

21st IAA SYMPOSIUM ON HUMAN EXPLORATION OF THE SOLAR SYSTEM (A5)  
Human Exploration of the Moon and Cislunar Space (1)

Author: Mr. Jason Crusan

National Aeronautics and Space Administration (NASA), United States, Jason.Crusan@nasa.gov

Dr. Greg Chavers

NASA Marshall Space Flight Center, United States, greg.chavers@nasa.gov

Ms. Nicole Herrmann

National Aeronautics and Space Administration (NASA), United States, nicole.b.herrmann@nasa.gov

Mr. Jonathan Krezel

National Aeronautics and Space Administration (NASA), United States, jonathan.krezel@nasa.gov

Ms. Erin Mahoney

Stellar Solutions, United States, erin.c.mahoney@nasa.gov

Mr. R. Marshall Smith

National Aeronautics and Space Administration (NASA), United States, Marshall.Smith@nasa.gov

LUNAR EXPLORATION CAMPAIGN: DEVELOPMENT OF THE LUNAR ORBITAL  
PLATFORM-GATEWAY AND ESTABLISHING THE CISLUNAR AND SURFACE ARCHITECTURE

**Abstract**

NASA has been charged with leading a sustainable program of exploration with commercial and international partners to enable human expansion beyond low-Earth orbit. Realizing this vision requires advancement of key capabilities and an implementation approach that pulls from the best NASA and the global industry can offer. NASA's human exploration activities are driving the development of high-priority technologies and capabilities using a combination of unique in-house activities and public-private partnerships to develop and test prototype systems that will form the basis for future human spaceflight missions.

In the near-term, there are three core focus areas: testing the systems needed for future human exploration; integrating those systems into the development flight elements of the Lunar Orbital Platform-Gateway - a spacecraft assembled in cislunar space that will be used as a staging point for missions to the lunar surface and to deep space destinations; and developing the infrastructure and lunar surface systems to support future human exploration.

This paper will explore the U.S. and international partner activities that are investing in development and demonstration of exploration capabilities to reduce risk, lower life cycle cost and validate operational concepts for future human missions. These include the ground habitation prototypes developed with U.S. industry partners through NASA's NextSTEP Habitation activity. These ground prototypes will be tested to evaluate human factors for different habitat configurations; assess how the various systems interact together and with other capabilities like propulsion modules and airlocks; and provide platforms to test and ensure that standards and common interfaces being considered are well designed. Additionally, international partners' activities evaluating deep space habitation systems and lunar surface capabilities will be explored.

An overview of the Gateway, including progress toward launch of the first component - the Power and Propulsion Element - will be reviewed. The description of initial Gateway missions in cislunar space provide the foundation for advancing the effort to establish a human presence on the Moon. Working in parallel with scientific lunar exploration, NASA is planning to develop a series of progressively more capable robotic lunar missions to the surface of the Moon, serving as a foundational training ground to

prepare for later missions to Mars. Beginning with these missions to cislunar space, this paper will also articulate how NASA will lead a return of humans to the Moon for long-term exploration and utilization with international and commercial partners, followed by human missions to Mars and other deep space destinations.