

July 2012

**EVOLVED  
EXPENDABLE  
LAUNCH VEHICLE**

**DOD Is Addressing  
Knowledge Gaps in Its  
New Acquisition  
Strategy**

This report was revised on August 13, 2012, to correct text regarding the space sector survey on page 10.



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Highlights of [GAO-12-822](#), a report to congressional committees

## Why GAO Did This Study

DOD plans to spend about \$19 billion to acquire launch services from fiscal year 2013 to fiscal year 2017, and total program costs through 2030 are expected to approach \$35 billion. The Evolved Expendable Launch Vehicle (EELV) program launches satellites for military, intelligence, civil, and commercial customers. In 2011, the Air Force created a Program Executive Officer for Space Launch position, responsible for completing a new EELV acquisition strategy. GAO reported that the new strategy needed to be based on sufficient information, and made seven recommendations to further this goal. DOD finalized a new EELV acquisition strategy in November 2011. In the 2012 National Defense Authorization Act, Congress required DOD to describe how it had implemented each GAO recommendation, and GAO to assess that information. This report provides that assessment.

GAO reviewed DOD's report and supporting information, program budgets, performance reports, and contracts. GAO examined recent defense industrial base studies, government audits of the prime contractor's business systems, independent engines cost assessments, and comparisons of historical and current launch manifests. GAO also interviewed or obtained perspectives from various launch officials and the prime contractor.

## What GAO Recommends

GAO is making no new recommendations in this report. DOD reviewed and concurs with this report.

View [GAO-12-822](#). For more information, contact Cristina Chaplain at (202) 512-4841 or [chaplainc@gao.gov](mailto:chaplainc@gao.gov).

July 2012

# EVOLVED EXPENDABLE LAUNCH VEHICLE

## DOD Is Addressing Knowledge Gaps in Its New Acquisition Strategy

### What GAO Found

The Department of Defense (DOD) has numerous efforts in progress to address the knowledge gaps and data deficiencies identified in the GAO report. Of the seven recommendations GAO made to the Secretary of Defense, two have been completely addressed. While two of GAO's recommendations have actions underway that are expected to be completed, two recommendations need more action for completion and one has had no action taken.

Recommendation	GAO assessment
Conduct an independent assessment of the health of the U.S. launch industrial base, paying special attention to engine manufacturers	Action underway; expected to complete
Reassess the block buy contract length given the additional knowledge DOD is gaining as it finalizes its new acquisition strategy	Action underway; expected to complete
Work closely with the National Aeronautics and Space Administration (NASA) to ensure DOD has sufficient knowledge of NASA heavy-lift program decisions—given the potential bearing those decisions could have on Evolved Expendable Launch Vehicle (EELV) engine prices—to facilitate DOD's ability to negotiate EELV launch contract prices that maximize the government's investment	Complete
Refrain from waiving Federal Acquisition Regulation requirements for contractor and subcontractor certified cost and pricing data as DOD finalizes its new EELV acquisition strategy	Complete
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	Some action taken; more action needed
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	Some action taken; more action needed
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	No action taken

Source: GAO assessment of DOD actions to address recommendations in [GAO-11-641](#).

Since GAO's 2011 report, DOD has completed or obtained independent cost estimates for two Evolved Expendable Launch Vehicle engines and completed a study of the liquid rocket engine industrial base. Officials from DOD, the National Aeronautics and Space Administration, and the National Reconnaissance Office have initiated several assessments to obtain needed information, and have worked closely to finalize new launch provider certification criteria for national security space launches. Conversely, more action is needed to ensure that launch mission assurance activities are not excessive, to identify opportunities to leverage the government's buying power through increased efficiencies in launch acquisitions, and to strategically address longer-term technology investments. Some information DOD is gathering could set the stage for longer-term strategic planning for the program, especially in critical launch technology research and development decisions. Investing in a longer-term perspective for launch acquisitions is important to fully leverage the government's buying power and maintain a healthy industrial base.

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### Abbreviations

DACO	Divisional Administrative Contracting Officer
DCAA	Defense Contract Audit Agency
DCMA	Defense Contract Management Agency
DFARS	Defense Federal Acquisition Regulation Supplement
DOD	Department of Defense
EELV	Evolved Expendable Launch Vehicle
FAR	Federal Acquisition Regulation
FTC	Federal Trade Commission
NASA	National Aeronautics and Space Administration
NDAA	National Defense Authorization Act
NRO	National Reconnaissance Office
OSD	Office of the Secretary of Defense
PEO	Program Executive Officer
SLS	Space Launch System
ULA	United Launch Alliance
USD(AT&L)	Under Secretary of Defense for Acquisition, Technology, and Logistics

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United States Government Accountability Office  
Washington, DC 20548

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July 26, 2012

### Congressional Committees

The Department of Defense's (DOD) 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. DOD plans to spend about \$19 billion to acquire launch services from fiscal year 2013 to fiscal year 2017, and total program costs through 2030 are expected to approach \$35 billion.<sup>1</sup> Following significant increases in estimates for launch prices, in 2009 the Commander of Air Force Space Command and the Director of the National Reconnaissance Office (NRO) determined that a new EELV acquisition strategy needed to be developed. Several efforts began to study the best way forward, and in March 2011, the Secretary of the Air Force created a new executive position, the Program Executive Officer (PEO) for Space Launch, who is responsible for, among other things, spearheading the effort to finalize the new EELV acquisition strategy. We reported in September 2011 that DOD needed to ensure the new acquisition strategy was based on sufficient information, and we made seven recommendations to the Secretary of Defense to assist in furthering this goal.<sup>2</sup> DOD generally concurred with our recommendations and its new EELV acquisition strategy was finalized in November 2011. Following our review, the Congress included a requirement in the National Defense Authorization Act (NDAA) for Fiscal Year 2012 that DOD report to congressional committees a description of how it implemented each recommendation contained in our report, or how it otherwise addressed the deficiencies we cited.<sup>3</sup> The fiscal year 2012 NDAA also mandated that GAO provide an assessment to congressional committees of the information contained in DOD's response.

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<sup>1</sup>This amount includes spending for launch services the DOD will acquire for the National Reconnaissance Office.

<sup>2</sup>GAO, *Evolved Expendable Launch Vehicle: DOD Needs to Ensure New Acquisition Strategy Is Based on Sufficient Information*, [GAO-11-641](#) (Washington, D.C.: Sept. 15, 2011).

<sup>3</sup>National Defense Authorization Act for Fiscal Year 2012, Pub. L No 112-81, §839 (2011).

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To fulfill this mandate, we reviewed DOD's report to the Congress and supporting information, including documentation of efforts underway to obtain sufficient information to negotiate EELV contracts, recent defense industrial base studies, government evaluations of contractor business systems, program budget and performance documents, independent cost assessments for two EELV engines, and compared historical and current launch manifests. We interviewed or obtained perspectives from launch officials in various military and civilian government agencies, and the prime contractor.

To assess the information contained in the DOD report and determine if the recommended action is complete or underway, we assigned one of the following four status assessments to each of the recommendations.

1. **Complete.** The recommended action item has been accomplished.
2. **Action underway; expected to complete.** Steps have been taken to complete the recommended action item, and the item is expected to be completed in the near term.
3. **Some action taken; more action needed.** Steps have been taken to complete the recommended action item, but more action is needed.
4. **No action taken.** No action has been taken to address the recommended action item, and the item is not expected to be completed.

We conducted this performance audit from May 2012 to July 2012 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. For more information on our scope and methods, see 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

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systems. Each family of launch vehicles consists of medium-, intermediate-, and heavy-lift vehicles.<sup>4</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 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>5</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.

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## Previous 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 each—Launch Capability and Launch Services—to Boeing and Lockheed Martin, the two launch service providers. The EELV Launch Capability cost-plus award fee contract was primarily for launch infrastructure (such as launch pads and ranges) and labor, while the EELV Launch Services firm-fixed price contract with a mission success incentive provision, was for launch services, including vehicle production.

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<sup>4</sup>The Atlas V heavy lift vehicle is neither fully designed nor built.

<sup>5</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).

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The contracts were negotiated under FAR Part 15, which governs negotiated acquisitions. In addition, FAR Part 15 allows the contracting officer to obtain certified cost or pricing data from the contractor. Certified cost or pricing data is meant to ensure that the government has the data it needs to effectively negotiate a fair and reasonable price with the contractor. The government can waive the requirement for certified data in exceptional cases. As part of the negotiations process for the 2005 EELV contracts, the government waived its requirement for certified cost or pricing data, and 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>6</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 \$650,000 or more, representing over \$1.4 billion total. The waiver states that Boeing purchased the materials via commercial item contracts and thus did not require the data of its

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<sup>6</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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subcontractors, and that further, the prices Boeing obtained in its large-quantity purchase of subcontractor hardware warranted waiving the data.

In 2007, DOD decided to advance the EELV program from the production phase to the sustainment phase.<sup>7</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>8</sup> Today, ULA's customers are mostly DOD, NRO, and the National Aeronautics and Space Administration (NASA). NASA negotiates its own contracts with ULA. Commercial customers have comprised less than 20 percent of ULA business since operations began in 2006.

According to DOD officials, in late 2009, projected increases in EELV program prices 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 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 remain a cornerstone of the new acquisition strategy.

Under this arrangement, DOD awarded a contract for each launch vehicle as needed, with a separate contract to cover the ULA's overhead and facilities cost. DOD did not guarantee a specific number of launch vehicle orders per year to the contractor, and the quantity of launch vehicles needed fluctuated. The Tiger Team and other DOD launch studies have raised concerns regarding the unpredictable orders and low demand for launch vehicle components. Both DOD and ULA officials say this

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<sup>7</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>8</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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condition is contributing to rising launch costs, particularly in the area of engines, a primary launch cost driver. According to DOD officials, the new EELV acquisition strategy was developed in part to address these concerns, and specifically to stabilize the industrial base and to keep costs from escalating more. The new EELV acquisition strategy outlines an approach to obtain prices from ULA for launch vehicles—or more specifically prices for common booster cores—in a range of quantities over varying contract periods.<sup>9</sup> The pricing proposal from ULA will inform DOD’s EELV quantity commitment and block buy contract period. The block buy is expected to commit the Air Force and NRO to buy a block of launch vehicles each year, and commit to doing so for a specific number of years, instead of buying one launch vehicle at a time as was done under the previous acquisition approach. The block buy is subject to Congress funding the procurement each year. DOD officials told us that the department is still obtaining a significant amount of data and information to analyze before locking into a specific booster core quantity or contract length through upcoming EELV block buy contract negotiations.

Finally, although no certified U.S. commercial launch capability for EELV-class payloads other than Atlas V and Delta IV exists at this time, 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. We reported in September that such competition could incentivize ULA pricing and efficiencies, potentially yielding cost savings to the government.

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<sup>9</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.

## DOD Is Taking Action to Address Deficiencies Identified in Our September 2011 Report

In general, DOD has been responsive to our recommendations, and efforts to address knowledge gaps and data deficiencies identified in our report should position DOD to make informed decisions on how to proceed with the EELV program. Of the seven recommendations made, six are completed or actions are underway for completion (see table 1 for summary of recommendations and status). DOD officials indicate that efforts currently planned or underway will yield sufficient information for Air Force contracting officials to negotiate and award EELV contracts supporting the new acquisition strategy. Officials say they intend to award a single-year “bridge” contract for launch capabilities to ensure no disruption to missions in the launch manifest occurs while they evaluate the information prior to a block buy contract award.

**Table 1: Status of DOD Action to Address Recommendations from GAO-11-641**

	<b>Recommendation</b>	<b>GAO assessment</b>
1	Conduct an independent assessment of the health of the U.S. launch industrial base, paying special attention to engine manufacturers	Action underway; expected to complete
2	Reassess the block buy contract length given the additional knowledge DOD is gaining as it finalizes its new acquisition strategy	Action underway; expected to complete
3	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	Complete
4	Refrain from waiving FAR requirements for contractor and subcontractor certified cost and pricing data as DOD finalizes its new EELV acquisition strategy	Complete
5	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	Some action taken; more action needed
6	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	Some action taken; more action needed
7	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	No action taken

Source: GAO assessment of DOD actions to address recommendations in GAO-11-641.

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Some of the activities DOD is undertaking to inform contract negotiations and award were underway at the time of our last report, and some have commenced since. We assessed the actions DOD describes in its report to the Congress, and in some cases identified other activities DOD is undertaking to obtain and incorporate needed information into upcoming contract negotiations and award.

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**Recommendation 1:  
Conduct an Independent  
Assessment of the Health  
of the U.S. Launch  
Industrial Base, Paying  
Special Attention to  
Engine Manufacturers**

We made this recommendation because the development of the new EELV acquisition strategy was predicated in part on the need to stabilize a vulnerable launch industrial base, yet at the time of our review, we found that DOD lacked reliable information on the health of the industrial base, including the need for stabilization. DOD also lacked independent analysis demonstrating the effect an EELV block buy would have in stabilizing the industrial base. Additionally, the predicted rise in engine prices was a primary driver of expected increases in launch vehicle costs, and DOD efforts to gain insight into the price increases were still in the early stages.

**Action underway; expected to complete.** Since our report, DOD has completed or obtained independent cost estimates for two EELV engines, completed a study of the liquid rocket engine industrial base, and begun efforts to develop a national rocket propulsion strategy with NASA as mandated by the Congress in the fiscal year 2012 NDAA. DOD is also participating in an in-depth assessment of the space sector industrial base, but the results from this effort are not expected to inform upcoming EELV contract negotiations and award.

The NRO Cost Analysis Improvement Group conducted an independent cost assessment of the RL-10 upper stage engine, a version of which is used on both the Atlas V and Delta IV launch vehicles. The assessment examined production costs of each engine variant, existing inventory, and engine price estimates for the anticipated block buy of EELVs, among other things. Additionally, the Air Force Cost Analysis Agency conducted a cost assessment of the main engine used on Delta IV launch vehicles, known as the RS-68, that analyzed estimated and actual labor hours, subcontractor materials, and overhead rates. Both assessments provide some explanation for the increased engine price estimates in recent years, and contain detailed information on pricing that EELV contracting officials told us they can use to assure reasonable prices in upcoming EELV contract negotiations.

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A December 2011 DOD report on the liquid rocket engine industrial base highlights recent NASA program changes that have contributed to an unstable supplier base. The report, issued by the Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics USD(AT&L), Manufacturing and Industrial Base Policy office, indicates that DOD must sustain this base to meet national security space launch requirements, and that all of the liquid rocket engines currently supporting these requirements are associated with the EELV program. The report provides evidence of instability in the supplier base and highlights the need for one of the expected benefits of an EELV block buy—a predictable and steady rate of production. But it also concludes that production activities alone will not be sufficient to protect critical skills, and that research and development programs are required to sustain the industry.<sup>10</sup>

A March 2011 DOD report of the solid rocket motor industrial base reached similar conclusions, and supporting documentation indicates that DOD investment in research and development is inadequate. Both reports also hold industry accountable for aligning their production capacity with current and future market demand. We spoke with officials involved in these and other defense industrial base studies, who asserted that an EELV block buy could ameliorate some of the negative impact that the Space Shuttle program retirement had on the propulsion industrial base by “leveling out” government quantity orders, and providing suppliers with a predictable rate of production for the duration of an EELV block buy contract.

In its fiscal year 2012 NDAA, the Congress indicated its belief that the sustainment of the liquid rocket engine and solid rocket motor industrial bases is a national challenge spanning multiple departments, and established a requirement for a national rocket propulsion strategy.<sup>11</sup> The strategy, to be transmitted by the President, is to include details on the effects of NASA program cancellations on the liquid rocket engine and solid rocket motor industrial bases, potential mitigation plans, current and

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<sup>10</sup>According to the report, NASA’s Space Shuttle program has been the primary stabilizing factor for liquid rocket engine industrial capabilities for decades, and its recent retirement has put the industry in jeopardy.

<sup>11</sup>National Defense Authorization Act for Fiscal Year 2012, Pub. L. No. 112-81, § 1095 (2011).

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future missile requirements and options and recommendations for interagency coordination to strengthen both supplier bases. According to DOD and NASA officials, this effort is early in development.

In commenting on our September 2011 report, DOD indicated that USD(AT&L) had begun a tier-by-tier evaluation of the space sector and other industrial sectors, that would provide a "comprehensive understanding of not only the prime contractors but the subcontractors and suppliers" of vital components, subsystems, and services. Since that time, the space sector effort has evolved into a separate, parallel, and significantly larger effort, and its end-date is currently to be determined. According to Air Force officials, the partnership with Department of Commerce on this effort arose in part because the Department of Commerce has authority to compel participation and disclosure of data that the DOD does not have. The larger space sector evaluation is being conducted by the Department of Commerce, Bureau of Industry and Security, in cooperation with the Air Force, NRO, and NASA through a comprehensive survey intended to provide a greater understanding of the industrial supply chain that supports the development, production, and sustainment of products and services across the defense, intelligence community, civil and commercial space sectors.<sup>12</sup> More than nine thousand surveys are expected to be sent to space sector companies in an effort to provide the U.S. Government with a baseline of the health and status of the space sector industrial base. Because the effort is still in the early stages of development and implementation, results from this survey are not expected to inform upcoming EELV contract negotiations or award.

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<sup>12</sup>The Department of Commerce, Bureau of Industry and Security, informed all Government space-related offices of the survey in Memorandum for All Government Space-Related Offices, Subject: Survey of the U.S. Space Industrial Base, dated September 13, 2011.

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**Recommendation 2:  
Reassess the Block Buy  
Contract Length Given the  
Additional Knowledge  
DOD Is Gaining as It  
Finalizes Its New  
Acquisition Strategy**

We reported in September 2011 that DOD was gathering data to finalize its EELV acquisition strategy, but that it may not allow sufficient time to leverage the knowledge gained before finalizing the new strategy. The strategy was finalized in November 2011 and states that the program leadership “believes it is essential to have more fidelity in the EELV pricing strategy before making a long term contractual commitment.” Despite indications in DOD’s report to the Congress that the EELV block buy contract will cover fiscal years 2013-2017, DOD officials emphasized to us that no decision on the duration and quantity of the government block buy commitment had been made, or would be until DOD fully analyzes the information it plans to obtain. DOD officials indicate that DOD intends to award a single-year bridge contract in fiscal year 2013 for EELV launch capabilities to ensure DOD has sufficient time prior to EELV block buy contract negotiations and award to incorporate the information generated by this approach.

**Action underway; expected to complete.** DOD has initiated an approach to obtain critical information prior to negotiating and awarding a new EELV block buy contract. The approach addresses deficiencies identified in our report, including both the lack of a detailed risk analysis of planned launches using DOD satellite program knowledge, and data supporting contractor and subcontractor prices. Additionally, DOD has assembled an independent team of retired military personnel with experience in space launch, to assess the predicted production, processing and launch capacity of potential new launch providers who may ultimately compete with ULA for EELV-class launches. Preliminary results of all three assessments are expected later this summer.

When we reported last, DOD had not assessed whether the satellites planned for launch during fiscal years 2013-2017 would proceed as scheduled. Without a confidence assessment of the planned launches, we pointed out that DOD did not have a clear picture of the likely number of launch vehicles it would need for that time period. We also noted that if actual DOD launch rates followed historical ones, DOD could find itself with a significant oversupply of launch vehicles, potentially requiring storage, retest, and retooling. According to DOD officials, the Air Force’s Space and Missile Systems Center is assessing the confidence associated with each of the satellites planned for launch during the fiscal year 2013-2017 time frame that will inform the likely number of launch

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vehicles needed for that period of time.<sup>13</sup> DOD launch officials indicate that the results of the confidence assessment will be weighed in determining the terms of the EELV block buy contracts.

Another deficiency we identified in our last report was the lack of cost or pricing data to support EELV prime contractor and subcontractor proposals. For over a decade, EELV contracting officials have been unable to access subcontractor cost or pricing data for hardware used on Delta IV booster cores, and DOD contract auditors have consistently found ULA proposals inadequate as a basis to negotiate contracts. To address the lack of cost or pricing data, DOD is planning to conduct an in-depth cost analysis of proposals from ULA and its subcontractors prior to EELV contract negotiations and award. In cases where no data exists, DOD officials indicate they intend to develop government estimates based on commercial products and historical pricing trends. Most significant to EELV contract negotiations may be an in-depth government analysis of ULA and subcontractor pricing data, some analysis of which is currently underway in advance of ULA's certified pricing proposal submission.

In its certified pricing proposal expected later this summer, ULA will present price proposals for its Atlas V and Delta IV booster cores to cover different launch quantities across several contract lengths. DOD officials indicate they will attempt to obtain subcontractor materials and labor pool costs to support an in-depth, full evaluation of the pricing proposal submitted by ULA prior to contract negotiations and award. According to DOD and ULA officials, some of the data requests are already underway. The PEO for Space Launch indicates that these evaluations will undergo peer review by senior pricing officials in the Office of the Secretary of Defense prior to contract award.

Another assessment that will take place prior to EELV contract award is an evaluation of the potential production capability and technology development status of a new launch provider, and potential competitor of ULA. DOD has authorized an assessment of a launch vehicle provider

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<sup>13</sup>According to Air Force officials, the satellite confidence assessment will be based on information from individual satellite program offices and contractors relating to the development status, cost increases, schedule delays, and overall readiness to meet planned launch dates, for each satellite currently planned for launch between fiscal years 2013 and 2017.

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who may in the future be certified by the Air Force to compete with ULA for EELV-class missions. The assessment is being conducted by retired Air Force personnel with launch expertise. The results of this assessment are expected to be finalized by the end of the fiscal year. DOD officials stress that competition for national security space launches is a priority, and recognize that the results of this assessment could inform strategic planning for the EELV program. Gaining an understanding of the potential production capacity and development timeframes of emerging competitors to ULA can contribute to informed decisions as DOD evaluates and negotiates sole-source proposals for the upcoming EELV block buy.

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**Recommendation 3: Work Closely with NASA to Ensure DOD Has Sufficient Knowledge of NASA Heavy-Lift Program Decisions**

At the time of our report, NASA had not finalized the design of its heavy-lift Space Launch System (SLS), which could have potentially included one of the same engines currently used on EELVs. DOD cost evaluators noted that the decision to use the same engine could significantly lower the price of that engine to DOD, as infrastructure and labor costs would likely have been shared across both agencies. Accordingly, knowledge of NASA's design plans could have better positioned DOD to negotiate EELV contracts.

**Complete.** Since our report last September, DOD has worked with NASA to keep apprised of SLS heavy-lift decisions that could have bearing on EELV contract negotiations, leverage knowledge across agencies, and coordinate some limited technology development, according to officials at both agencies. According to NASA officials, NASA finalized design plans for its SLS heavy-lift launch vehicle late last year and provided a briefing to DOD summarizing its decisions. The NASA SLS vehicle will not use the RS-68 engine that is currently used on EELVs, and will instead use an RS-25D as its main engine—this was also the Space Shuttle main engine—and a newer J-2X engine for the upper stage engine. NASA will use the RS-25Ds already in NASA's inventory from the Space Shuttle program, which officials say provided the earliest path at the lowest cost for developing a heavy lift capability, as using the RS-68 engine would have required design modification and added development cost. DOD reported to the Congress that the use of the RS-25 and J-2X engines in the SLS program will likely have a positive impact on the EELV supplier business base, possibly resulting in lower overhead rates to DOD, the NRO, and NASA for EELVs. NASA officials added that while the supplier base for the RS-68 and RS-25 production lines are not identical, the manufacturer of both engines is the same, and plans to bolster its supplier base by maximizing commonality in the supply chain for both

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engines. In addition to discussing SLS design and development progress, launch officials at both agencies told us they meet quarterly to share knowledge resulting from launch acquisitions and operations, new entrant certification, and space industrial base studies.

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**Recommendation 4:  
Refrain from Waiving FAR  
Requirements for  
Contractor and  
Subcontractor Certified  
Cost and Pricing Data as  
DOD Finalizes Its New  
EELV Acquisition Strategy**

On May 2, 2007, the Air Force waived the requirement for Boeing to provide certified cost or pricing data for a significant amount of hardware associated with the production contract. The hardware is still being used, and the waiver, while officials believe it afforded DOD a reduced price, has limited government insight into cost or pricing data on a large lot of launch vehicle hardware, including engines, purchased at that time. The lack of certified cost or pricing data for this hardware has contributed to years of Defense Contract Audit Agency (DCAA) reports that consistently find ULA proposals inadequate for government evaluation and contract negotiation. Given that the waiver limited government insight into the reasonableness of launch vehicle prices, we recommended that DOD refrain from waiving such requirements under its new acquisition strategy and subsequent EELV block buy.

**Complete.** DOD indicates it has no intention of waiving FAR requirements for certified cost or pricing data in implementing the EELV acquisition strategy. According to DOD officials, a government cost assessment team plans to obtain and analyze a sample of the missing subcontractor cost or pricing data. The team will also assess prices for ULA's existing launch vehicle inventory intended for use under the upcoming block buy—DOD estimates the excess inventory values between \$260-300 million. DCAA will be involved in reviewing contractor and subcontractor proposals and cost or pricing data, and though DCAA officials expressed concern that they may not have time to do so prior to contract award, DOD officials indicate DOD will not award new EELV contracts prior to DCAA evaluation of these proposals. ULA business systems determine the output or cost data which goes into proposed contracts and provides a reasonable basis for the government to negotiate a contract deal. DCAA audits of these systems may still find deficiencies.

In addition to insufficient cost or pricing data, our previous report highlighted DCAA findings that some ULA business systems were inadequate or immature. We made no recommendations related to the business systems, as audits were planned or underway at the time of our last report. Both DCAA and the Defense Contract Management Agency (DCMA) have continued to evaluate ULA's six business systems and

subsystems to determine their compliance with the Defense Federal Acquisition Regulation Supplement (DFARS). If the audits result in findings of significant deficiencies that rise to the level of a material weakness in the system, DCAA would report those deficiencies as potentially noncompliant with the business system criteria. See table 2 for the status of ULA business systems evaluations as of July 2012. Following each evaluation, and in some cases, corrective actions by ULA, the DCMA Divisional Administrative Contract Officer (DACO) will make a final determination of the adequacy or compliance of the system.

**Table 2: Summary of ULA Business System Evaluations**

Business system	Lead agency	DACO determination	Status of evaluation
Accounting	DCAA	Not evaluated, final determination expected September 2012	Final DCAA audit report February 2012 identified 10 DFARS noncompliances out of 18
Estimating	DCAA	Not evaluated, final determination date unknown	Final DCAA audit report expected August 2012
Earned Value Management	DCMA	Approved (initial), final determination date unknown	DCMA validation review April 2012 identified 8 high-risk deficiencies; ULA provided its response on June 4, 2012
Material Management & Accounting	DCAA	Not evaluated, final determination date unknown	Expected start date November 2012
Property Control	DCMA	Approved	February 2012
Purchasing	DCMA	Approved	September 2011

Source: GAO analysis of DCAA and DCMA data.

**Recommendation 5:  
Ensure Launch Mission Assurance Activities Are Sufficient and Not Excessive, and Identify Ways to Incentivize the Prime Contractor**

We reported in September 2011 that DOD has little insight into the costs, adequacy or excess of its mission assurance activities. Industry and DOD studies describe launch mission assurance as activities undertaken throughout the lifecycle of a launch vehicle development program and through launch to assure success and safety. DOD officials maintained at the time of our last report that mission assurance costs may not be severable from the many launch activities in which they are integrated, and that the level of effort required to quantify them would likely be outweighed by any cost savings identified in the process.

**Some action taken; more action needed.** DOD restructured the EELV Launch Capability contract from a cost-plus award fee-, to a cost-plus incentive fee contract, to incentivize ULA to find efficiencies and reduce

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costs while maintaining mission assurance.<sup>14</sup> This change affords ULA flexibility in determining the areas in which efficiencies can be gained without being overly prescriptive. Additionally, Air Force officials recently conducted a comprehensive evaluation of missions in the launch manifest with an eye toward reducing redundant steps in the independent launch verification matrix.<sup>15</sup> Air Force officials said that while the verification activities for each mission have always been tailored on a case-by-case basis at the start of a launch vehicle acquisition, the current missions in the launch manifest represent a unique opportunity to revisit the matrix and identify potential efficiencies because the current launch manifest contains more second-, and third-flight missions, or re-flights, than it has in decades. The “re-flight era,” as some officials called it, presented Air Force officials with an opportunity to revisit the activities typically undertaken prior to a first-flight launch, and effect the suspension of redundancies.

Independent launch verification is only a small percentage of overall launch vehicle mission assurance activities, however, and most mission assurance activities remain undefined and unquantified. DOD officials are working to develop standards for potential new launch providers, but actions are still needed to address defining mission assurance requirements. As we previously reported, defining mission assurance requirements for national security space launches is important as new entrants emerge who will have to meet and account for defined mission assurance requirements to compete with ULA for EELV-class launches.

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<sup>14</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.

<sup>15</sup>The Launch Verification Matrix is a tool used for tracking closure of mission assurance activities, reviews and analyses related to mission assurance.

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**Recommendation 6:  
Examine How Broader  
Launch Issues, Such as  
Greater Coordination  
across Federal Agencies,  
Can Increase Efficiencies  
and Cost Savings.**

When we last reported on EELV, the Secretary of the Air Force, Director of the NRO, and the Administrator of NASA had signed an agreement formalizing their commitment to more closely coordinate launch vehicle acquisitions, but implementation details were largely undecided and the certification guide had yet to be finalized. Additionally, fragmented launch acquisitions contributed to pass-through fees levied on government launch agencies. For example, according to a 2010 Air Force study, 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. These are the costs the program could avoid if it were to coordinate purchases directly from other agencies.

**Some action taken; more action needed.** Since our report, significant formal and ad hoc coordination has taken place across the DOD, NASA, and NRO, in areas such as new entrant certification and launch technology development, but officials at DOD and NASA indicate actions to implement broader efficiencies in launch acquisitions are not yet planned.

DOD finalized its certification guide for new launch providers in October 2011 following much collaboration with NASA and NRO. In addition to coordinating the final certification guide, officials at DOD, NASA and NRO meet regularly to discuss launch issues, such as vehicle design, technology development and the space industrial base. The Commander, Air Force Space Command, and the NASA Administrator also hold quarterly summit meetings, and DOD and NASA program-level launch officials at each agency hold monthly and ad hoc meetings to discuss upcoming launches and to share lessons learned.

In December 2011, NASA, announced establishment of four expert teams as part of the National Institute for Rocket Propulsion Systems. These teams are comprised of specialists whose purpose is to tackle a series of challenges facing the rocket propulsion industrial base, which is at risk to industry downsizing and a shortage of new propulsion programs. The teams, consisting of propulsion experts representing government, industry, and academia lead by NASA's Marshall Space Flight Center, have been created to develop action plans addressing challenges identified including fostering access to facilities and expertise and developing and implementing an integrated science and technology plan for propulsions systems, among others.

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DOD and NASA also continue to work together on launch technology development efforts, including several new and ongoing efforts to upgrade existing engines and develop alternate engines. DOD and NASA are collaborating for example, on upperstage engine technology research and hydrocarbon booster engine projects jointly managed and executed by the Air Force Research Laboratory and NASA as part of the Integrated High-Payoff Rocket Propulsion Technology program.<sup>16</sup> Additionally, both agencies contribute to NASA's Ground Systems Development and Operations program, a modernization effort to develop NASA ground systems and refurbish infrastructure for the next generation of rockets.

The collaboration among the three agencies on the new entrant certification guide represents a step toward establishing greater coordination in governmentwide launch acquisitions, but, according to officials, DOD and NASA plan to continue to acquire launch vehicles on separate contracts. We have previously reported that space launch acquisition processes for NASA and DOD are not formally coordinated, duplicate one another, and may not fully leverage the government's investment because the government is not acting as a single buyer.<sup>17</sup> And though communication takes place among the agencies, officials at DOD and NASA indicate little action has been taken to address broader launch issues governmentwide to leverage government buying power or coordinate launch and range acquisitions.

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### Recommendation 7: Develop a Science and Technology Plan for Improving and Evolving Launch Technologies

We previously reported that national space policy and varied launch studies point to a lack of investment in the future of the U.S. launch industry, and we noted that 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.

**No action taken.** Since our report, no launch technology plan has been developed. DOD investment in future launch technologies remains minimal, and DOD officials indicate developing a science and technology

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<sup>16</sup>The Integrated High Payoff Rocket Propulsion Technology Program is a structured government and industry program to improve U.S. rocket propulsion systems.

<sup>17</sup>GAO, 2012 Annual Report: *Opportunities to Reduce Duplication, Overlap and Fragmentation, Achieve Savings, and Enhance Revenue*, [GAO-12-342SP](#) (Washington, D.C.: Feb. 28, 2012).

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plan is not a high priority. DOD officials noted that in the current budget climate, increased investment in launch technology research and development is unlikely. In some cases, technology efforts have been underway for 5 years or more, but receive minimal funding. Less than \$8 million of the roughly \$1.7 billion in the EELV budget for fiscal year 2013 is dedicated to launch technology research and development, with no funding budgeted after 2014. However, national policy and EELV and industrial base sustainment plans highlight the need for significant technology development and predict dire consequences if the current lack of development is sustained.

In June 2011, the EELV program provided a sustainment plan to the Congress which identified required technology and investments to maintain the program's current capability.<sup>18</sup> The investments identified in the plan include \$80 million for the RL10C engine conversion activities, \$500 million in non-recurring costs over 5 years to develop a new or evolved upper stage engine, and \$100 million each year to sustain and replace avionics, ordnance, ground command, control, and communications, and launch infrastructure. The plan states that due to the limited demand for some types of materials and components for propulsion, avionics, and ordnance systems, which can include complex materials, electronics, and computers, special emphasis must be placed on designing and qualifying new designs to mitigate obsolescence issues. Many of the parts across the systems either have designs that have become obsolete or are no longer produced. For example, to sustain some EELV mission-critical components, the Air Force is drafting a time phased plan to (1) identify obsolescence issues, (2) consolidate suppliers and components to improve the health of the supplier base by ordering larger quantities of one version versus smaller quantities of multiple versions, and (3) identify opportunities to insert new technology and design common systems, thereby increasing system reliability and interoperability.

National policies, such as the National Security Presidential Directive-40, place a requirement on the government to sustain the EELV program and preserve its systems that provide access to space for the foreseeable

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<sup>18</sup>The House of Representatives Committee on Appropriations directed the Secretary of the Air Force, in consultation with the Director of the National Reconnaissance Office, to submit an EELV sustainment plan to the congressional defense committees by January 4, 2010. H. R. Rep. No. 111-230, at 277 (2009).

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future, and the 2010 National Space Policy recognizes a need to continue technology development directing the Secretary of Defense, with NASA, to sustain technology development for the next generation of launch.<sup>19</sup> The December 2011 liquid rocket engine report indicates the current lack of design opportunities creates a challenge for industry to sustain a skilled workforce for future liquid rocket engine development programs, adding that a loss of critical skills and resources to continue development would be detrimental to mission success.

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## Conclusions

DOD is taking steps to address deficiencies we identified in our September 2011 report and obtain the knowledge it needs to negotiate and award contracts supporting its new EELV acquisition strategy. We are encouraged by the wide range of actions taken and underway, although the quality of data to be yielded through these various activities is to be determined. Much of the value of the information obtained will depend on its quality and the extent to which DOD makes use of the information it obtains. That being said, the information likely to be available, coupled with actions such as not waiving access to cost or pricing data and providing more deliberative time via a bridge contract, should put DOD in a much better position to decide how to proceed with EELV than when we last reported. Near-term, it is imperative that DOD follow through with its plan to award a bridge contract for fiscal year 2013 and allow its contracting officials enough time to incorporate the information it is gaining prior to awarding EELV block buy contracts, and that DOD remain flexible in awarding the block buy contract until it has all the knowledge it needs. Additionally, some information DOD is gaining could set the stage for longer-term strategic planning for the program, especially in critical launch technology research and development decisions. Investing in a longer-term perspective for launch acquisitions is important to fully leverage the government's buying power and maintain a healthy industrial base.

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<sup>19</sup>National Space Policy of the United States of America, Intersector Guidelines Section, Pages. 5, 7, & 11 (June 28, 2010).

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## Agency Comments

DOD reviewed a draft of this report and concurred, with technical comments, which we incorporated in the final report as appropriate. See appendix II for DOD's comments.

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We are sending copies of this report to appropriate congressional committees, the Secretary of Defense, and other interested parties. In addition, the report will be available at no charge on our website at <http://www.gao.gov>.

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 found in appendix III.



Cristina T. Chaplain  
Director  
Acquisition and Sourcing Management

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*List of Committees*

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The Honorable C.W. Bill Young  
Chairman  
The Honorable Norman Dicks  
Ranking Member  
Subcommittee on Defense  
Committee on Appropriations  
House of Representatives

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# Appendix I: Scope and Methodology

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To assess the information contained in the Department of Defense (DOD) report to the Congress mandated by the fiscal year 2012 National Defense Authorization Act (NDAA), we reviewed DOD's report and the supporting information contained therein, the Evolved Expendable Launch Vehicle (EELV) Acquisition Strategy, National Aeronautics and Space Administration (NASA) reports on its Space Launch System heavy-lift launch vehicle program, and DOD documentation of efforts underway to obtain sufficient information to negotiate EELV contracts; we assessed recent defense industrial base studies, DOD reports on United Launch Alliance (ULA) business systems from the Defense Contract Audit Agency (DCAA) and Defense Contract Management Agency (DCMA), and the EELV Sustainment Plan. We also examined EELV program budget and performance documents, independent cost assessments for two EELV engines, and compared historical and current launch manifests. We interviewed DOD officials responsible for auditing ULA's business systems, and summarized the results or status of six subsystem audits. We interviewed or obtained perspectives from launch officials in various military and civilian government agencies and ULA. Through our review of DOD efforts, industrial base studies, and other relevant government and industry reports, our interviews with DOD, NASA, and contractor officials, and our review of an NRO report, we assessed the extent to which DOD has taken action to implement each of our seven recommendations made in [GAO-11-641](#). Officials from DOD reviewed a draft of this report and provided technical comments, which we incorporated in the final report as appropriate. We did not evaluate progress made toward implementing prior GAO recommendations, for example from our 2008 report, as this was not part of the fiscal year 2012 National Defense Authorization Act mandate.

In summarizing the status of each recommendation, we assigned one of the following four status assessments to each of the recommendations.

1. **Complete.** The recommended action item has been accomplished.
2. **Action underway; expected to complete.** Steps have been taken to complete the recommended action item, and the item is expected to be completed in the near term.
3. **Some action taken; more action needed.** Steps have been taken to complete the recommended action item, but more action is needed.

4. **No action taken.** No action has been taken to address the recommended action item, and the item is not expected to be completed.

We interviewed officials in Washington, D.C. at the Office of the Secretary of Defense, Cost Assessment and Program Evaluation; and the Offices of the Under Secretary of Defense for Acquisition, Technology and Logistics, Defense Procurement and Acquisition Policy Directorate; Office of the Under Secretary of Defense for Acquisition for Manufacturing and Industrial Base Policy; and the National Aeronautics and Space Administration; in addition, we interviewed the Program Executive Officer (PEO) for Space Launch, Launch and Range Systems Directorate Commander; various EELV contracting officials; as well as officials at the Office of the Assistant Secretary of the Air Force for Acquisitions to discuss ongoing initiatives with respect to the space industrial base. We talked to the United Launch Alliance regarding its business systems, the EELV acquisition strategy, and mission assurance. We reviewed relevant reports from and interviewed officials directly involved in overseeing the program in DCAA, Littleton, Colorado, and in DCMA, Englewood, Colorado.

# Appendix II: Comments from the Department of Defense



ACQUISITION,  
TECHNOLOGY  
AND LOGISTICS

OFFICE OF THE UNDER SECRETARY OF DEFENSE  
3000 DEFENSE PENTAGON  
WASHINGTON, DC 20301-3000

JUL 19 2012

Ms. Cristina T. Chaplain  
Director, Acquisition and Sourcing Management  
U.S. Government Accountability Office  
441 G Street, N.W.  
Washington, DC 20548

Dear Ms. Chaplain:

This is the Department of Defense (DoD) response to the GAO request for security review and approval to publically release final report, GAO-12-822, Evolved Expendable Launch Vehicle: DOD Is Addressing Knowledge Gaps in Its New Acquisition Strategy, dated July 2012. We concur with comment.

We have coordinated with the Air Force and recommend changing one sentence on Page 6, paragraph 2 to remain consistent with DoD's position and message. (See Attachment)

**Change:** "The block buy is expected to commit the Air Force and NRO to buy a block of launch vehicles each year, and commit to doing so each year..."

**To:** "The block buy is expected to commit the Air Force and NRO to buy a block of launch vehicles *subject to funding appropriations* each year, and commit to doing so each year..."

The report is UNCLASSIFIED and is cleared, with incorporation of the above recommendation, for open publication. We also recommend the GAO remove all "DRAFT", "FOR OFFICIAL USE ONLY", "PROPRIETARY", and "PRE-DECISIONAL" markings before final printing.

Should you have any questions or need any further assistance, please contact me at [Carolyn.Campbell@OSD.mil](mailto:Carolyn.Campbell@OSD.mil) or 703-692-6249.

Sincerely,

A handwritten signature in cursive script that reads "Carolyn D. Campbell".

Carolyn D. Campbell, Col, USAF  
Director, Enabling Systems Division  
ODASD for Space and Intelligence

Attachment:  
Comment Resolution Matrix

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# Appendix III: GAO Contact and Staff Acknowledgments

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## Contact

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

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## Acknowledgments

Key contributors to this report were Art Gallegos, Assistant Director; Claire Buck; Desirée Cunningham; John Krump, and Bob Swierczek.

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