



GAO

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United States General Accounting Office  
Washington, DC 20548

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June 24, 2004

The Honorable Wayne Allard  
Chairman  
The Honorable Bill Nelson  
Ranking Minority Member  
Subcommittee on Strategic Forces  
Committee on Armed Services  
United States Senate

Subject: *Defense Space Activities: Continuation of Evolved Expendable Launch Vehicle Program's Progress to Date Subject to Some Uncertainty*

The U.S. space policy states that access to and use of space is critical to preserving peace and protecting U.S. national security and also benefits the country's civil and commercial interests. Air Force guidance explains further that access to space requires the ability to launch critical space assets, when needed, by a mix of space launch systems from standard launch pads at major support facilities. This is to ensure that a launch failure or other catastrophic event does not prevent mission success. These critical space assets, or satellites, are used for a wide range of government activities such as communications, navigation, and ballistic missile warning. The Evolved Expendable Launch Vehicle (EELV) program, consisting of both Atlas V and Delta IV launch vehicles, was established as the strategic launch system to meet the nation's critical space mission needs and correspond with U.S. policy that requires U.S. government satellites to be launched on U.S. manufactured launch vehicles. The program was implemented in 1995 to support and sustain assured access to space with more affordable launch vehicles, provided by two contract launch providers, that replaced the past, or "heritage," systems such as the Delta II, Atlas II, Titan II, and Titan IV.

Specifically, the EELV program's overarching objective called for the development of a national expendable launch capability for assured access to space that would reduce the overall recurring cost of launch by at least 25 percent to 50 percent while maintaining or improving the reliability and capability levels over those of the heritage systems. The Air Force further identified four EELV system capabilities referred to as key performance parameters—mass to orbit,<sup>1</sup> vehicle design reliability,

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<sup>1</sup> Mass to orbit is the requirement to lift a certain amount of payload to a specific orbit.

standard launch pads, and standard vehicle interfaces<sup>2</sup>—considered essential for mission success. In its instruction on mission needs and operational requirements guidance and procedures, the Air Force states that key performance parameters are so significant that failure to meet their minimum values could be cause for program reevaluation or termination.

The current EELV acquisition strategy addresses and reinforces the program's objective and system capabilities by encouraging contractor investment in launch vehicle development and promoting competition over the life of the program in an expected robust commercial marketplace. However, this commercial market never materialized. Furthermore, the availability of federal funding may affect future program strategy and condition. For instance, GAO has stated that the U.S. government's long-term financial condition presents enormous challenges to the nation. This condition is likely to affect a broad range of federal programs.

This letter responds to your February 25, 2004, request. As agreed with your offices, our objective was to determine the extent to which the implementation of the Department of Defense's (DOD) EELV program has achieved assured access to space and projected program cost savings. On April 6, 2004, we provided your offices with a briefing on our observations regarding the EELV program's achievements. As requested, we are transmitting the briefing (encl. I) in this letter.

In conducting our work, we reviewed laws, presidential directives, and DOD and Air Force policy documents on assured access to space, as well as pertinent EELV program reports and related material, to determine the EELV program's progress in achieving program mission objectives and cost goals. We interviewed responsible DOD, Air Force, and other government officials from, among others, the EELV System Program Office; Office of the Secretary of Defense; and the Cost Analysis Improvement Group. We also interviewed Air Force officials at offices of the Secretary of the Air Force, Air Force Operational Test and Evaluation Center, and Air Force Space Command and responsible space access officials at the National Aeronautics and Space Administration. Furthermore, we inspected the Delta IV launch site at Vandenberg Air Force Base, California, and toured the Atlas V production facility in Denver, Colorado. Additionally, we received briefings by both launch providers. We discussed relevant information with appropriate officials to assess its validity and determined that the data were sufficiently reliable to answer our objective. Our review was conducted from April 2003 to May 2004 in accordance with generally accepted government auditing standards.

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<sup>2</sup> Common launch vehicle interfaces such as mechanical and electrical connections, ground support equipment, services, and environmental conditioning provide the flexibility to change the launch vehicle in case there's a major problem requiring extended repair.

## Summary

While the EELV program achieved success in meeting its assured access to space and cost-saving objective, the program continues to face various risks and cost increases that could jeopardize this objective. Since August 2002, the EELV has been launched successfully six times using two contract launch providers, and the EELV System Program Office projected 25 to 50 percent in cost savings over previous launch systems initially through July 2003 and recently in May 2004. Furthermore, three out of four of the Air Force's key performance parameters have been met, which contributed to initial program success. While the fourth parameter, the standard vehicle interface, has not yet been fully met for both launch providers' vehicles, progress has been made in achieving solutions. However, vehicle mission reliability, which is the ability to complete the entire mission successfully (i.e., from launch to satellite replacement), has not been fully demonstrated. Several more launches need to take place before vehicle mission reliability can be assured. Furthermore, program risks, such as a potential single point of failure involving one upper stage engine used by both launch providers, present, at this time, some uncertainty about continuing to achieve the assured access to space part of the EELV's program objective and present cost implications.

Program costs have increased over the approved 2002 program baseline estimate of \$18.8 billion, resulting from the failure of the commercial market to materialize, additional access to space and mission assurance initiatives, and several other factors such as incorrect inflation assumptions and satellite weight growth. Specifically, the EELV System Program Office reported about \$13.3 billion in program cost increases over the life of the program, as reflected in previous DOD acquisition reports. These cost increases impact the cost-savings goal, although the significance of that impact cannot be determined until the Air Force submits a revised program cost baseline. Furthermore, these cost increases triggered a requirement<sup>3</sup> requiring the Secretary of Defense to certify that the EELV Program is critical to national security and that revised program cost estimates are reasonable. The certification process was completed on April 26, 2004, after the Secretary of Defense's certification group identified a potential cost increase of up to \$13.2 billion. This figure differs from the \$13.3 billion previously reported by the EELV System Program Office because it includes some overlapping costs addressed in prior DOD acquisition reports and additional unrecognized costs such as the launch providers' infrastructure costs that will be incurred in fiscal year 2005. The System Program Office disagrees with the addition of some of these previously unrecognized costs in the recently certified program baseline cost estimate and is working with the certification group to adjust the baseline by the end of June 2004. Despite this disagreement, the System Program Office, in May 2004, estimated launch cost savings of 51.4 percent over the heritage systems. The System Program Office is also in the process of modifying the existing acquisition strategy to better achieve EELV program objectives. The government,

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<sup>3</sup> 10 U.S.C. § 2433 commonly referred to as the "Nunn-McCurdy Act" requires notification of Congress when major acquisition programs exceed specific cost thresholds.

however, will continue to pay a significant share of costs until a commercial market emerges and the cost burden shifts to others requiring launch services.

## **Background**

In mid-1994, the Air Force conducted a study to address the deficiencies and the rising costs of space launch. While considering options, the Air Force determined that continued production, operation, and maintenance of existing launch vehicle systems were not cost-effective. Increasing expenses associated with these launch vehicle systems and their extensive infrastructure along with outdated technologies, designs, and manufacturing techniques generated the need for a more capable, affordable, and flexible launch vehicle system. Later that year, a plan was selected to improve, modernize, and evolve existing expendable launch vehicles that served as the genesis of the EELV program. By May 1995, the Air Force initiated a new acquisition strategy to obtain launch services using the EELV system. While the Air Force's initial acquisition strategy was to select one contractor for final development and production, in November 1997 it approved a revised acquisition strategy designed to maintain the ongoing competition between the two previous pre-engineering phase contractors. The revised strategy was based on forecasts that growth in the commercial space launch services market would support more than one contract launch provider.

The EELV Program Acquisition Strategy was structured to break new ground in the area of military and commercial integration of the space-related defense industrial base with the commercial industrial base. This strategy forged a partnership between the government and industry to gain affordable and assured access to space by

- promoting competition for launch services over the life of the program;
- encouraging contractor investment and innovation for launch vehicle development;
- procuring launch services that include the vehicle, the liftoff, and flight to orbit under one contract instead of procuring launch vehicles and launch operations under two or more separate contracts;
- leveraging the benefits of a robust commercial marketplace; and
- providing the government with free and open access to contractor performance data.

This acquisition strategy permitted the government to obtain launch services that placed a satellite in the proper orbit at a fixed price instead of having to buy launch vehicles on a cost reimbursement basis while paying for launch pad operations, maintenance, repairs, and improvements.

Despite the initial promise of the EELV Program Acquisition Strategy, the expected robust commercial market for space activities never materialized. Furthermore, future federal funding may affect the program's acquisition strategy and condition. GAO has recently stated that the U.S. government's long-term financial condition and fiscal outlook present enormous challenges to the nation and to the role of the federal government. The growing long-term fiscal imbalance will continue to

constrain the federal budget in future years. These constraints will, in turn, affect DOD investments in the EELV program.

**Progress Made in Achieving Assured Access to Space and Cost Savings Objective, but Program Risks Present Some Uncertainty for Continued Access to Space**

The EELV System Program Office has made progress in implementing DOD's assured access to space program objective through early successful launches and cost savings over heritage systems. While three of four performance parameters have been met, certain elements of the remaining performance parameter are currently unrealized. Nevertheless, progress is being made to meet them. However, program risks present some uncertainty in continuing to achieve the access to space objective.

Progress Was Made in Achieving EELV Program's Objective

The EELV System Program Office and two launch providers, working together, have met the assured access to space objective by completing six consecutive successful missions (two government missions and four commercial missions) between August 2002 and August 2003. According to a December 2002 Air Force Test and Evaluation Center Operational Assessment report, the EELV system is a significant improvement over the heritage launch systems it replaces. For example, the report stated that the level of standardization implemented under EELV would reduce costs and launch schedule delays and allow for contingencies that the heritage systems could never provide. Further, according to the EELV System Program Office, launch services acquired under the current government contract met projected program cost savings of 25 percent to 50 percent—projected at 50.8 percent in July 2003 and at 51.4 percent in May 2004—over heritage launch systems. We were unable to verify the statements or projections.

This early success is based, in part, on the program structure, management initiatives, and initial favorable launch service costs. For example, in order to monitor risk, System Program Office Integrated Product Teams, comprised of government and industry representatives, were established with the responsibility to address issues before they become serious matters of concern. The EELV System Program Office and launch providers also maintain open lines of communication, interacting on a daily basis to gauge program progress, resolve issues, and monitor performance. Further, the government benefited from "Initial Launch Services" contracts that reflected substantially lower launch services prices to the government that were submitted in anticipation of a robust commercial marketplace. This, in turn, was to allow the launch providers to spread substantial fixed costs among all of the participants in the market.

## While Progress Continues on the Remaining Performance Parameter, Risks Present Some Uncertainty for Future Mission Success

According to the EELV System Program Office, the EELV systems have met three of four performance parameters that the Air Force considers essential for mission success. The EELV Atlas V and Delta IV systems have not met elements within the fourth parameter—standard vehicle interface. Furthermore vehicle mission reliability, which is the ability to complete the entire mission from launch to placement of the satellite in orbit, has not been fully demonstrated. With regard to the parameter's elements, both families of launch vehicles (i.e., the Delta IV and Atlas V systems) have vibration problems that exceed the vehicles' established performance parameters. The vibrations, caused by the separation of the nose-cone from the Delta IV launch vehicle, and the noise, generated from the Atlas V solid-fuel rocket engines during initial launch, exceed acceptable performance parameters. The EELV System Program Office and its launch providers are currently working on solutions to these problems. Regarding the Delta IV vehicle, a design solution is being pursued, and a modification is being tested for the Atlas V vehicle. With regard to vehicle mission reliability, according to DOD and Air Force test and evaluation and Space Command program officials, determination of the EELV systems' mission reliability is typically demonstrated by 10 to 30 successful launches within the same family, class, and configuration of launch vehicles (e.g., a Delta IV medium launch vehicle with two strap-on solid rocket engines). Thus, several more launches need to take place before vehicle mission reliability can be fully demonstrated.

While progress regarding all performance parameters has been made, several program risks present some uncertainty in achieving continued assured access to space. First, both launch providers use a variant of the RL-10 engine for the EELV's upper-stage that is a potential single point of failure for the system. While the RL-10 engine has a proven reliability record, if a launch failure occurred and were attributed to the engine, neither launch provider would be able to launch its vehicle until an investigation was completed. The Air Force has funded a study to evaluate the engine's critical components, producibility, and viability. Second, even though the Atlas V launch contractor has 13 RD-180 launch vehicle engines in its U.S. inventory, continued engine availability remains uncertain because the engine is produced solely in Russia. To address this issue, that contractor plans to build a co-production facility in the United States. However, the operation of a U.S. co-production facility is not scheduled until 2008; and the first mission-ready, co-produced U.S. RD-180 engines may not occur until 2012, which is over halfway through the EELV program life. If the RD-180 U.S. co-production facility is not completed, U.S. dependence on the Russian-made engine will be prolonged. And third, the risk of not having an operational West Coast launch pad for the Atlas V vehicle leaves only the Delta IV family of vehicles capable of launching from both coasts. Although the Atlas V contractor has begun building a West Coast launch pad, it is not scheduled to be operational until May 2005 with the first Atlas V launch occurring in October 2005. While the EELV System Program Office is working to mitigate these risks, assured access to space is subject to some uncertainty. Mitigating these risks to avoid the

possibility of mission failure will have an impact on cost, as discussed in the following section.

### **EELV Program Costs Have Significantly Increased, Potentially Impacting Cost Savings and Prompting a Revised Acquisition Strategy and Contract Approach**

Increased program costs resulting, in part, from future infrastructure, launch, and other costs could impact the EELV program's cost savings objective. However, the specific impact has not yet been determined. This increase in costs was caused, in part, by the failure of the commercial market for launches to materialize. EELV launch providers claimed that this market failure negatively affected their financial condition, prompting the need for a revised Air Force acquisition strategy and contract approach to assure access to space with two viable launch providers.

#### Program and Launch Costs Have Increased for Several Reasons, Potentially Impacting Cost Savings

Program and launch costs increased by about \$13.3 billion over the approved 2002 baseline estimate of \$18.8 billion for several reasons, as reflected in DOD's December 2003 Selected Acquisition Report and other program documentation. First, program initiatives to mitigate the risk of a launch failure and increase mission success and safety required additional funding. The EELV System Program Office considered these initiatives critical to improve launch vehicle system reliability and support assured access to space. Next, several other factors such as launch reallocations, contract modifications, satellite weight growth, and inflation contributed to cost growth. Furthermore, the commercial market failed to materialize as expected, significantly raising costs to the launch providers under the launch services contracts and eventually causing them to renegotiate, with the government paying a larger portion of the fixed costs. The EELV System Program Office reported the cost of these initiatives and other factors as follows:

- Assured access to space and safety initiatives costing \$538.8 million through fiscal year 2009.
- Mission assurance initiatives for fiscal years 2010 through 2020 costing \$527 million.
- Reallocation of seven launches from one contractor to the second for Procurement Integrity Act<sup>4</sup> violations and Air Force support for the second West Coast launch pad totaling \$227 million.
- Satellite weight growth that required the use of larger and more expensive launch vehicles costing \$1.335 billion.

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<sup>4</sup> 41 U.S.C. § 423. The Procurement Integrity Act restricts the disclosing and obtaining of contractor bid or proposal information.

- Incorrect inflation assumptions of \$2.821 billion.
- Price increases on the second and all subsequent launch services contract awards costing \$7.807 billion due to the lack of a commercial market.

According to the EELV System Program Office, the next contract for up to 20 launches is anticipated to be completed in the summer of 2004 but might be delayed until Procurement Integrity Act sanctions against one launch contractor are lifted. The government may procure individual launches on an “as needed” basis until the sanctions are lifted and a new contract takes effect.

Because of these realized and expected cost increases, the EELV Program Office anticipated a breach of the 25 percent cost increase threshold established by title 10 United States Code section 2433, or the Nunn-McCurdy Act.<sup>5</sup> As a result of the anticipated breach, the Office of the Secretary of Defense certified that

- this acquisition program is essential to the national security;
- there are no alternatives to this program that will provide equal or greater military capability at less cost;
- the new estimates of the program acquisition unit cost or procurement unit cost are reasonable; and
- the management structure for this program is adequate to manage and control total program acquisition unit cost or procurement unit cost.

To provide a basis for this certification, the Office of the Secretary of Defense initiated an examination by the Cost Analysis Improvement Group, an independent DOD audit group responsible for estimating and verifying costs, to review and validate program costs. Based on the Cost Analysis Improvement Group’s examination, the Office of the Secretary of Defense’s certification was completed on April 26, 2004. This group reported additional cost increases built into the revised program cost baseline based on 137 operational missions instead of the previous 181 manifested missions. The Cost Analysis Improvement Group’s revised estimates included about \$13.2 billion in potential costs consisting of the following:<sup>6</sup>

- Annual fixed infrastructure costs to fund the EELV launch complex, supplier readiness, production facilities, a government mission director, and mission assurance. Mission assurance costs occurring in fiscal years 2010 through 2020 will be incorporated into annual fixed infrastructure costs under a new acquisition strategy and contracting approach.
- Fiscal year 2005 infrastructure costs to be recovered by the launch providers during fiscal years 2006 through 2009.
- RD-180 engine co-production development costs billed to the government during fiscal years 2006 through 2015.
- Launch providers’ recovery of losses incurred on the first and second launch services contracts to be recouped during fiscal years 2006 through 2009.

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<sup>5</sup> 10 U.S.C. § 2433.

<sup>6</sup> Individual costs are excluded from the estimates because some of those costs are proprietary.

Some of these costs had not been included in previous EELV DOD reports. Conversely, annual fixed infrastructure costs contain some mission assurance cost amounts (e.g., video instrumentation for selected flights) that were previously included in these reports.

The EELV System Program Office, however, disagrees with the Cost Analysis Improvement Group about including costs of the Atlas V RD-180 engine co-production development, recovery of launch providers' financial losses from previous launch agreements, and fiscal year 2005 infrastructure cost recovery in the revised EELV program cost estimate. The EELV System Program Office's position is that the Atlas V RD-180 engine co-production development costs, launch service losses, and fiscal year 2005 infrastructure costs should be borne by the launch providers. While the Office of the Secretary of Defense certified the program for continuation based on the Cost Analysis Improvement Group's cost estimate, it directed the Air Force and the Cost Group to update their estimates. The Air Force is to submit a revised program cost baseline within 60 days of the April 26, 2004, certification. Until the revised program cost baseline is established, the specific impact of program cost increases on program cost savings cannot be determined. Nevertheless, using its own estimate, the EELV System Program Office in May 2004 projected life-cycle program cost saving of 51.4 percent over the heritage systems.

#### Acquisition Strategy Will Be Revised to Restructure Contracting Provisions

According to the two launch providers, they have incurred substantial financial losses as a result of the failure of commercial launch market to materialize, leading them to work with the EELV System Program Office to modify the acquisition strategy and contract approach. They are considering changing from a "fee for service" firm fixed price contract to an approach that will use a combination of fixed price contracts for actual launch services and cost reimbursement/fixed price contracts to pay for contractors' fixed costs. Under this new approach, the EELV System Program Office will pay for infrastructure upkeep previously absorbed by the launch provider.

Other key features of this revised acquisition strategy include

- maintaining mission success as the number one priority and providing launch providers with incentives to achieve this goal;
- encouraging the launch providers to innovate and increase launch market business; and
- maintaining an affordable program with balanced production of launch vehicles given limited competition.

According to the launch providers, changes in the acquisition strategy and contract approach are necessary for each provider to avoid a repetition of their financial losses. They believe this contract approach may sustain their technical and financial viability. Furthermore, the Under Secretary of the Air Force stated in recent congressional hearings that it was important for the Air Force to develop a strategy

that “does not cause either provider to go into a death spiral of trying to be competitive or face extinction.”

### **Conclusions**

Having a strategic launch capability, as cited in U.S. space policy, is critical to the nation. However, program risks and significant cost increases create some uncertainty about the continued achievement of assured access to space. Because a robust commercial space launch market may not materialize for some time, the government might be burdened with a larger share of launch providers’ fixed costs. In addition, continued escalation of EELV program costs, in a fiscally constrained environment with intense funding competition, is likely to raise more concerns about the program’s strategy, execution, funding, and risk mitigation initiatives. As we have noted, key decisions or program changes resulting from the recently completed certification from the Office of the Secretary of Defense, the Air Force’s revised program cost baseline due in June 2004, and expected revisions to the launch acquisition strategy and contract approach will affect the EELV program’s strategy and funding. They could also negatively impact mission success if such decisions and changes are not carefully conceived and applied.

### **Agency Comments**

We requested official comments from DOD. The department’s Office of Networks and Information Integration reviewed a draft of this letter and elected not to provide written or oral comments.

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We will send copies of this letter to appropriate congressional committees; the Secretary of Defense; the Secretary of the Air Force; and the Director, Evolved Expendable Launch Vehicle Program. In addition, the letter will be available at no charge on our Web site at <http://www.gao.gov>. If you have any questions, please contact me at 202-512-6020. James Bancroft, Aisha Cabrer, Jane Hunt, Kenneth Patton, and George Vindigni were major contributors to this letter.



Raymond J. Decker  
Director, Defense Capabilities  
and Management

Enclosure



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**Briefing for  
Committee on Armed Services,  
Subcommittee on Strategic Forces  
U.S. Senate**

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**DEFENSE SPACE ACTIVITIES:  
Continuation of Evolved Expendable Launch  
Vehicle Program's Progress to Date Subject to  
Some Uncertainty**

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# Outline

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- Objective
  - Scope and Methodology
  - Summary
  - Background
  - Program Has Been Successful, but Risks Present Some Uncertainty
  - Program Cost Increases Have Been Significant, Potentially Impacting Overall Cost Savings
  - Conclusions
  - Appendix: Detailed Support Slides
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## Objective

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- To determine the extent to which the implementation of DOD's Evolved Expendable Launch Vehicle (EELV) program achieved assured access to space and projected program cost savings of at least 25 percent to 50 percent over past launch systems.



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## Scope and Methodology

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- Reviewed laws, presidential directives, and Department of Defense (DOD) and Air Force policy and related documents on space launch.
  - Conducted interviews with appropriate officials in DOD, Air Force, National Aeronautics and Space Administration, and launch providers.
  - Visited Delta IV launch site at Vandenberg Air Force Base, California, and toured the Atlas V production facility in Denver, Colorado.
  - Data were validated and sufficiently reliable to answer our objective.
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## Summary

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- Progress made toward assured access to space and cost-savings objective.
    - Three successful Delta IV and three successful Atlas V launches.
    - EELV System Program Office projected a 25 to 50 percent cost saving over previous launch systems under the current acquisition strategy.
    - Three of four vehicle performance parameters have been met with progress made on the fourth.
    - Several risk issues present some uncertainty.
  - Program cost increases will be significant.
    - Potential costs identified by DOD cost group.
    - Specific impact on cost savings currently unknown.
    - Acquisition strategy being revised to restructure contract.
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## Background

- U.S. Space Policy - Access to and use of space is critical to preserving peace and protecting U.S. national security including civil and commercial interests.
- Assured Access to Space - The ability to launch critical satellites when needed and ensure that launch failures, other catastrophes, or events do not prevent mission success.



Source: Lockheed Martin ©



## Background

- EELV Program – Implemented in 1995 to meet specific objectives including:
  - Affordable assured access to space.
  - Reliable and flexible national launch capability.
  - Reduce launch costs by 25 percent to 50 percent over past (“heritage”) systems.



EELV  
Atlas V



EELV  
Delta IV

Source: Lockheed Martin © and Boeing ©



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## Background

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- Key Performance Parameters – Capabilities and characteristics essential for mission accomplishment. Failure to meet minimum values could be cause for program reevaluation or termination per Air Force Instruction 10-601.
    - Mass to orbit
    - Vehicle design reliability
    - Standard launch pads
    - Standard vehicle interfaces
  - Vehicle Mission Reliability – The ability to complete the spacelift mission from launch to placement of the satellite payload in orbit at a success rate that can support the government’s satellite needs.
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## Background

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- EELV Acquisition Strategy – currently structured to gain affordable and assured access to space.
    - Create partnership between government and industry;
    - Encourage contractor investment and innovation;
    - Promote competition for launch services—two providers;
    - Procure launch services under one contract instead of launch vehicle and operations under separate contracts;
    - Provide government free and open access to contractor performance data; and
    - Leverage benefits of commercial market.
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## Background

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- Nunn-McCurdy Provision – Requires notification to Congress when major acquisition program exceeds specific cost thresholds.
  - EELV must meet Nunn-McCurdy provision.
  - Requires DOD certify for continuation of a program exceeding 25 percent unplanned growth.
- Procurement Integrity Act – Restricts the disclosing and obtaining of contractor bid or proposal information.



# Progress Toward Access-to-Space and Cost-Savings Objective

- 6 consecutive successful missions—2 government and 4 commercial launches—since Aug. 2002 with 2 providers.



**Eutelsat Hotbird 6**  
*Atlas V*  
*21 Aug 02*



**Eutelsat W5**  
*Delta IV*  
*20 Nov 02*



**DSCS A3**  
*Delta IV*  
*10 Mar 03*  
Government launch



**Hellas Sat**  
*Atlas V*  
*13 May 03*



**Rainbow 1**  
*Atlas V*  
*17 Jul 03*



**DSCS B6**  
*Delta IV*  
*29 Aug 03*  
Government launch

Source: Lockheed Martin © and Boeing ©



## Progress Toward Access-to-Space and Cost-Savings Objective

- A December 2002 Air Force Operational Test and Evaluation Center assessment concluded that EELV systems are a significant improvement over heritage launch vehicles.
- EELV recurring launch cost-savings projection in July 2003 of 50.8 percent based on initial launch services contracts. Contract pricing anticipated a robust commercial market.



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## Progress Toward Access-to-Space and Cost-Savings Objective

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- Success attributed to:
  - Contracts contained costs favorable to government in anticipation of a robust commercial market;
  - Government and launch providers share risk-monitoring responsibility; and
  - Open lines of communications between government and launch providers.



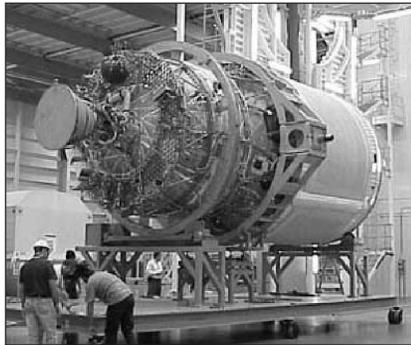
## Continued Progress on Remaining Performance Parameter

- Three of four key performance parameters have been met, according to EELV program.
- Elements of the standard vehicle interface parameter have not been fully met, but progress is being made.
  - Vibration issue with Delta IV nose-cone separation. Design solution is being pursued.
  - Vibration issue with Atlas V engine noise. Modification is being tested.
- Vehicle mission reliability.
  - Progress made. However, several more launches are needed to fully demonstrate vehicle mission reliability.



## Several Risks Present Some Uncertainty

- RL-10 upper stage engine
  - While proven reliable, potential single point of failure for both families of launch vehicles.
  - Studies are being funded to evaluate the engine's critical components, producibility, and viability.



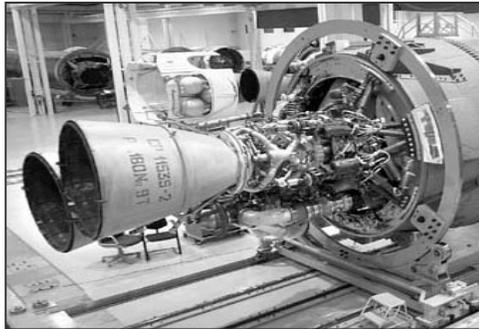
Source: Boeing ©

RL-10 Engine (B-2 Variant)



## Several Risks Present Some Uncertainty

- RD-180 engine for Atlas V launch vehicle.
  - Russian produced and tested; 13 in U.S. inventory.
  - Potential loss of single source of engines.
  - Co-production in U.S. of a mission-ready engine may not occur until 2012.



Source: Lockheed Martin ©

RD-180 Engine



# Several Risks Present Some Uncertainty

- Only one launch provider can launch from both coasts.
  - Additional launch pad needed on the West Coast.
  - West coast pad for Atlas V to be ready by May 2005.



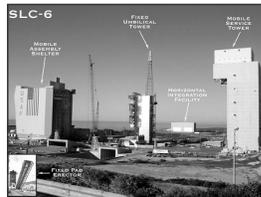
Atlas V East Coast Launch Site, Space Launch Complex 41, Cape Canaveral Air Force Station, Florida



Delta IV East Coast Launch Site, Space Launch Complex 37, Cape Canaveral Air Force Station, Florida



Atlas V West Coast Fixed Launch Platform Construction, Space Launch Complex 3E, Vandenberg Air Force Base, California



Delta IV West Coast Launch Site, Space Launch Complex 6, Vandenberg Air Force Base, California

Source: Lockheed Martin ©

Source: Boeing ©



## Significant EELV Program Cost Increases Reported

- Costs reported as of Dec. 2003 increased by about \$13.3 billion over the approved baseline estimate of \$18.8 billion due to
  - Assured access to space mission and safety initiatives costing \$538.8 million through fiscal year 2009.
  - Mission assurance initiatives for fiscal years 2010 through 2020 costing \$527 million.
  - Reallocation of seven launches due to sanctions and Air Force support of second West Coast launch pad totaling \$227 million.
  - Satellite weight growth costing \$1.335 billion.
  - Incorrect inflation assumptions of \$2.821 billion.
  - Price increases on second and subsequent launch services awards costing \$7.807 billion due to the lack of the commercial market.



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## Potential Cost Increases Reported by DOD Cost Group

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- The Air Force on January 15, 2004, reported an anticipated breach of the 25 percent threshold of the Nunn-McCurdy provision.
- Office of the Secretary of Defense certified the program's national security need, cost estimate, management structure, and lack of alternatives on April 26, 2004.
- DOD's Cost Analysis Improvement Group examined the program and provided revised cost estimates.



## Potential Cost Increases Reported by DOD Cost Group

- Cost Analysis Improvement Group estimated about \$13.2 billion in potential costs (specific costs are excluded because they are proprietary and certain amounts may overlap with previously reported costs of \$13.3 billion):
  - Annual fixed infrastructure cost to fund EELV launch complex, supplier readiness, production facilities, a government mission director, and mission assurance.
  - Fiscal year 2005 infrastructure costs incurred by launch providers.
  - RD-180 co-production development cost.
  - Launch providers' recovery of losses incurred on the first and second launch services contracts.



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## Potential Cost Increases Reported by DOD Cost Group

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- Air Force and Cost Analysis Improvement Group disagree on including fiscal year 2005 infrastructure cost recovery, RD-180 co-production development cost, and recovery of launch providers' financial losses.
- DOD directed the Air Force and the Cost Group to update their estimates and the Air Force to submit a revised program cost baseline within 60 days of the April 26, 2004, certification.
- Specific impact on cost savings will be determined after new cost baseline is established.



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## Revised Acquisition Strategy Prompted

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- The EELV Program Office exploring new strategy to:
  - Maintain mission success as top priority.
  - Encourage launch providers innovation to promote new commercial business.
  - Maintain program affordability in light of limited competition.
  - Avoid launch providers' stated continued financial losses.



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## Conclusions

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- Program risks present some uncertainty in continuing to achieve assured access to space objective.
- Commercial market has not materialized.
- Future government budgets will be constrained.
- Decisions involving cost, program management, and revised acquisition strategy, if not carefully considered, could negatively impact program.



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# APPENDIX

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## Detailed Support Slides



# Heritage Launch Vehicles



Delta II

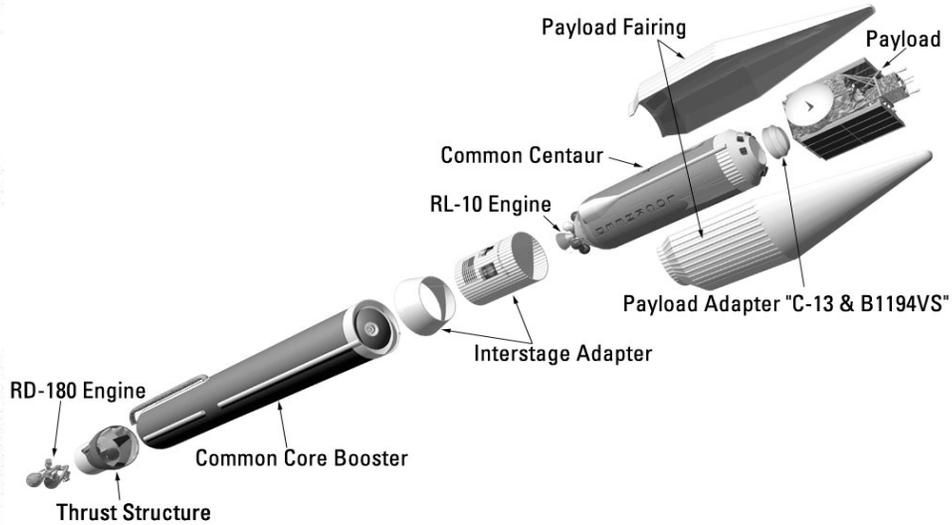
Atlas II

Titan II

Titan IV

Source: Lockheed Martin © and Boeing ©

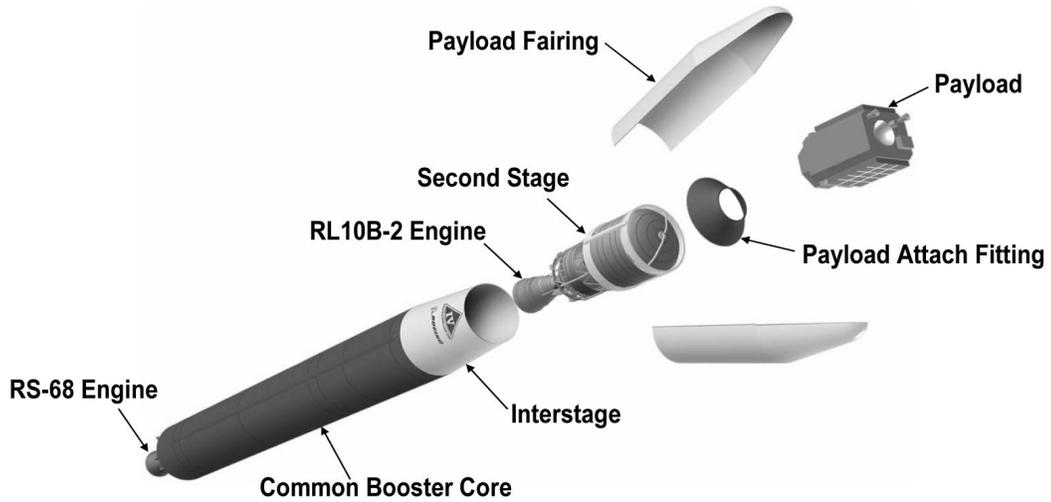
# Components of Atlas V Medium Launch Vehicle



Source: Lockheed Martin ©



# Components of Delta IV Medium Launch Vehicle



Source: Boeing ©

(350357)

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