

September 2011

**EVOLVED  
EXPENDABLE  
LAUNCH VEHICLE**

**DOD Needs to Ensure  
New Acquisition  
Strategy Is Based on  
Sufficient Information**

U.S. Government Accountability Office

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## Why GAO Did This Study

The Department of Defense (DOD) and the National Reconnaissance Office (NRO) plan to spend about \$15 billion for launch services from fiscal year 2013 to fiscal year 2017 through DOD's Evolved Expendable Launch Vehicle (EELV) program. The program launches satellites for military, intelligence, civil, and commercial customers. In 2009, DOD and the NRO decided the program's business model needed improvement, and initiated studies to determine the best approach. The studies addressed potential business models, cost reductions, and the nation's assured access to space. Given expected changes to the EELV acquisition strategy, GAO was asked to (1) determine whether DOD has the knowledge it needs to develop a new EELV acquisition strategy, and (2) identify issues that could benefit future launch acquisitions. To address these questions, GAO reviewed launch studies, a supplier survey, and interviewed DOD and other officials.

## What GAO Recommends

Among other things, GAO recommends DOD assess engine costs and mission assurance activities, reassess the length of the proposed block buy, and consider how to address broader launch acquisition and technology development issues. DOD generally concurred with the recommendations.

## EVOLVED EXPENDABLE LAUNCH VEHICLE

### DOD Needs to Ensure New Acquisition Strategy Is Based on Sufficient Information

## What GAO Found

DOD officials believe the launch industrial base is unstable and plan to implement an acquisition strategy they believe will help stabilize it. The leading proposal would commit the government to a block buy of eight common booster cores—the main component of a launch vehicle—each year, for a 5-year term. However, this approach may be based on incomplete information and although DOD is gathering data that it needs as it finalizes the new acquisition strategy, some critical knowledge gaps remain. DOD expects the strategy to be finalized in the next few months, but this may not allow DOD sufficient time to leverage the knowledge it continues to gain as it develops the strategy. DOD analysis on the health of the U.S. launch industrial base is minimal, and officials continue to rely on contractor data and analyses in lieu of conducting independent analyses. Additionally, some subcontractor data needed to negotiate fair and reasonable prices are lacking, according to Defense Contract Audit Agency (DCAA) reports, and some data requirements were waived in 2007 in exchange for lower prices. Mission assurance comprises numerous activities to ensure launch success, but DOD has little insight into the sufficiency or excess of these activities. The expected block buy may commit the government to buy more booster cores than it needs, and could result in a surplus of hardware requiring storage and potentially rework if stored for extended periods. Also, DOD is gaining insight into the rise in some engine prices, expected to increase dramatically in the near term, but it is unclear how this knowledge will inform the expected acquisition approach or subsequent negotiations. Program decisions at the National Aeronautics and Space Administration (NASA) later this year could impact EELV engine prices, but DOD may lock in higher prices before it fully understands NASA's plans. Further, DOD intends to allow companies other than the current sole-source contractor to compete for EELV launches as they prove vehicle reliability, but DOD is still developing criteria to facilitate this competition. A recent memorandum of understanding between the Air Force, NRO, and NASA committed to publish a coordinated certification strategy by July 31, 2011, but did not meet that date.

Broader issues exist as well, regarding the U.S. government's acquisition of, and future planning for, launch services—issues which GAO believes should be addressed, given that they could reduce launch costs and assure future launch requirements are met. For example,

- Federal agencies—like the Air Force, NRO, and NASA—could more closely coordinate their acquisitions of launch services, and recently committed to do so, but many details are yet to be determined.
- Resource planning focused on launch technology development could inform the next generation of launch vehicles particularly with respect to engines, for which the United States is partially reliant on foreign suppliers.

Policymakers could benefit from additional insight into these issues, but it is not clear that DOD will address these issues in its upcoming strategy.

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G A O

Accountability \* Integrity \* Reliability

United States Government Accountability Office  
Washington, DC 20548

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September 15, 2011

The Honorable Bill Young  
Chairman  
The Honorable Norm Dicks  
Ranking Member  
Subcommittee on Defense  
Committee on Appropriations  
United States House of Representatives

The Department of Defense's Evolved Expendable Launch Vehicle (EELV) program is the primary provider of launch vehicles for U.S. military and intelligence satellites, as well as some civil and commercial satellites. The Department of Defense (DOD) and the National Reconnaissance Office (NRO) plan to spend about \$15 billion to acquire launch services from fiscal year 2013 to fiscal year 2017; however, the life-cycle costs for the program are unknown. In 2009, the Commander of Air Force Space Command and the Director of the National Reconnaissance Office (NRO) determined that the current approach for acquiring EELV launch vehicles was likely not the best business model and decided that a new acquisition strategy needed to be developed. In March 2011, the Secretary of the Air Force created a new executive position, the Program Executive Officer (PEO) for Space Launch, responsible for, among other things, spearheading the effort to finalize the new EELV acquisition strategy. To inform the strategy, DOD conducted or commissioned various studies to evaluate alternatives to the current program structure, assessing the U.S. government's access to space, analyzing options to leverage commercial and foreign capabilities, identifying possible cost reductions in the program, and evaluating the current business model. The new PEO for Space Launch states he is leading several recent and ongoing efforts to gain additional knowledge to inform the new acquisition strategy. Given anticipated changes in the acquisition strategy and potential changes in the broader launch landscape, you asked us to report on (1) whether DOD has the knowledge it needs to develop a new EELV acquisition strategy and (2) issues that could benefit future launch acquisitions.

To address these objectives, we reviewed and analyzed information contained in five recent launch studies, and interviewed study leaders or participants in three of the five studies; we analyzed historical launch data and expected launch vehicle demand, and reviewed past launch industry studies of the U.S. industrial base. We assessed a supplier survey

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conducted by the EELV prime contractor of its subcontractors. The survey was used by the government to gauge the health of the U.S. industrial base. We reviewed the survey questionnaire, comparing methods to GAO sound survey development practices,<sup>1</sup> comparing summary data to the questions asked, and interviewing and obtaining information and summary data from the surveyors. We also interviewed or obtained perspectives from launch officials in various military, intelligence, and civilian government agencies, as well as the EELV prime contractor and two commercial launch companies. Through our review of DOD launch studies and other relevant government and industry reports, our interviews with DOD, NASA, and contractor officials, and information obtained from NRO, we identified issues that may be important to current and future government launch acquisitions.

We conducted this performance audit from September 2010 to September 2011 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives. Additional details of our scope and methodology are discussed in appendix I.

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## Background

DOD began the EELV program in 1995 to provide a new generation of launch vehicles to ensure affordable access to space for government satellites. It resulted in two families of commercially owned and operated launch vehicles—Boeing’s Delta IV and Lockheed Martin’s Atlas V. It also includes manufacturing and launch site facilities and ground support systems. Each family of launch vehicles consists of medium-, intermediate-, and heavy-lift vehicles.<sup>2</sup>

In 1995, DOD awarded contracts to four companies to define EELV system concepts and complete preliminary system designs. At the end of their contracts, DOD planned to choose one contractor with the most reliable and cost-effective design. However, in November 1997, the Office

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<sup>1</sup> GAO, *Program Evaluation and Methodology Division: Developing and Using Questionnaires*, [GAO/PEMD-10.1.7](#) (Washington, D.C.: Oct. 1, 1993).

<sup>2</sup> The Atlas V heavy lift vehicle is neither fully designed nor built.

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of the Secretary of Defense (OSD) approved maintaining two contractors, based on forecasts that growth in the commercial space launch market would support more than one launch provider and the resulting competition would translate into lower costs for the government. In 1998, DOD competitively awarded Boeing and Lockheed Martin two firm-fixed price contracts for Delta IV and Atlas V launch services, respectively, under the Federal Acquisition Regulation (FAR) provisions governing commercial items. Under these contracts, DOD had limited insight into contractor costs because certified cost or pricing data is not required in the acquisition of commercial items.<sup>3</sup> In 2000, new market forecasts showed a dramatic reduction in the expected demand for commercial launch services and the robust launch market upon which the DOD based the EELV acquisition strategy did not materialize. As a consequence, estimated prices for future contracts for launch services increased, along with the total cost of the program. Commercial launch demand forecasts have remained relatively stable since then, and in recent years seem to indicate a slight upturn in worldwide demand for commercial launches, but the expected demand for commercial launches remains significantly lower than was anticipated near the start of the EELV program.

#### Current Acquisition Approach

In March 2005, DOD revised the EELV acquisition strategy to reflect the changes in the commercial market and the new role of the government as the primary EELV customer. This revised strategy provided two contracts apiece—Launch Capability and Launch Services—to Boeing and Lockheed Martin, the two launch service providers. The EELV Launch Capability cost-plus incentive fee contract is primarily for launch infrastructure (such as launch pads and ranges) and labor, while the EELV Launch Services firm-fixed price mission success incentive contract is for launch services, including vehicle production.<sup>4</sup>

The new contracts were negotiated under FAR Part 15, which allowed the contracting officer to obtain certified cost or pricing data from the

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<sup>3</sup> Under the FAR, the government typically has little insight into a contractor's costs since contracting officers cannot require cost or pricing data when the contracting officer determines, among other things, that prices agreed upon are based upon adequate price competition or when a commercial item is being acquired. FAR 15.403-1(b).

<sup>4</sup> In July 2011, the EELV program awarded a Launch Capability contract as a cost-plus incentive fee contract. Air Force officials stated the contract includes a mission performance incentive plan and that the change in contract type is intended to incentivize ULA to deliver mission success at a lower cost.

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contractor for future procurements. As part of the negotiations process, the government waived certified cost or pricing data for some requirements. The contracts were awarded using “other than full and open competition procedures” under Part 6 of the FAR.

In May 2005, Boeing and Lockheed Martin announced plans to form a joint venture that would combine the production, engineering, test, and launch operations associated with U.S. government launches of Boeing’s Delta and Lockheed Martin’s Atlas launch vehicles. According to both contractors, the joint venture, named the United Launch Alliance (ULA), would gain efficiencies and provide the government with assured access to space at the lowest possible cost by operating independently as a single company and providing launches on both Atlas V and Delta IV vehicles. Though the Federal Trade Commission (FTC) initially opposed the ULA joint venture because of its potential to limit competition in the launch industry, DOD stated the benefits of the joint venture to national security outweighed the loss of competition, and FTC allowed the joint venture to proceed. ULA officially began operations in December 2006 as the sole source contractor for EELV. The government, Boeing, Lockheed Martin, and ULA entered into novation agreements which transferred the obligations and liabilities of the earlier Boeing and Lockheed Martin contracts to ULA.<sup>5</sup>

Following ULA formation, the Air Force approved a waiver to obtain certified cost or pricing data from the top 104 Boeing subcontractors whose purchase orders valued at \$650 thousand or more, representing over \$1.4 billion total. The waiver states that Boeing purchased the materials via commercial items contracts and thus did not require the data of its subcontractors, and that further, the prices Boeing obtained in its large-quantity purchase of subcontractor hardware warranted waiving the data.

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<sup>5</sup> With respect to government contracts, a novation agreement is a legal instrument executed by the contractor (transferor), successor in interest (transferee), and government, and by which, among other things, the transferor guarantees performance of the contract, the transferee assumes all obligations under the contract, and the government recognizes the transfer of the contract and related assets. FAR 2.101.



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In 2007, DOD decided to advance the EELV program from the production phase to the sustainment phase.<sup>6</sup> We reported in 2008 that this action significantly reduced the program's reporting requirements to the DOD and the Congress, such as program cost and status information, limiting its own ability to oversee the program.<sup>7</sup> Today, ULA's customers are mostly DOD, NRO, and the National Aeronautics and Space Administration (NASA) (which negotiates its own contracts with ULA). With regard to commercial customers, since ULA began operations in 2006, they represent less than 20 percent of ULA's business.

According to DOD officials, in late 2009, projected increases in EELV program costs prompted the Commander of Air Force Space Command and the Director of the NRO to reconsider the current EELV business model. They commissioned a team of Air Force and various other DOD acquisition officials, NRO, and NASA officials, and contractor personnel—known as the Tiger Team—to study the current approach to buying government launches, and develop a new acquisition strategy. Although development of the acquisition strategy shifted from the Tiger Team to the new PEO for Space Launch in late March 2011, the Tiger Team study findings and recommendations will likely remain a cornerstone of the new acquisition strategy.

## Planning Underway for New Acquisition Strategy

Under the current acquisition approach, DOD awards a contract for each launch vehicle as needed, with a separate contract to cover the ULA's overhead and facilities cost. DOD does not guarantee a specific number of launch vehicle orders per year to the contractor, and the quantity of launch vehicles needed fluctuates. While this business model is flexible, as launch vehicles are purchased on an as-needed basis, it has also been costly, and projected costs are rising. Recent DOD launch studies have raised concerns regarding the unpredictable orders and low demand for launch vehicle components, and both DOD and ULA officials say this condition is contributing to rising launch costs, particularly in the area of

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<sup>6</sup> Typically, major defense acquisition programs in the production phase achieve an operational capability that meets mission needs; the sustainment phase begins when the acquired weapons or automated information systems have been fielded or deployed. In this phase, DOD oversight is normally reduced and program emphasis is on activities such as supply, maintenance, and transportation.

<sup>7</sup> GAO, *Space Acquisitions: Uncertainties in the Evolved Expendable Launch Vehicle Program Pose Management and Oversight Challenges*, [GAO-08-1039](#) (Washington, D.C.: Sept. 26, 2008).

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engines, a primary launch cost driver. To address its concerns, DOD is developing a new EELV acquisition strategy for how it procures launch services and pays for launch infrastructure costs, officials say to stabilize the industrial base and to keep costs from escalating more. Based on a memorandum of understanding, signed on March 10, 2011, between the Air Force, NRO and NASA, the new EELV acquisition strategy will most likely commit the Air Force and NRO to buy each year a block of eight launch vehicles—or more specifically eight common booster cores<sup>8</sup>—and commit to doing so for a 5-year period, instead of buying one launch vehicle at a time as is currently done. Though the acquisition strategy is still in development, the first block buy of booster cores is expected to cover fiscal years 2013 through 2017 and cost around \$15 billion for that period. The PEO for Space Launch indicates the new strategy is expected to be finalized within the next few months.

DOD recently conducted or participated in five major launch studies that officials told us were the basis for developing early concepts of the new EELV acquisition strategy. While the studies spanned a wide range of launch-related issues, we focused on issues related to the acquisition of launch services. The studies are:

- The *2010 Launch Broad Area Review* was conducted by the Institute for Defense Analyses for the Air Force to assess the current state of assured access to space. Issued in January 2010, this report states that the current practice of buying launch services as needed threatens the viability of the launch industrial base because the unpredictable buying tempo leads to inefficient production by suppliers.<sup>9</sup> It recommended maintaining the current mission assurance focus, and investing in pre-planned product improvement, such as engine modifications and upgrades.<sup>10</sup>

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<sup>8</sup> The booster core is the main body of a launch vehicle. In the EELV program, common booster cores are used to build all of the Atlas V and Delta IV launch vehicles. Medium and intermediate launch vehicles use one core each, while the Delta IV Heavy launch vehicle requires three.

<sup>9</sup> Institute for Defense Analyses is a federally funded research and development center (FFRDC). FFRDCs are unique independent nonprofit entities sponsored and funded by the government to meet specific long-term technical needs that cannot be met by existing in-house or contractor resources.

<sup>10</sup> Industry and DOD studies describe launch mission assurance as the comprehensive collection of activities undertaken throughout the lifecycle of a launch vehicle development program and through launch to assure success and safety.

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- The *EELV Should Cost Review* was conducted by Air Force Space Command (AFSPC) and the NRO for the Secretary of the Air Force, to identify possible EELV efficiencies and cost reductions.<sup>11</sup> The report was issued in October 2010, and recommended over 80 cost-reduction initiatives for the EELV program. In February 2011, the Secretary of the Air Force directed his senior acquisition executives to integrate the findings from this review with Tiger Team recommendations (discussed below) in time to award the new launch contracts. Air Force officials say the Should Cost Review was valuable, that some of the cost reduction recommendations identified therein were implemented in recent contract negotiations, and that the Should Cost Review recommendations will support future contract actions.
  - The *Launch Enterprise Transformation Study* was conducted by Booz Allen Hamilton for the Air Force, to evaluate alternatives to the current EELV program consisting of two launch vehicle lines of production, or families, while assessing risks, costs, savings, and the industrial base, among other things. According to Air Force officials, this study, completed in March 2009, was the impetus for several of the other launch studies DOD conducted to inform the new acquisition strategy. This study concluded that mission success should remain the first priority when making decisions about the launch enterprise. It recommended that the Air Force adopt a more efficient acquisition approach, including pursuing a new definition of assured access to space, and enabling pre-planned product improvements.
  - The *Resource Management Directive 700 Fiscal Year 2010 Launch Study* was conducted by the Under Secretary of Defense, Office of Acquisition, Technology and Logistics; the Assistant Secretary of Defense, Office of Networks Information and Integration; the Office of the Secretary of Defense, Cost Assessment and Program Evaluation; and the Air Force Space and Missile Systems Center's Launch and Range Systems Directorate, to identify and assess alternatives for reducing launch costs, including options for downsizing to either the Atlas or Delta lines of launch vehicles instead of producing both, and

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<sup>11</sup> Should-cost reviews are a specialized form of cost analysis. These reviews evaluate the economy and efficiency of the contractor's existing work force, methods, materials, equipment, real property, operating systems, and management. The objective of should-cost reviews is to promote both short and long-range improvements in the contractor's efficiency in order to reduce the cost of performance of government contracts.

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leveraging commercial and foreign capabilities. Completed in August 2010, this study stated that a new acquisition strategy should control cost growth and stabilize the industrial base. It also recommended investing in post-EELV technologies.

- The *Tiger Team Study* was co-sponsored by the Commander of AFSPC and the Director of the NRO, with members from the Air Force, NRO, various DOD offices, and NASA. The study began in November 2009 to look at alternative acquisition models for EELV and develop a revised EELV acquisition strategy. The Tiger Team concluded its formal study period in August 2010, and its recommendations will likely be a key input to the expected EELV block buy acquisition strategy, which has yet to be finalized. We interviewed multiple DOD officials and obtained their views on what the recommendations included. We received substantive oral briefings from the study co-leader and participants, but we did not receive copies of the Tiger Team briefings or supporting documentation with sufficient time to review them during the course of our work.

In addition to the issues for which the studies were commissioned, several of the study reports addressed other topics. Table 1 shows the broad issues each study addressed.

**Table 1: Studies Informing New EELV Acquisition Strategy and Issues They Addressed**

	Competition for EELV Launches	EELV Program Structure	Launch Costs	Launch Industrial Base	Launch Plans & Schedule	Launch Site and Range Infrastructure	Launch Vehicle Hardware Upgrades	Launch Vehicle Mission Assurance	Leadership of the Launch Community
2010 Launch Broad Area Review	X	X		X	X	X	X	X	X
EELV Should Cost Review			X						
Launch Enterprise Transformation Study	X	X		X	X	X	X	X	
Resource Management Directive 700 Fiscal Year 2010 Launch Study	X	X	X	X					
Tiger Team Study	X	X	X	X					

Source: GAO analysis of information on launch studies.

Finally, although no U.S. commercial launch capability for EELV-class payloads other than Atlas V and Delta IV existed when the previous EELV acquisition strategy was developed, domestic commercial launch providers are emerging that may satisfy some of DOD’s EELV-class launch vehicle needs. According to DOD officials, these newer providers have not yet demonstrated adequate reliability to provide launches for critical satellites, but may be poised in the future to compete with the current sole-source EELV provider, ULA. Such competition could incentivize ULA pricing and efficiencies, potentially yielding cost savings to the government.

## DOD Gaining Knowledge as It Finalizes a New EELV Acquisition Strategy, but Critical Gaps Remain

DOD officials are gathering data they expect will fill some knowledge gaps, but they do not have some of the information they need to make informed decisions in developing the new acquisition strategy for EELV. Current plans are to finalize the acquisition strategy later this year, but efforts to gain additional knowledge are still underway. Program officials state that a primary reason for revising the EELV acquisition strategy is to stabilize the launch industrial base, but analyses performed by DOD on the health of the space launch industrial base are limited. EELV program officials plan to devise a new contracting approach as a part of the new acquisition strategy, but they may have difficulty assessing fair and reasonable prices given the insufficiency of historical and current

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contractor cost or pricing data. DOD also continues to have limited insight into mission assurance costs, gaining clarity on which, DOD officials say, would be cost-prohibitive given the integrated nature of these activities. Additionally, DOD has incomplete data on current and future engine prices—though Air Force officials are pursuing cost data from subcontractors who supply engines—which some estimates show doubling or even tripling in the near term. The proposed block buy of eight booster cores per year for five years is based on ULA’s stated minimum necessary to maintain a steady production rate, but this number of cores may not reflect the actual number needed, and could result in a surplus of booster cores if not used. DOD indicates plans to allow companies other than the current prime contractor, ULA, to compete for EELV launches once these companies have proven their reliability, and although DOD has developed criteria for how to facilitate this competition in conjunction with the NRO and NASA, DOD officials indicate the criteria are not yet finalized.

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### DOD analysis on the health of the launch industrial base is limited

Program officials, recent launch studies, and the prime EELV contractor all cite a diminishing launch industrial base as a risk to the mission success of the program, but DOD analysis supporting this condition is minimal. Tiger Team leaders asked the prime EELV contractor and three subcontractors in April 2010 to respond to questions concerning production rates needed to sustain viability and achieve cost efficiencies, but independent government analyses on the health of the space launch industrial base were not performed.<sup>12</sup> A principal source of data cited by DOD is a 2009-2010 survey of about 50 subcontractors out of roughly 3,000, conducted and analyzed by ULA. According to ULA, the subcontractors surveyed represent about 80 percent of total subcontract value.<sup>13</sup> EELV program officials say they relied, in part, on the 2009-2010 ULA supplier survey when assessing the health of the industrial base, in

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<sup>12</sup> The three engine subcontractors questioned in April 2010 included Aerojet, Alliant Techsystems, Inc., and Pratt & Whitney Rocketdyne, each of which provides engines or rockets for use on EELVs.

<sup>13</sup> ULA sent its initial survey in 2009, and then sent another version of the same survey to suppliers in March 2010 to capture additional detail. The 2009 survey had an 82 percent response rate (45 of 51 suppliers), and the follow-up to that survey sent in March 2010 received about a 55 percent response rate (29 of 51 suppliers). Because data used in the cited studies constitute the combined data from both the 2009 and 2010 survey responses, for presentation purposes, we refer in this report to the 2009 survey and the 2010 follow-up as the 2009-2010 survey.

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addition to more detailed information they obtained from the engine subcontractors. The 2010 Launch Broad Area Review—which DOD officials cite as support for the proposed block buy approach—also relied, in part, on the 2009-2010 ULA data and analysis to conclude that the launch industrial base needs stability.

Although the ULA survey of its supplier base covered the appropriate topic areas for such a review—for example, financial stability and production operations—our analysis determined the survey was neither designed nor administered in a manner consistent with sound survey methodology practices, and in some cases, survey results presented to DOD could not be linked back to the survey questions. When ULA sent its survey questionnaire to its suppliers, it provided a cover letter to introduce the survey. The survey cover letter goes beyond the standard acceptable practices of stating the purpose of the survey and why the respondents' answers are important by including ULA's Chief Executive Officer's views on the "inefficient" method used by DOD to acquire launch vehicles and the need for "a relatively stable multi year demand." It further states that the goal of the survey is to "justify" a new acquisition strategy "that will enhance our collective business," but sound survey practices indicate that surveys should not be perceived as trying to support a particular position. The purpose of questionnaires is to develop information for an objective evaluation.

Further, sound survey practices often provide for the use of close-ended questions with various response options provided to the survey respondent to facilitate survey response and analysis. In a well-designed survey, close-ended questions contain a comprehensive list of options that are mutually exclusive and unbiased. Pre-testing the survey with expected respondents is important for ensuring the adequacy of the questionnaire, and in principle, enough people should be tested in order to obtain a sufficiently valid sample of participants. ULA pre-tested only a subset of its survey questions with a single ULA supplier.

In the Overall Risk Profile portion of its survey, ULA asked respondents to list and rank—in an open-ended format—five short-, and five long-term risks in maintaining production for ULA. ULA provided survey participants with four suggested risk items that supported the ULA survey's stated purpose of justifying a stable multiyear acquisition approach for the EELV program. According to one ULA official, "we wanted certain answers." Summary data presented to DOD shows the potential risk items provided to suppliers by ULA as the four top-rated risk areas identified by suppliers, without indicating that the answers were suggested by ULA.

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This implies that survey respondents independently raised those areas as their top-rated concerns. ULA presents these results specifically in its briefing as support for a multiple year acquisition approach.<sup>14</sup>

Despite these and other methodological weaknesses, the data generated from the survey were neither reviewed nor independently assessed by DOD officials, according to ULA surveyors. Further, although the intention of the survey was in part to help the EELV program develop a new acquisition strategy, ULA told us the program office did not review the survey design, questions, methods, or analysis, though program officials said they provided questions for the follow-up survey. Additionally, although the 2010 Launch Broad Area Review uses direct language from the ULA supplier survey results, according to ULA officials, the review participants also did not ask to independently assess any of the ULA data or analysis, relying instead on ULA's analysis of its survey data.

ULA's survey findings are in some cases inconsistent with each other. For example, ULA data analysis used in the 2010 Launch Broad Area Review report indicates that most suppliers are operating at or below their minimum production rates and that at least 50 percent are concerned about customer demand and long-term viability. However, other ULA data contained in its briefing to us indicated no current concern regarding the financial viability of its main suppliers, stating that "98 percent of the ULA suppliers meet or exceed sustainable financial and operational criteria in 2010 (92 percent in 2009)." The ULA briefing also shows that ULA/EELV business constitutes 15 percent or less of the total business base for 75 percent of ULA suppliers who responded to the survey. ULA officials told us at no time did DOD ask to review the survey source data or ULA analysis, and ULA provided it to no one until we requested it for this review.

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<sup>14</sup> In other questions, ULA also asked respondents to rank various risks and did not provide any potential responses. However, such open-ended questions do not help respondents consider a comprehensive range of possible answers; rather they depend on the respondent's unaided recall. Moreover, the mere rank ordering of risks conveys nothing about their magnitude or the degree to which they can be managed and ULA did not include any questions that addressed these issues.



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Cost or pricing data for the EELV program are largely unknown

Under the new acquisition strategy, contracting officials may have difficulty assessing fair and reasonable prices given the limited availability of contractor and subcontractor cost or pricing data. The EELV Should Cost Review indicates there are significant contractor data and business system limitations that we believe should be resolved before DOD makes a commitment to a long-term (block buy) acquisition of launch vehicles. According to Defense Contract Audit Agency (DCAA) reports, ULA proposals contain inadequate cost or pricing data that make it difficult for DOD to assess the adequacy and fairness of launch prices and the cost-effectiveness of launch operations. DCAA has stated DOD should obtain additional data before negotiating launch contracts to ensure ULA proposals are an acceptable basis for contract negotiation. Despite historical challenges obtaining cost or pricing data, senior Air Force officials recently indicated they have confidence in their ability to obtain adequate cost or pricing data to facilitate informed contract negotiations as part of the new acquisition strategy. It is unclear whether this data will be captured in advance of the expected release of the new acquisition strategy later this year, or how it may be used to inform the strategy or subsequent contract negotiations.

For over a decade, the EELV program has been unable to access subcontractor cost and pricing data for hardware used on Delta IV booster cores. In 2007, the Program Executive Officer for Space authorized a waiver to Boeing for certified cost or pricing data for 104 of Boeing's major subcontractors and suppliers. The rationale for this decision was based on Boeing's purchase of items from these subcontractors and suppliers under a commercial contract, and that certified cost or pricing data are not required for that type of contract. The waiver covered the entire lot of items that had been purchased by Boeing in 1998, comprising hardware such as engines, graphite motors and guidance systems, to build 42 common booster cores, as the prices negotiated under the large-quantity subcontracts may not have been achievable by the government at the time. At that time, industry experts expected a high commercial demand for launch vehicles, and it was assumed by the program that the lot would be used in a few years; Boeing's Decatur, Alabama facility was built with the capacity to produce 40 common booster cores per year. However, the anticipated commercial market never materialized, and the EELV program is still using hardware from Boeing's first lot buy.

Without certified cost or pricing data on the booster cores, which constitute the major component on a launch vehicle, DCAA officials believe that program contracting officials have an inadequate basis on

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which to negotiate launch contracts. In fact, DCAA audits consistently find ULA proposals and estimating techniques inadequate for evaluation and audit, and recommend deferring contract negotiations until the data are made available. The recent EELV Should Cost Review found that ULA business systems, including purchasing, accounting, and estimating systems are immature, making it difficult for DCAA to validate cost data. ULA's business systems have "weak auditable records with high error rates," it says, causing reduced confidence and unreliability in ULA cost estimates. It further states that since ULA's formation, every audit report of EELV pricing DCAA issued has contained an adverse opinion, with unsupported or questioned costs ranging from 20-60 percent. Program contracting officials say that while this data would be beneficial, they are able to adequately estimate prices within the Air Force, which is how they can obtain clearance from their leadership to proceed with contract negotiations despite DCAA adverse opinions. ULA business systems are currently under review by DCAA and DCMA, and officials estimate these reviews will complete by the end of calendar year 2011.

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**DOD has little insight into mission assurance costs and activities, but plans to incentivize the contractor to gain efficiencies**

DOD officials believe that mission assurance is the most important contributing factor to launch mission success, but the costs, sufficiency or excess of these activities have not been fully assessed, and current contracts with ULA may not motivate the contractor to operate efficiently. Launch studies point to major launch failures in the late 1990s that are largely thought to be the result of inadequate mission assurance. Since then, the Air Force and NRO have taken steps to enhance mission assurance and government oversight. DOD launch studies credit enhanced mission assurance activities with the unprecedented launch successes in the EELV program, but have thus far been unable to quantify mission assurance costs, or pinpoint the sufficiency of mission assurance activities, limiting DOD's ability to gauge the sufficiency or surplus of its investment in mission assurance activities. For example,

- A 2007 Booz Allen Hamilton report created a definition of launch mission assurance, the basis of which is still in use, but the report was not able to quantify specific costs that comprise launch vehicle

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mission assurance, relying instead on percentages of total launch vehicle costs and averages to give a general picture.<sup>15</sup>

- The 2010 Broad Area Review was tasked in part with assessing the effectiveness of launch vehicle mission assurance, but it did not identify actual costs associated with mission assurance activities, such as pre-launch readiness reviews or launch vehicles hardware and software verification activities. This review supported maintaining the current level of mission assurance, but did not attempt to assess the sufficiency or surplus of current launch vehicle mission assurance activities, stating only that, “the current process and resource allocation...is producing the desired result.”
- Mission assurance costs are not fully quantified in launch contracts, either. According to the 2010 EELV Should Cost Review, mission assurance activities are part of the same contract line item number as mission integration activities like requirements analysis and verification, even though they are not directly related. This review also noted that under the contract structure at that time, ULA was neither motivated nor incentivized to find efficiencies in its operations, but Air Force officials told us they recently changed the EELV launch infrastructure contract to incentivize ULA to deliver mission success at a lower cost.

DOD officials maintain that mission assurance costs may not be severable from the many launch activities in which they are integrated, adding that the level of effort required to do so may far outweigh the potential cost savings that may be identified in the process. Also, recent launch studies have been unable to assess the level of investment or execution of activities thought to be part of the mission assurance process. Identifying the adequacy or excess of these activities is increasingly important, however, as new launch providers emerge who may be able to compete for EELV launches, providing the government with an unprecedented opportunity to incentivize efficiencies at ULA.

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<sup>15</sup> Booz Allen Hamilton, Launch Mission Assurance Assessment Study (April 2007). This study was commissioned by the Air Force and National Reconnaissance Office. The study defined launch vehicle mission assurance as: “a technical and management process rigorously, continuously, and iteratively employed over the life-cycle of a launch system to maximize mission success, ahead of cost and schedule.” According to the 2010 Should Cost Review, however, “nearly every organization and person involved has a different definition of mission assurance.”

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Senior Air Force officials told us they plan to include incentives in upcoming EELV contracts to motivate ULA to identify ways to increase efficiency in its operations. Incentivizing the contractor to find efficiencies in its own processes while maintaining mission success, without prescribing the areas to streamline, could allow DOD to effect cost savings while sustaining the unprecedented and critical launch success in the EELV program.

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### Data on EELV engine costs are incomplete

One of the primary drivers of rising launch cost estimates is the escalating price of engines used on both Atlas V and Delta IV launch vehicles, and while Air Force officials are undertaking efforts to assess engine price increases, some data are still lacking, and it remains unclear how this information will impact development of the new acquisition strategy and future contract negotiations. Air Force officials have recently begun pursuing explanations for engine price increases from one EELV engine subcontractor, and expect to obtain additional data before the new acquisition strategy is finalized. The subcontractor presented Air Force officials with cost breakdown information on the RL-10 upper stage engine, a version of which is used on both Atlas V and Delta IV launch vehicles, that Air Force officials say satisfied their request for information on that engine. However, similar cost information on EELV main engines is not available. For example, the EELV Should Cost Review indicates prices for the RS-68 engine, the main engine used on Delta IV launch vehicles, are expected to increase four-fold, but is unable to attribute the rise in prices to specific and identifiable cost increases. Air Force officials requested a cost breakdown on the RS-68 from the same subcontractor who provided cost data on the RL-10, but the subcontractor has not yet provided adequate data, according to Air Force officials. One reason for the lack of insight into engine costs is that ULA buys engines under commercial subcontracts, which limit the cost or pricing data available to the government. Additionally, according to DOD officials, the Should Cost Review team was unable to obtain detailed technical or cost data for the Russian RD-180 main engines used on the Atlas V due to time constraints, though EELV program officials say some cost data are available.

Further, uncertainty in NASA launch development programs like the Constellation program could make EELV the primary customer for some engines, resulting in the EELV program having to pay most labor and infrastructure costs at engine production facilities. DOD cost estimators suggest that when program decisions are finalized at NASA, the price of EELV engines will stabilize and may decrease. For example, if NASA

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pursues a program that uses the same engines as EELV, the two programs might share labor and infrastructure costs, bringing down the per-engine costs for EELV. However, DOD may lock in current unstable EELV engine prices before it has collected and fully analyzed the cost data it is pursuing, and before program decisions at NASA are final. NASA is in the process of transitioning away from the Constellation Program in FY 2011—which would have used the same RS-68 engines that are used on EELVs—to the new Space Launch System (SLS) heavy-lift launch vehicle. NASA has yet to finalize plans for the SLS design. NASA’s decisions could have significant bearing on engine prices for the EELV program.

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**Proposed block buy may generate oversupply**

DOD’s new EELV acquisition strategy may commit the Air Force and NRO to buy eight common booster cores—four each of the Atlas V and Delta IV lines—each year over a five-year term, which may be more than it needs. NASA launch needs are not factored into the proposed block buy, and will be purchased independently of the new EELV acquisition strategy. ULA says that eight cores per year is the minimum number it needs to keep production steady and maintain mission success, but historical launch rates indicate that DOD may face an oversupply at that rate. The Air Force believes a “bow wave” of satellite payloads will be ready for launch in the near future as satellites previously delayed are nearing delivery and will require launch vehicles at an unprecedented rate. Satellite delivery delays are often the primary cause of launch delays, and Air Force officials expect most satellites planned for launch in the next several years to launch on time. Many of these satellites are clones of previously-built satellites, so the satellite development risk (and thus risk of delayed delivery) is significantly reduced, according to Air Force officials, providing confidence that launches planned will launch on time.

Historically, according to the 2010 Launch Broad Area Review, only about two-thirds of planned launches are launched in any given year; in recent years that number has been closer to forty percent, as shown in the table below. If DOD purchases eight cores per year and does not use them all in that year, they may have to be stored. Table 2 shows launch rates for fiscal years 2005 through 2009.

**Table 2: Planned vs. Actual EELV Launches, Fiscal Years 2005-2009**

	FY 05	FY 06	FY 07	FY 08	FY 09
<b>Missions Planned at Beginning of Fiscal Year</b>					
Delta IV	6	7	4	5	5
Atlas V	3	4	6	9	7
<b>Total</b>	<b>9</b>	<b>11</b>	<b>10</b>	<b>14</b>	<b>12</b>
<b>Missions Launched by End of Fiscal Year</b>					
Delta IV	1	2	1	1	2
Atlas V	3	2	2	4	3
<b>Total</b>	<b>4</b>	<b>4</b>	<b>3</b>	<b>5</b>	<b>5</b>
<b>Percent of Planned Missions Actually Launched</b>					
	44%	36%	30%	36%	42%

Source: GAO analysis of Air Force data.

DCMA officials at the ULA Decatur production facility say that storing cores for a year or more would likely require retooling and retrograding, which would increase program costs. DOD may be able to use stored booster cores in the following year, but under the proposed five-year block buy, DOD will be committed to buying an additional eight in each year of the block buy term, potentially creating its own bow wave of cores produced, the use of which would continue to be pushed out to subsequent years. The number of stored cores and the length of time they need storing could accumulate if several years of underutilization pass. Though Air Force officials say they have no concerns about storing unused booster cores, DCMA technical officials expressed concerns over long-term storage of booster cores as they contain some limited life items that may have to be retested and possibly replaced if stored long term. They said the main consideration is the time required to bring the items up-to-date with relevant engineering; changes which cannot be made while the booster cores are stored. The new acquisition strategy will likely propose a term of five years for the first block buy, but none of the recent launch reports indicate that a five-year term is the optimum period in which to achieve the goals of the new acquisition strategy. In fact, officials at the EELV program office and ULA were at a loss to explain the rationale behind the five-year term, though recent launch studies assert a multiyear or long-term block buy would benefit the industrial base. Further, DOD has not conducted a detailed risk analysis using available knowledge of current planned launches for fiscal years 2013 to 2017—the time frame of the expected block buy—to determine the likelihood that

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planned launches will actually launch, and that the expected block buy of 40 booster cores will not exceed projected needs.

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### DOD criteria for new EELV-class launch vehicle providers are still in development

DOD plans to allow new companies to compete for EELV launches once they can prove their launch vehicles are reliable, but DOD has yet to finalize metrics that will allow these companies to demonstrate launch vehicle reliability. Competition to provide government launch services has historically been minimal in the EELV program; demand for launch vehicles is low, and the EELV program continues to award sole-source contracts to ULA. These contracts have precluded the need for new entrant eligibility criteria, but while ULA is currently the only U.S. company able to launch the full range of EELV-class<sup>16</sup> payloads, there are two other U.S. space launch companies that may be capable in the near future.<sup>17</sup> Representatives from these companies say that they need a clear set of criteria from DOD as they develop their launch vehicles, so they can be developed to meet mission assurance needs and compete for EELV launches. The development of such criteria could encourage additional launch companies to participate in the EELV program, thereby increasing competition. The subject of the March 2011 memorandum of understanding signed by the Air Force, NRO and NASA was the stabilization of the current EELV industrial base, while recognizing the need for future entrants, to ensure long-term, viable, assured access to space. The three agencies agreed to finalize criteria for new entrants to compete by July 31, 2011, but DOD officials indicate the effort to finalize the criteria is still in process. It is expected at this time that the new entrants' criteria will be issued separately from the new acquisition strategy.

Conflicting goals within DOD of preserving the current program versus expanding the launch provider pool for EELV may make it difficult for the program office to finalize criteria for new entrant eligibility, even though National Security Presidential Directive-40 outlined the need for commercial competition in EELV in 2004. Some DOD officials

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<sup>16</sup> EELV-class payloads range from 6,000 to 28,000 lbs to Geosynchronous Transfer Orbit. They are divided into intermediate (6,000-18,000 lbs to GTO), and heavy (18,000-28,000 lbs to GTO) classes. Medium class launches range from 2,500-6,000 lbs to GTO.

<sup>17</sup> The two space launch companies are Space Exploration Technologies, Inc. (also known as SpaceX), and Orbital Sciences Corporation.

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acknowledge competition offers potential benefits, but others believe that competing for EELV launches will endanger the program's stability and threaten its long history of launch successes. These officials would rather increase the number, reliability, and quality of ULA vehicles produced and launched, and believe that allowing competition with ULA could decrease ULA's business and potentially hurt the quality of its product, ultimately risking government satellites. On the other hand, with launch prices likely to continue increasing, and the emergence of potentially capable new entrants to the EELV market, some DOD officials believe that competition could incentivize ULA to find efficiencies and restrain prices while broadening the provider pool and bolstering U.S. access to space. The new PEO for Space Launch told us he believes competition will benefit the program, and intends to work with ULA and potential competitors to incentivize cost efficiencies while maintaining mission success. It is unclear whether the new EELV acquisition strategy will introduce specific measures to increase competition in the EELV program. Both DOD and ULA acknowledge that launch prices may increase substantially in the coming years.

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## Addressing Other Issues Could Benefit Future Launch Acquisitions

The studies we analyzed and our interviews with agency officials identified broader issues about the federal government's use of launch services that we believe should be addressed as DOD plans and implements its next EELV acquisition, as well as in any future acquisitions of launch services, particularly since these issues have the potential to reduce costs and assure future requirements can be met. For example

- Coordination of launch acquisitions across federal agencies—like the Air Force, NRO, and NASA—is limited, but recent launch studies suggest it could potentially benefit the government as a whole in the form of increased efficiencies and potential launch cost savings. These three agencies recently committed to more closely coordinate launch vehicle acquisition, but there is currently no strategy in place to implement this coordination.
- Planning is needed for technology development focused on the next generation of launch technologies, particularly with respect to engines, for which the U.S. is partially reliant on foreign suppliers.

It is not clear whether DOD will integrate issues that cut across the government into its upcoming EELV strategy, and officials indicate that quantifying mission assurance costs is not part of the current acquisition strategy development effort.



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Increased U.S. government coordination of launch acquisitions may yield efficiencies

Multiple government entities, including DOD, NRO, and NASA buy launch services each year from U.S. launch providers, but these agencies typically acquire launch services with minimal formal coordination, according to recent launch studies and DOD and NASA officials. The Secretary of the Air Force, Director of the NRO, and the Administrator of NASA recently signed an agreement formalizing their commitment to more closely coordinate launch vehicle acquisitions, but according to DOD and NASA officials, the details of how it will be implemented are still undecided.

The EELV Should Cost Review said increased coordination and information sharing between the Air Force, NRO, and NASA, for example, and within the Air Force itself, presented opportunities for cost savings by avoiding fees on items ULA buys for the program office (known as pass-through fees), and implementing process efficiencies in launch activities. According to the EELV Should Cost Review, ULA charges up to an 18 percent profit on top of engine prices and to act as a broker for the program office on commodities like propellants bought from other government agencies, like NASA and the Defense Logistics Agency—costs the program could avoid if it were to coordinate purchases directly from other agencies. The review also recommends that the EELV program office develop stronger relationships with other Air Force launch operations organizations so it can buy launch and range support directly from them and avoid the pass-through fees associated with buying through ULA. Some studies highlight opportunities to increase efficiency through interagency information sharing and coordination of launch mission assurance activities, like hardware pedigree reviews.<sup>18</sup>

Although launch acquisitions are not part of the launch scheduling process, increased coordination among agencies that buy launch services could also improve launch scheduling at the launch pads and ranges. Recent launch studies point to inefficient launch scheduling due in part to competing agency interests and reluctance to relinquish launch slots until it is too late to reassign them. This is problematic, because according to the 2010 Launch Broad Area Review, “launch slots are a limited and critical asset and should be treated as such.” Despite the widespread call for increased coordination in launch acquisitions in

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<sup>18</sup> Pedigree reviews are vehicle and component data packages to ensure that the subject articles have been manufactured and tested in accordance with approved processes.

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various launch studies and the acknowledged need for collaboration by launching agencies, according to EELV officials, the new EELV acquisition strategy may not present a strategy for facilitating greater agency coordination.

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**Technology development may be needed to inform the next generation of launch vehicles**

The EELV program currently relies on technology that dates back to the 1950s. While heritage technology is good from a launch vehicle maturity standpoint, less expensive materials and more advanced capability may be available. Also, the EELV program is dependent on Russian RD-180 engines for its Atlas line of launch vehicles, which according to the Launch Enterprise Transformation Study, is a significant concern for policymakers. Although the EELV program is in the sustainment phase of its lifecycle, and as such, receives minimal research and development funding, recent national space policy and launch studies point to a lack of investment in the future of the U.S. launch industry, and indicate there are several areas, including engines, where launch technology development may be needed.

- The 2010 National Space Policy of the United States of America recognizes a need to continue technology development as it directs the Secretary of Defense, with NASA, to sustain technology development for the next generation of launch;
- A 2007 Acquisition Decision Memorandum issued by the Office of the Under Secretary of Defense for Acquisition, Technology and Logistics directs the Air Force to continue to pursue research and development of a hydrocarbon engine to meet future space launch requirements; the 2010 Broad Area Review also indicates that developing a hydrocarbon engine could address U.S. reliance on a foreign engine;
- The Launch Enterprise Transformation Study found that domestic propulsion technology is lagging and suggests that to meet future spacelift capability demands, the U.S. should consider developing a new EELV-class engine; the study recommends establishing a full-scale engine development program;<sup>19</sup>
- The Resource Management Directive 700 study report recommended investing in next-generation of launch to facilitate lower cost, reliable EELV replacement when the program ends in 2030;

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<sup>19</sup> The report specifically advocates a liquid oxygen/hydrocarbon engine, as due to lower cost, better operability, and its significant advantages over other liquid propulsion systems.

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- A 2010 Air Force Scientific Advisory Board study determined that investment in future launch systems is needed, recommending evolving current EELV capabilities and investing in new vehicle concepts.

Several of the studies, and the 2010 NASA Authorization Act,<sup>20</sup> discuss developing reusable launch vehicles, which could also influence future acquisitions. A 2010 Air Force Science Advisory Board study on the future of Air Force launch systems also noted that while solid rocket motors would likely be part of future strategic systems, there is no ongoing technology development on them. It recommended the Air Force pursue science and technology development efforts for launch. While the 2011 Space Science and Technology Strategy—mandated by the 2010 National Defense Authorization Act—calls for the development of a national space science and technology strategy to guide development of space technologies and presents short- and long-term space access goals, it does not specify a direction for launch technology development.<sup>21</sup> Because technology development is not typically part of a program's acquisition strategy, it may not be included in the new EELV acquisition strategy. However, the future of U.S. launch depends in part on next-generation technology, and decision-makers could benefit from early insight into the path forward for launch.

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## Conclusions

The EELV program serves a vital mission of placing critical national security and civilian satellites in their required orbits. It is also on the brink of major changes. EELV is an important investment for the government as the program executes national security space launches, but recent contractor projections indicate significant price increases. DOD needs to ensure it is taking the time it needs to collect and assess sufficient information on which to base its new acquisition strategy. DOD is taking steps to gain knowledge on the best way forward for the program through ongoing data collection and recent EELV studies, but its focus on finalizing the new strategy by the end of this year may not allow for a full evaluation of the information it is still collecting. Gaining sufficient

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<sup>20</sup> National Aeronautics and Space Administration Authorization Act of 2010, Pub. L. No. 111–267, § 802(c).

<sup>21</sup> National Defense Authorization Act for Fiscal Year 2010, Pub. L. No. 111–84, § 911 (2009).

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knowledge to make sound decisions before committing to an expensive long-term block buy is essential to an acquisition of this magnitude. Considering that the leading proposal for a new acquisition strategy may commit the government to spending billions of dollars on a block buy covering at least 5 years, it is imperative that DOD continue to obtain and use all available information to make decisions in its long-term interests and in the interests of the American taxpayer.

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## Recommendations for Executive Action

To gain a better understanding of the condition of the U.S. space launch industrial base, facilitate fair and reasonable launch contract negotiations, ensure consistent grounds for evaluating launch providers, and identify the best path forward for U.S. space launch operations and technology development, we recommend the Secretary of Defense take the following seven actions.

- Conduct an independent assessment of the health of the U.S. launch industrial base, paying special attention to engine manufacturers,
- Reassess the block buy contract length given the additional knowledge DOD is gaining as it finalizes its new acquisition strategy,
- Work closely with NASA to ensure DOD has sufficient knowledge of NASA heavy-lift program decisions—given the potential bearing those decisions could have on EELV engine prices—to facilitate DOD’s ability to negotiate EELV launch contract prices that maximize the government’s investment,
- Refrain from waiving FAR requirements for contractor and subcontractor certified cost and pricing data as DOD finalizes its new EELV acquisition strategy,
- Ensure launch mission assurance activities are sufficient and not excessive, and identify ways to incentivize the prime contractor to implement efficiencies without affecting mission success as DOD develops a new contracting structure for the EELV program,
- Examine how broader launch issues, such as greater coordination across federal agencies, can be factored into future launch acquisitions to increase efficiencies and cost savings, and
- Develop a science and technology plan for improving and evolving launch technologies. This plan should link to the broader space science and technology plans mandated by the 2010 National Defense and NASA Authorization Acts.

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## Agency Comments and Our Evaluation

We provided a draft copy of this report to the Secretary of Defense for comment in May 2011. In written comments on the draft report, DOD concurred with one of our seven recommendations, partially concurred with four, and nonconcurred with two. In July 2011, following the formal agency comment period, DOD officials requested the opportunity to provide additional documentation, follow-up interviews, and various relevant DOD, contractor, and subcontractor briefings to us that they believed directly addressed some of the findings and recommendations identified in the draft report. We agreed to review the additional information, but because this information was provided to us after our review was completed, we did not fully evaluate or assess the data or documentation provided. Based on our review of the additional information from DOD and NASA, we included relevant information throughout the report as appropriate, revised the report title, and clarified four of the seven recommendations to reflect efforts currently underway at both agencies.

In a written response to the revised draft dated September 12, 2011, DOD concurred with six of our seven recommendations, and partially concurred with one. DOD partially concurred with our recommendation that the Secretary of Defense reassess the block buy contract length given the additional knowledge DOD is gaining as it finalizes its new EELV acquisition strategy. DOD indicated that it intends to use all the information being collected to develop an acquisition strategy for EELV, and will balance contractual decisions such as the quantity purchased and the length of the contract, with other factors such as price, operational requirements and the potential for new launch providers to compete.

DOD's written comments are reprinted in appendix II.

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As agreed with your office, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. At that time, we will send copies to the Secretary of Defense, the appropriate congressional committees and other interested parties. In addition, the report will be available at no charge on GAO's Web site at <http://www.gao.gov>.

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If you have any questions about this report, please contact me at (202) 512-4841 or [chaplainc@gao.gov](mailto:chaplainc@gao.gov). Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this letter. Key contributors to this report are provided in appendix III.

A handwritten signature in black ink, appearing to read 'C. Chaplain', with a stylized flourish at the end.

Cristina T. Chaplain  
Director  
Acquisition and Sourcing Management

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# Appendix I: Scope and Methodology

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To determine whether DOD has the knowledge it needs to develop a new Evolved Expendable Launch Vehicle (EELV) acquisition strategy, we reviewed and analyzed information contained in five recent DOD-sponsored launch studies including the 2010 Launch Broad Area and EELV Should Cost Reviews, Launch Enterprise Transformation and Resource Management Directive 700 Fiscal Year 2010 Launch studies, and the EELV Tiger Team study. We assessed the ULA-conducted 2009-2010 supplier survey used by the government to gauge the health of the U.S. industrial base by reviewing the survey questionnaire, comparing methods of administering the survey and obtaining responses with established survey writing guidance, comparing summary data to the questions asked, and interviewing and obtaining information and summary data from the surveyors.<sup>1</sup> DOD officials provided additional information on the acquisition strategy development effort during the report draft agency comment period, including briefings from three engine subcontractors they obtained as part of their assessment of the space launch industrial base in April 2010, but did not provide the briefings or results to us within the audit time frame. As a result, we were unable to evaluate the methods or conclusions drawn from these efforts as part of this review, though we incorporated relevant information as appropriate in the report that we obtained from these documents, and through multiple discussions with senior Air Force and DOD personnel from June to September 2011.

In reviewing the 2010 Launch Broad Area Review, we interviewed people who had indirect involvement in the report, and discussed the report's findings and methodology with them. In reviewing the 2010 EELV Should Cost Review, we discussed the report's methodology, findings, and data sources with the report's leader and several study participants. In reviewing the Resource Management Directive Study, we met with some of the study leaders and participants and discussed with them the study's methodology and findings. In reviewing the Tiger Team study, we interviewed DOD officials and received substantive oral briefings from the study co-leader and participants, but we did not receive copies of the briefings or supporting documentation with sufficient time to review them during the course of our work.

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<sup>1</sup> GAO, *Program Evaluation and Methodology Division: Developing and Using Questionnaires*, [GAO/PEMD-10.1.7](#) (Washington, D.C.: Oct. 1, 1993).

To identify other important launch issues with potential bearing on current and future government launch acquisitions, we reviewed the DOD launch studies listed above and interviewed study leaders or participants in three of the five studies; we analyzed historical launch data and expected launch vehicle demand; reviewed other relevant government and industry reports; interviewed DOD, NASA, and contractor officials; and reviewed information from NRO.

We interviewed officials in Washington, D.C., at the Offices of the Under Secretary of Defense for Acquisition, Technology and Logistics; and the Office of the Secretary of Defense, Cost Assessment and Program Evaluation. We also reviewed and analyzed documents from and interviewed officials at the Office of the Assistant Secretary of Defense for Networks and Information Integration; Office of the Assistant Secretary of the Air Force for Acquisitions; and at the Orbital Sciences Corporation. In addition, we reviewed and analyzed documents from and interviewed officials at Air Force Space Command; the Launch and Range Systems Directorate, Air Force Space and Missile Systems Center, Los Angeles Air Force Base, California; Defense Contract Audit Agency, Centennial, Colorado; Defense Contract Management Agency, Littleton, Colorado, and Decatur, Alabama; National Aeronautics and Space Administration, Washington, D.C. and Cape Canaveral Air Force Station, Florida; National Reconnaissance Office, The Aerospace Corporation, and Space Exploration Technologies, Hawthorne, California; National Security Space Office, Washington, D.C. and Fairfax, Virginia; and United Launch Alliance, Centennial, Colorado and Decatur, Alabama.



# Appendix II: Comments from the Department of Defense



NETWORKS AND INFORMATION  
INTEGRATION

## OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE

6000 DEFENSE PENTAGON  
WASHINGTON, D.C. 20301-6000

12 SEP 2011

Ms. Cristina Chaplain  
Director, Acquisition and Sourcing Management  
Government Accountability Office  
441 G Street, NW  
Washington, DC 20548

Dear Ms. Chaplain:

This is the Department of Defense (DoD) response to the GAO Draft Report GAO-11-641, "EVOLVED EXPENDABLE LAUNCH VEHICLE: DoD Needs to Ensure New Acquisition Strategy is Based on Sufficient Information," dated May 31, 2011 (GAO Code 120933). The Department offers the following response to the recommendations expressed in the GAO report.

**RECOMMENDATION 1:** The GAO recommends that the Secretary of Defense conduct an independent assessment of the health of the U.S. launch industrial base paying special attention to engine manufacturers.

**DoD RESPONSE:** The DoD concurs with this recommendation. The Department recently completed the Solid Rocket Motor Industrial Base study and is currently executing a study on liquid rocket engines which is expected to be completed in 2011. The Solid Rocket Motor Industrial Base study report is located at <http://www.acq.osd.mil/mibp/studies.shtml> under "studies." Furthermore, the DoD is conducting a sector-by-sector, tier-by-tier evaluation of the industrial base including not only space but other industrial sectors as well. This evaluation will provide a comprehensive understanding of not only the prime contractors but the subcontractors and suppliers that contribute vital components, subsystems, and services. Initial space sector results are expected by the end of 2011. All of these studies are led by the Office of the Under Secretary of Defense Acquisition, Technology and Logistics (USD(AT&L)), Manufacturing and Industrial Base Policy.

**RECOMMENDATION 2:** The GAO recommends that the Secretary of Defense reassess the block buy contract length given the additional knowledge DoD is gaining as it finalizes its new acquisition strategy.

**DoD RESPONSE:** The DoD partially concurs with this recommendation. The DoD will use all the information being collected to determine an appropriate, yet to be developed, acquisition strategy for Evolved Expendable Launch Vehicle (EELV). The decision on specific contractual quantity and period of commitment will be balanced among price, operational requirements, budget realities and the potential for new entrant competition.

RECOMMENDATION 3: The GAO recommends that the Secretary of Defense work closely with NASA to ensure DoD has sufficient knowledge of NASA heavy-lift program decisions- given the potential bearing those decisions could have on EELV engine prices- to facilitate DoD's ability to negotiate EELV launch contract prices that maximize the government's investment.

DoD RESPONSE: The DoD concurs with this recommendation and will continue to work with NASA to ensure full understanding of the potential bearing NASA program decisions may have on sustaining the launch industrial base.

RECOMMENDATION 4: The GAO recommends that the Secretary of Defense refrain from waiving Federal Acquisition Regulation (FAR) requirements for contractor and subcontractor certified cost and pricing data as DoD finalizes its new EELV acquisition strategy.

DoD RESPONSE: The DoD concurs and agrees that certified cost and pricing is an important aspect of confidence in the contractor's proposals and will refrain from waiving FAR requirements as appropriate. However, there are cases where it is impractical. For example, it is not likely the prime contractor or the DOD will be able to obtain certified cost or pricing data for the Atlas V RD-180 engines which are purchased from a Russian company.

RECOMMENDATION 5: The GAO recommends that the Secretary of Defense ensure launch mission assurance activities are sufficient and not excessive, and identify ways to incentivize the prime contractor to implement efficiencies without affecting mission success as DoD develops a new contracting structure for the EELV program.

DoD RESPONSE: The DoD concurs with this recommendation. The DoD has already taken steps to more effectively incentivize the contractor to gain efficiencies in launch capability by moving from a cost-plus award fee to a cost-plus incentive fee contract, where the contractor earns fee based on cost reductions below the negotiated target. The DoD will continue to look at other ways to incentivize efficiencies without affecting mission success.

RECOMMENDATION 6: The GAO recommends that the Secretary of Defense examine how broader launch issues, such as greater coordination across federal agencies, can be factored into future launch acquisitions to increase efficiencies and cost savings.

DoD RESPONSE: The DoD concurs with this recommendation. The Department continues to monitor and assess the overall domestic and international launch market and take into consideration trends and capabilities as they evolve.

RECOMMENDATION 7: The GAO recommends that the Secretary of Defense develop a science and technology plan for improving and evolving launch technologies. This plan should link to the broader space science and technology plans mandated by the 2010 National Defense and NASA Authorization Acts.

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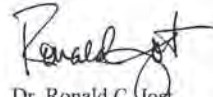
Appendix II: Comments from the Department  
of Defense

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DoD RESPONSE: The DoD concurs with this recommendation. A vibrant Science and Technology (S&T) plan is key to the long range technology investment for space access, and the Department is currently developing an S&T plan for utilizing new and improved concepts.

The Department appreciates the opportunity to respond to the report prior to publication. If there are any questions, please contact Ms. Ruth Moser, [ruth.moser@osd.mil](mailto:ruth.moser@osd.mil), 703-607-0401.

Sincerely,



Dr. Ronald C. Jost  
Deputy Assistant Secretary of Defense  
(C3, Space and Spectrum)

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# Appendix III: GAO Contact and Staff Acknowledgments

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## GAO Contact

Cristina T. Chaplain, (202) 512-4841 or chaplainc@gao.gov

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## Staff Acknowledgments

Key contributors to this report were Art Gallegos, Assistant Director; Claire Buck; Laura Hook; John Krump, Sigrid McGinty, Carol Petersen, and Bob Swierczek.

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