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Moon Exploration – Part 2 (2B)

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LUNAR SCIENCE PRECURSOR MISSION AND LANDER-MOUNTED SOLAR TOWER SYSTEM

Abstract

We aim to produce world-class scientific results, taking into account that Japan's participation in the ARTEMIS program will increase the opportunities for lunar activities in the future. In particular, the following three types of science are envisaged.
- Astronomical observations from the Moon's surface (Lunar Observatory)
- Selection, collection and return to Earth of lunar samples that will yield important scientific knowledge (Lunar Surface SR)
- The lunar seismometer network to understand the inner structure of the Moon (Lunar Seismometer NW)

The following mission is being considered as a lunar science precursor mission.
- Pinpoint landing at the lunar South Pole.
- Deployment of a 50 kg class rover by a lander-mounted robotic arm.
- Automatic operation and slope running by a 50 kg class rover.
- Collection, grinding and in-situ analysis of samples by the 50 kg rover-mounted robotic arm and instruments.
- Installation of a lunar seismometer package by the lander-mounted robotic arm.
- Lunar seismic observation using the lunar seismometer package.

- Deployment of the Lunar Observatory Proto-Type Antenna (LOPTA).
- Radio observation using the LOPTA.
- Over-night in the polar region of the Moon using solar tower.

The solar tower shall have the following specifications with the aim of being universally used on landers.

- The tower is mounted in a stowed state, and after landing, the boom extension mechanism extends one highly rigid boom (tri-STEM closed section boom) and deploys the two membranes attached to the left and right sides of the boom using the lunar gravity.
- Lightweight solar cells (Space Solar Sheet) attached to the membranes generate solar power.
- The phase adjustment mechanism allows the boom to rotate around an axis in the direction of boom extension so that the solar cell membranes can track the sun.
- The horizontal adjustment mechanism makes the boom extension mechanism horizontal regardless of the inclination of the landing point, so that the boom can be extended vertically.

This paper introduces the lunar science precursor mission and presents the lander-mounted solar tower system under development.