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Paper Session I-B - Evolved Expendable Launch Vehicle Program

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EVOLVED EXPENDABLE LAUNCH VEHICLE PROGRAM

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Future of the Commercial Space Industry Panel,
Current and Future Launch Vehicles and Facilities Topic

INTRODUCTION

In a press conference last year, the Secretary of the Air Force, Dr. Sheila E. Widnall stated, "Award of the EELV contracts, is the first step in our nation's long quest to reduce the cost of space launch."¹ The Evolved Expendable Launch Vehicle (EELV) program represents a national commitment to significantly reduce the cost of space launch. While the space launch mission is being adequately accomplished from an operational perspective today with our existing fleet of launch systems, expendable launch systems (which include Titan II, Delta II, Atlas II and Titan IV space launch vehicles) and the Space Transportation System (Space Shuttle), it is not being accomplished cost effectively. Looking beyond the horizon and into the future, a fully reusable system appears to be the low-cost solution to fulfilling the nation's space launch mission. The EELV program, then, serves as a more affordable bridge between current space launch boosters and the future promise of fully reusable systems. The focus of the EELV program is affordability. As a designated Air Force Lead Program for acquisition reform, affordability will be achieved through the synergy of innovative contractor system design solutions and innovative government management processes. This presentation will address unique features of the EELV acquisition strategy, the program's recognition and consideration of commercial requirements, cost savings and benefits the government expects to accrue , and increased national competitiveness in the international market place.

BACKGROUND

U.S. legislators, in a 1994 act of Public Law, provided the impetus for a major study to be accomplished by the Department of Defense which was later to become the basis for a clearly defined national course of action to be undertaken to significantly reduce the cost of space launch. The Fiscal Year 1994, National Authorization Act, Public Law 103-160, Section 213 (a), in part read:

PLAN REQUIRED - (1) The Secretary of Defense shall develop a plan that establishes and clearly define priorities, goals, and milestones regarding modernization of space launch capabilities for the Department of Defense or, if appropriate, for the Government as a whole...²

In response to the law, the then-Deputy Secretary of Defense, Dr. John M. Deutch, tasked the Air Force to produce the plan.³ To complete the tasking set forth by Dr. Deutch, then-Lieutenant General Thomas S. Moorman, Jr., Vice Commander of Air Force Space Command, (now General Moorman, Vice Chief of Staff of the Air Force) was commissioned to lead the study. General Moorman assembled the Space Launch Modernization Plan (SLMP) by deliberately organizing the study to include “participation from each of the nation’s four space sectors--defense, intelligence, civil and commercial.”⁴ The study effort was accomplished between January 1994 and May 1994. An extensive effort was accomplished and information was collected from over 130 presentations from Government agencies, industry, laboratories, and think tanks. Inputs, important to the study, were also obtained from interviews and roundtable discussions with congressional members and staff, industry executives, and current and past national space leaders.⁵

In completing the SLMP, General Moorman identified four alternative courses of action:

- Roadmap 1: Continue with current space launch systems
- Roadmap 2: Evolve current expendable launch systems
- Roadmap 3: Develop a clean-sheet expendable launch system
- Roadmap 4: Develop a new reusable system⁶

In the Fiscal Year 1996 Program Objective (POM) which was completed in June of 1994, the Air Force worked vigorously to build a viable program to acquire a modernized and affordable launch system for the nation. The program focus followed the SLMP guidelines described in alternative two, “Roadmap 2.” This strategy was confirmed in the Fiscal Year 1996 Budget Estimate Submission (BES), supported with programming direction in Program Budget Decision-172 (PBD-172), and substantiated by the President’s National Space Transportation Policy PDD/NSTC-4 (August 1994) and the DOD implementation plan to that policy dated November 1994. Following the submission of the Fiscal Year 1996 President’s Budget, and approval of the Office of the Secretary of Defense (OSD) and the Administration, the Air Force followed through with the implementation of its Evolved Expendable Launch Vehicle (EELV) program.

THE EELV ACQUISITION STRATEGY

The objective of the EELV program is to significantly reduce the cost of space while maintaining design reliability and equal or improved operability of current expendable launch systems in launching the national mission model, including commercial Delta and Atlas-class missions, in Fiscal Year 2001 and beyond.⁷ The actual cost goal specified in the Air Force Space Command (AFSPC) Operational Requirements Document, is a reduction of 25% to 50% of the recurring costs--production, and operating and support costs--from current expendable launch systems.⁸ The cost reduction goal will be measured against a launch cost baseline estimate developed and maintained by the government program office. This baseline, which estimates the costs of fulfilling the requirements of the EELV mission model with the existing medium to heavy expendable launch systems, will be further refined and updated at predetermined junctures

throughout the development phases of the EELV program. Based on the findings of the SLMP, the Air Force is committed to developing an evolved expendable launch system--capable of achieving the AFSPC cost reduction goal within a total program development cost ceiling which is not to exceed \$2 billion.

To ensure the program's development costs are maintained under the \$2 billion cap and the desired affordability goal will be achieved, a modular strategy has been developed which includes two critical decision gates to assess satisfactory progress (see Figure 1 below). These gates limit investment to a maximum of \$250 million (over the program's first two development modules) if it becomes apparent the cost reduction goal can not be realized within the program's development budget. The first assessment gate occurs 15 months after the initial award of four \$30 million contracts. During the first 15 months of the program, referred to as the Low Cost Concept Validation (LCCV) phase, each of the four competing contractors are refining their concepts, completing trade studies, conducting tests and demonstrations, and maturing Life Cycle Cost Estimates (LCCEs). As individual concept designs mature, each contractor will update their concept's LCCE, which was initially submitted at a 50 percent level of confidence with their LCCV contract proposals, to reflect an increased confidence level of 70 percent. The program's cost philosophy/process requires that the range of uncertainty of contractor LCCEs decrease--even at higher levels of confidence--as concepts mature, critical manufacturing and operational processes are demonstrated, and technical risks/challenges are mitigated. Therefore, in order to continue into the next program phase, the potential of overrunning the predetermined cost objectives must decrease, at the same time that the band of uncertainty around the point estimate decreases while the estimate's confidence level increases. As a result, the LCCE, along with the data obtained from a Tailored Preliminary Design Review, and the ongoing program assessments documented in Contractor Performance Assessment Reports will become primary inputs for senior decision makers to consider in recommending their approval to continue into the next phase of EELV program development, Pre-Engineering and Manufacturing Development (Pre-EMD).

During the 17-month Pre-EMD phase, up to two of the four original LCCV contractors will be selected to continue and further mature their EELV system concepts to a critical design review level of detail. Each of the contracts will be awarded for up to \$65 million. Again, based on the technical information of a tailored design review, an updated LCCE, this time increased to a 85% confidence level and documented ongoing program assessments, senior decision makers will have a second opportunity to determine if the affordability goals can be achieved within the \$2 billion dollar development cap.

If a favorable decision is made to continue the development program into full scale EMD, one of the two competing Pre-EMD contractors will be selected for the approximate eight year phase to finalize the EELV system design, begin manufacturing, complete site activation and accomplish one medium-lift test flight and one heavy-lift test flight.

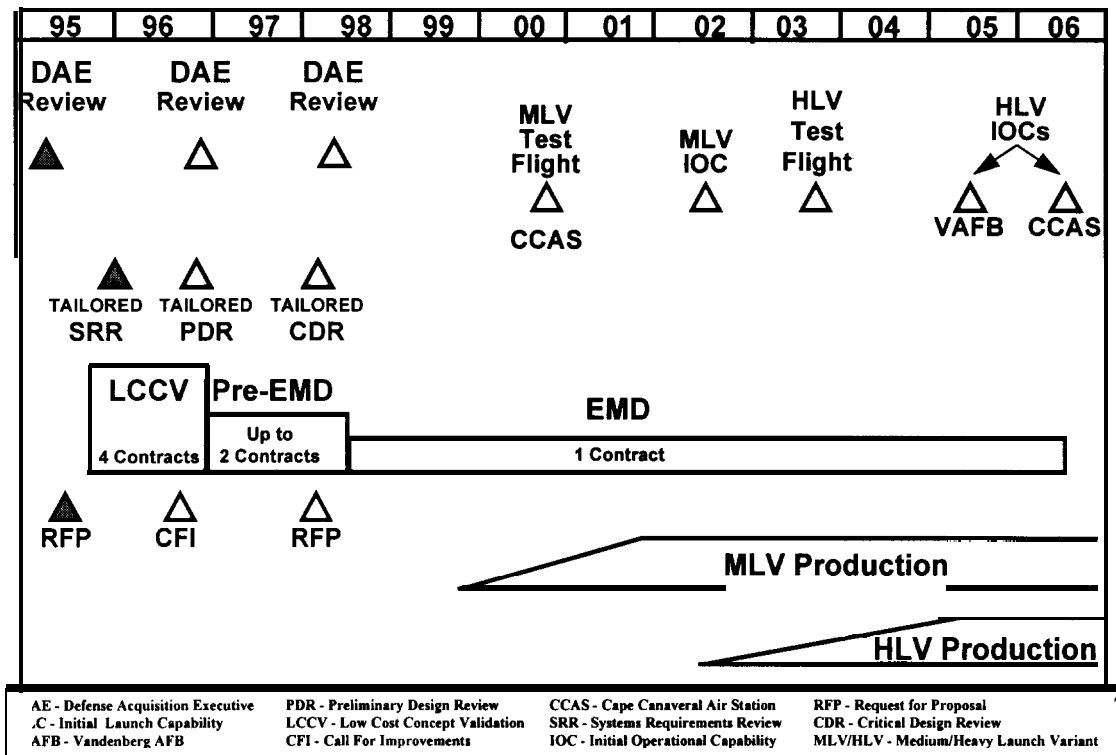


FIGURE 1
Modular approach of the EELV program schedule and acquisition strategy

ACQUISITION REFORM AND COMMERCIAL BENEFITS

“Better, Faster, Cheaper,” characterizes the emphasis of acquisition reform being aggressively pursued by the Air Force and the Department of Defense.⁹ Both the government and the commercial sector want a lower cost of delivering satellites into orbit. In turn, the many innovative initiatives the EELV program has adopted, developed and implemented in preparing for its first program phase, LCCV, are documented in a paper presented jointly by the EELV Deputy System Program Director and the EELV Principal Director from the Aerospace Corporation at the 46th International Astronautical Congress.¹⁰ Among this list, Government “insight vs. oversight” is one of the major program initiatives. In Dr. Widnall’s award of the four EELV contracts, on August 24, 1995, the Secretary of the Air Force outlined the new business approach and cooperative platform which both the government and contractors will work together to obtain an affordable launch system for the nation. The program foundation is based on partnership and trust, not pervasive government direction, and overall, significantly reduced government involvement.¹¹ The government has abandoned traditional oversight practices and rather, participates in an insight role. The new focus of the government is to now conduct ongoing assessments of the contractors’ progress and performance, and communicate only when it believes the contractor may not be satisfying a program requirement. Within the EELV program, the government no longer participates in the design development. In truly handing contractors the responsibility for the design effort they have been contracted to perform, less resources (in terms of manpower and time) will be required by both parties. This directly

translates into cost savings, thus allowing the limited budget to be expended on more meaningful system development effort. This philosophy will be extended throughout the program. During the program's production and launch phase, the dollar savings from government insight will contribute to greater reductions in the government's cost of space launch and be a further contribution to achieving internationally competitive prices for the commercial launch market.

Another early program innovation, the use of information technology to expedite communications and reduce the handling of paper, will be further exploited. Instantaneous delivery of and access to information, and the ability to directly copy and manipulate data is a tremendous time-saver. For example, early use of information technology by the government was evident in solicitation of EELV's initial development contract proposals. The extensive use of an Electronic Bulletin Board (EBB) was exercised to relay important solicitation information in near real-time to potential LCCV offerors. The EBB was used by the Air Force to provide draft Requests for Proposals (RFPs) to industry, for industry to submit comments and questions back to the government on the draft RFP release, and, in turn, for the government to answer the questions asked by potential offerors. Additionally, information technology was also exploited to new heights as the source selection for EELV's initial phase was conducted almost completely electronically. Offerors submitted their LCCV contract proposals via CD-ROM and the Source Selection Evaluation Board evaluated those proposals on-line, assisted by the use of 21-inch color monitors. As electronic communications requires substantially less manpower to manage paper handling and movement, these benefits were distinctly realized in the LCCV Electronic Source Selection as the evaluation was completed with only about 30 full-time evaluators and in record time of only 58 days--from receipt of proposal to date of contract award. To reiterate, dollar savings allow limited resources to be expended on more meaningful development effort. The ultimate benefit of the use of information technology will be in achieving the lowest possible prices for the government and commercial customers in the production and launch service phases of the program.

Finally, in desiring the greatest possible reductions in recurring production and operating costs for the government, it is recognized higher production and launch rates (within capacity capabilities of expensive infrastructure) will result in further cost reductions. To this end, the ability of the EELV system to capture commercial market share will translate to further cost savings to the government as greater economies and efficiencies are achieved and program overhead can be distributed across a larger business base. As a result, the EELV contractors are highly encouraged to consider in design of their EELV system concept the requirements of potential commercial customers. The government program office attempts to maximize the influence of commercial spacecraft launch requirements in the design of EELV concepts through their invitation to and active participation at the regularly scheduled Payload Interface Working Group (PIWG) meetings. At the PIWGs, the Air Force and other government agency spacecraft program offices meet with the four EELV prime contractors to help better define the interfaces and environmental requirements needed by the launch vehicle users. Here, commercial spacecraft programs have the opportunity to communicate their interface and environmental requirements in the systems engineering of the EELV design. Additionally, at a high level industry meetings of space launch and spacecraft contractors hosted by the Assistant Secretary of the Air Force (Acquisition) in May 1995, Mrs. Druyun ensured that commercial spacecraft

manufacturers were invited and represented. The government program office also places significant amounts of unclassified EELV data on the EBB and Home Page on the world-wide web. In a recent speech, Secretary Widnall made the following remark: "Nowhere is the integration of defense and commercial industrial bases more evident than the EELV program. Private sector involvement is particularly crucial for this program. We expect that the EELV will not only satisfy the needs of the military, but it will also help the U.S. industry bolster its competitive position in the world space-launch market."

THE CONTRACTS AND A CURRENT STATUS

On August 24, 1995, \$30 million contracts were awarded Alliant Techsystems, Boeing, Lockheed Martin and McDonnell Douglas. In announcing the awards, the Secretary of the Air Force, said she was pleased and impressed with the innovative concepts presented by the industry offerors. From that date to present, the government program office personnel have earnestly worked with the contractors in its new insight role. Simultaneously, the four contractors are effectively accomplishing the program tasks they proposed to the government. In a partnership fashion, the contractors and government have collaborated on numerous exercises, particularly in the identification of funding shortfalls in the current approved funding through fiscal year 2001. Even before LCCV contract awards, the Air Force recognized that funding earmarked for the program's development was not properly phased by fiscal year. However, it was planned early on that the phasing would be corrected during the LCCV module with the contractors' assistance after more was learned on the various concepts. Although it is still believed the EELV program can be developed within the original \$2 billion cost cap, the government and contractors agreed that several hundreds of millions of dollars previously programmed outside the Future Years Defense Program had to be advanced earlier in the program. As a result, the Air Force accelerated approximately \$500M into the Fiscal Year 1999 to Fiscal Year 2001 time frame as part of its final adjustment to the Fiscal Year 1997 President's Budget which will be submitted to Congress in March of this year. This adjustment reflects the Air Force's strong commitment to the EELV program and its importance in light of all the other funding priorities .

In December 1995, the first major program event, a Tailored System Requirements Review (T-SRR) was completed by the four contractors. In accomplishing the T-SRR, the benefit of the government insight role was clearly demonstrated. Each of the four reviews were completed in one day, and the government team was comprised of only twenty individuals. Additionally, the government contingent was present as part of the Integrated Product Development team and not as the primary recipient of the information presented at the reviews. Therefore, no additional preparation and rehearsal by the contractors was required. In this case, the insight approach resulted in significant time and manpower reductions by both the contractor and government. At the conclusion of the T-SRRs, in a summary of findings to the Acting Assistant Secretary of the Air Force (Acquisition), the System Program Director said, "There are still four solid candidates with no clear front runners at this time, there will be no easy downselect at the end of the LCCV phase; this is exactly the situation we want. A tough

downselect decision for the government means all of the LCCV contractors are doing what we hoped they would--that is, to develop very competitive EELV concepts.”¹²

SUMMARY

The EELV program continues to be a viable interim solution to reduce the cost of space launch until a reusable system comes on-line. The EELV acquisition strategy lays out planned exit points where the potential to achieve the directed cost reduction goals within a total program development cost of \$2 billion will be assessed. Commercial competitiveness remains an underpinning to the overall success of the EELV program. And finally, the EELV program is demonstrating the positive benefits of acquisition reform. EELV will continue its leadership role in the arena of acquisition reform and further seek, define, and implement new opportunities to do business “better, faster and cheaper” and to realize the largest reduction in cost possible to both the government and commercial sector, the greatest potential to establish a preeminent position in the global commercial launch market through internationally competitive prices.

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