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LUNAR PATHFINDER - A COMMERCIALY-DRIVEN LUNAR DATA RELAY SATELLITE, 2
YEARS UNTIL LAUNCH

Abstract

The Lunar Pathfinder communications relay satellite is currently being developed, leading to a launch in the second half of 2025. The mission is a “public private partnership” between the European Space Agency (ESA) and Surrey Satellite Technology Ltd.

Lunar Pathfinder will offer data relay communication services for 8 years to other lunar missions – orbiters, landers and rovers. The service offered mean that other lunar assets making use of Lunar Pathfinder will no longer need their own “Direct to Earth” (DTE) capability with three key benefits for those assets – (1) lower cost of data communications, (2) the ability to communicate when DTE is impossible e.g. when shadowed by craters or when operating on the far-side and (3) lower volume, mass and power requirements for the communications equipment compared to DTE.

In addition to the communication services, Lunar Pathfinder will also act as a technology testbed for other payloads of interest to ESA and NASA. Pathfinder will carry 3 payloads in this category – (1) Weak signal navigation (GNSS) receiver to demonstrate possible use of GNSS in future lunar navigation infrastructure (2) Laser retro-reflector to allow precise ranging experiments in parallel with the GNSS receiver (3) Radiation monitor forming part of ESA’s Space Weather monitoring network.

Lunar Pathfinder is also a precursor to ESA’s Moonlight system which will provide communications and navigation services from a constellation of moon orbiting satellites. Moonlight will be deployed between 2027 and 2030 and will include Lunar Pathfinder in its initial capability.

Lunar Pathfinder will be launched by NASA’s Commercial Lunar Payload Service (CLPS) on the CS-3 (CLPS Science) mission in 2025. The launch vehicle will inject Lunar Pathfinder into an Elliptical Lunar Frozen Orbit (ELFO) chosen to provide excellent coverage of the main areas of interest to future lunar missions, namely the South Pole and Far Side regions.

The paper will provide an overview of the Lunar Pathfinder mission – the satellite, its ground segment and the communications services it offers to its users.