

**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.

Q1-RESPONSE – Yes, XCOR Aerospace concurs with this CAA high level recommendation for multiple reasons including those related to cost avoidance and leveraging of existing beneficial resources. The use of existing infrastructure avoids unnecessary expense in facilities development, saves scarce money by relying on existing environmental impacts analysis (since it has been largely completed for an existing site), and speeds the implementation process for a site which also saves significant amounts of money. An existing site also is generally beneficial because it will allow the suborbital operator to leverage existing aerospace supply chain actors and work force experience in the surrounding communities. This is also a positive development for the additional users of the suborbital craft that will migrate to the community and cluster together, such as experimenters, researchers, educators and others who intend to use the suborbital craft for their investigations. Further, once operations are established, the recurring costs of operating the spaceport / airport will be spread amongst more customers, therefore lowering the cost to each individual user, had the new operations not commenced.

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?

Q2-RESPONSE – Yes, XCOR Aerospace concurs with this statement. A single suborbital operator would not be able to fully support the operational cost of an airport / spaceport based on current projected demand, price and operating costs. It has been shown in the United States that airports / spaceports with multiple and diverse tenants can exist together and thrive as a multi-revenue stream environment for the airport / spaceport operator. The combination of several suborbital operations a day with moderate aircraft traffic, commercial service, military service, or general aviation service, is quite straight forward to coordinate and operate. Other non-flight aviation and non-aviation related services (and manufacturing) at the airport / spaceport are also positive developments for the airport / spaceport, as all of these businesses contribute to the economic health of the airport / spaceport and again, as noted earlier, tend to lower the overall cost to each individual tenant.

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

Q3-RESPONSE – Yes, since there are numerous potential other existing sites that can readily meet the needs of a suborbital spaceport operation and the level of expected demand as the industry begins to mature.

**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.

Q4-RESPONSE – XCOR Aerospace agrees that the five principal categories of criteria are reasonable. When evaluating sites, XCOR uses a similar set of criteria, with certain criteria “must haves” and others being “highly desirable” and others as “bonus.” XCOR “must haves” focus on the ability to fly safely and operate efficiently, including: regulatory environment, runway length and configuration, population density along intended trajectories, airspace congestion / flexibility, environmental impact, and weather (expected runway usability due to crosswinds and cloud cover during daylight hours, annually). “Highly desirable” factors XCOR looks at are: anticipated site specific operational costs (including “friction costs” such as ease of access to the site for international customers), supply chain in the community, ability to hire and retain qualified employees in the area, community acceptance of the operations, and the perception of our potential clients (is it a place they would like to fly from in the future or establish an operational site for their entity). “Bonus” factors would include: local accommodations and amenities for the customer base and their friends / families / colleagues, ease of access to the site (under two hours by plane, helicopter, train or automobile or a combination thereof, from a major metropolitan area or international airport).

With respect to the “must haves” we provide the following additional comments. Prior to operating at a site, XCOR seeks an enlightened regulatory environment that recognizes that suborbital reusable spaceplanes are not as mature as aircraft, present a higher risk profile to the flying participant who must legally acknowledge and accept these risks, and regulates accordingly; the proposed UK regulatory environment is one such environment that XCOR welcomes and hopes is fully implemented. XCOR’s runway length / configuration criteria generally mirrors the UK report criteria of a long main runway (or two) of greater than 3000 metres. However, for runways that are in the 2500 metres range, an appropriate crossing runway, long taxiway or even an access road on the airport property aligned in the general direction of take off (e.g., +/- 15-30 degrees) is a plus for potential aborted takeoff procedures. Population density along the intended trajectories needs to meet the US Federal Aviation Administration standard for expected casualties (Ec) and any additional UK levied requirements. Clean airspace above the intended operational area is essential, and the UK analysis and recommendation meets all of XCOR’s needs in this area. Environmental impacts must meet acceptable government levels and avoid unnecessary controversy in the community. Weather is a significant commercial consideration since it is our belief that many of the participants (both individuals and experimenters) will prefer daytime flights with clean views of the ground (certainly not cloudless skies, but a good ability to see the ground and coastlines). Crosswinds are another significant factor for site selection, as the XCOR Lynx vehicle lands as a glider, so needs relatively modest crosswind components, perhaps as low, if not lower than 15 knots.

Regarding a few of the “highly desirable” criteria, we provide the following thoughts. It will be very important to any suborbital spaceplane operator to maintain a reasonable level of local operational costs; therefore, sharing of local costs with other airport users (e.g., local ATC / landing fees, first responder costs, etc.) needs to be equitable and reasonable. This includes “friction costs” that may come along with a particular site, for example, if the airport / spaceport is co-located at a Ministry of Defense or government owned operational base. A situation that is of concern in the United States at

joint use government / civil sites is the question -- will it be possible (or generally easy) to bring a non-US person (e.g., a Chinese citizen) on to the base to fly or witness a flight of a loved one?

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

Q5-RESPONSE – Although challenging to assess for all potential operators at a site, the local amenities and community acceptance factors should perhaps be considered as should the local expected operational costs and “friction costs” associated with a proposed site.

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

Q6-RESPONSE – If the site does not pass the “must haves” or threshold requirements it should be excluded. These “must haves” are just that, necessary. However, clearly one site that meets all the “must haves” could be better than another that meets all of the “must haves.” For example, if the runway was materially longer, or the site had multiple long runways that met the requirement, or a site had a crossing runway that may be shorter than the requirement but was particularly well suited to aborted takeoff from the longest main runway that did meet the requirement, such factors should be considered in site selection. Another example is if a site had 350 days of flyable weather versus 200 (which would probably be near XCOR’s bare-minimum) this would favor a site over another. Therefore, XCOR would recommend having a point system, or rating system for materially exceeding a minimum criteria that is a “must have.” With respect to criteria weighting, a runway that is over 4000 metres in length is probably not much better than one that is 3500 metres or 3750 metres, so XCOR would not provide extra points above a certain length. Factoring in weather and winds versus runways, with respect to multiple long runways that align with the compass rose for the site, XCOR would rate such a site higher than a single runway site that has less overall usable days due to winds, but not a site with a single runway that has more usable runway days due to constant winds over time. If there was one “trumping” factor for “must have” criteria, we believe it is weather / winds. If there is a materially different (+10 to 15% or more) expected number of days of operational flight time for one site versus another (assuming both sites met the other “must have” criteria) the site with materially more operational days should win.

We also note the following consideration ... sometimes it is easier to make a good site great, or even a marginal site great, by extending a runway (or two). In our experience, it may be easier to extend a runway 300 metres at one site than perhaps move population out from under the flight path or clean up airspace at another site. We note therefore that it is probably a mistake to quickly rule out sites excellent in other respects but needed a longer runway or a crossing runway, so long as the site plan permits such an expansion and there is a willingness to make the needed infrastructure improvements.

Q7. If more than one location closely meets 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?

Q7-RESPONSE – Yes, as tertiary factors, these local and national economic impact should be considered, but not at the expense of “must haves” and “highly desirable” factors as described above. Clearly, economic gain at a national level is critical, but it is not easy to see how one site in one corner of the United Kingdom would drive economic gain at a national level over another site in another corner of the UK, in such magnitude great enough that it would not show up in the local analysis. XCOR would

consider these as tie-breaker criteria. Given all else equal, such factors should be brought in to the mix for decision.

**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?

Q8-RESPONSE – XCOR believes that in the UK, this is probably the best approach.

**CAA's shortlist of potentially feasible locations**

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

Q9-RESPONSE – The sites with the most number of days without substantial cloud cover (Newquay and Llanbedr) offer attractive opportunities for suborbital spaceflight operations.

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

Q10-RESPONSE – Without visiting all of the sites or having access to their wind rose / cloud cover data, it is challenging to rule out any today. The sites with below 200+ estimated days of flyable weather due to wind and weather should be excluded.

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

Q11 – RESPONSE – Not at this time.