

# Terms of Reference for the Lunar Critical Data Products Specific Action Team

A Joint MAPSIT-LEAG Activity

*Requestor:*

*NASA's Human Exploration and Operations Mission Directorate Science, Technology, and Utilization Office  
and*

*NASA's Science Mission Directorate Planetary Science Division*

## Rationale

United States National Space Policy directs NASA to extend human economic activity into deep space by establishing a permanent human presence on the Moon, and, in cooperation with private industry and international partners, develop infrastructure and services that will enable science-driven exploration, space resource utilization, and human missions to Mars. As the first step towards that goal, United States National Space Policy directs NASA to lead a program to land the next Americans on the Moon no earlier than 2024, followed by a sustained presence on the Moon, and the subsequent landing of the first human on Mars.

As highlighted by the Artemis III Science Definition Team (SDT) Report – the definitive statement of science priorities for the first crewed mission to the lunar surface and the basis for all future crewed lunar mission – the success of human and robotic precursor missions to the lunar surface depends on and requires the use of several lunar datasets from past and recent orbital missions. To that end, the SDT report issued several formal recommendations, including:

***Recommendation 8.2-1:*** *Any needed updates to the standard lunar geodetic coordinate reference frame (e.g., currently used by the Lunar Reconnaissance Orbiter (LRO)) should be identified in 2021, and foundational products should be mapped onto it and/or developed to use it directly. Establishing a standardized coordinate reference frame can significantly improve data reliability and reduce the risk of errors.*

***Recommendation 8.3-1b:*** *To support the level of accuracy and precision needed for landing and surface operations, new cartographic products, including mosaics and topographic models, for the south pole should be developed using the highest quality data available (e.g., LRO NAC and WAC frames; SELENE TC, MI, and Chandrayaan M3) and using the standard (possibly updated) lunar geodetic coordinate reference frame.*

***Recommendation 8.3-1c:*** *New derivation of higher-order data products from existing missions should also be supported where needed for Artemis III. For example, it is vital that more detailed geologic mapping of candidate landing sites be accomplished at a scale similar to what was done in preparation for Apollo.*

The Artemis III SDT report also issued **Recommendation 6.5-1b:** *“NASA’s existing Program Analysis Groups, such as LEAG and CAPTEM, serve an important community role synthesizing community input across diverse stakeholders in the engineering, science, and commercial communities, and should be leveraged as the program continues to promote external community engagement to the fullest practical extent.”*

To begin the process of responding to the recommendations of the Artemis III SDT, the two analysis groups with the relevant domain expertise for planetary cartography and lunar exploration, the Mapping and Planetary Spatial

Infrastructure Team (MAPSIT) and the Lunar Exploration Analysis Group (LEAG) are hereby requested and empowered to establish the Lunar Critical Data Products Specific Action Team (LCDP-SAT).

## Deliverables

LCDP-SAT will be asked to present nonbinding findings to NASA in the form of a report. Draft findings will be due no later than 3 Sep 2021 and will be presented at the Annual LEAG Meeting for open comment. A final report will be due no later than 30 Sept 2021. The LCDP-SAT will execute the following functions on a best-effort basis, considering the timeframe in which the upcoming Artemis program and commercial activities will occur:

- 1a. Based on the outcomes of the Artemis III SDT report, summarize the current lunar coordinate reference schema and practices known to be employed by active NASA lunar flight missions.
- 1b. Assess whether any updates to the standard lunar geodetic coordinate reference frame (e.g., currently used by LRO mission teams) are required or highly desirable to enable near-future a) safe landings on the lunar surface, b) successful surface operations by humans and spacecraft for science, exploration, or economic development, or c) to maximize the science obtained from current and upcoming lunar datasets.
2. The SAT will assess and prioritize what new mission-derived cartographic products, including mosaics and topographic models, for the south pole region (prioritizing NASA's proposed Artemis III landing sites) could be developed to facilitate science or exploration using the highest quality data available (e.g., NAC and WAC frames, SELENE TC, MI, and Chandrayaan M3). It is understood that some number of these might need to be created to support early human landed missions and surface operations, robotic precursor missions, as well as early commercial activity on the lunar surface.
3. The team will assess and prioritize which higher-order data products, such as geologic maps or resource availability maps, need to be created to support early human landed missions and surface operations and any robotic precursor missions as well as early commercial activity on the lunar surface near the south pole.
4. Assess, in a general sense, what new mission-enabling data or products (including maps) may be required from existing or future orbital and surface assets within the south pole region and beyond.
5. Assess the general availability and accessibility of lunar data as well as tools to evaluate and analyze data for the science community, the Artemis program, and the general public.
6. While the focus of this activity will be on identifying specific critical data products per the recommendations of the Artemis III SDT, the team is also requested to issue nonbinding findings detailing preliminary steps to enable a "Planetary Spatial Data Infrastructure" (PSDI) for the Moon, such as goals for deploying a lunar PSDI catalog/registry for the discoverability of existing data products; the development of standards and best practices on how to characterize, report, and represent uncertainty and distortion within data; and the longer-term considerations of establishing a lunar PSDI (including benefits, maintenance, and evolution).

## Membership

LCDP-SAT is established as a joint LEAG/MAPSIT activity to leverage the strength and domain subject expertise of the communities represented by both analysis groups. Membership shall be comprised of subject matter experts in active lunar mission flight operations, lunar cartography, Planetary Data System delivery and operations, derived data product and data analysis, and surface navigation.

## Membership of the Lunar Critical Data Products Specific Action Team

Julie Stopar (LPI), Co-Chair

Angela Stickle (JHUAPL), Co-Chair

### **Members:**

Brent Archinal (USGS)

Ross Beyer (SETI)

Lisa Gaddis (LPI)

Trent Hare (USGS)

Jose Hurtado (U.T.)

Pete Mouginis-Mark (U Hawaii)

Jean-Pierre Williams (UCLA)

Myriam Lemelin (U Sherbone, Canada)

Emerson Speyerer (ASU)

Sam Lawrence (NASA)

Noah Petro (NASA)

Maria Banks (NASA)

Kelsey Young (NASA)

### **Ex-Officio Members**

Jake Bleacher (NASA)

Sarah Noble (NASA)

Becky McCauley Rench (NASA)

Amy Fagan (LEAG chair)

Brad Thomson (MAPSIT chair)