



Lunar Science Strategy Update



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What is a “Implementation Plan for a NASA Integrated Lunar Science Strategy in the Artemis Era”?

The OWL recommended that “PSD should develop a strategic lunar program that includes human exploration as an additional option to robotic missions to achieve decadal-level science goals at the Moon.”

This Implementation Plan provides a snapshot of NASA’s plans to implement the strategy recommended in OWL and to address the M2M objectives relevant to lunar science. It is an opportunity to present the full scope of tools currently available to NASA and how they map to high-priority lunar science that can be accomplished at the Moon.

The word “integrated” in the title refers to integrating the capabilities and new opportunities afforded by Artemis and CLPS alongside more traditional mechanisms such as Discovery/New Frontiers and various R&A elements to achieve our science objectives.

The Big Challenges

(i.e., science that requires a strategy to accomplish)

Specific missions that can be achieved through multiple architecture options:

- South Pole-Aitken (SPA) Basin Sample Return
- Lunar Geophysical Network (LGN)
- Cryogenic Volatile Sample Return

Objectives that require a build up of knowledge and global access to samples to achieve:

- Lunar Chronology
- Lunar Formation/Evolution

Status Update

Draft released for public comment on November 14th

- Received 21 individual responses through the Google Form (plus 1 additional individual response through email), plus a compiled group response from GSFC and a compiled response from LEAG
- We appreciate the feedback. While we will not provide a bullet-by-bullet response, we did read and consider each and every comment and have made substantial changes in response.

Final version expected to be released this month

Major Changes since draft release

- Clarification that the document is focused on the science that we can extract from the current and evolving lunar architecture, and does not discuss the important role that science plays in enabling exploration
- Volatiles added as a 6th “Big Challenge”
- LExSO section clarified and reworded to focus on science objectives rather than the strawman payload.
- Clarification on Artemis SDTs and strategic input
 - A3 SDT valid for all short duration polar sorties
 - Two NAS studies: non-polar locations, long duration stays
- Added new ROSES element, the Lunar Mapping Program (LMaP) to section 5.4.2
- Added long duration NAS study to Next Steps list

Next Steps – activities we are committing to undertake over the next two years

- Fund a short study to further define the rover requirements and potential payloads of the Endurance-A concept. This effort includes gathering community input, to better define the science objectives (section 4.1).
- Conduct a pre-phase A study on “LExSO” (Lunar Exploration Science Orbiter) using the LEAG Continuous Lunar Orbital Capabilities Specific Action Team (CLOC-SAT) report as a guide (section 3.2)
- Request a joint LEAG/ExMag study on Artemis Samples, including panels on volatile as well as non-volatiles samples and sample data (sections 4.3, 5.2, 5.5).
- Continue community engagement on the evolving Moon to Mars Definition Document (section 1).
- Continue the Lunar Surface Science Workshop series to acquire direct feedback on topics important to the science community (section 5.7).
- Develop a South Pole Aiken Basin Sample Return Science Definition Team (SDT) to further flesh out the science objectives and measurement requirements of such a mission (section 4.1).
- Contract the National Academy of Sciences to conduct a study on Key Non-Polar Destinations Across the Moon to Address Decadal-level Science Objectives with Human Explorers (sections 4.1, 4.4).
- Work with the USGS to define a coordinated geologic mapping strategy for exploration of the south pole (section 5.5).
- Conduct a LGN payload study to explore the requirements and feasibility of a CLPS-based approach (section 4.2)
- ~~• National Academy of Sciences study has been requested on the cross-disciplinary science humans should address on the surface of Mars (section 5.8).~~
- Contract the National Academy of Sciences to conduct a study on the science objectives that can be achieved in the sustained phase of lunar exploration (Sections 4.1, 4.4).

Forward Work For Next Iteration

This implementation plan is expected to be a living document that is updated roughly every two years. Though we intend to revise the full document, these are the areas we expect to focus on fleshing out in the next iteration:

- CLPS strategy
 - Several more CLPS landings are expected to be completed within the next two years, which will allow for a more detailed CLPS strategy to evolve. We are also thinking about “CLPS 2.0”, which is both an evolution of the CLPS Project and a follow-on contract with industry.
- Artemis strategy
 - The Artemis architecture will have matured further, allowing increased definition of our Artemis science strategy
- Technology development strategy
 - Working with the PESTO office to optimize our science investments in instruments
 - Long term power/comm needs, PNT, etc
- International partners strategy