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Affordability Approaches for Human Space Exploration

By

Jon Holladay, Flight Projects, Marshall Space Flight Center (Jon.Holladay@nasa.gov)
David Alan Smith, Design Affordability, Victory Solutions Incorporated (davidalan.smith@v-s-inc.com)
Marshall Space Flight Center, Alabama 35812 USA
Ph: 1-256-698-2983 Fax: 1-256-270-9617

Abstract

The design and development of historical NASA Programs (Apollo, Shuttle and International Space Station), have been based on pre-agreed missions which included specific pre-defined destinations (e.g., the Moon and low Earth orbit). Due to more constrained budget profiles, and the desire to have a more flexible architecture for Mission capture as it is affordable, NASA is working toward a set of Programs that are capability based, rather than mission and/or destination specific. This means designing for a performance capability that can be applied to a specific human exploration mission/destination later (sometime years later). This approach does support developing systems to flatter budgets over time, however, it also poses the challenge of how to accomplish this effectively while maintaining a trained workforce, extensive manufacturing, test and launch facilities, and ensuring mission success ranging from Low Earth Orbit to asteroid destinations.

NASA Marshall Space Flight Center (MSFC) in support of Exploration Systems Directorate (ESD) in Washington, DC has been developing approaches to track affordability across multiple Programs. The first step is to ensure a common definition of affordability: the discipline to bear cost in meeting a budget with margin over the life of the program. The second step is to infuse responsibility and accountability for affordability into all levels of the implementing organization since affordability is no single person's job; it is everyone's job. The third step is to use existing data to identify common affordability elements organized by configuration (vehicle/facility), cost, schedule, and risk. The fourth step is to analyze and trend this affordability data using an affordability dashboard to provide status, measures, and trends for ESD and Program level of affordability tracking. This paper will provide examples of how regular application of this approach supports affordable and therefore sustainable human space exploration architecture.