Paper ID: 43039
oral

IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Launch Vehicles in Service or in Development (1)

Author: Mr. Akhil Gujral
The Aerospace Corporation, United States

Dr. William Emanuelsen
The Aerospace Corporation, United States
Mr. Randolph Kendall
The Aerospace Corporation, United States
Dr. Walter Lauderdale
United States Air Force, United States
Mr. Jon Strizzi
United States Air Force, United States

LAUNCH SYSTEM REUSE

Abstract

Launch vehicle providers are advancing technology for reusable launch systems and beginning to demonstrate them at an unprecedented pace. Reusable launch vehicles for orbital space launch has the potential to reduce the cost of space access in the commercial sector and for National Security Space (NSS) launches, but cost savings is not the only nor the most significant factor for the Air Force to consider. Reusable launch vehicles may also offer higher reliability, increased responsiveness, and greater flexibility than expendable systems. The U.S. Air Force Launch Enterprise is evaluating how to best leverage reusable launch vehicle technology while integrating it into the existing flight worthiness certification process. NSS missions have a low tolerance for risk and require high reliability launchers. Existing Mission Assurance (MA) processes and standards (e.g., reliability, testing, parts) were developed for expendable, one-time use launch systems. Expendable and reusable launch systems alike must undergo the Air Force's rigorous design validation and as-built verifications. However, reusable systems are subject to reentry environments and extended hardware life-cycles due to multiple launches, recoveries, refurbishments, and re-tests. Inspection of previously flown vehicles may allow improvements to the design and operations for subsequent launches. Previously flown boosters may also support assured access to space by providing additional assets with reduced lead time. Upper stages, support infrastructure, and payloads must also be designed to support rapid, responsive and flexible launch. Given that the existing and envisioned medium to heavy (Evolved Expendable Launch Vehicle - class) reusable launch systems are still in their relative infancy, it is not yet clear whether the potential benefits will be obtained. While adhering to established EELV tenets for mission success, the Air Force launch system reuse strategy is pursuing a forward-leaning approach of researching and understanding the challenges of reuse, gathering data, gaining insight from government and commercial launch system partners, augmenting mission assurance processes and standards as appropriate, and pursuing the use of demonstration missions. This paper will highlight some of the areas that the USAF and The Aerospace Corporation are beginning to explore, including updates to specifications and standards, Independent Verification Validation (IVV) tools, added inspections, reuse parts traceability, and more to establish the technical baseline from which the Air Force will make future flight worthiness determinations for launch. These efforts will help determine whether and how National Security Space launch can benefit from the development of reusable launch systems.