



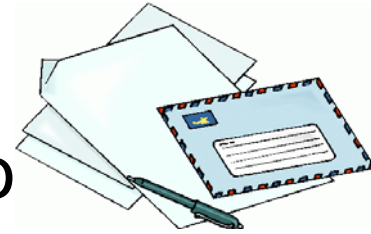
Technical Briefing on Emerging UK Spaceports Requirements

THE UK GOVERNMENT REVIEW OF POTENTIAL SPACEPLANE OPERATIONS AND CERTIFICATION IN THE UK

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DfT Section 16 Letter



- In Aug 2012 the CAA received a request to carry out a Review of the options for Spaceplane Certification and Operations in the UK.
- Request was under Section 16 of the Civil Aviation Act - which meant it was funded by Government.
- Task was completed in partnership with UKSA

Review Objectives were:

- To assess the extent to which UK can support safe spaceplane operations.
- To develop options for the certification of spaceplanes, engines and associated systems.
- To identify key characteristics and potential locations of a spaceport.
- To develop an understanding of the future market for spaceplane operations.



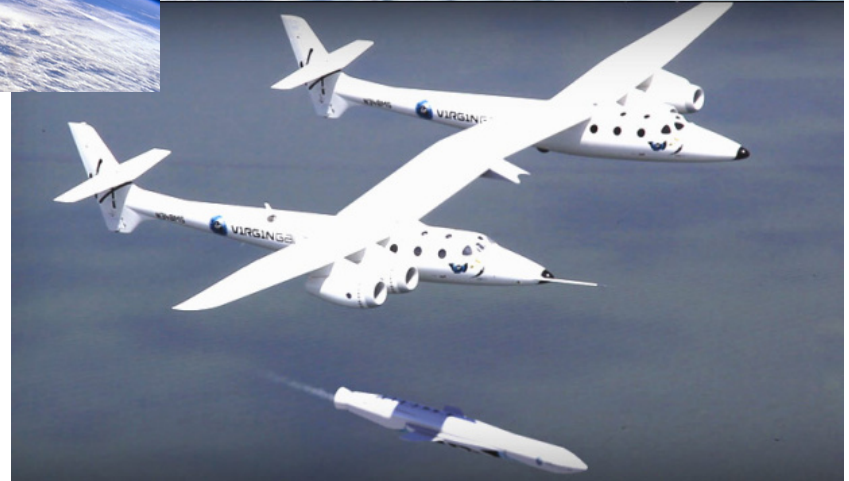
What was in Scope?

Sub orbital commercial space passenger/scientific flights



What was in Scope?

Orbital insertion from sub orbital flights or aircraft



What was in Scope?

- Single stage to orbit for passengers, satellites and cargo



What was in Scope?

- Intercontinental very high speed transport



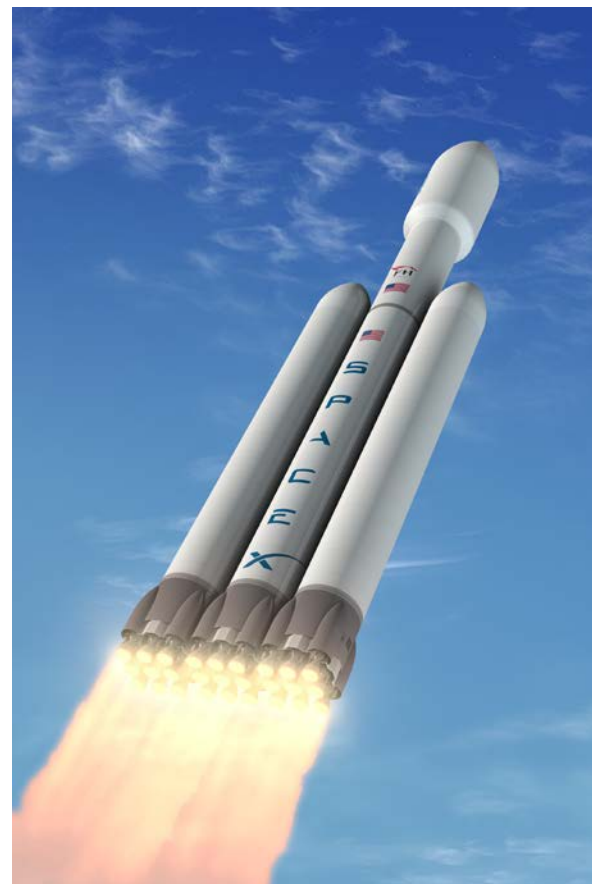
What was in Scope?

- UK Spaceport and rocket engine test facility?



What was Not in Scope, but!

- The review concentrated on those space vehicles that took off horizontally and used wings or lifting bodies to derive lift from the atmosphere.
- However options for the location of vertical launch sites in the UK were considered as part of the review.



Review Completion

- The Summary Report was Handed to Government Ministers on 19 Mar 2014
- The Final Technical Report made public by Government Ministers on the Space Day during Farnborough Airshow, July 2014
- http://www.caa.co.uk/docs/33/CAP1198_spaceplane_certification_and_operations_summary.pdf
- http://www.caa.co.uk/docs/33/CAP1189_UK_Government_Review_of_commercial_spaceplane_certification_and_operations_technical_report.pdf



Technical Report - Contents

- 1. Introduction - covers mandate for the Review, process; required outputs
- 2. Spaceplanes today and tomorrow
- 3. The economic case/opportunity for the UK
- 4. Legal context and considerations
- 5. Flight operations
- 6. Spaceplane airworthiness
- 7. Airspace
- 8. Spaceports and ATM
- 9. Environment
- 10. Flight crew licensing and training
- 11. Medical issues



Recommended Regulatory Framework: Sub-Orbital Spaceplanes

- The recommended framework ‘ring fences’ Spaceplanes operations by:
 - uses the CAA’s power to exempt from the Articles of the Air Navigation Order
 - Attaches conditions to the exemptions, in particular to manage third party risk; and
 - uses the concept of ‘Informed Consent’ to ensure passengers/participants understand the risks of such operations.



Spaceports

- The Review assessed the requirements for UK Spaceports (horizontal and vertical launch)
 - A UK spaceport for horizontally launched spaceplane operations is most likely to be based on existing civil or military aerodromes.
 - All licensed (and some unlicensed) civil and military aerodromes were considered as part of the review.
 - A vertical launch site for polar orbital satellite launch would most likely be at a green field location in the north of Scotland.



Safety Considerations for Spaceport Location

- In order to protect the uninvolved general public, and to comply with FAA AST safety requirements, a spaceport should be located in an area of low population density:
- The UK has no desert locations! Therefore a coastal site was seen as most appropriate.
- Easy access to segregated airspace – away from normal air traffic routes.

Spaceport Operational Considerations

- Runway length/direction
- Coastal location
- Weather patterns
- Local population density
- Airspace and local ATM complexity
- Other aviation users of site
- Environmental considerations
- (For vertical launch site/spaceport, a clear sea track to the North is required for Polar Orbit insertion)

Spaceport Locations

- The CAA carried out a detailed desktop review of all UK aerodromes that had the potential to become a Spaceport.
- These locations were filtered by applying the Spaceplane safety and operational requirements.
- This resulted in 8 locations that met most if not all of these requirements.

Progress Since Review Completion

- Ministers agreed to establish a cross government programme to action the review recommendations.
- The CAA has received a further Section 16 letter to develop the required regulatory frameworks
- This work is underway and as part of this we are working with government to develop the detailed UK safety regulatory requirements for a spaceport