight rules.

There may also be commercial considerations, such as participants wishing to see the earth from space and if cloud cover restricted that, the experience may not live up to expectation. Regional variation in weather conditions may therefore have a significant bearing on the economic case for a particular location.

4. Environmental Concerns

International aviation environmental regulation exists for aircraft, aerodromes and airspace covering issues such as noise, air quality (including carbon emissions) and the storage of hazardous materials. Accepting that in the UK, spaceplanes would be considered aircraft, for at least part of the journey, aviation environmental regulations would apply to spaceplane operations.

Even with legislative restrictions in place, issues of noise, air quality and impact on the local area are likely to be of significant public interest. Therefore, environmental issues of noise, air quality and storage and use of hazardous materials, such as fuels, need to be considered.

¹ Integration of some spaceplane operations with other air traffic may prove feasible in the future but at least in the near term - until the operation matures and as confidence builds - segregated special use airspace will be a necessary first step.

5. Economic Issues

The site would need to be accessible to both employees and visitors. Employees and visitors would also require accommodation in the vicinity. Good transport links would be required.

2.12 We would welcome views on the validity of these criteria and whether there are other criteria which should also be taken into account and why?

2.13 The fundamental criteria appear to be runway length, availability of segregated airspace and a low local population density. Then additional factors such as local weather conditions, environmental issues and ease of access to the site need to be considered. We would welcome views on the relative impact and weight that should be given to the criteria identified and any criteria which it is thought should be included but are not currently.

2.14 At this time, it is likely that the UK economy could only support one spaceport. However, it is possible that more than one feasible location could meet the fundamental criteria (runway length, local airspace complexity and population density) and satisfactorily demonstrate the additional factors of weather, environmental considerations and transport links. We would welcome views on whether other factors around the contribution to local and national growth should also be considered in the event that, following further analysis, there is more than one potentially feasible location to choose from. We would also welcome views as to weighting of such factors. At this stage the view is taken that these could include the factors below. We welcome views on these and views as to the weighting of these factors:

- a) advancement of science and innovation;
- b) growth of the space or aerospace sector including stimulating jobs in the wider supply chain or supporting existing space sector clusters
- c) synergy or support to existing economic usage of the spaceport location;
- d) promotion of high level skills;
- e) spin-off benefits such as tourism or other jobs related to spaceplane operations; and
- f) deliverability.

2.15 Any UK investment in a spaceport will, as with any investment potentially involving public funding, need to demonstrate that such a facility is economically viable and will provide value-for-money for this support.

An existing aerodrome?

- 2.16** In order to make maximum use of existing infrastructure, the CAA make a high-level recommendation that sub-orbital operations should preferably commence, either on a permanent or a temporary basis, from one (or more) of the following:
- an existing EASA-certificated aerodrome;
 - an existing UK CAA-licensed aerodrome; and/or
 - an existing UK military aerodrome, subject to MOD approval.
- 2.17** The CAA recommends that the location should still preferably be active but at a low level of aircraft movements and that it should have existing and appropriate ground infrastructure/facilities and service provision. The CAA does not consider greenfield sites in the Review at the present time but has considered sites that have the potential to be licensed.
- 2.18** We would welcome views on these high level recommendations.

The CAA's review of feasible locations

- 2.19** CAA reviewed all operational civil and military aerodromes within the UK to identify those that met the fundamental criteria of runway length – i.e. airports which already had a runway of at least 3000m and airports with runways over 2000m that could be extended.
- 2.20** There were 46 aerodromes that were either 3000m long or could be extended – but some are not currently operational and were ruled out.
- 2.21** Figure 9.1 in the CAA's Technical Report provides a tabular analysis of these 46 aerodromes based on a general assessment of airspace issues and population density.
- 2.22** CAA excluded those civil airports where the volume of aircraft movements, creating areas of segregated special use airspace and managing spaceplane operations on the ground would be impractical. Based on these factors, the CAA excluded a further 20 sites, including the four civil aerodromes with runways over 3000m (Heathrow, Gatwick, Stansted and Manchester).
- 2.23** This left 26 potential sites which met the CAA's operating criteria – as shown in Figure 9.2 of the CAA's Technical Report.

A coastal location?

- 2.24** If a decision were to be taken to do so, the earliest spaceflight operations would most likely to initially involve US regulated spaceplanes. To date, the need to meet FAA AST minimum safety standards has resulted in the licensing operations only in areas of very low population density such as desert and coastal locations. As there are no land areas of similar low population density in the UK, in its review, the CAA strongly recommends that a UK spaceport should be established at a coastal location to protect the safety of the uninvolved general public.
- 2.25** The CAA consider that in the UK, a coastal location will therefore best ensure the safety of the uninvolved general public and offer the best chance of enabling operations to take place in line with FAA AST launch site licensing requirements.
- 2.26** The review notes, however, that with a better understanding of sub-orbital spaceplane safety performance and the possibility of the development of suitable certification codes, it may, in future, be possible to relax the coastal location requirement.
- 2.27** We would welcome views on the CAA's strong recommendation that initial spaceplane operations should take place at a coastal location.

The CAA's shortlist of eight potentially feasible locations

- 2.28** Based on the CAA's essential operating criteria and strong recommendation to base a spaceport at a coastal location, the CAA identified eight existing working aerodromes which might feasibly host sub-orbital operations. These are:

Campbeltown Airport
Glasgow Prestwick Airport
Kinloss Barracks
Llanbedr Airfield
Newquay Cornwall Airport
RAF Leuchars
RAF Lossiemouth
Stornoway Airport

- 2.29** We would welcome views on the CAA's shortlist of eight potential sites.
- 2.30** It should be noted that these are locations which the CAA believe may be technically suitable for spaceplane operations – however, it should be noted that no agreement has yet been sought with the MOD, civil owners of these airports or the local communities in which they are based. Location owners are entitled to withdraw their property from consideration if they choose to do so. We will work to seek the views and agreement of all those with an interest in any proposed location that may be identified before any decisions are taken to proceed with a UK spaceport.
- 2.31** The CAA also note that a discounted site could be re-instated following a more detailed operational and safety analysis in the future. The Government herein recognises that at this stage, it does not rule out the case that the optimal location for a spaceport may be at a location not on the list.

3. Consultation Questions

CAA's high level recommendation

Q1. Do you agree with the CAA's high-level recommendation that, if a decision were taken to proceed, sub-orbital operations should preferably commence, either on a permanent or a temporary basis, from one (or more) of the following:

- an existing EASA-certificated aerodrome;
- an existing UK CAA-licensed aerodrome; and/or
- an existing UK military aerodrome, subject to approval from the MOD.

Q2. Do you agree that in order to make maximum use of existing infrastructure, the location should preferably still be active but at a low level of aircraft movements and should have existing and appropriate ground infrastructure/facilities and service provision?

Q.3 Do you agree that greenfield sites should not be considered?

CAA's criteria

Q4. Do you agree with CAA's analysis identifying the criteria to be considered in identifying a permanent location for a UK spaceport? If not, please explain why.

Q5. Do you think there are any other criteria that should also be taken into consideration? If so, please explain why.

Q6. Do you agree that these are relevant criteria? What weight should be attached to them?

Q7. If more than one location closely meet the essential operating criteria, safety, meteorological, environmental and economic criteria, do you agree that we should also consider factors around the contribution to local and national growth? If so, what weight should be given to these factors?

A coastal location?

Q8. Do you agree with the CAA's analysis and strong recommendation that until there is a better understanding of sub-orbital spaceplane safety performance, spaceplane operations should only take place in areas of low population density and the resulting view that only a coastal location is suitable to protect the uninvolved general public?

CAA's shortlist of potentially feasible locations

Q9. What are your views on the CAA's shortlist of eight potential sites?

Q10. Are there any locations on the CAA's shortlist which you consider should be disregarded? If yes, please give your reasoning.

Q11. Are there any additional locations that you consider should be on the CAA's short list? If yes, please explain why.

Next Steps

The Department expects to publish a response later in the year and invite interested parties to put themselves forward as a preferred location for development.

Annex

List of Consultees

Airport Operators Association
Aviation Environmental Federation
BAR UK
BATA
British Business and General Aviation Association
Campbeltown Airport
ELFAA
Glasgow Prestwick Airport
Health and Safety Executive
IATA
Llanbedr Airfield
Local Government Association
Ministry of Defence
NATS
Newquay Cornwall Airport
QinetiQ
Stornoway Airport
Strategic Aviation Special Interest Group (SASIG)