

Scientific Objective and Infrastructure of Space Exploration (1)
Scientific Objective and Infrastructure of Space Exploration (2)

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THE POTENTIAL ROLE OF LONG-DURATION DEEP SPACE HABITATION AND
TRANSPORTATION IN THE EVOLUTION AND ORGANIZATION OF HUMAN SPACEFLIGHT
AND SPACE EXPLORATION

Abstract

The global human spaceflight and exploration community will be entering a period of transition over the next decade. This paper argues that the development of long-duration deep space habitation and transportation has the potential to serve as an effective organizing focus during this period. The argument has three main points; that the current human spaceflight workforce is best positioned for a focus on long-duration deep space human spaceflight development; that long-duration deep space human spaceflight presents a number of engaging mission opportunities with a minimum set of hardware elements; and that long-duration deep space human spaceflight systems will be required for human transportation to Mars, and eventually to habitable worlds around other star systems.

Although the debate around exploration destinations continues there are number of programmatic elements that are effectively set through legislation and programmatic commitment and that are expected to remain set over the next decade. The first of these elements is the continued operation of the International Space Station (ISS) through to 2024. NASA's Commercial Crew and Cargo effort - and the vehicles developed through it - is similarly expected to support the ISS with transportation and logistics through its programmatic life. NASA is also developing heavy lift launch capabilities with the Space Launch System (SLS) and deep space human spaceflight capabilities with the Orion crew capsule. These efforts have received bipartisan support in Congress and the White House for over a decade and are the core of a renewed national commitment to human spaceflight beyond low Earth. Exploration Mission 1 (EM-1) in 2018 and Exploration Mission 2 (EM-2) in 2021 will see NASA astronauts return to flights around the Moon for the first time since the 1970s. Although there are a number of other nascent and important exploration program efforts underway, it is the above elements that have the levels of political and institutional support to allow for them to be considered the baseline on which we will likely build the next phase of programmatic development.

This note argues that the development of long-duration deep space human spaceflight technologies and capabilities, capable of sustaining human life in deep space for a year or more, is a logical focus for the next phase of space exploration infrastructure that is compatible with on-going programs and commitments. The argument proceeds through three perspectives that highlight the value and rationale of such an approach; workforce, public interest, and destiny.