

HUMAN SPACE ENDEAVOURS SYMPOSIUM (B3)

Human Space Endeavour: Overview (1)

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NASA'S CONSTELLATION PROGRAM: FROM CONCEPT TO REALITY

Abstract

Purpose: NASA's Constellation Program enters its third year having moved from conceptual design and requirements definition into component testing and preliminary design. This program was formulated to achieve the objectives of maintaining American presence in low Earth orbit, returning to the Moon for purposes of establishing an outpost, and exploring Mars and beyond in the first half of the 21st century. This paper describes the progress made as the program moves from formulation into preliminary design; including evolution of organizational structure; approaches to completion of requirements; integrated test program development; and refinements in planning, budget formulation, risk management, operational philosophies, and procurement strategies.

Methodology: The Apollo Program built upon the heritage of the Mercury and Gemini Programs, expanding capabilities and mission objectives as NASA gained experience in human space flight. In a similar way, the Constellation Program is phased as a stepwise capability build-up; largely based upon Space Shuttle heritage components. The Initial Capability (IC) build comprises elements necessary to service the International Space Station (ISS) with crew rotations: including the Orion Crew Exploration Vehicle, the Ares I Crew Launch Vehicle, and the supporting ground and mission infrastructure to enable these missions. The Constellation Lunar Capability (LC) builds upon the IC; adding the Ares V Cargo Launch Vehicle, the Altair Lunar Lander, and space suits designed for partial gravity exploration. Lunar Outpost capabilities will follow, including rovers, habitats, and infrastructure to support a permanent exploration presence.

Results: IC Preliminary Design Review milestones are on the forefront for 2008 with Orion and Ares I gearing up to certify readiness to enter preliminary design, while the Constellation Program assures readiness for the integrated program preliminary design. Integrated testing of the IC begins this year, with a series of flight tests of the Orion Launch Abort System commencing soon. The Ares 1-X flight, scheduled for April 2009, will test the integrated flight control system and stage separation dynamics on a simulated flight vehicle "stack". Follow-on integrated testing is described, culminating in human test flights to certify the spacecraft for human rating.

Conclusion: All of the critical Initial Capability development activities this year lay the foundation for build up of the Lunar Capability that will enable humans to depart low earth orbit for the first time in nearly 40 years.