

HUMAN SPACEFLIGHT SYMPOSIUM (B3)
Advanced Systems, Technologies, and Innovations for Human Spaceflight (7)

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NASA'S ADVANCED EXPLORATION SYSTEMS: INNOVATIVE APPROACHES TO SPACE
SYSTEMS DESIGN AND DEVELOPMENT

Abstract

NASA's Advanced Exploration Systems (AES) Division is leading the agency in nontraditional development and procurement approaches for deep-space capabilities. The AES core function is to develop foundational technologies and high-priority capabilities that are the building blocks for future human space missions. Using an approaches that range from traditional, focused, in-house activities with public-private partnerships to open-source challenges to rapidly develop and test prototype systems, AES pioneers methods to drive a rapid pace of progress, streamline management, foster partnerships with external organizations, and effectively utilize the NASA workforce to advance human spaceflight beyond low-Earth orbit and on to other locations, including Mars. This amalgam of approaches creates a progressive environment that is a departure from traditional, large-scale government efforts, allowing AES to uncover potential risks of new capabilities before integration into more critical systems by performing early validation of complex systems, testing those systems in the proper environments, and flying the technology. This early risk reduction helps avoid cost growth and improve affordability of future space exploration. These efforts will enable human space flight to become increasingly Earth independent and capable of expanding into the solar system. The AES portfolio is focused on human spaceflight architecture analysis, human space flight systems for deep space, and robotic precursor missions to identify and fill in knowledge gaps related to potential destinations in advance of flight missions. Major areas of work include systems development for more reliable life support; deep space habitation technology; advanced in-space propulsion; advanced space suit sub-system technology; landing capabilities; in situ resource prospecting and processing; and overall capabilities to reduce logistics requirements to support future human spaceflight missions. Within this framework, AES is developing concepts and subsystems for habitation capabilities, developing public-private partnerships for lunar landers and other capabilities, and creating the ability to support missions using space resources available such as processing atmosphere for the production of oxygen and the separation of water from regolith. This paper will share the innovative approaches that AES has developed and further applied within NASA and other U.S. federal government agencies.