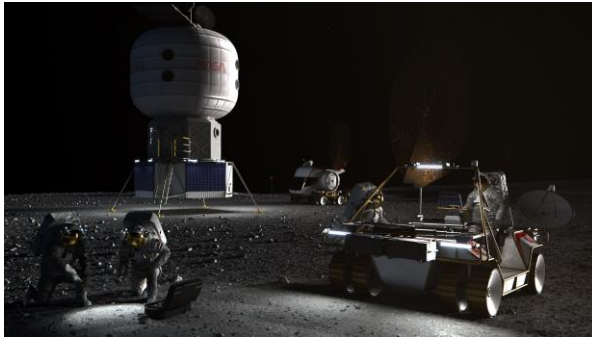


NASA LUNAR SURFACE HABITAT: ENABLING A SUSTAINED LUNAR PRESENCE. P. D. Kessler,
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Introduction: NASA's human [lunar exploration plans](#) under the Artemis program call for sending the first woman and first person of color to the surface of the Moon by 2024 and establishing sustainable exploration by the end of the decade. Working with both commercial and international partners, NASA will establish a permanent human presence on the Moon within the next decade to uncover new scientific discoveries and lay the foundation for private companies to build a lunar economy. Longer duration missions on the lunar surface or in lunar orbit can also serve as a test bed for technologies to support future Mars exploration campaigns. The agency will use what we learn on the Moon to prepare for humanity's next giant leap – sending astronauts to Mars. This LEAG presentation will provide an overview of the Surface Habitat, its benefits, and the challenges faced operating on the lunar surface.



Artemis Base Camp: NASA intends to establish a sustained lunar presence with the development of the Artemis Base Camp by the end of the decade. The base camp core elements – including the lunar terrain vehicle (LTV), Pressurized Rover (PR), Surface Habitat (SH), power systems, and in-situ resource utilization (ISRU) systems – leverage new international and commercial partnerships and national investment in systems needed to return to the Moon, establish sustained human exploration of the moon, and contribute directly to the first human mission to Mars.

Lunar Surface Habitat. Anchoring the long-term, human-led exploration at the lunar South Pole is the lunar Surface Habitat (SH). The SH is a fixed surface habitat offering a home base for astronauts, hub for communications, science facility, extravehicular activity (EVA) equipment repair site, waste processing facility, supply hub, surface operations base, and test bed for sustained surface presence and preparation for

Mars missions. The SH will be self-sufficient for operations on the lunar surface, including providing its own power generation, energy storage to survive eclipse periods, and capability to communicate with surface assets, orbital assets, and directly with Earth ground stations. Two (2) crew will initially live in the habitat for ~30-day stays with crew swap-outs occurring mid-mission, in which the PR crew trades places with the habitat crew. During the swap-out, the habitat will nominally support 4 crew for a short period of time. Long-term, the SH will evolve to support up to four (4) crew for up to 60-day stays.

There are many operational and environmental challenges the SH will face and must be designed to endure for the safety of the crew and mission. Design considerations must consider the ability for the crew to safely outfit the SH in partial gravity following initial deployment on the surface, enable the crew to safely transfer logistics into and out of the SH, maintain nominal SH operation during long-duration uncrewed missions, mitigate the impacts of dust contamination and radiation on both internal and external systems and surfaces, and maintain nominal SH operation during 100hr+ eclipse periods.

Commercial Partnerships: While a suite of habitation concepts is currently under study within NASA, the agency is also working closely with U.S. industry through the [Next Space Technologies for Exploration Partnerships \(NextSTEP\)](#) activity to understand their concepts for commercially provided habitation capabilities as well as close coordination with our international partners to understand their desires for in-space and surface habitation.

Summary: The lunar Surface Habitat (SH) will anchor the long-term, human-led exploration at the lunar South Pole, enabling a sustained lunar presence. Utilizing the SH as a test bed for Mars analog missions will also ensure NASA and its partners can successfully pivot to eventual human missions to Mars.