Evolved Expendable Launch Vehicle (EELV)

Executive Summary
- The Heavy Launch Vehicle testing phase of Air Force Evolved Expendable Launch Vehicle (EELV) was initiated during FY05.
- The EELV system configurations of both contractor vehicles have successfully flown with solid boosters strapped to the main booster segment.
- The EELV Post Operational Assessment II operational evaluation concept uses combined developmental and operational test events.

System
- The EELV system includes:
  - Space Launch Vehicles
  - System Launch Infrastructure
  - Booster Support Systems
  - System Interfaces
- The system is standardizing payload interfaces, launch pads, and infrastructure so all configurations of each contractor's EELV family can be launched from the same pad, and so payloads can be interchanged between vehicles in the same class (i.e., medium, intermediate, or heavy).
- Boeing's EELV family of launch vehicles is designated the Delta IV, and Lockheed Martin's family the Atlas V.
- System production and launch operation responsibilities, as well as ownership of all EELV flight hardware and launch pad structures, will remain with the system contractor.
- FY03 marked the transition to the new launch vehicle, which is expected to provide launch services through 2020.

Mission
- The Department of Defense will use the EELV medium, intermediate, and heavy payload space launch capability to fulfill government satellite launch requirements currently served by the Delta II, Atlas II, Titan II, and Titan IV generation of spacelift boosters.
- The EELV program is intended to maintain the current operational mass-to-orbit capability while increasing the space launch rate and decreasing launch costs.

Activity
- The Air Force EELV Boeing Heavy Launch Vehicle initial flight demonstration launch occurred in December 2004.
- The new EELV system Test and Evaluation Master Plan was approved by DOT&E in December 2004.
- The DOT&E evaluation effort continued into 2005 because the launch operations and integration of the program continued to expand.
- The EELV system completed the demonstration of an initial activation and launch from the heavy-lift booster version of the Delta IV launch pad.
- The initial Heavy Launch Vehicle flight of the first EELV 5-meter diameter payload fairing and the associated vehicle separation were completed as an established program objective.
- The new EELV used Air Force Research Laboratory Nanosat test payloads during launch operations to demonstrate the low-shock separation system.

Assessment
- Trend analysis of EELV launch data by the system launch managers is improving responsiveness of the system engineering and anomaly resolution by the program.
- Analysis of the EELV Heavy Launch Vehicle post-flight data revealed the RS-68 engines of the booster were commanded to shut off prior to the expected shutdown time. The cause was a liquid oxygen fluid cavitation within the feed system for the RS-68 engines. To correct this fluid cavitation, the program is increasing the pressure to the liquid oxygen tank to offset the pressure losses experienced in the upper portion of the liquid oxygen feedline. Subsequent flights will retest these features.

Recommendations

The Air Force should:

1. Expand the variety of flight test data points being used during EELV Post Operational Assessment II evaluation

activities to thoroughly characterize integrated booster system performance.
2. Track the EELV resolution and retest actions associated with the engine cavitation events of the Heavy Launch Vehicle demonstration flight.
3. Expand the integrated review and analysis of EELV launch data points in areas such as avionics, flight mechanics, loads and dynamics, and environments.