

Lunar Logistics

Frequently Asked Questions

This document contains an evolving set of assumptions and ideas pertaining to the provision, delivery, transportation and accommodation of logistics for the lunar surface operations at Artemis Base Camp. It does not represent requirements, but a starting point from which partners can iterate. Given that the systems and the location for Artemis Base Camp are still being determined, the attached document represents a snapshot in time of ideas and some bounding constraints with respect to logistics operations. Partners are free to challenge operational constructs and assumptions to achieve better solutions. The concepts and assumptions in this document serve as a starting point for innovation to help identify factors that need to be considered for logistics operations and system design. It will be updated periodically as more information is developed and refined, and eventually serve as a basis for documenting ground rules and assumptions, leading eventually to requirements in the future.

Category: Power

Status: **OPEN Due July '21**

Context: RHUs for logistics systems and in general for the lunar architecture

Questions:

- Can RHUs be part of the integrated logistics system design for accommodation thermal needs?
- Are there any restrictions on crew being close to or handling RHUs?
- Can we accept RHUs as part of international systems, can we launch them?
- Certainly infusion of RHUs could have many benefits across the architecture, what is their availability, can they be made interchangeable?

Category: Mobility Systems

Status: **READY TO SHARE**

Context: Logistic Lander landing location interaction with mobility systems

Question:

- What is the largest size rock the mobility systems should be able to accommodate when getting cargo from cargo lander?

Answer:

- May need to clarify the question. The Lunar Terrain Vehicle (LTV) and Pressurized Rover (PR) will be designed to have a reasonable ground clearance, but is this getting more at if there is a rock near the lander where the offloading will occur and how to handle that? If so, this comes down to making the davit (assumed to be on the logistic lander) long enough to account for offloading at the worst case landing angle and to have the option to drop the payloads off in at least 2 directions to avoid obstacles. (see attached concept graphics).

Category: Mobility Systems

Status: **READY TO SHARE**

Context: Logistic Lander landing location interaction with mobility systems

Question:

- What is the maximum slope the mobility systems will be able to accommodate when getting cargo from the cargo lander?

Answer:

- The LTV and PR have a requirement to be able to operate on up to a 20 degree slope, so the davit on the logistics lander will have to be sized to still be able to drop the logistics off on to the LTV/PR (i.e. the horizontal member of the davit needs to be sized for the worst case landing angle and height of the lander)

Category: Mobility Systems

Status: **READY TO SHARE**

Context: Logistic Lander landing location interaction with mobility systems

Question:

- Is there an optimal height above the lunar surface that the cargo lander should position the Small Pressurized Logistics Carriers (SPLCs) at to better accommodate transfer to the mobility systems?

Answer:

- May need to clarify the question. The baseline plan is to not set/lower the SPLCs to the lunar surface, but to transfer directly from the lander to the mobility asset. If the question assumes the SPLC is lowered onto the surface, that would only be a contingency and would require additional study

Category: Cargo/SPLC's

Status: **READY TO SHARE**

Context: SPLC conditioning and resource requirements

Question:

- What telemetry and power services will be needed independent of thermal heating?

Answer:

- Not aware of power needs beyond those that maintain temperature and pressure (pressure should come for free if it is sealed well).

Category: Cargo/SPLC's

Status: **OPEN Due July '21**

Context: SPLC conditioning and resource requirements

Question:

- What are the temperature requirements that must be maintained in the SPLC?

Answer:

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Category: Cargo/SPLC's

Status: **READY TO SHARE**

Context: Dimensional limits on the SPLC

Question:

- Once through the hatch, is there a driving dimension for the SPLC that allows it to be unloaded or stored?

Answer:

- Preliminary Thinking: A suitport airlock has been baselined for the hab (see attached concept graphics). This means that the logistics carriers never come fully inside of the hab but rather dock to suitports within the suitport airlock and the logistics are brought into the hab the same way they are brought into the PR. The SPLC size does drive the size of the airlock portion of the suitport airlock (reference attached graphics).

Category: Cargo/SPLC's

Status: **READY TO SHARE**

Context: Dimensional limits on the SPLC

Question:

- What size hatch is the SPLC required to fit through?

Answer:

- SPLCs never come fully inside of the hab or PR, but rather dock to suitports. From a contingency perspective, the hab has a 40"x 60" hatch and the NASA concept for the PR envisions 40"x40" hatch.

Category: Suitport

Status: **OPEN Due '22**

Context:

Question:

- What is the suit port interface?

Answer:

- Initial Response: suit port interface is currently in work and will not be available until early 2022 at the earliest

Category: Landing Site

Status: **OPEN Due Fall '21**

Context:

Question:

- What are the 5-10 potential landing sites for Artemis Base Camp?

Answer:

- Initial Response: Potential landing sites for Artemis Base Camp are being studied and will be available this fall.

Category: Landing Site

Status: **READY TO SHARE**

Context:

Question:

- What eclipse /shadow period should be used for the logistics lander design?

Answer:

- Initial Response: The current point of departure is 14 days. However, the logistics lander launch window is currently being studied with completion expected fall '21.

Category: Communications

Status: **READY TO SHARE**

Context:

Question:

- Can architecture use a high gain antenna?

Answer:

- Yes, it would be beneficial to the architecture.

Category: Cargo/SPLC

Status: **OPEN Due September '21**

Context: Batteries (required to power heaters) and insulation add weight

Question:

- Can cargo be delivered frozen?

Answer:

- Preliminary Thinking: More study required. If some items can be delivered sealed in bags but otherwise exposed to cold (i.e., not in SPLCs), there could be advantages. Or even if they are in SPLCs and don't need to be kept warm, there are still advantages.

Category: Power

Status: **OPEN Due September '21**

Context:

Question:

- Can RTGs be used around crew.

Answer:

- Will study and provide answer in two months.

Category: Cargo/SPLC

Status: **OPEN Due September '21**

Context:

Question:

- Can we tow cargo container on 2-3 passive wheels?

Answer:

- Will study and provide answer in two months.

Category: Cargo/SPLC

Status: **READY TO SHARE**

Context: Weight considerations of lander

Question:

- Does davit need to lift cargo back onto LTV?

Answer:

- Yes. We have been assuming that the LTV and PR do not have a davit but the logistics landers and the habitat do (see concepts in the attached). Thus, those davits would be used to assist in loading/unloading SPLCs from the rovers.