

IAF SPACE EXPLORATION SYMPOSIUM (A3)  
Moon Exploration – Part 2 (2B)

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## PROGRESS OF LUNAR POLAR EXPLORATION MISSION

**Abstract**

The moon is considered the next area of human activity. The Gateway will be constructed by NASA and its partner agencies and serve as orbital outpost to support human and scientific exploration of the Moon. In addition, many lunar surface explorations around polar regions of the Moon are planned recently, because it has been suggested that water ice might be present in the lunar polar region based on remote sensing observation of the lunar surface using a neutron spectrometer and visible to infrared spectrometer. However, the precise amount and state of the water ice are still unknown.

Under the circumstances, the Japan Aerospace Exploration Agency (JAXA) is also planning a lunar polar exploration mission that aims mainly to confirm the abundance of water-ice resources and to establish the technology of planetary surface exploration. JAXA had been conducting a feasibility study on the mission with the Indian Space Research Organisation (ISRO) since December 2017. Based on the results of the joint study, ISRO and JAXA held the Joint Mission Definition Review (JMDR) in December 2018. Following the JMDR, JAXA successfully concluded the internal Project Readiness Review at the end of 2019. The mission is now included in the revised implementation schedule of the Basic Plan on Space Policy of Japan. Then, JAXA has established the Lunar Polar Exploration Pre-Project Team in JAXA Space Exploration Center at the beginning of 2020. At present, ISRO and JAXA is jointly continuing the Phase-A study aiming to realize the mission.

The spacecraft system comprises a lander system and a rover system. The system does not have a communication relay satellite but is based on direct communication with the Earth. The minimum target for the landing payload mass is more than 350 kg. The landing site is planned for a long-term sunlit area close to the permanently shadowed region around the lunar south pole. Therefore, the mission duration is assumed to be more than half a year because sunshine continues around the landing site. The current assignment of roles and responsibilities for spacecraft developments are that the ISRO will provide the lander and the JAXA will provide the rover and launch rocket.

The most important matter is to know whether the amount of water in the lunar polar region is enough. In addition, it is also important that the water condition is suitable for utilize as a resource. Therefore, from the viewpoint of prospecting lunar resources, the mission objectives are defined as follows: - Obtain data on the quantity and quality of lunar water to clarify whether it can be used for future activities. - Obtain data to understand the principle of the water distribution and concentration to estimate the quantity and quality of water across the Moon. Though resource investigation is the main objective of the mission, technology demonstration and environmental investigation will also be conducted. From a technological viewpoint, the Moon is the best place for demonstrating new technologies of planetary exploration, especially for surface activities. In addition, surface temperature, sunshine and radiation environment will be investigated in preparation for future manned exploration. we are currently developing various technologies to explore lunar polar regions.

We expect the mission to contribute to the international space exploration roadmap and expect to carry it out in the early 2020s. In this paper, we will report on the study status of the mission.