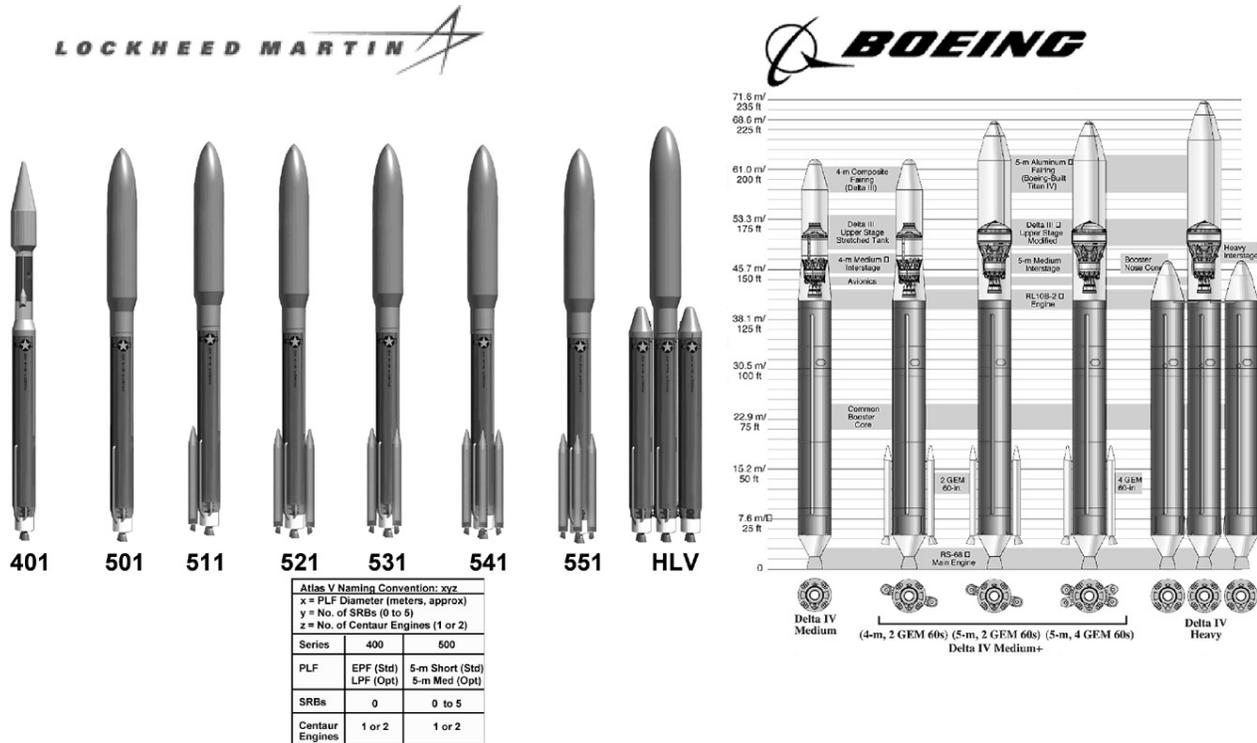


EVOLVED EXPENDABLE LAUNCH VEHICLE (EELV)



Air Force ACAT ID Program

Total Number of Systems: 181 launch services
 Total Program Cost (TY\$): \$17.3B
 Average Unit Cost (TY\$) \$95.2M
 Milestone III: FY03

Prime Contractors

Boeing and Lockheed Martin

SYSTEM DESCRIPTION & CONTRIBUTION TO JOINT VISION 2020

The mission of the Evolved Expendable Launch Vehicle (EELV) is to develop a national launch capability that satisfies the Government's launch requirements and reduces the cost of space launch by at least 25 percent compared with existing systems (with a goal to reduce costs by 50 percent). The EELV launch forecast for the FY02-FY20 period includes 117 Air Force and 64 National Reconnaissance Office missions for a total of 181 launches. Both contractors' families of EELV configurations will support the full range of payload requirements specified in the Operational Requirements Document. The current competing concepts are evolutionary outgrowths of the Boeing Delta II & III and Lockheed Martin Atlas II & III launch vehicles. Boeing's EELV family of launch vehicles are designated as Delta IV, and Lockheed Martin's family of launch vehicles are designated as Atlas V. The current acquisition strategy is to retain both contractor versions of EELV throughout the life of the program.

EELV must be capable of launching payloads weighing between 2,500 and 41,000 pounds to seven different orbits with apogees ranging from 100 to 21,150 nautical miles above the Earth. The

EELV system includes launch vehicles, infrastructure, support systems, and interfaces. Payload interfaces will be standardized so that any payload can be mated with either contractor's launch vehicle. Launch pads and infrastructure will be standardized in that all configurations of each contractor's EELV family can be launched from the same pad. EELV will support military, intelligence, and civil mission requirements in the National Launch Forecast currently serviced by Titan II, Delta II, Atlas II, and Titan IV.

As an evolutionary space launch system, EELV is based on *innovation* to secure our nation's assured access to space. This launch capability will enable the U.S. to take the high ground of space and help achieve the military concept of *full-dimensional protection*.

BACKGROUND INFORMATION

The EELV Acquisition Strategy has evolved since 1995 when the Government planned to downselect to a single contractor for launch services. Under the second revision to that strategy (approved in November 1997), the Government will procure launch services from two contractors, Boeing and Lockheed Martin. The Air Force judged that the growing commercial spacelift market would support increased cost sharing by two U.S. contractors and provide the nation with a more robust access to space. An initial launch services contract, for 28 launches from FY02-FY06, was awarded in October 1998, with the contractors' shares determined by competitive source selection.

The Under Secretary of Defense for Acquisition, Technology and Logistics (USD(A,T&L)) approved a third revision to the original EELV acquisition strategy in September 2000. The revised strategy captures: (1) recommended actions resulting from the DoD Launch Broad Area Review ("Launch BAR") mandated by the President; (2) approval by the Deputy Secretary of Defense, the Secretary of the Air Force, and the USD(A,T&L) of Lockheed Martin Corporation's request to delete their West Coast EELV launch service capability requirement; and (3) recommended actions resulting from the Secretary of the Air Force-directed EELV Joint Assessment Team ("EELV JAT"). As a result, Boeing will be the sole-source provider of West Coast EELV launch services through 2010. Lockheed Martin will still complete design and flight qualify the associated hardware for a Heavy Lift Vehicle of the Atlas V family of vehicles, which could be launched from their East Coast launch pad. One of the Launch BAR and EELV JAT recommendations incorporated into the revised acquisition strategy is to conduct a Heavy Lift Vehicle (HLV) Operational Launch Services Demonstration in FY03 prior to the first government mission HLV launch.

The EELV TEMP describes a test strategy that relies almost exclusively on combined developmental/operational testing. The operational testing community has been participating continuously with the Program Office and with each of the contractors to monitor ongoing test activities. The test strategy includes extensive use of models and simulations to predict individual sub-system and total system performance. The test strategy includes two OAs and a dedicated IOT&E phase for each contractor. The first OA, which AFOTEC conducted from FY97-FY98, supported the Milestone II decision in September 1998. The second OA, which began in FY99 and extends to FY02, will provide an assessment to support the Air Force Space Command launch readiness decision for the government's first medium-lift vehicle flight planned for FY02. The first heavy-lift vehicle flight is a government mission planned for FY03 and will be included as part of the system IOT&E. Each EELV rocket will carry an operational payload, with the exception of the heavy lift vehicle demonstration (Delta IV).

As described in the current TEMP, dedicated IOT&E will begin with the first government launch and is currently scheduled for the FY02-FY03 period. Eight operational EELV flights are projected during the IOT&E timeframe. Several commercial flights are planned prior to and during the government IOT&E period; additional data will be collected during these commercial flights to augment government launch test data.

TEST & EVALUATION ACTIVITY

The pace of developmental and qualification testing increased during FY00. The operational test community participated in numerous design reviews and observed as much of the test activity as possible given limited staffing.

- **Boeing Delta IV Development Testing:** Significant concerns arose during developmental testing of the RS-68 main engine, which required several fuel turbopump design changes. The RS-68 development issues caused Boeing to re-baseline their first commercial launch from April 2001 to November 2001. Qualification tests for the major structural components of the Common Booster Core and Upper Stage and the avionics began in FY00 and are well underway. The successful Delta III flight of August 23, 2000 reduced the risk associated with Delta IV since Delta IV will use the Delta III RL-10B-2 upper stage engine and the two vehicles also share some avionics components.
- **Lockheed Martin Space Systems Atlas V Development Testing:** All areas of the Atlas V have components in qualification testing, including the avionics system and both the liquid oxygen and propellant tanks. On May 24, 2000, Lockheed Martin successfully launched the first Atlas IIIA commercial vehicle powered by a Russian-built RD-180 main engine and with a single-engine Centaur Upper Stage engine. The Atlas IIIA/B are viewed as evolutionary steps for the EELV Atlas V family since the two rocket lines have about 80 percent commonality of parts, engines (i.e., the RD-180 and Centaur), and avionics. This successful flight reduced the overall design risk for the Atlas V.

AFOTEC established a liaison office at Los Angeles Air Force Base to facilitate more complete and timely exchange of information between the EELV program and the test community.

TEST & EVALUATION ASSESSMENT

DOT&E considers the currently approved T&E strategy to be adequate, but cautions that it is the minimum level of effort required to adequately evaluate the EELV system. Adding the Boeing Delta IV Heavy Lift Vehicle (HLV) Operational Launch Services Demonstration before the first government HLV flight strongly benefits the test program and mitigates risk.

AFOTEC's second OA, which is currently in progress, is assessing space launch operations, EELV operational effectiveness and suitability, and operational factors that impact spacelift support to the warfighter. The primary space launch operations issues are: (1) the capability to deploy, sustain, and augment space-based capabilities supporting various government users; and (2) the deploy-on-demand responsiveness of the EELV system in support of contingencies and major theater war. The EELV effectiveness and suitability assessment focuses more directly on the performance of the launch vehicle itself. Space launch supporting functions being examined include launch vehicle preparation, payload

preparation, launch control operations, logistics, surge launch rate, the ability to interchange payloads, range preparation, and range post-launch recovery.

CONCLUSIONS, RECOMMENDATIONS AND LESSONS LEARNED

The 1998 TEMP must be updated to reflect recent progress and planned changes to each contractor's program, as well as reflect AFOTEC's planned improvements to the overall operational test strategy. DOT&E considers AFOTEC participation to be essential to this program.

The Program Manager has re-invigorated his EELV "homework" meetings, which are three day, government-only, immersion sessions to review every aspect of the Boeing and Lockheed Martin development programs and mission integration activities. However, despite these attempts to facilitate communications flow, there are still continuing problems with operational test community access to contractor information. Currently, access must be coordinated through the System Program Office, which is often a slow and tedious process. This process effectively limited timely access to contractor technical information during the first OA. Open and timely access to information has improved but is still a limiting factor.