

24th IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Access to Space for Small Satellite Missions (5)

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VERTICAL LAUNCH OF SMALL SATELLITES FROM THE UK

Abstract

The UK is looking to become a launching state, with strong support from government and industry to get a first launch from UK territory by 2020. This paper presents the results of an investigation of the commercial feasibility of operating a small launch vehicle from the north of the UK. Our commercial model is servicing Earth Observation missions in Sun Synchronous Orbits and future communication mega-constellation replenishment in polar orbits using an imported (US) launcher.

Detailed trajectory modelling was performed to optimize the payload mass deliverable to the most commercially desirable orbits from a number of potential UK launch sites. Launch trajectories are constrained by populations located north of Scotland, notably in the Faroe Islands and Iceland. Expected casualty analysis is used to assess the risk to population under the launch trajectory. “Dog-leg” manoeuvres are included in the trajectory to reduce the risk to downrange populations, at a cost of reducing the payload mass to orbit. We optimise the trajectories to maximise the mass deliverable within the safety constraints.

A detailed business case for a UK launch operation was established, based on a thorough analysis of the potential market accessible to a UK launch operation and costs analysis. The competitiveness of different sites could be assessed under a number of different operating scenarios, varying parameters such as range architecture, launch vehicle maturity, finance structure, etc. A review of range architectures was carried out and their costs assessed.

The regulatory framework adopted by the UK will be a decisive factor in determining the commercial feasibility of a UK launch operation, driven by factors such as potential restrictions on the trajectories that may be permitted; operational issues such as the required range architecture and potential technical safeguard obligations. A review of contemporary worldwide regulatory regimes was undertaken, and their applicability to the UK assessed.

Finally a number of potential launch site locations across the north of the UK were traded-off in order to inform future decision making by potential operators. The site trade-off included outputs from the rest of the project as well as additional factors such as accessibility, weather and regional development potential. Sites in the Shetland Isles offer higher payloads but that the improved accessibility of a site on the mainland may be a decisive factor in choice of launch site location. It is also noted having separate sites to service the different orbits could be considered.