SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
New missions enabled by Extra-large launchers (8)

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NEW MISSIONS FOR ARES V CLASS LAUNCH VEHICLES

Abstract

Ares V class launch vehicles provide nearly unlimited possibilities for solar system exploration and enable a new generation of very large space observatories. Northrop Grumman has conducted a preliminary assessment of 18 solar system exploration missions and four very large space observatories enabled by Ares V class launchers. These are dedicated missions with special payload accommodations and mission operations. This paper discusses the Ares V class dedicated solar system exploration missions and large space observatories assessed to date. Ares V performance capability and initial trajectory concepts were used to make delivered mass calculations for new mission ideas and enhancements to previous missions. This included interesting surface destinations and orbits throughout the solar system. Downlink data rates were also assessed based upon existing large scale antennas and for planned improvements. Scientific value was then assessed and conceptual mission descriptions prepared. For large space observatories, layouts and simulations were prepared using a progression of deployment architectures from the James Web Space Telescope (JWST) Chord-Fold, to larger and lighter weight Stacked Hex, to very large Fan Fold. The results show that Ares V class launch vehicles enable future space observatories with apertures from 17 to 24 meters. Ares V also enables a whole new class of secondary or piggyback science and exploration missions coupled to primary Ares V lunar missions. The Ares V Earth Departure Stage (EDS) has spacecraft systems and functionality due to the low Earth orbit loiter, rendezvous and docking requirement to the Orion crew exploration vehicle. For normal lunar Orion/Altair missions the EDS spacecraft systems will be staged with a loiter skirt but there will be numerous lunar cargo missions driven by payload volume that have significant mass margin. On those missions the loiter skirt can be retained and the EDS can perform a wide variety of secondary missions after it has performed its primary mission trans-lunar injection (TLI) burn. This paper will discuss both dedicated and secondary new missions enabled by Ares V class launchers.