Paper ID: 85075
interactive

IAF HUMAN SPACEFLIGHT SYMPOSIUM (B3)
Governmental Human Spaceflight Programmes (Overview) (1)

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FILLING THE GAPS: HOW NASA INITIATES NEW ELEMENTS INTO ITS MOON TO MARS ARCHITECTURE

Abstract

NASA is establishing a long-term presence on the Moon and preparing for humanity's journey to Mars. To achieve these goals, NASA has developed a systems engineering approach driven by the agency's Moon to Mars Objectives. Those objectives define what the agency wants to accomplish with crewed deep space exploration. NASA's Moon to Mars Architecture defines how.

NASA evolves that roadmap through a yearly Architecture Concept Review process, where the agency performs analyses and trade studies while seeking feedback from the NASA workforce, the international community, industry, and academia. This process culminates in an annual meeting where representatives from NASA's mission directorates, centers, and technical authorities concur on updates to the architecture, as defined in the agency's Architecture Definition Document. NASA releases new revisions of the document yearly.

The architecture comprises segments, pieces that progressively increase in complexity and objective satisfaction; sub-architectures, groups of interconnected systems that work together to accomplish objectives; and elements. Elements are notional exploration system that enable a set of functions in the architecture. Elements include existing systems like the Space Launch System, the Orion Spacecraft, and Exploration Ground Systems, but also include systems that have yet to be built.

This paper will explain the process by which NASA's Exploration Systems Development Mission Directorate integrates new elements into the agency's Moon to Mars Architecture. Specifically, it will cover the new element initiation process, whereby the directorate reviews whether a concept fills gaps identified in the architecture; how NASA engages industry, academia, and international partners in this process; and how the directorate's Strategy and Architecture Office transitions newly initiated elements to the Moon to Mars Program Office for implementation.

The element initiation process will ensure that NASA invests in the most effective technologies and capabilities to meet the Moon to Mars Objectives, and that those technologies and capabilities demonstrate sufficient maturity and contribute to the needs of the architecture.