



April 14, 2015

Congressional Committees

Presidential Helicopter Acquisition: Program Established Knowledge-Based Business Case and Entered System Development with Plans for Managing Challenges

The VH-92A (formerly designated VXX) program is to develop replacement aircraft for the aging presidential helicopter fleet. It follows the VH-71 program, which was terminated in June 2009 due to cost growth, schedule delays, and a projected shortfall in system performance. For this follow-on program, the Navy's acquisition strategy has been to (1) use mature technologies and integrate them into an existing certified helicopter selected for the program and (2) limit the modifications to the selected helicopter in order to avoid a costly total aircraft recertification. The Navy plans to acquire a VH-92A fleet of 21 operational helicopters (that will also be used to perform training missions) and two test aircraft to replace the existing fleet of 19 legacy helicopters and two trainers and two testing assets.

We have reported on the program since 2011.¹ In 2013, the House Armed Services Committee, Tactical Air and Land Force Subcommittee requested that we continue to monitor the VH-92A presidential helicopter acquisition through a series of reviews, with each review tailored to where the program is in the acquisition process. The National Defense Authorization Act for Fiscal Year 2014 subsequently mandated that we continue reporting on the program annually to the congressional defense committees.² This report discusses the cost, schedule, and performance status of the program, challenges it will face in system development, and the program's adherence to acquisition best practices.

To conduct this work, we identified acquisition best practices based on our extensive body of work in that area, statutory requirements such as the Weapon Systems Acquisition Reform Act of 2009 (WSARA),³ and on Department of Defense (DOD) policy and guidance. We analyzed program documents (including the acquisition strategy, approved program baseline, and contractor progress reports) and plans to determine how the program is progressing in terms of its cost, schedule, and performance, and how well the program is adhering to best practices. We interviewed program officials from the Navy's Presidential Helicopter Replacement Program Office to discuss the status of the program. We examined the Office of the Secretary of Defense (OSD) Office of Cost Assessment and Program Evaluation (CAPE) independent cost estimate; we met with a CAPE official to discuss how the independent cost estimate (ICE) was derived; and we met with officials from the Naval Air Systems Command's cost department to

¹The Ike Skelton National Defense Authorization Act for Fiscal Year 2011 mandated that GAO review and report annually to the congressional defense committees on the program beginning in 2011 and ending in 2013. Pub. L. No. 111-383, § 233.

²Pub. L. No. 113-66, § 252 (2013).

³Pub. L. No. 111-23, as amended.

discuss the service cost position and factors contributing to the difference between the CAPE ICE and the service cost position. We compared the Navy's cost estimating methodology to the GAO Cost Estimating and Assessment Guide,⁴ to determine if it produced an estimate that met the criteria for being comprehensive, well documented, accurate, and credible.

To understand potential program challenges, and steps taken to address those challenges, we examined DOD's risk management planning guidance and reviewed a copy of the program's draft risk management plan and the contractors' latest risk assessment. We discussed risk management with an official from the Office of the Assistant Secretary of Defense (Systems Engineering) and with officials from the Sikorsky Aircraft Corporation and Lockheed Martin (the prime and subcontractor, respectively, for the program). We also met with officials from the Defense Contract Management Agency and reviewed their reports on the program. To learn more about the planned design, assembly, and integration effort, we visited and toured the prime contractor's headquarters facility in Stratford, Connecticut and its Coatesville, Pennsylvania facility.

We conducted this performance audit from August 2014 to April 2015 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.

Results in Brief

In the past year, the VH-92A program continued to make progress by establishing a knowledge-based business case for entry into system development that included an approved cost, schedule and performance baseline based on actions substantively in line with acquisition best practices. Demonstrating technology maturity, making trade-offs, having reasonable cost and schedule estimates, and holding a system-level preliminary design review (PDR) by the start of system development are all best practices. The Navy had previously completed assessments that found no immature critical technologies and had made trade-offs to achieve affordability with accepted requirements. While it deferred a system-level PDR until after the start of development, its reliance on mature technologies, selection of an existing aircraft for use in the program, and award of a fixed price type contract reflect reduced risk in the deferral. The Navy completed a cost estimate for the program and OSD CAPE completed an independent cost estimate for the acquisition. We assessed the Navy's cost estimate and found that the methodology the Navy used to derive its estimate was consistent with GAO's cost estimating guidance and either fully or substantially met the criteria for being comprehensive, well documented, accurate, and credible.⁵ In April 2014, the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)) approved the program's entry into the system development phase of acquisition with an estimated cost of \$2.8 billion⁶ for research, development, test and evaluation and \$2.4 billion for procurement of a total of 23 aircraft, which includes two test aircraft. In May 2014, the Navy awarded Sikorsky Aircraft Corporation a fixed-price incentive development contract for this effort to help reduce overall program risk by limiting

⁴GAO, *GAO Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Capital Program Costs*, [GAO-09-3SP](#) (Washington, D.C.: Mar. 2009)

⁵[GAO-09-3SP](#).

⁶Unless otherwise specified, dollar amounts given in this report are in then-year dollars. Then-year dollars include the effects of inflation or escalation.

the government's exposure to contract cost overruns. As of December 2014, no significant cost, schedule, performance deviations are apparent, based on our examination of the contractor's cost report data.

As the program progresses, it faces what appear to be manageable challenges. Among others, those challenges include the design and integration of subsystems on the aircraft, keeping on schedule, and controlling system requirements so as to not risk renegotiation of the fixed-price incentive development contract. The Navy has plans in place and has undertaken actions to meet those challenges. For example, it has utilized integration labs in designing a major VH-92A subsystem to be integrated into the platform and will utilize two engineering and development model aircraft to integrate and test a number of mission critical components. To address potential schedule challenges, the program office has conducted a schedule risk assessment and indicated that it will continue to do so annually to mitigate schedule related concerns that may arise. Perhaps most importantly, the program will need to minimize requirements changes that would require it to renegotiate its fixed-price development contract. A significant risk mitigation factor the Navy has in its favor is its contract with Sikorsky which includes a ceiling price that would limit how much the Navy would have to pay under the contract. To maintain this advantage, the Navy will have to ensure that no requirements changes are made that would require it to negotiate a supplemental agreement for equitable adjustment to the contract. The Navy recognizes this, and according to program officials, they have implemented a change management plan that requires executive level oversight of any engineering or contract changes affecting system requirements or having the potential to affect program cost, schedule, and performance baselines.

Background

The Marine Corps' HMX-1 (Marine Helicopter Squadron One) uses a fleet of 19 helicopters to transport the President in the national capital region, and when traveling in the continental United States and overseas. These aircraft have been in service for decades. The September 2001 terrorist attacks highlighted the fleet's need for improved transportation, communication, and security capabilities. As a result, the Navy in April 2002 began development of a replacement helicopter later identified as the VH-71 program. By 2009, schedule delays, performance issues, and a doubling of cost estimates from \$6.5 billion in 2005 to \$13 billion in 2009, prompted the Navy to terminate the program. The need for a replacement helicopter remained, so the Navy began an analysis of alternatives (AOA) for the development and fielding of a replacement aircraft, now known as the VH-92A program. As we reported in 2011, the Navy's AOA was focused, at least in part, on one of the primary lessons learned from the VH-71 experience—the need to establish and maintain a sound business case.⁷ In April 2012, the Navy finalized its AOA; OSD approved the Navy's AOA, which was based on an acquisition approach that would make use of mature commercial and military technologies being developed outside of the program before including them on aircraft selected for the program. Commercial or military aircraft in production would then be selected and government-provided mature technologies would be integrated into the aircraft.⁸

Our prior work has demonstrated that positive acquisition outcomes require the use of a knowledge-based approach to product development that demonstrates high levels of knowledge

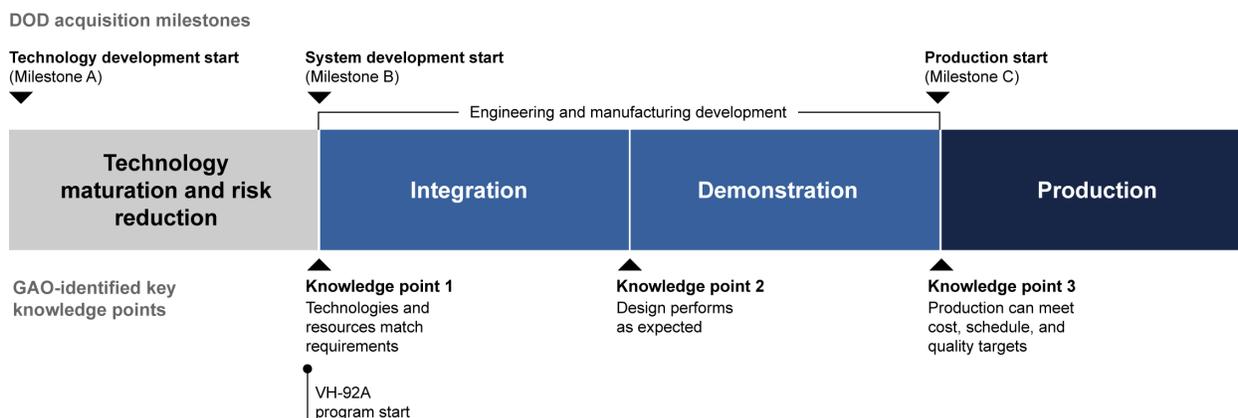
⁷GAO, *Defense Acquisitions: Application of Lessons Learned and Best Practices in the Presidential Helicopter Program*, [GAO-11-380R](#) (Washington, D.C.: Mar. 25, 2011).

⁸GAO, *Presidential Helicopter Acquisition: Program Makes Progress in Balancing Requirements, Costs, and Schedule*, [GAO-13-257](#) (Washington, D.C.: Apr. 9, 2013).

before significant commitments are made. This approach involves achieving the right knowledge at the right time—enabling leadership to make informed decisions about when and how best to move forward. On the basis of this work, we have identified three key knowledge points during the acquisition cycle at which programs need to demonstrate critical levels of technology, design, and manufacturing knowledge to proceed. The first knowledge point is the most critical point of the three. At that point programs should present their business case for review and approval, which establishes an acquisition program baseline. This baseline describes the cost, quantity, schedule, and performance goals of a program and provides a framework for effective oversight and accountability.

We reported last year that the Navy’s acquisition strategy was for the program to enter DOD’s acquisition process at the first of those knowledge points, the start of system development, as shown in figure 1.⁹

Figure 1: Program’s Entry into DOD Acquisition Process and GAO-Identified Key Knowledge Points



Source: GAO analysis of the VH-92A program, DOD’s acquisition process, and GAO-identified key knowledge points. | GAO-15-392R

We also reported that the Navy had continued to make progress toward (1) establishing a knowledge-based program that generally aligned with acquisition best practices and (2) meeting corresponding statutory certification requirements for entering the DOD acquisition process in the engineering and manufacturing development phase. Additionally, we reported that the Navy had completed an independent technology assessment finding no immature critical technologies, made trade-offs to ensure affordability, and obtained approval of its system requirements. Further, we reported that OSD CAPE was in the process of developing an independent cost estimate for the program. We noted, though, that DOD had waived a requirement for competitive prototyping and that the Navy was going to defer a system-level preliminary design review (PDR) until after the start of development. We had previously reviewed DOD’s waiver of competitive prototyping for the program and found that it addressed one of the two bases provided in the Weapon Systems Acquisition Reform Act of 2009 for such waivers; that is, that the cost of producing competitive prototypes exceeds the expected life-cycle benefits (in constant dollars) of producing the prototypes.¹⁰ In addition, while the Navy’s deferral of a system-level PDR until after the start of system development deviates from

⁹GAO, *Presidential Helicopter Acquisition: Update on Program’s Progress toward Development Start*, [GAO-14-358R](#) (Washington, D.C.: Apr. 10, 2014).

¹⁰GAO, *Department of Defense’s Waiver of Competitive Prototyping Requirement for the VXX Presidential Helicopter Replacement Program*, [GAO-13-826R](#) (Washington, D.C.: Sept. 6, 2013).

acquisition best practices and is a waiver of a statutory requirement, we reported last year that a number of factors, such as the program's reliance on mature technologies and selection of an existing aircraft, suggest reduced risk in the deferral.¹¹

Program Established a Knowledge-Based Business Case and Entered System Development

The VH-92A program continued to make good progress in 2014 using a knowledge-based approach. The program established a cost, schedule and performance baseline that reflected a match of customer's needs and available resources. The Navy awarded a fixed-price incentive contract for and entered into system development. It has since been working toward establishing a stable design.

Program Established a Knowledge-Based Business Case at Milestone B

During 2014, the VH-92A program established a knowledge-based cost, schedule and performance baseline substantively in line with acquisition best practices. Demonstrating technology maturity, making trade-offs, having reasonable cost and schedule estimates, and holding PDRs by the start of system development (milestone B) are all best practices. The Navy had previously completed assessments that found no immature critical technologies and made trade-offs to achieve affordability with accepted requirements. While the Navy deferred a system-level PDR until after the start of development, as previously reported, it has measures in place to reduce development risks.

In 2014, the Navy completed a cost estimate for the program (Service Cost Position) and OSD CAPE completed an independent cost estimate (ICE) for the acquisition.¹² In January 2014, the Naval Center for Cost Analysis completed an assessment of a life cycle cost estimate developed by Navy cost estimators for the program, finding that the program life cycle cost estimate was consistent with best practices and was reasonable for budget planning purposes.¹³ We also assessed the Navy's cost position and found that the methodology the Navy used to derive its estimates is consistent with GAO's cost estimating guidance¹⁴ and either fully or substantially met the criteria for being comprehensive, well documented, accurate, and credible.

In an April 17, 2014, acquisition decision memorandum, USD(AT&L) assigned a total investment cost affordability cap to the program of \$6.5 billion (then-year dollars) for development and procurement of a total of 23 aircraft and approved the milestone B decision, allowing the start of system development. Table 1 provides a summary of the cost and quantity baseline for the program at milestone B.

¹¹[GAO-14-358R](#).

¹²An ICE is required for major defense acquisition programs prior to certification at milestone A, certification at milestone B, before any decision to enter into low-rate initial production or full-rate production, and in advance of certification following critical cost growth. 10 U.S.C. § 2430. Major defense acquisition programs are those designated by DOD or estimated by DOD to require an eventual total expenditure for research, development, test, and evaluation of more than \$480 million, or, for procurement, of more than \$2.79 billion, in fiscal year 2014 constant dollars.

¹³The Naval Center for Cost Analysis also cautioned that any deviations from the overarching acquisition strategy will invalidate the service cost position.

¹⁴[GAO-09-3SP](#).

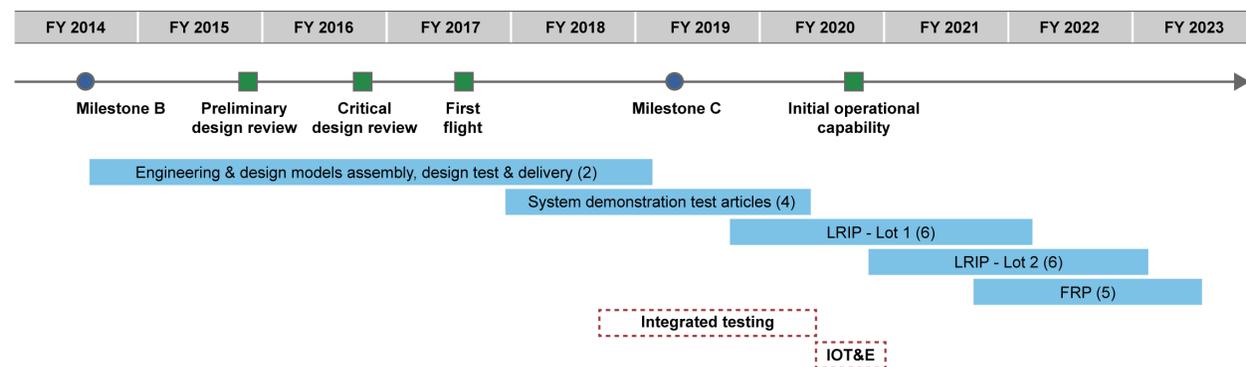
Table 1: Summary of the VH-92A Presidential Helicopter Replacement Program Cost and Quantity Baseline

April 2014 (system development start)	
Expected quantities	
Development quantities	6
Procurement quantities	17
Total quantities	23
Cost estimates (then-year dollars in billions)	
Development	\$2.81
Procurement	2.38
Total program acquisition	\$5.19

Source: GAO analysis of DOD data. GAO-15-392R
 Note: Total quantity of aircraft includes 2 test aircraft.

A schedule has been established for the program that would result in first flight in fiscal year 2017 and accomplishment of initial operational capability in fiscal year 2020. Figure 2 depicts that schedule.

Figure 2: VH-92A Presidential Helicopter Replacement Program Schedule



FY = Fiscal year
 LRIP = Low-rate initial production
 FRP = Full rate production
 IOT&E = Initial operational test and evaluation
 Source: GAO analysis of VH-92A Program data. | GAO-15-392R

Navy Awarded System Development Contract

Following the milestone B decision, the Navy awarded Sikorsky Aircraft Corporation a fixed-price incentive development contract in May 2014 to help reduce overall program risk by limiting the government’s exposure to contract cost overruns. Sikorsky is modifying its commercial S-92 aircraft to meet the Navy’s requirements. The contract includes development of two engineering and development model aircraft and four system demonstration test articles for the purposes of conducting risk-reduction activities, systems integration/engineering design work, test & evaluation procedures, and operator training. It also includes fixed-priced options for two low-rate initial production (LRIP) lots—consisting of six aircraft per LRIP lot and one full-rate production lot for five aircraft. The development portion of the contract has a target price of \$1.46 billion, which includes the contractor’s costs, a negotiated profit margin, and cost and

schedule incentives. The contract further contains a ceiling price of \$1.56 billion. The total estimated research, development, test, and evaluation cost for the program is \$2.8 billion—consisting of \$240 million in sunk costs, the contract’s ceiling price, and \$1.1 billion for government labor, test and evaluation functions, and out-year research and development.

This type of contract is designed to provide a profit incentive for the contractor to control costs. It specifies target cost, target profit, and ceiling price amounts, with the latter being the maximum amount that may be paid to the contractor. The contract specifies a 50-50 incentive ratio for sharing savings in the event of underruns or sharing costs in the event of overruns. Cost sharing ends when the contract price reaches the ceiling price. Thereafter, provided the Navy is not responsible for the contractor incurring additional costs, such as by changing requirements, the contractor would bear responsibility for cost overruns. If the Navy is responsible for cost overruns a supplemental agreement for equitable adjustment to the contract with Sikorsky could be required. As of December 2014, no significant cost, schedule, performance deviations are apparent, based on our examination of the contractor’s cost report data.

Program Faces Manageable Challenges Moving Forward

As it progresses, the VH-92A program faces what appear to be manageable challenges. Among others, those challenges include design and integration of subsystems on the S-92 platform, keeping on schedule, and maintaining system requirements so as to not risk breaking the fixed-price incentive contract with the contractor. The Navy has plans in place and has undertaken actions to meet those challenges.

Challenges with Design and Integration

One of the principal challenges facing the program will be the successful integration of subsystems onto S-92 aircraft including incorporating the mission communications system and the additional antennas on the aircraft. In addressing this challenge, the Navy (1) has utilized systems integration laboratories to test out the functionality of the mission communications system, (2) conducted an independent technology readiness assessment of the mission communications system; (3) completed a preliminary design review and a critical design review of that subsystem, and (4) is conducting antenna co-site interference testing.¹⁵

In December 2014, Sikorsky delivered the initial engineering development model aircraft to its subcontractor, Lockheed Martin, which is responsible for integrating the government-provided mission communications system and 14 VH-92A unique antennas onto the S-92 aircraft.¹⁶ The program is planning to hold the deferred system-level preliminary design review in September 2015 and a system-level critical design review in July 2016. While the design of the commercial platform (S-92) is stable, knowing the full scope of modifications (with at least 90 percent of the design drawing complete) will require a system-level critical design review. Prior to that, the two engineering and development model aircraft will be used to integrate and test a number of mission critical components. For example, they will undergo a series of tests to determine and test antenna placement as well as integrate and test the mission communications system. In

¹⁵Co-site interference occurs when signals from antennas interfere with one another and can be mitigated by selective placement of the antennas.

¹⁶The mission communications system consists of existing analog radios and encryption equipment and a digital Internet Protocol (IP)-based network architecture using currently available hardware and an existing high-speed data link. The system has undergone laboratory testing, but has not yet been flight tested.

addition, ice testing¹⁷ will be conducted before the first engineering and development model aircraft returns to Sikorsky in 2016, where the executive interior will be completed. It will then return to Lockheed Martin for exterior painting. First flight testing with a fully functioning mission communications system is scheduled to begin in May 2017.

Challenges with Schedule

Another challenge facing the VH-92A program will be to maintain its schedule. Various circumstances could arise to affect the program's schedule. For example, the development and production of the VH-92A relies on both government and contractor furnished equipment and the supply of that equipment for integration onto aircraft could be delayed. The program currently faces the potential for such a delay with the delivery of an interior communications system by a subcontractor. The interior communications system provides the aircrew and passengers the ability to talk among themselves as well as use radios for off-aircraft communications. If delivery of this subsystem is delayed, it could affect Lockheed Martin's ability to meet its schedule commitment for a fully functioning mission communications system. Lockheed Martin has been working with Sikorsky and the program office to mitigate possible schedule impacts in this instance and the program office is monitoring this risk. To help address schedule risks overall, the program office has conducted a schedule risk assessment and indicated it will continue to do so annually to mitigate schedule related concerns that may arise.

Challenges Managing Requirements

Perhaps most importantly, the VH-92A program will need to minimize changes to system requirements so as to avoid a need to renegotiate its contract. We have previously reported that despite the importance of well-developed and stable requirements for obtaining good weapon program outcomes, program requirements often change during development. For example, the threat the program originally addressed may change, or the user and acquisition communities may change opinions on what is needed from a program.¹⁸ We have found that programs that modified critical system characteristics after development start experienced higher levels of cost growth and longer delays in delivering capabilities. A significant risk mitigation factor the Navy has in its favor is its contract with Sikorsky, which includes a ceiling price which would limit how much the Navy would have to pay under the contract to the ceiling price. To maintain this advantage the Navy will have to minimize changes to the requirements to avoid the need to negotiate a supplemental agreement and equitable adjustment to the contract. The Navy recognizes this and according to program officials, they have implemented a change management plan that requires executive level oversight. Specifically, according to program officials, any engineering or contract changes affecting system requirements or having the potential to impact program cost, schedule, and performance baselines must be approved by Navy senior executives. The Air Force's KC-46 program's experience suggests that this is manageable. In 2011, the Air Force awarded a development contract for the KC-46 of the same type being used for the VH-92A acquisition—a fixed-price incentive contract. Since that time, the program has not had any significant (greater than \$5 million) requirements changes and the total cost to develop, procure, and field the KC-46 has declined by about \$2.3 billion from the February 2011 baseline, a 4.5 percent decrease.

¹⁷The VH-92A has a requirement to be able to operate in icing conditions.

¹⁸GAO, *Defense Acquisitions: Assessments of Selected Weapon Programs*, [GAO-08-467SP](#) (Washington, D.C.: Mar. 31, 2008).

While the VH-92A program has taken steps to address these challenges and made progress in pursuing a knowledge-based acquisition, much remains to be accomplished before VH-92A aircraft are fielded. It will remain important for the program to maintain its initial baseline by continuing to follow best practices—that is, ensuring resources continue to match requirements, the design performs as expected, and the program meets its cost, schedule, and quality targets.

Agency Comments

DOD provided written comments on a draft of this report. The comments are reprinted in enclosure I. In commenting on a draft of this report, DOD stated that it believes its efforts on this program are aligned with our best practices and it will continue to monitor the program and ensure that mitigations are in place to address potential risk areas.

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 were Bruce H. Thomas, Assistant Director; Bonita J.P. Oden, Analyst-in-Charge; Robert K. Miller; Matthew J. Ambrose; Marie P. Ahearn; Kenneth E. Patton; Robert S. Swierczek; Jennifer Echard; and Karen Richey.



Michael J. Sullivan, Director
Acquisition and Sourcing Management

Enclosure - 1

List of Committees

The Honorable John McCain
Chairman
The Honorable Jack Reed
Ranking Member
Committee on Armed Services
United States Senate

The Honorable Thad Cochran
Chairman
The Honorable Richard J. Durbin
Ranking Member
Subcommittee on Defense
Committee on Appropriations
United States Senate

The Honorable Mac Thornberry
Chairman
The Honorable Adam Smith
Ranking Member
Committee on Armed Services
House of Representatives

The Honorable Rodney Frelinghuysen
Chairman
The Honorable Pete Visclosky
Ranking Member
Subcommittee on Defense
Committee on Appropriations
House of Representatives

The Honorable Michael Turner
Chairman
The Honorable Loretta Sanchez
Ranking Member
Subcommittee on Tactical Air and Land Forces
Committee on Armed Services
House of Representatives

Enclosure I: Comments from the Department of Defense



ASSISTANT SECRETARY OF DEFENSE
3015 DEFENSE PENTAGON
WASHINGTON, DC 20301-3015

MAR 26 2015

Mr. Mike 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 Government Accountability Office (GAO) Draft Report, GAO-15-392R, "PRESIDENTIAL HELICOPTER ACQUISITION: Program Established Knowledge-Based Business Case and Entered System Development with Plans for Managing Challenges," dated February 26, 2015 (GAO Code 121247). The Department appreciates the effort of the GAO and the opportunity to comment on the draft report.

We believe our efforts on this program are aligned with GAO's best practices and will continue to monitor the program and ensure that mitigations are in place to address potential risk areas.

My point of contact for this effort is Mr. John McGough and he can be reached at John.T.McGough.civ@mail.mil or 703-695-3043 or.



Katharina McFarland

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