Press Release

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ispace, inc.

ispace Releases Interim Success Report for HAKUTO-R Mission 1

Mission 1 Lunar Lander Enters Second Phase of Transit,
Becomes Farthest Commercial Operating Spacecraft to Travel into Deep Space

TOKYO—February 28, 2023—ispace, inc., ("ispace") a global lunar exploration company, released an interim success report and announced that its HAKUTO-R Mission 1 lunar lander has entered the second phase of its mission, having traveled to its farthest point from Earth into deep space. The lander is now on a trajectory to the Moon with a scheduled landing for the end of April 2023.

The HAKUTO-R Mission 1 lunar lander was launched Dec. 11, 2022, on a SpaceX Falcon 9 rocket from Cape Canaveral, Fla. Since being deployed from the rocket, the lander has traveled approximately 1.376 million kilometers into deep space becoming the farthest privately funded, commercially operating spacecraft to travel into space.

As the cruise continues, ispace's flight team is expecting to complete all deep space orbital maneuvers before Lunar Orbital Insertion to occur around mid-March 2023 ("Success 6"), followed by a Lunar Orbital Insertion maneuver to occur around late March 2023 ("Success 7"). More details will be released once the exact date and timing have been determined.

The announcement was made by Takeshi Hakamada, Founder and CEO of ispace, and Ryo Ujiie, CTO of ispace along with other executives at a press conference hosted today in Tokyo.

This press release contains forward-looking statements. They are based on certain assumptions and forecasts of when this press release was prepared, on the basis of information available to us at the time such statements were made. These statements and assumptions may not be objectively correct or may not be realized in the future.

HAKUTO-R Mission 1 Interim Success Report

ispace's inaugural mission is considered a technology demonstration with an overall objective to validate the lander's design and technology, as well as ispace's business model to provide reliable lunar transportation and data services. Prior to the launch and deployment of the lander, ispace released ten mission success milestones. To date, five of the ten mission success milestones have been achieved.

The interim success report consists of an overview of the lander's subsystems and operations during the first phase of flight while traveling on the low-energy transfer orbit to the Moon. The lander has proven its flight worthiness, having been integrated into the SpaceX Falcon 9 rocket, deployed following launch and then undertaken multiple orbital control maneuvers while on a stable course to the Moon. The ispace Mission Control Center staff have also proven their expertise while managing the lander's operations to the Moon.

Lander's Subsystem Status Update

Structure:	The lander was designed and tested to show compatibility with Falcon 9 launch environments and compliance with U.S. Range Safety requirements. During the first phase of its transit, ispace engineers confirmed that the lander's structural design was able to withstand the harsh mechanical environment of both the launch and deployment phases without sustaining damage to any element of the lander, corresponding to Success 2 of Mission 1 milestones. Even after being subjected to such high structural stress phases, the lander's legs were also successfully deployed.
Thermal:	The thermal condition after the launch was hotter than planned, but since the temperature range was within the flight team's expectation, its impact has been closely managed and controlled. Currently, the flight team is carefully analyzing any impact to the lunar surface operation as well as ongoing space cruise. A positive side effect has been saving heater power consumption during the flight. Closely controlled power management at Low Lunar Orbit is expected to to allow more flexibility in the operation.
Communication:	During the initial phase of launch, an unexpected communication instability occurred immediately following deployment from the launch vehicle. ispace engineers were able to quickly identify and resolve the issue and establish a communication link. Since that point, communication uplinks and downlinks between the lander and ground have been stabilized. The link performance has been as expected and all necessary data for the flight operation has been downloaded in a timely manner. Moreover, in order to maximize the downlink and uplink rates to efficiently download and upload data, the flight team has evaluated the lander's trajectory and ground station parameters (e.g. antenna size and minimum elevation angle of antenna) for each communication path, and successfully optimized transponder parameters.
Power:	The power generation performance is higher than expected based on solar panel performance, resulting in positive performance during the flight, including more flexible attitude management plan at each attitude change operation and may result in possible relaxed power management plan at the Low Lunar Orbit in the future. In addition, there has been no unexpected power consumption to date. During the flight, the flight team has

carefully evaluated the battery charging level and determined it to be normal.

Propulsion:	Both the main propulsion system and Reaction Control System (RCS) have shown expected performance. A main propulsion tank's temperature is hotter than expected, as described in the thermal section, but no major impact has been identified during this stage of the cruise. To prepare for longer burns around the Moon, the impact is being analyzed in detail now. RCS thrusters on one side of the lander were determined to be hotter than planned due to continuous sun illumination, but the flight team has confirmed it remains within the acceptable range. To avoid any potential damage, a proper offset was added on the lander's attitude, and the temperature has returned to the expected range.
Onboard Computer	All nine onboard computers are working. The cadence of 1 bit memory error detection is higher than expected, but it remains within the manageable range. Although one computer has rebooted multiple times, there has been no significant impact on the operation due to redundancy in the lander's design. All autonomous sequences have worked as expected and the daily parameter update has been steadily carried out.
Guidance, Navigation, and Control	Despite brief periods of unstable attitude performance during separation from the launch vehicle, due to an unexpected sensor performance influenced by the Earth, Sun, and lander positions, the attitude control has been stable. Even with the instability, the flight team recovered the proper attitude and took adequate countermeasures to avoid the same issue by tuning parameters. Because the RCS propellant was additionally consumed at each transition, the flight team updated GNC parameters and has successfully saved propellant. On the one hand, the orbital control maneuver algorithm has shown expected performance, and no trouble has been detected even through each critical Orbital Control Maneuver operation.
Payload	The communication between all customer payloads and lander was successfully confirmed, and all checkouts were also completed without any issue, corresponding to Success 3 of Mission1 milestones. Each customer has subsequently confirmed their payload status. In addition, customers have confirmed receipt of data during the flight. Following checkout processes, one of the payloads encountered an issue, however the customer

and ispace engineers jointly worked to successfully recover the payload functionality. Our internal payload, ispace's camera, took several photos and videos of the Earth, with quality meeting expectations. Of note, the flight team carried out a once pointing operation for one of the shots, and the Earth was successfully captured by the camera due to the proper pointing operation.

Flight Status Update

LEOP

Launch and Early Operation (LEOP), corresponding to Success 3 of Mission 1 milestones, was successfully completed. The flight team required longer duration to complete the operation due to an unstable communication (see Communication section) and a sensor anomaly (see GNC section), but the lander was successfully guided to a stable condition by the team. In general, LEOP is always one of the most difficult moments in spacecraft operation, and this proved to be the case for ispace's maiden voyage. Despite the longer than expected duration of the operation and maiden flight concerns, the flight team quickly identified issues during the operation and took proper action under pressure.

OCM

The flight team has already successfully completed three Orbital Control Maneuver (OCM) operations in total, since first Orbital Control Maneuver, corresponding to Success 4 of Mission 1 milestones. Each OCM is a critical operation, and significant preparation is required before each execution. For each maneuver, the flight team analyzed the lander's trajectory at the time, planned an OCM to guide the lander into an ideal trajectory, uploaded a parameter set to realize the maneuver, carried it out as planned, and finally evaluated the performance. All OCMs were executed precisely and within expectation, and the achievements have proven the lander system performs as designed and the flight team is capable of carrying out critical operation properly.

Daily Cruise

The flight team has planned and executed daily house-keeping operations effectively, and flexibly performed payload operations during cruise. Even during cruise, any previously mentioned anomalies that have been identified were immediately shared with the team and the solutions have always been prepared and executed within a timely manner. Before each solution execution, the flight team also carried out a flight simulation to verify and validate that the solution won't cause any extra issue and will work as expected. This effort results in our current stable operation, and it gives us more confidence in the incoming future operations.

To this point, each subsystem has been verified in each phase from LEOP, OCM and daily cruise. During the second phase of Mission 1, further verification of each subsystem function is planned during both the lunar orbit injection and lunar landing phases.

Valuable feedback such as data and operational experience obtained to this point has already been incorporated into Mission 2 and Mission 3, which will contribute to NASA's Artemis Program. These two missions will further improve the maturity of ispace's technology and business model. Development of the landers and customer payload acquisition for Mission 2, planned for 2024, and Mission 3, planned for 2025, are already in progress. Further details are announced in "ispace Releases Updates on Progress of Mission 2 and Mission 3."

Mission 1 Milestones

For Mission 1, ispace has set 10 milestones between launch and landing, and aims to achieve the success criteria established for each of these milestones. Recognizing the possibility of an anomaly during the mission, the results will be weighed and evaluated against the criteria and incorporated into future missions already in development between now and 2025. Mission 2 and Mission 3, which also will contribute to NASA's Artemis Program, will further improve the maturity of ispace's technology and business model. Future announcements on progress of milestone achievement are expected to be released once attained.

#	Milestone	Success Criteria per Milestone
1	Completion of Launch Preparations	• Complete all development processes of the Series 1 lunar lander before flight operations. • Contract and prepare launch vehicle, and complete integration of lunar lander into the launch vehicle.
2	Completion of Launch and Deployment	• Complete successful separation of the lunar lander from the launch vehicle. • Prove that the lander's structure is capable of withstanding the harsh conditions during launch, validating the design and gathering information towards future developments and missions.
3	Establishment of a Steady Operation State (*Initial Critical Operation Status)	• Establish communication link between the lander and Mission Control Center, confirm a stable attitude, as well as start stable generation of electrical power in orbit. The completion of this step verifies the integrity of lander core systems and customer payloads.
4	Completion of first orbital control maneuver	• Complete the first orbital control maneuver, setting the lander on a course towards the Moon and verifying operation of the main propulsion system, as well as related guidance, control, and navigation system.
5	Completion of stable deep-space flight operations for one month	• Prove that the lander is capable of steady deep-space flight by completing a nominal cruise and orbital control maneuvers over a 1 month period.
6	Completion of all deep space orbital control maneuvers before LOI	• Complete all planned deep space orbital control maneuvers by utilizing gravity assist effects and successfully target the 1st lunar orbit insertion maneuver. This stage proves the ability of the lander's deep-space survivability, as well as the viability of ispace's orbital planning.
7	Reaching the lunar gravitational field / lunar orbit	• Complete the first lunar orbit insertion maneuver and confirm the lander is in a lunar orbit, verifying the ability of ispace to deliver spacecraft and payloads into stable lunar orbits.
8	Completion of all orbit control maneuvers in lunar orbit	• Complete all planned lunar orbital control maneuvers before the landing sequence. • Confirm the lander is ready to start the landing sequence.
9	Completion of lunar landing	• Complete the landing sequences, verifying key landing abilities for future missions.
10	Establishment of a steady system state after lunar landing	• Establish a steady telecommunication and power supply on the lunar surface after landing to support customer payloads' surface operations.

About ispace, inc.

ispace, a global lunar resource development company with the vision, “Expand our Planet. Expand our Future.”, specializes in designing and building lunar landers and rovers. ispace aims to extend the sphere of human life into space and create a sustainable world by providing high-frequency, low-cost transportation services to the Moon. The company has offices in Japan, Luxembourg, and the United States with more than 200 employees worldwide. ispace U.S. is part of a team led by Draper, which was awarded a NASA Commercial Lunar Payload Services (CLPS) Program contract to land on the far side of the Moon by 2025. Both ispace, and ispace EU were awarded contracts to collect and transfer ownership of lunar regolith to NASA, and ispace EU was selected by ESA to be part of the Science Team for PROSPECT, a program which seeks to extract water on the Moon.

Established in 2010, ispace operated “HAKUTO”, which was one of five finalist teams in the Google Lunar XPRIZE race. The company’s first mission as part of its HAKUTO-R lunar exploration program launched on Dec. 11, 2022, from the United States on a SpaceX Falcon 9 rocket and is currently expected to land on the lunar surface at the end of April 2023. Subsequent missions are in development with launches expected in 2024 and 2025. ispace has also launched a lunar data business concept to support new customers as a gateway to conduct business on the Moon.

For more information, visit: www.ispace-inc.com; Follow us on Twitter: @ispace_inc.

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