Department of Homeland Security
Office of Inspector General

U.S. Coast Guard's Acquisition of the Vertical-Takeoff-and-Landing Unmanned Aerial Vehicle

OIG-09-82

June 2009

Office of Inspector General

U.S. Department of Homeland Security
Washington, DC 25028

June 24, 2009

Preface

The Department of Homeland Security (DHS) Office of Inspector General (OIG) was established by the Homeland Security Act of 2002 (*Public Law 107-296*) by amendment to the Inspector General Act of 1978. This is one of a series of audit, inspection, and special reports prepared as part of our oversight responsibilities to promote economy, efficiency, and effectiveness within the department.

Given the cancellation of the Vertical-Takeoff-and-Landing Unmanned Aerial Vehicle acquisition, this report identifies issues that the U.S. Coast Guard can address to mitigate the existing operational capability gap. It is based on interviews with employees and officials of relevant agencies and institutions, direct observations, and a review of applicable documents.

The recommendations herein have been developed to the best knowledge available to our office, and have been discussed in draft with those responsible for implementation. We trust this report will result in more effective, efficient, and economical operations. We express our appreciation to all of those who contributed to the preparation of this report.

Richard L. Skinner
Inspector General

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Abbreviations

FAA	Federal Aviation Administration
VUAV	Vertical-Takeoff-and-Landing Unmanned Aerial Vehicle

OIG

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Executive Summary

In June 2007, after five years of effort and a total of $113.7 million in expenditures and outstanding obligations, the Coast Guard terminated the Vertical-Takeoff-and-Landing Unmanned Aerial Vehicle acquisition. Internal Coast Guard analyses recommended program cancellation due to unresolved developmental risks and increased costs. Without the Vertical-Takeoff-and-Landing Unmanned Aerial Vehicle, the aerial surveillance capability of the National Security Cutter is reduced from 58,160 square nautical miles to 18,320 square nautical miles, a 68% reduction.

The Coast Guard needs to document its short-term strategy to mitigate the maritime surveillance gap resulting from canceling the Vertical-Takeoff-and-Landing Unmanned Aerial Vehicle program. The Coast Guard should also continue to work with the Federal Aviation Administration and the International Civil Aviation Organization to ensure that future unmanned aircraft acquisitions meet regulatory requirements that may otherwise restrict the operation of unmanned aircraft in national and international airspace.

The Coast Guard proceeded with the acquisition of the Vertical-Takeoff-and-Landing Unmanned Aerial Vehicle without assurance that the aircraft would be able to operate in a manner to meet the Coast Guard's mission needs without restrictions.

This report contains two recommendations to the Coast Guard to mitigate the surveillance capability gap and resolve regulatory issues for operating unmanned aircraft in controlled airspace.

Background

Acquisition of the Vertical-Takeoff-and-Landing Unmanned Aerial Vehicle (VUAV) was a key component of the Coast Guard's Integrated Deepwater System (Deepwater) contract with Integrated Coast Guard Systems. The $24 billion, 25-year acquisition program was designed to replace and modernize the Coast Guard's aging and deteriorating fleet of ships and aircraft.

The 2002 Deepwater contract specified the delivery of 69 VUAVs for an estimated total cost of $425 million, with the delivery of the first eight aircraft to occur in 2006. The VUAV project did not receive funding in FY 2003 because the Deepwater program was not fully funded and available funds were used on higher priority projects. The VUAV project was only partially funded from FY 2004 through FY 2006. To continue with the VUAV acquisition within budget limitations, the Coast Guard divided the original VUAV development and demonstration contract into three increments: system development, system component production, and vehicle assembly and demonstration. According to the Coast Guard, incrementally funding the VUAV project increased costs and added two years to the acquisition schedule. In February 2006, the Coast Guard revised its Deepwater Implementation Plan to the delivery of one VUAV (delivery date not specified).

In June 2007, the Coast Guard terminated the VUAV, citing development risks and a lack of funding beyond 2007 as reasons for discontinuing the program. The Coast Guard said that it does not intend to seek recoupment of the funds expended on the VUAV acquisition other than unobligated funds in Integrated Coast Guard Systems' accounts. According to the Coast Guard, at project termination, $90.3 million was expended with outstanding obligations of an additional $23.4 million.

The Coast Guard has been conducting a series of alternatives analyses to determine the path forward to replacing the capability lost resulting from the termination of the VUAV project. These analyses have included research on land- and cutter-based unmanned aircraft. For example, the Coast Guard has worked collaboratively with U.S. Customs and Border Protection on the use of unmanned aircraft in a marine environment.

Results of Review

The Coast Guard needs to document its short-term strategy to mitigate the maritime surveillance capability gap resulting from canceling the VUAV project. The Coast Guard should also continue to work with the Federal Aviation Administration (FAA) and the International Civil Aviation Organization to ensure that future unmanned aircraft acquisitions meet regulatory requirements that may otherwise restrict the operation of unmanned aircraft in national and international airspace. The Coast Guard proceeded with the acquisition of the VUAV without assurance that the aircraft would be able to operate without restrictions, potentially hampering the Coast Guard's ability to accomplish its missions.

Need to Mitigate the Existing Aerial Surveillance Capability Gap

Without VUAVs, the aerial surveillance capability of the National Security Cutter is reduced from 58,160 square nautical miles to 18,320 square nautical miles, a 68% reduction. According to the Coast Guard, the operational effectiveness of the National Security Cutter without the VUAV will be comparable to that of the 378-foot Hamilton class high-endurance cutter.[1] Hamilton class cutters are currently deployed with a single helicopter programmed to conduct up to four hours of aerial surveillance per day. In contrast, the National Security Cutter was projected to be deployed with aviation assets ranging from one manned helicopter and two VUAVs, to four VUAVs without a helicopter. Together, these assets were to provide up to 16 hours of aerial surveillance per day for each cutter. A similar reduction in aerial surveillance capability is expected to affect the proposed Offshore Patrol Cutter fleet. The Coast Guard expected the VUAV to

Bell Eagle Eye Demonstrator Aircraft

[1] The Coast Guard intends to replace its aging and deteriorating fleet of high- endurance and medium-endurance cutters with 8 National Security Cutters and 25 Off Shore Patrol cutters, to be acquired over the next 20 years.

significantly improve the ability of the National Security Cutter and the Offshore Patrol Cutter to conduct drug and migrant interdiction, law enforcement, living marine resource patrols, and search and rescue missions.

With the cancellation of the VUAV, the Coast Guard needs to document its short-term strategy to fill the aerial surveillance capability gap for the National Security Cutter. For the short term, the Coast Guard has proposed compensating for the surveillance capability gap through increased flight hours of the HH-65 Dolphin Helicopters. The Coast Guard is also considering increasing the flight hours of the medium-range surveillance maritime patrol aircraft and the long-range surveillance and transport aircraft. The Coast Guard has said that these short-term solutions come at a higher price per flight hour than the planned VUAV. We are concerned that the diversion of these air assets to compensate for the National Security Cutter surveillance capability gap also may impact other Coast Guard mission requirements. For example, a long-range surveillance and transport aircraft may need to be diverted from conducting a living marine resources enforcement patrol to provide higher priority aerial surveillance support for a National Security Cutter.

For the long term, the Coast Guard is continuing to investigate unmanned aircraft alternatives. In February 2009, the Department of Homeland Security approved the Coast Guard's strategy for determining the most effective unmanned aircraft system to operate from the National Security Cutter. The Coast Guard plans to conduct research, including testing and evaluation, of an existing unmanned aircraft system to support future system acquisition programs. The research also includes an air safety analysis to determine the requirements necessary to address regulatory issues that may restrict unmanned aircraft operations in the Coast Guard's operating and mission areas. According to the Coast Guard, the final report is expected in March 2010.

Need to Resolve FAA Regulatory Requirements

The FAA and the International Civil Aviation Organization classify unmanned aerial vehicles as aircraft. Therefore, the operation of unmanned aerial vehicles in national and international airspace is subject to existing aircraft flight rules and regulations. The Coast Guard worked with the FAA to address regulatory requirements such as airworthiness certification standards. However, the Coast Guard did not resolve with the FAA and the International Civil Aviation

Organization how it would operate the VUAV in airspace controlled by either of these organizations.

See and Avoid Capability

Central to FAA air safety requirements for aircraft to operate unrestricted in regulated airspace is the ability of the aircraft pilots to see and avoid other traffic in the airspace.[2] To meet this requirement, Integrated Coast Guard Systems proposed using a High Frequency Surface Wave Radar. The High Frequency Surface Wave Radar was a U.S. Navy developmental program that was outside the Coast Guard's direct control. This radar technology was to be installed aboard the National Security Cutter and the proposed Offshore Patrol Cutter to provide a detect, see, and avoid capability. The U.S. Navy cancelled the High Frequency Surface Wave Radar project in 2003 due to technological problems.

The Coast Guard and Integrated Coast Guard Systems had no assurances that the High Frequency Surface Wave Radar would have satisfied FAA airspace deconfliction requirements. According to the FAA, a detect, sense (see), and avoid system capable of meeting FAA requirements does not yet exist. Without detect, see, and avoid technology for unmanned aircraft vehicles that satisfies FAA requirements for unrestricted access to U.S. airspace, or a FAA accepted airspace safety risk analysis and usage plan, it is unlikely that unmanned aircraft will be authorized for unrestricted use by the Coast Guard in performing its missions in FAA-regulated airspace.

The Coast Guard intended to operate the VUAV over the high seas in national and international airspace using the National Security Cutter's air search radar capability to mitigate risk by clearing the airspace around the VUAV. The Coast Guard was also investigating the use of "Due Regard" provisions. These provisions would have permitted the Coast Guard to operate the VUAV in international airspace even though it had not met the FAA's detect, see, and avoid requirements. The Due Regard provisions allow the Coast Guard to deviate from normally accepted flight procedures by requiring that it assume full responsibility for separation of its aircraft from all other aircraft operating in the same international airspace.[3]

[2] Per 14 CFR § 91.113 (b), when weather conditions permit, regardless of whether an operation is conducted under instrument flight rules or visual flight rules, vigilance shall be maintained by each person operating an aircraft so as to see and avoid other aircraft.

[3] Article 3(d) of the Convention of International Civil Aviation of 1944 states, "The contracting States undertake, when issuing regulations for their state aircraft, that they will have due regard for the safety of navigation of civil aircraft."

The Coast Guard, under its Due Regard provisions and the FAA's Certificate of Authorization application process, intended to use the cutters' air search radar to provide airspace deconfliction for VUAV operations in international airspace. These operations would be conducted more than 50 nautical miles from shore, where the likelihood of encountering other air traffic would be relatively low. However, the operation of the VUAV 50 nautical miles from shore might not have permitted the Coast Guard to conduct missions in accordance with the planned Concept of Operations. For example, the Coast Guard planned to operate the VUAV in the Caribbean, but those operations might have been problematic because of the proximity of many islands and countries in the region to each other. The Coast Guard is conducting airspace studies to determine the closest approach to shore for VUAV operations that will meet FAA safety criteria.

Recommendations

We recommend that the Commandant of the Coast Guard:

Recommendation #1: Document the short-term strategy and plans to mitigate the maritime surveillance gap, including potential impacts on Coast Guard missions, until the long-term solution to replacing the operational capability lost as a result from the cancellation of the VUAV project is identified.

Recommendation #2: Ensure that any future unmanned aircraft system acquisition will satisfy FAA and international regulatory requirements necessary to meet Coast Guard operational needs.

Management Comments and OIG Analysis

The Coast Guard concurred with both recommendations. Additionally, the Coast Guard has indicated that it is taking corrective actions to address the recommendations. We consider both recommendations resolved, but they will remain open until we receive additional information regarding the Coast Guard's implementation of the corrective actions indicated.

Management Comments to Recommendation #1: The Coast Guard concurred with our recommendation regarding the documentation of

its short-term strategy and plans to mitigate the maritime surveillance gap, until the long-term solution to replacing the operational capability lost as a result from the cancellation of the VUAV project is identified. According to the Coast Guard, its operational commanders will prioritize the level of manned aviation support to the National Security Cutter and will adjust the level of aviation support depending on the mission and maritime surveillance needs. Additionally, the Coast Guard stated that it is conducting a fleet mix analysis to identify mission demands and capability requirements. The fleet mix analysis will quantify changes made to the original Deepwater program of record (including unmanned aircraft surveillance) to identify current and projected operational gaps. The resulting analysis will be used to define any maritime surveillance gaps that may exist and formulate recommendations on material solutions to close the gaps.

OIG Analysis: We consider the Coast Guard's proposed actions responsive to the recommendation. However, this recommendation will remain open until the Coast Guard provides the results of the fleet mix analysis and its short-term strategy and plans to mitigate the maritime surveillance gap, including potential impacts on Coast Guard missions.

Management Comments to Recommendation #2: The Coast Guard concurred with our recommendation to ensure that any future unmanned aircraft system acquisition will satisfy FAA and international regulatory requirements necessary to meet Coast Guard operational needs. According to the Coast Guard, it is working with the FAA to address the challenges of integrating unmanned aircraft into the National Airspace System, including the creation of a Coast Guard liaison officer position in the FAA Unmanned Aircraft Branch. The liaison officer will focus on unmanned aircraft operations in the maritime environment and development of unmanned aircraft airspace policies and procedures. The Coast Guard stated that it would fill the liaison officer position within the FAA Unmanned Aircraft Branch by the summer of 2009.

OIG Analysis: We consider the Coast Guard's proposed actions responsive to the recommendation. However, this recommendation will remain open until the Coast Guard fills the Coast Guard liaison officer position at the FAA Unmanned Aircraft Branch.

This audit identifies lessons learned from the unsuccessful Bell "Eagle Eye" Vertical-Takeoff-and-Landing Unmanned Aerial Vehicle (VUAV) project, contracted by the Coast Guard with Integrated Coast Guard Systems, LLC, under the Deepwater Acquisition Program.

As part of the effort, we reviewed cost, schedule, and performance measures surrounding the VUAV acquisition to determine changes from the original Deepwater contract and their effects on the VUAV acquisition. We also reviewed the Coast Guard's management and oversight of the VUAV acquisition, including its policies, procedures, and oversight authorities.

The audit period generally covered historical VUAV data and documents as related to the original Deepwater request for proposal; the 2002 Deepwater contract; the 2005 Revised Deepwater Implementation Plan; the 2007 Award Term 1 contract; delivery/task orders and undefinitized contract actions; engineering change proposals; and requests for equitable adjustment.

We conducted fieldwork at Coast Guard headquarters in Washington, DC; at the Bell Helicopter VUAV Program Office located in Hurst, TX; and at the Coast Guard Research and Development Center in Groton, CT. We interviewed Coast Guard, Integrated Coast Guard Systems, Bell Helicopter, and subcontractor personnel. We also reviewed department records and documents.

We conducted this performance audit between June 2007 and February 2009 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.

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MEMORANDUM

From: K. A. TAYLOR, RDML
COMDT (CG-8)

Reply to Attn of: Audit Manager
Mark Kulwicki
(202) 372-3533

To: Assistant Inspector General for Audits
Department of Homeland Security

Subj: DHS-OIG DRAFT REPORT: "U.S COAST GUARD'S ACQUISITION OF THE VERTICAL TAKEOFF-AND-LANDING UNMANNED AERIAL VEHICLE"

Ref: (a) OIG DRAFT Report of April 21, 2009

1. This letter transmits the Coast Guard's response to the Office of Inspector General's (OIG) draft report findings and recommendations in reference (a).

2. The Coast Guard concurs with both recommendations and is taking corrective action.

3. If you have any questions, my point of contact is Mr. Mark Kulwicki at (202) 372-3533. Alternately, our Chief of the External Coordination in the Office of Budget & Programs, Commander Todd Offutt, can be reached at (202) 372-3535.

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Enclosure (1) USCG Comments

U.S. COAST GUARD (CG) RESPONSE TO OFFICE OF INSPECTOR GENERAL'S DRAFT REPORT OF APRIL 2009

TITLE: "U.S. COAST GUARD'S ACQUISITION OF THE VERTICAL TAKEOFF-AND-LANDING UNMANNED AERIAL VEHICLE"

COAST GUARD'S COMMENTS ON DHS OIG FINDINGS:

The U.S. Coast Guard generally concurs with the OIG's recommendations and appreciates the opportunity to comment on the draft report. The Coast Guard is taking corrective actions to address the recommendations.

SPECIFIC COAST GUARD RESPONSES TO DHS OIG RECOMMENDATIONS:

Recommendation #1: "Document the short-term strategy and plans to mitigate the maritime surveillance gap, including potential impacts on Coast Guard missions, until the long-term solution to replace the operational capability lost as a result from cancellation of the VUAV project is identified."

Coast Guard Comments/Actions:

- Concur.
- The Coast Guard will support the National Security Cutter (NSC) with manned aircraft based on the operational commander's priorities to meet the Commandant's strategic direction. The number of flight deck equipped cutters (FDEC) and their associated underway days do not affect our support capacity. Operational commanders will prioritize the level of manned aviation support to the NSC and may increase support above what is currently provided to other Coast Guard Cutters depending on the mission and the urgency to provide maritime surveillance to accomplish the mission. With proper management of mission priority, the employment of existing Maritime Patrol Aircraft and helicopters deployed aboard the NSC will allow the Coast Guard to provide maritime surveillance without adversely impacting current Coast Guard operations.
- The Coast Guard is conducting a fleet mix analysis (FMA). The FMA is a comprehensive study to identify mission demands and capability requirements to the year 2025 timeframe. The FMA will quantify changes made to the original Deepwater program of record (including unmanned aircraft surveillance) to identify current and projected operational gaps, and provide a set of solutions (force mix, rough order of magnitude costs, concept of operations). The FMA will be used to define any maritime surveillance gaps which may exist. It will also formulate conclusions and recommendations to inform Coast Guard leadership on material solutions to close gaps. This includes how best to incorporate the UASs as one of the many surveillance tools available to the operational commander.

Recommendation #2: "Ensure that any future unmanned aircraft system acquisition will satisfy FAA and international regulatory requirements necessary to meet Coast Guard operational needs."

Coast Guard Comments/Actions:

- Concur.
- The Coast Guard is working with the FAA and other government agencies to address the challenge of integrating UAS into the National Airspace System (NAS). To this end, the Coast Guard has created a Captain Liaison Officer (LNO) position in the FAA Unmanned Aircraft Branch, Air-160. The position will be filled by the summer of 2009. It will focus on UAS operations in the maritime environment and development of the UAS airspace policies and procedures. The Coast Guard will continue to involve the FAA to: develop policies and procedures that meet FAA policy; address the Certificate of Authorization (COA) process; and involve future airspace regulations addressing UAS operations.
- The Coast Guard crafted a two-prong effort (cutter-air-search radar and safety analysis) to obtain COA approval. The Coast Guard is investigating the use of "due regard" rules to satisfy the requirement and to de-conflict airspace while operating outside of international rules. As part of the UAS for NSC study, the Coast Guard is conducting an airspace safety analysis to determine the probability of causing harm to users of the airspace. The study is scheduled to be completed March 2010.
- Regarding the specific recommendation to satisfy FAA and international regulatory requirements: There are currently no known FAA regulations pertaining specifically to UAS operations in national or international airspace. UAS operators must obtain a Certificate of Authorization request to the FAA to waive certain requirements in the Code of Federal Regulations (CFR) governing the operation of all aircraft in the NAS. Currently, no known UAS can meet "see and avoid" requirements in the CFR.

Appendix C
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