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Systems and Infrastructures to Implement Sustainable Space Development and Settlement - Systems (2A)

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LUNAR COMMS AND NAV INFRASTRUCTURE – FIRST ORBITER LUNAR PATHFINDER READY TO RELAY DATA TO AND FROM THE MOON FROM 2023 ONWARDS

Abstract

Sustainable lunar exploration is likely to rely on permanent, low-cost and high performance support infrastructure. Commercially available and affordable, access to lunar orbiters for key services, such as communication and navigation, will lower ticket price for lunar exploration and science and stimulate the emerging cis-lunar market.

Bringing the first piece to this ambitious puzzle, Surrey Satellites Technology Ltd (SSTL), in partnership with ESA, has kicked off the first implementation phase of the Lunar communication programme. Expected to be in orbit and fully commissioned in 2023, the Lunar Pathfinder spacecraft will be ready to relay scientific and TTC data between lunar assets and Earth.This follows a successful feasibility study, realized in partnership with Goonhilly Earth Station (GES) and ESA, to offer a low-cost, high performance relay communication and navigation services to scientific Lunar missions.

The Lunar Pathfinder mission, in addition to demonstrating technology, will test and validate an innovative business model, by which industry provides affordable services for Space Exploration, and institutions contribute to mitigate the market risks stimulating scientific research in a win-win scenario. Operational in 2023, the Lunar Pathfinder spacecraft will be available for companies and institutions to buy communication services packages, designed to accommodate a wide range of users, relaying data between lunar assets and dedicated GES ground station.

The proximity of the relay to lunar assets will enable polar and far-side missions with limited or no direct line of sight to Earth. Lunar orbiters, CubeSat and surface near-side assets will benefit from better availability, improved data-rates and cheaper alternative to direct to Earth solutions, while relieving pressure on institutional deep space ground stations. When used as a main communication node, it will also allow lunar assets to simplify their communication modules, focusing mass and resource to their scientific payloads instead.

In parallel, the partnership is working on the follow-on to Lunar Pathfinder, as the market moves from mainly science and exploration towards in-situ resource utilisation and purely commercial endeavours, such as tourism. The service will evolve from a single spacecraft to a constellation, building on Lunar Pathfinder's heritage, and offering extended communication availability, capacity and navigation capabilities, from 2030 onwards. The constellation will be developed in coordination with ESPRIT (communication module of Gateway), follow international communication standards, and be part of a fully integrated and interoperable network with space and ground assets.