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ASSESSMENT OF THE PAYLOADS THAT CAN BE DELIVERED TO THE MOON FROM UK
SPACEPORTS

Abstract

The UKSA Office of the Chief Engineer (OCE) is a relatively new technical team within the UKSA which has been established to provide technical oversight of the UKSA project portfolio and perform technical feasibility studies. One of the feasibility studies the OCE is currently exploring is to assess the type of payloads that could be delivered to the Moon using emerging UK launch options.

Access to space from the UK is a key objective in the UK's National Space Strategy. Several spaceports have been proposed and are being developed throughout the UK which will enable orbital launch from the UK. Current plans envisage the UK becoming a major player in the European small satellite launch market by 2030, providing access to Low Earth Orbit (LEO). Capability beyond LEO, for example to the Moon, could be foreseeable as the next step in developing the UK's launch capability. This study will assess the feasibility of lunar access from the launch vehicles currently proposed to launch from the UK.

Within this study, the launch vehicles currently proposed for UK launch have been modelled in the COTS trajectory and optimisation software ASTOS. The launch and trans-lunar orbital trajectories are modelled and optimised – where optimisation is performed to assess the maximum possible payload capability deliverable to the Moon and the constraints associated. Potential missions include lunar orbit, as well as delivery to the lunar surface through both soft and hard lunar landings – the mission design will impact the maximum payload capability, and is also discussed here.

The currently proposed launch vehicles include both horizontal and vertical launch. Due to the high latitude of the UK launch sites, a discussion is also included highlighting the opportunities and challenges of highly inclined orbits for trans-lunar orbital access.

The maximum deliverable payloads for each feasible mission type, and their context within the UK's National Space Strategy and ESA's lunar ambitions is also discussed. Considering future developments, the scope and feasibility of a heavy-lift launch vehicle from a UK launch site will also be briefly discussed, and what capability that would bring for a UK-based lunar mission.