

April 2013

PRESIDENTIAL HELICOPTER ACQUISITION

Program Makes
Progress in Balancing
Requirements, Costs,
and Schedule



G A O

Accountability * Integrity * Reliability

Why GAO Did This Study

The VXX is a Navy program to develop a replacement for the current fleet of presidential helicopters. The Ike Skelton National Defense Authorization Act for Fiscal Year 2011 directed GAO to review and report annually to the congressional defense committees on the program. GAO has reported on the program twice previously. The first report identified major lessons learned from a prior terminated program that should be applied in the follow-on program. The second covered the program's progress, upgrades to the existing helicopters, and plans for moving the program forward. This is the last of the required reports. It discusses (1) the program's progress over the past year, particularly regarding evaluation of alternatives, and (2) DOD's efforts to develop key technologies for the VXX aircraft. GAO examined program documents; interviewed officials; and compared the AOA with elements GAO previously reported are needed for a robust AOA, and cost estimating and analysis standards. GAO also assessed the Navy's approach to developing key technologies and progress made.

What GAO Recommends

GAO is not making recommendations in this report. DOD stated that it would ensure that mitigations are in place to address potential risk areas. It believes its efforts are aligned with GAO's best practices and the recommendations in GAO's 2011 report on the program and plans to continue to monitor program progress in view of these standards.

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Program Makes Progress in Balancing Requirements, Costs, and Schedule

What GAO Found

The Navy made progress in the past year in establishing a sound VXX business case that reflects a rational balance between requirements, costs and schedule. In 2012, the Navy completed an updated Analysis of Alternatives (AOA) based on refined requirements and an acquisition approach that would leverage mature technologies from outside the program onto an in-production commercial or military airframe—allowing the program to begin in the engineering and manufacturing development phase of the Department of Defense's (DOD) acquisition process. The 2012 AOA reflected additional trade-offs made among cost, schedule, risk, and performance. The table below illustrates how some key performance requirements changed from the terminated VH-71 program to the VXX.

Comparison of Minimum VXX to VH-71 Requirements for Certain Performance Areas

Performance area	VXX requirements compared to VH-71
Passenger capacity	Reduced
Range	Reduced
Landing zone suitability	Unchanged
Transportability	Reduced
Operational availability	Reduced
Airspeed	Reduced
Hover performance	Reduced

Source: GAO analysis of VXX and VH-71 program information.

Per the AOA, using this approach would reduce investment cost by approximately \$1.5 billion (19.7 percent) and shorten the schedule by about 18 percent from the approach anticipated in 2010, which included more time and cost to develop technology within the program.

DOD's Director of Cost Assessment and Program Evaluation deemed the AOA sufficient to inform future acquisition decisions and the Under Secretary of Defense for Acquisition, Technology and Logistics approved the program to move forward toward a decision to begin engineering and manufacturing development. GAO's review of the AOA found it to be sufficient for this phase of the acquisition.

DOD's efforts to ensure key technologies are ready for integration into VXX aircraft are also making progress. The Navy's acquisition approach relies on the government providing mature technologies for integration into an in-production aircraft selected for the VXX program. These technologies either exist or are in development. Their use will be an important factor in achieving the reduced cost and schedule the Navy seeks. While the program reports that these efforts are on track and assesses the risks of integration as low, it is possible that key technologies may not be realized as planned or be as easy to integrate as anticipated. To mitigate integration risk, the Navy is making use of an integration laboratory and plans to demonstrate key technologies in a test aircraft.

Building on these decisions, the program will have to manage challenges in a number of areas, including holding the line on VXX requirements, controlling helicopter weight growth, and ensuring that efforts to mitigate integration risks are adequately planned, resourced, and executed.

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Abbreviations

AOA	Analysis of Alternatives
CAPE	Cost Assessment and Program Evaluation
CDD	Capability Development Document
DOD	Department of Defense
EMD	engineering and manufacturing development
OSD	Office of the Secretary of Defense
OUSD (AT&L)	Office of the Under Secretary of Defense for Acquisition, Technology and Logistics
JROC	Joint Requirements Oversight Council

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United States Government Accountability Office
Washington, DC 20548

April 9, 2013

Congressional Committees

In June 2009, the Department of Defense (DOD) terminated the Navy's VH-71 presidential helicopter program because of cost growth, schedule delays, and a projected shortfall in system performance. The Navy subsequently began work to define a follow-on program, now known as VXX, to acquire aircraft to replace the current presidential helicopters. The Ike Skelton National Defense Authorization Act for Fiscal Year 2011 directed that we review and report annually to the congressional defense committees on the program beginning in 2011 and ending in 2013.¹ We have previously issued two reports in response to this requirement. In the first, we identified major lessons learned from the terminated program that should be applied in the follow-on program.² In the second, we provided information on the program's delays and on DOD's planned upgrades to the in-service fleet of presidential helicopters and plans for moving the program forward.³ This is the last of the required GAO reports. It discusses (1) the program's progress over the past year, particularly regarding the evaluation of alternatives, and (2) DOD's efforts to develop key technologies and capabilities for integration into VXX aircraft.

To determine the progress of the VXX program since our last report, we examined program documents and interviewed program officials. We assessed the program's Analysis of Alternatives (AOA) report and supporting materials against GAO identified factors that have affected the scope and quality of AOAs in the past.⁴ We also reviewed and assessed the AOA report and supporting materials against cost estimating and

¹Pub. L. No. 111-383 § 233.

²GAO, *Defense Acquisitions: Application of Lessons Learned and Best Practices in the Presidential Helicopter Program*, [GAO-11-380R](#) (Washington, D.C.: Mar. 25, 2011).

³GAO, *Presidential Helicopter Acquisition: Effort Delayed as DOD Adopts New Approach to Balance Requirements, Costs, and Schedule*, [GAO-12-381R](#) (Washington, D.C.: Feb. 27, 2012).

⁴An AOA is an evaluation of the effectiveness, suitability, risks, and estimated costs of alternative systems to meet a capability. The AOA is normally conducted during the Materiel Solution Analysis phase of the Defense Acquisition Management System to support a Milestone A decision to begin technology development for a preferred solution.

analysis best practice standards. In addition, we discussed the AOA report with the study team director and other study team staff. We also compared the requirements for VXX to the requirements for the terminated VH-71 program. However, because the VXX requirements were not finalized until January 2013, we were unable to complete our analysis of them during this review. To determine the status of DOD's efforts to develop key technologies and capabilities for integration in VXX aircraft, we obtained a list of ongoing and planned upgrades to the current presidential helicopters and had the program office identify those intended for use in the VXX platform. We reviewed documents related to each upgrade, discussed those efforts with program officials, including those responsible for the cockpit mission system and the aircraft's avionics system, and analyzed those documents and the results of those discussions to identify issues. We discussed the benefits and status of each upgrade effort. We also discussed the risks associated with maturing key technologies in time for insertion into the platform. We toured the systems integration laboratory at the Naval Air Station (Patuxent River, Maryland) and observed some of the upgraded equipment installed on demonstration test assets.

We conducted this performance audit from July 2012 to April 2013 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.

Background

The Marine Corps' HMX-1 squadron uses a fleet of 19 VH-3D and VH-60N helicopters to transport the President in the national capital region, as well as when the President is traveling in the continental U.S. and overseas locations. These aircraft have been in service for decades. The events following the September 11, 2001, terrorist attacks on the United States highlighted the need for improved transportation, communication, and security capabilities for the presidential helicopter fleet. As a result, a program (subsequently designated the VH-71 program) was initiated in April 2002 to develop aircraft to replace the helicopters currently in service. Initial plans to field the VH-71 by 2011 were accelerated in response to a November 2002 White House memorandum directing that a replacement helicopter be fielded by the end of 2008. By 2009 significant cost growth, plus schedule delays and performance issues resulted in the decision to terminate the VH-71 program. At the time of

termination, in June 2009, the estimated VH-71 program cost had doubled from about \$6.5 billion at development start in 2005 to \$13 billion. Because there remained a need to replace the current in-service presidential helicopters, the Office of the Under Secretary of Defense for Acquisition Technology and Logistics (OUSD(AT&L)) directed the Navy by late June 2009 to present a plan to develop options for a new program to acquire replacement aircraft, now designated VXX.

The Navy's VXX efforts began immediately with the initiation of an AOA to assess options on how to proceed toward developing and fielding the replacement presidential helicopter. It was focused, at least in part, on one of the primary lessons learned from the VH-71 program experience—the need to establish and maintain a sound business case. A sound business case is one in which a balance is established between requirements, costs, and schedule that reflects an executable program with acceptable risk.⁵ According to program officials, the program would be aligned to pursue a best practices knowledge-based acquisition approach with the intent of establishing and maintaining an affordable business case.⁶

Last year, we reported that VXX program's entry into development had been delayed as the program worked to provide a sound initial business case for development, which is a best practice that was not followed by the terminated VH-71 program.⁷ The Navy had produced an initial AOA report under June 2010 study guidance from DOD's Office of Cost Assessment and Program Evaluation (CAPE). This initial work presumed an acquisition strategy under which the program would start in the technology development phase of DOD's acquisition process. The Navy released this initial AOA report to DOD. While CAPE found this initial work sufficient, OUSD(AT&L) did not accept its results. Rather, it identified the need for a 2012 update to address using a streamlined acquisition strategy focused on mitigating cost drivers identified in the 2010 AOA study. Additional guidance was provided by the Office of the Secretary of Defense (OSD) in December 2011. That guidance reflected insights on requirements gained in the 2010 study and expectations of

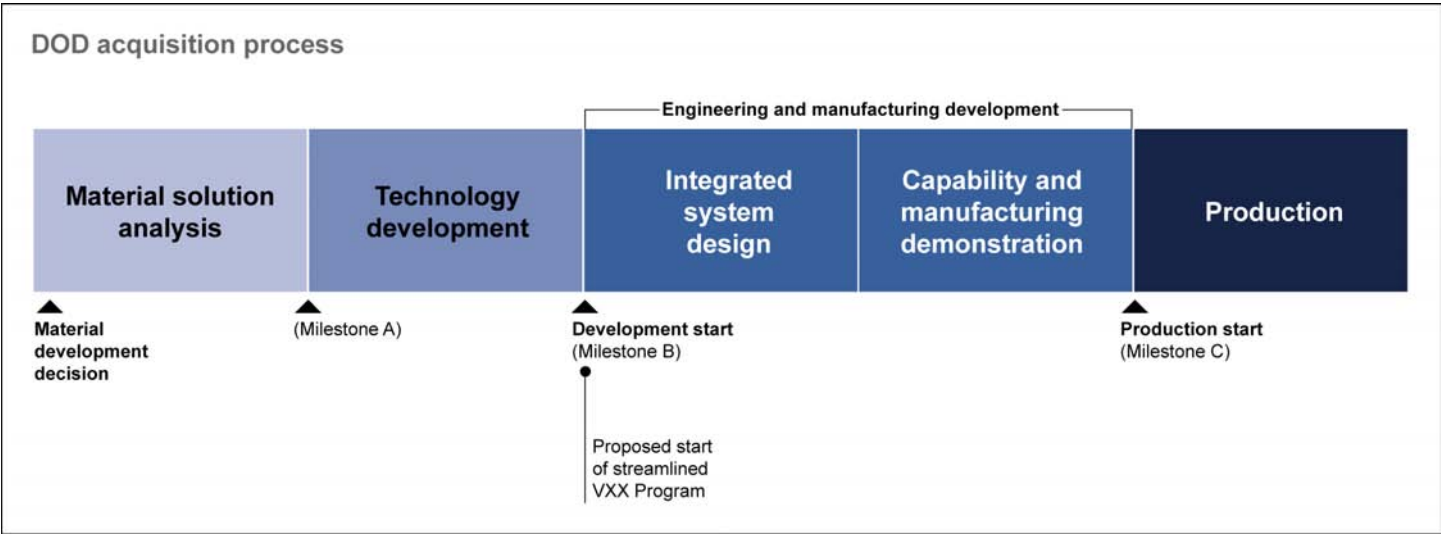
⁵[GAO-11-380R](#).

⁶[GAO-11-380R](#).

⁷[GAO-12-381R](#).

using a streamlined acquisition approach proposed by the Navy. The proposed approach would leverage mature technologies being developed outside of the program before including them on aircraft selected for the program with their adoption being facilitated by open systems architectures. This would allow the program to start with Milestone B approval for engineering and manufacturing development (EMD) and then selecting an existing in-production commercial or military platform and working to integrate communications and mission systems provided by the government, which are expected to be mature by that time. Figure 1 depicts the program’s entry into DOD’s acquisition process as currently anticipated.

Figure 1: Program’s Entry into DOD Acquisition Process as Currently Anticipated



Source: GAO analysis of the VXX program and DOD’s acquisition process.

DOD is investing in the current fleet of presidential helicopters to increase their service life and address capability gaps while working to field VXX aircraft. The current inventory of 19 aircraft are sometimes stressed to meet operational demands—demands that have been growing—making it difficult to take them out of service for lengthy upgrades. A larger VXX inventory of 21 aircraft is expected to help address this.

Program Makes Progress Toward Establishing a Sound Business Case

The Navy has made progress in the past year toward establishing a sound business case for development that reflects a rational balance between requirements, costs and schedule. The Navy completed the AOA, which was deemed sufficient by CAPE to inform future acquisition decisions, and OSD has approved the program to proceed to a Milestone B decision. The CAPE did note, however, some areas of caution, for example, that some air vehicles would require aggressive efforts to manage the weight of the VXX while other air vehicles would be more challenged in other respects. We reviewed that AOA and found that it included elements of a sound AOA.

Navy Completes AOA

The Navy, building on its initial 2010 study, completed its AOA on April 4, 2012, and concluded that the currently proposed acquisition approach of using mature technologies from outside the program on an in-production commercial or military helicopter was acceptable. The initial 2010 study, which considered nine alternative aircraft, revealed that technology development and recertification of aircraft for airworthiness were primary cost drivers of the total projected program cost under the approach it presumed. The 2012 updated study (focused on the most promising aircraft) assessed that mature, certified, and capable in-production commercial and military aircraft exist that can be modified for presidential requirements and be procured under the proposed strategy using a “Customized” rather than a “Min Mod” approach.⁸ It determined that there are candidate aircraft with performance characteristics that can meet to varying degrees the February 2012 draft Capability Development Document (CDD) requirements used to conduct the study and found that

⁸The 2012 updated AOA study defined the “Customized” approach as utilizing an existing in-production commercial or military helicopter modified by the prime contractor to satisfy VXX requirements without requiring recertification of the aircraft’s airworthiness by the original airworthiness certification authority (Federal Aviation Administration, Army, or European Aviation Safety Agency). As defined, any modification that would void those certifications would be prohibited and certifications needed would be limited to the unique VXX mission modifications as opposed to the entire air vehicle. According to the definition, this approach would principally involve an integration effort—incorporating government supplied items such as communications and mission systems which would hypothetically reduce development time and cost. The “Min Mod” approach was considered in the 2010 AOA analysis work and was thought at the time to represent the lowest cost approach allowing the prime contractor to make the minimum necessary modifications to an aircraft’s structure, drive-train, or other fundamental systems to meet minimum VXX requirements. As defined, this approach would have required a Navy or other airworthiness recertification of the aircraft.

the Navy's proposed streamlined acquisition strategy is feasible and would reduce the program's expected schedule, cost, and risk.⁹

Specifically, the 2012 study estimates suggest that using the proposed approach of having the program enter the acquisition process in the engineering and manufacturing development phase rather than the technology development phase, as was anticipated in the 2010 study, would reduce investment cost by approximately \$1.5 billion (19.7 percent) and shorten the development schedule by about 18 percent. The 2012 study also revealed, however, that the alternatives offered varying degrees of individual system performance with no single alternative meeting all of the VXX requirements. For example, while one alternative met most of the requirements, it would require strict weight and requirements management throughout its life to avoid a more costly Min Mod approach. While other alternatives provided differing capacities for weight growth, they would be challenged in meeting other requirements, such as range, transportability, landing zone suitability, or material supportability requirements. Further, for all of the alternatives in the 2012 study, it was found that if they were required to meet the military's airworthiness standards (as opposed to the certifying authority standard they currently meet), the weight growth associated with meeting some of these standards would likely trigger a more costly Min Mod approach.¹⁰

The 2012 VXX AOA study team made a number of recommendations including:

- To mitigate aircraft certification risk, the airworthiness certifying authority actively participate in all government development activities for the cockpit, communications, and mission systems and be involved in the source selection process for the aircraft;¹¹

⁹The CDD is a document that captures the information necessary to develop a proposed program(s). It outlines an affordable increment of militarily useful, logistically supportable, and technically mature capability.

¹⁰The Navy currently plans to rely on the airworthiness certification already existing on whatever aircraft is selected for VXX (e.g., Federal Aviation Administration certification).

¹¹At the time the 2012 AOA study was conducted, the program intended to provide a cockpit as government furnished equipment for integration into VXX aircraft; however, the program subsequently determined that doing so would increase risk and cost and decided to utilize the existing cockpit in the to-be-selected aircraft.

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- To reduce the risk of having to resort to a Min Mod approach, an active and aggressive life cycle weight management effort should be put in place if the selected platform does not provide a large enough margin to accommodate future weight growth; and
 - The release of a request for proposals be contingent upon achieving acceptable technical maturity of critical government developments, such as communications and mission systems.

AOA Accepted and VXX Program Approved to Proceed

The Director of CAPE in a May 30, 2012, memorandum concluded that the 2012 study achieves a logical outcome and was sufficient to inform future acquisition decisions. The CAPE found that the AOA demonstrates that each of the alternatives examined can be provided in a manner consistent with the streamlined acquisition approach, though with assessed limitations as described in the report. It concluded that the study also shows that an approach that avoids recertification was feasible for some of the options considered, and, if adopted, offers potential for reduced cost and schedule.

There are some areas of caution, however, in the CAPE's assessment.

- The alternatives examined in the 2012 study identified similar mission limitations as those seen in the 2010 study. In particular, it was noted that some air vehicles studied exhibited weight sensitivities that would require aggressive weight management for the program's lifecycle. Other air vehicles exhibited better performance in some aspects including allowing for weight growth, but were more challenged in others, for example, landing zone suitability and transportability.
- The AOA did not examine the integration risk of the government-developed communications package and mission systems—key system components that under the Navy's acquisition strategy are being developed outside of the program but must then be successfully integrated into the selected aircraft.

The CAPE's assessment also stated that the validity of the study results was contingent on the reduced requirements in the draft CDD—reduced from the requirements for the VH-71 acquisition—becoming finalized as documented and that a return to the previous requirements would require

additional analysis. The Joint Requirements Oversight Council (JROC)¹² subsequently approved the CDD on January 3, 2013. While program officials informed us that there were changes to requirements reflected in the approved CDD, they stated that none would affect the validity of the AOA or require the additional analysis mentioned in CAPE's memo. A CAPE official subsequently informed us that they had reviewed the CDD and do not believe that any of the changes affect the AOA's validity. In addition, the official stated that they reviewed the requirements changes and were satisfied that they made sense.

In an August 28, 2012 Acquisition Decision Memorandum, the USD (AT&L) approved the VXX to proceed to Milestone B—approval to enter engineering and manufacturing development—as the program's initial acquisition milestone. The Under Secretary decided that:

- Milestone B, scheduled for 3rd quarter of fiscal year 2014, will be the first formal acquisition system milestone for VXX; however, a Pre-EMD Review will occur prior to release of the Request for Proposals for development, integration, and production;¹³
- Prior to the pre-EMD review, the Navy and the JROC are to approve the CDD and the Director, Cost Assessment and Program Evaluation is to develop an Independent Cost Estimate based on the approved CDD; and
- The Under Secretary will establish affordability targets for the VXX program concurrent with CDD approval by the JROC.

The Under Secretary concluded that based on utilization of mature technologies and a proven, mature, existing aircraft, this approach would not require a technology development phase. In addition, the Under Secretary expects to waive a requirement in the Weapon Systems Acquisition Reform Act of 2009, as amended, for competitive prototyping

¹²The JROC is an advisory council to the Chairman of the Joint Chiefs of Staff with the responsibility to assist the Chairman of the Joint Chiefs of Staff in: (1) identifying, assessing, and approving joint military requirements; and (2) assigning priority for joint military requirements. JROC also has responsibility to assist acquisition officials in identifying alternatives to acquisition programs that meet joint military requirements.

¹³The Navy released a draft Request for Proposals in November 2012 and anticipates releasing a final request in March 2013.

because its anticipated cost outweighs the expected risk reduction and life cycle benefit it would provide.¹⁴

Our Assessment of the AOA

In our prior two reports on this acquisition, we stated that when the AOA was issued we would assess it for its robustness—the range of alternatives it considered, its depth of analysis, and its consideration of trade-offs.¹⁵ Based on our review of the AOA report, supporting material, and interviews of program and other defense officials, we found the AOA to be sufficient for this stage of the acquisition. It included elements that GAO has reported should be part of a robust AOA.¹⁶ We also found it used a cost estimating process that was substantially compliant with GAO identified best practices.¹⁷

An AOA compares the operational effectiveness, suitability, and life-cycle cost estimates of alternatives that appear to satisfy established capability needs. Cost estimating and analysis are significant components of an AOA.¹⁸ We have previously reported on the importance of a robust AOA as a key element in ensuring a program has a sound, executable

¹⁴Pub. L. No. 111-23, § 203(a); Pub. L. No. 111-383, § 813. Specifically, the Weapon Systems Acquisition Reform Act of 2009 required DOD to modify its guidance relating to the operation of its acquisition system to provide that the acquisition strategy for each major defense acquisition program provides for competitive prototypes before Milestone B approval to enter system development unless the Milestone Decision Authority waives the requirement. DOD did so through Directive-Type Memorandum (DTM) 09-027, “Implementation of Weapon System Acquisition Reform Act of 2009” (Dec. 4, 2009, incorporating Change 3, Dec. 9, 2011). Major defense acquisition programs are those estimated by DOD to require an eventual total expenditure for research, development, test, and evaluation of more than \$365 million, or for procurement, including all planned increments or spirals, of more than \$2.19 billion in fiscal year 2000 constant dollars. The Milestone Decision Authority for major defense acquisition programs is the Under Secretary of Defense for Acquisition, Technology and Logistics, the head of a DOD component, or if delegated the component acquisition executive.

¹⁵[GAO-11-380R](#) and [GAO-12-381R](#).

¹⁶GAO, *Defense Acquisitions: Many Analyses of Alternatives Have Not Provided a Robust Assessment of Weapon System Options*, [GAO-09-665](#) (Washington, D.C.: Sept. 24, 2009).

¹⁷GAO, *GAO Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Capital Program Costs*, [GAO-09-3SP](#) (Washington, D.C.: Mar. 2, 2009).

¹⁸[GAO-09-3SP](#).

business case prior to program initiation.¹⁹ Our work has found that programs that conduct a limited AOA (failing to consider a broad range of alternatives or assess technical and other risks associated with each alternative) tended to experience poorer outcomes—including cost growth.

We found that the AOA study team considered a broad range of alternatives. The initial 2010 study effort evaluated 9 platforms and 19 possible alternatives to satisfy the mission and the 2012 update studied the most promising platforms in the 2010 study to document the impact of the Navy's proposed streamlined acquisition strategy would have on the merits of each of those alternatives. The study team assessed effectiveness, suitability, technical, schedule, and operational risks associated with the alternatives, though, according to CAPE, it did not assess the risks of integrating government-furnished communications and mission control systems into those alternatives. The study director noted that this integration risk could not be assessed by the study team, given the maturity of these subsystems at the time. Rather, the AOA identified the need to consider this issue at a future engineering review when sufficient maturity existed and an accurate assessment could be made.

The AOA process reflected and influenced performance trade-offs. The initial 2010 analysis was based on performance requirements that were lower in a number of areas than for the VH-71 program. The 2012 AOA study reflected additional trade-offs made with regard to cost, schedule, risk and performance. The performance trade-offs enabled the Navy's revised strategy, and is expected to result in reduced costs and schedule. Following the 2012 study the performance requirements were further refined as reflected in the final CDD. Table 1 illustrates some of the performance trade-offs made by comparing the minimum requirements for VXX aircraft as captured in the final CDD to the minimum VH-71 requirements captured in the equivalent Operational Requirements Document for that program.

¹⁹ [GAO-09-665](#).

Table 1: Comparison of Minimum VXX to VH-71 Requirements for Certain Performance Areas

Performance area	VXX requirements compared to VH-71
Passenger capacity	Reduced
Range	Reduced
Landing zone suitability	Unchanged
Transportability	Reduced
Operational availability	Reduced
Airspeed	Reduced
Hover performance	Reduced

Source: GAO analysis of VXX and VH-71 program information.

We also assessed the cost estimating procedure for the AOA using GAO's criteria for cost estimating and assessment and found that it was substantially compliant with those criteria. For the purposes of this review, we collapsed the best practices identified in the GAO Cost Estimating and Assessment Guide into four general characteristics: well documented, comprehensive, accurate, and credible.²⁰ The cost estimating best practices associated with each of those characteristics used in judging the AOA are provided in appendix I.

We found the AOA cost estimate to be comprehensive and well documented. We also found that it was substantially accurate and partially met our criteria for being credible. The AOA cost estimate was properly adjusted for inflation, relied on historical analogous aircraft data, contained no significant calculation errors, and had been recently updated from the estimate contained in the 2010 study. While the documentation stated that the estimate reflected most likely costs, it did not specifically identify potential contingency costs and no cost risk analysis was performed to determine a level of confidence for the cost estimate. As result, we were unable to determine if the costs were indeed most likely.²¹ In addition, the AOA cost estimate was deemed as having partially met the best practices criteria for being credible as there was evidence that a

²⁰ [GAO-09-3SP](#).

²¹ In comments provided after we had completed our audit work, program officials stated that subsequent to the 2012 AOA confidence levels were developed that depict a reasonable probability of program success.

robust sensitivity analysis had been performed but not an independent cost estimate or cost risk analysis.

Although there was not a cost risk analysis, a detailed technical risk assessment process was followed for identifying technical risks, their likelihood of occurring, and the consequences if they occurred. The technical risks were mitigated by incorporating costs into the cost estimate through derivation of realistic and reasonable staffing levels and sufficient schedule for design, development and testing of each alternative. In addition, while an independent cost estimate had not been conducted, the USD(AT&L)'s August 28, 2012, acquisition decision memorandum directs CAPE's completion of one prior to the Pre-EMD Review. This is to occur in the second quarter of fiscal year 2013. As a result, the program could have confirmation of the AOA cost estimating results at that point. The program will then continue to work on its cost estimate to result in a more refined estimate supporting the Milestone B decision in the third quarter of fiscal year 2014.

Efforts Intended to Leverage Technologies into VXX Aircraft Progress

The Navy's currently proposed acquisition approach relies on the government's providing, as government furnished equipment, mature technologies for integration into aircraft. Those technologies either already exist or are in development, some as legacy fleet aircraft upgrades. Their provision will be an important factor in the Navy's achieving the reduced cost and schedule it seeks through its proposed acquisition approach. The program assesses their risks for integration into VXX aircraft as low—supporting the Navy's goal of providing initial operational capability in fiscal year 2020.

While the program reports the key technologies to be provided by the government for integration are on track, there are risks that they will not work out as planned. For example, the Navy had originally anticipated that the cockpit technologies leveraged into the VXX acquisition would include a "glass cockpit" display system installed as an upgrade on VH-60N aircraft. It dropped its planned use of this system. Adopting its use would likely necessitate an airworthiness recertification of the platform selected to be the VXX aircraft, a costly and time-consuming endeavor. As a result, the Navy now plans on the prime contractor using the display systems already in use in its certified aircraft—systems that the program manager noted are as capable if not more capable than the VH-60N's.

Even if individual technologies work out as anticipated, they will still have to be successfully integrated in the aircraft. The program depends on a number of government-defined sub-systems and technologies being hosted in a new airframe. Environmental issues such as size, weight, thermal profile, and stability will have to be ascertained, not separately but in totality as a dynamic system. Only then will it be known whether key performance parameters are met, how closely, and what, if any, refinements need to be applied. In the past, we found integration issues can be significant. For example, in fiscal year 2004 DOD rebaselined the Joint Strike Fighter program extending its development by 18 months and adding resources to address problems discovered during systems integration and the preliminary design review.²² To mitigate integration risk, though, the VXX program is making use of a systems integration laboratory and also plans to install the communications and mission systems into a test aircraft and do demonstration testing before integration efforts begin on the VXX platform. Table 2 provides more information on the technologies to be provided by the government for integration in VXX aircraft.

²²GAO, *Joint Strike Fighter: Progress Made and Challenges Remain*, [GAO-07-360](#) (Washington, D.C.: Mar. 15, 2007).

Table 2: Technologies to Be Provided by the Government for Integration in VXX Aircraft

Existing technologies	Description/status
Central Data Unit	<p>Description: The program intends to use the existing cockpit that is provided with the basic aircraft. Integration and consolidation of the control of the Mission Communications System is being developed by the government and validated in a Systems Integration Laboratory, using the legacy central data units (CDU-7000) to host communication functionality.</p> <p>Status: The computer is an existing fielded system currently in use on cockpit upgraded VH-60N helicopters. It is also planned for incorporation into the current VH-3D helicopters in a cockpit upgrade. The Navy is working toward integration of the CDU-7000 into the Mission Communications System and will test and verify it using a Systems Integration Laboratory. As such, the program assesses the risk for transition to VXX as low.</p>
Navigation System	<p>Description: The navigation technology referenced here is the Embedded GPS Inertial system, a radar altimeter, remote air data system and a stability augmentation capability.</p> <p>Status: These components exist in fielded systems flying on the current fleet of helicopters. As such, the program assesses the risk for transition to VXX as low.</p>
Surveillance System	<p>Description: This component includes the transponder which meets all U.S./North Atlantic Treaty Organization requirements for the air traffic control system that is used to identify and track military aircraft. The system measures the distance and heading of the aircraft, and the transponder encodes identification and position information into the response.</p> <p>Status: This system is an existing fielded system that is flying on the current fleet of helicopters. As such, the program assesses the risk for transition to VXX as low.</p>
Existing technologies currently being upgraded	Description/Status
Command Communication System	<p>Description: This system consists of various radios and components that provide for off-board communications. Current communications capability includes: UHF/VHF Line of Sight (via ARC-210 Gen 5 radios); Satellite Communications (via ARC-210 Gen 5 radios); VHF FM LOS (via ARC-244 radios); and HF (via HF 9067) radios. With the exception of the HF radio, all of these radios are planned for incorporation into the VXX platform. The HF-9067 radio will be replaced by an existing ARC-220 HF radio. To satisfy a new National Security Agency Cryptography mandate for encryption, the VXX team is working closely with another Navy organization to develop new software for the ARC-210 Gen 5 radios which meets the new encryption requirements. This software upgrade is on schedule for release in early fiscal year 2015.</p> <p>Status: All of these radios are existing fielded radios, so the program assesses the risk for transition to VXX as low. The ARC-210 Gen 5 software update for Crypto mandate is on track and is expected to be fielded on the in-service helicopters in fiscal year 2015. As such, the program also assesses its risk for transition to VXX as low.</p>
New technologies	Description/Status
Mission Communications System	<p>Description: The Presidential Helicopters Program Office is currently partnering with another Navy organization to assemble an executive communications suite, referred to as the Mission Communications System, using existing off-the-shelf components that will meet the communications subsystem requirements of the VXX program. The Mission Communications System is a communications architecture consisting of currently available hardware components integrated together to create a network designed to provide passengers and crew with access to on-board and off-board communications services. Off-board communications are to be provided through the use of existing radios (described above) integrated into this architecture.</p> <p>Status: A preliminary design review of the Mission Communications System was completed on December 17, 2012 and the effort is on track for prototyping and testing in a Systems Integration Laboratory. As such, the program assesses the risk for transition to VXX as low.</p>

Source: U.S. Navy, Presidential Helicopters Program Office.

Concluding Observations

The program has made progress toward establishing a sound business case for development, one that rationally balances requirements, costs, and schedule. The program still faces challenges that will need to be actively managed to provide greater assurance that a sound business case is maintained throughout development as the program moves forward. These challenges include:

- Maintaining the VXX requirements without significant deviation throughout the acquisition process. Subsequent requirement changes will need to be considered carefully in the context of their implications for cost, schedule, risk, and performance and the program will need to effectively manage technology maturation and integration to achieve success.
- Managing weight growth of the platform during development so as to not trigger the need for modifications that could then require a flight recertification of the VXX platform. Also, having a weight margin once fielded will place the program in a better position in the future to more readily enhance the platform over its anticipated 40-year service life.
- Ensuring the technologies being developed for integration into the selected VXX platform develop as needed and integration mitigation efforts are adequately planned, resourced, and executed.

Failing to address these challenges could impact the program's ability to stay on track and delay replacement of the in-service helicopter fleet, which is currently stressed at times to meet demand. Additionally, in our prior reports we described both VH-71 lessons learned and acquisition best practices that, if heeded, should help the program remain on track.

Agency Comments

DOD provided written comments on a draft of this report. The comments are reprinted in appendix II.

In commenting on a draft of this report, DOD stated that it would ensure that mitigations are in place to address potential risk areas. It believes its efforts are aligned with GAO's best practices and the recommendations in GAO's 2011 report on the program and plans to continue to monitor program progress in view of these standards.

We are sending copies of this report to interested congressional committees; the Secretary of Defense; the Under Secretary of Defense for Acquisition, Technology and Logistics; and the Secretary of the Navy. This report also is available at no charge on GAO's website at <http://www.gao.gov>.

Should you or your staff have any questions on the matters covered in this report, please contact me at (202) 512-4841 or sullivanm@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. Key contributors to this report are listed in appendix III.

A handwritten signature in black ink, appearing to read 'Michael J. Sullivan', with a stylized, flowing script.

Michael J. Sullivan, Director
Acquisition and Sourcing Management

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The Honorable James M. Inhofe
Ranking Member
Committee on Armed Services
United States Senate

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The Honorable Thad Cochran
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Subcommittee on Defense
Committee on Appropriations
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The Honorable Adam Smith
Ranking Member
Committee on Armed Services
House of Representatives

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

Appendix I: Cost Estimating Best Practices

Characteristic	Best practices
Comprehensive	<ul style="list-style-type: none">• The cost estimate includes all life cycle costs.• The cost estimate completely defines the program, reflects the current schedule, and is technically reasonable.• The cost estimate work breakdown structure (WBS) is product-oriented, traceable to the statement of work/objective, and at an appropriate level of detail to ensure that cost elements are neither omitted nor double-counted.• The estimate documents all cost-influencing ground rules and assumptions.
Well documented	<ul style="list-style-type: none">• The documentation should capture the source data used, the reliability of the data, and how the data were normalized.• The documentation describes in sufficient detail the calculations performed and the estimating methodology used to derive each element's cost.• The documentation describes step by step how the estimate was developed so that a cost analyst unfamiliar with the program could understand what was done and replicate it.• The documentation discusses the technical baseline description and the data in the baseline is consistent with the estimate.• The documentation provides evidence that the cost estimate was reviewed and accepted by management.
Accurate	<ul style="list-style-type: none">• The cost estimate results are unbiased, not overly conservative or optimistic and based on an assessment of most likely costs.• The estimate has been adjusted properly for inflation.• The estimate contains few, if any, minor mistakes.• The cost estimate is regularly updated to reflect significant changes in the program so that it is always reflecting current status. Variances between planned and actual costs are documented, explained, and reviewed.• The estimate is based on a historical record of cost estimating and actual experiences from other comparable programs.
Credible	<ul style="list-style-type: none">• The cost estimate includes a sensitivity analysis that identifies a range of possible costs based on varying major assumptions, parameters, and data inputs.• A risk and uncertainty analysis was conducted that quantified the imperfectly understood risks and identified the effects of changing key cost driver assumptions and factors.• Major cost elements were cross-checked to see whether results were similar.• An independent cost estimate was conducted by a group outside the acquiring organization to determine whether other estimating methods produce similar results.

Source: GAO.

Appendix II: Comments from the Department of Defense



ACQUISITION,
TECHNOLOGY
AND LOGISTICS

THE UNDER SECRETARY OF DEFENSE

3010 DEFENSE PENTAGON
WASHINGTON, DC 20301-3010

APR 03 2013

Mr. Michael J. Sullivan
Director
Acquisition and Sourcing Management
U.S. Government Accountability Office
441 G Street, N.W.
Washington, DC 20548

Dear Mr. Sullivan:

This is the Department of Defense response to the Government Accountability Office (GAO) Draft Report, GAO-13-257, "PRESIDENTIAL HELICOPTER ACQUISITION: Program Makes Progress in Balancing Requirements, Costs, and Schedule," dated February 27, 2013 (GAO Code 121084).

I will examine closely the assessments in the annual report and ensure that mitigations are in place to address potential risk areas. In general, we believe our efforts on this program are aligned with GAO's best practices and recommendations from the original 2011 audit report. We will continue to monitor program progress in view of these standards.

We appreciate the opportunity to comment on the draft report. Should you have any questions, please contact Mr. David Ahern, Deputy Assistant Secretary of Defense for Strategic and Tactical Systems, at David.Ahern@osd.mil or 703-697-9386.

Sincerely,

A handwritten signature in black ink, appearing to read "Frank Keada", is written over a printed name tag that says "Frank Keada".

Frank Keada

Appendix III: GAO Contact and Staff Acknowledgments

GAO Contact

Michael J. Sullivan, (202) 512-4841 or sullivanm@gao.gov

Staff Acknowledgments

Key contributors to this report were Bruce H. Thomas, Assistant Director; Jerry W. Clark, Analyst-in-Charge; Bonita J.P. Oden; Karen A. Richey; Jennifer K. Echard; Tisha D. Derricotte; Marie P. Ahearn; Hai V. Tran; and Robert S. Swierczek.

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