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Report to the Chairman, Subcommittee on Coast Guard and Maritime Transportation, Committee on Transportation and Infrastructure, House of Representatives

January 2016

NATIONAL SECURITY CUTTER

Enhanced Oversight Needed to Ensure Problems Discovered during Testing and Operations Are Addressed

Accessible Version

GAO-16-148

GAO Highlights

Highlights of GAO-16-148, a report to the Chairman, Subcommittee on Coast Guard and Maritime Transportation, Committee on Transportation and Infrastructure, House of Representatives

Why GAO Did This Study

As part of the decades-long, multi-billion-dollar effort to replace aging Coast Guard vessels, aircraft, and information technologies, the Coast Guard developed the NSC to replace its High Endurance Cutter fleet. The Coast Guard conducted initial testing—a key acquisition event designed to ensure an asset is capable of meeting its mission prior to approving full-rate production—in 2014 after seven of eight planned NSCs had already been placed under contract and three were operational. In June 2014, GAO found that the Coast Guard continues to address design changes required for the NSC fleet that were identified prior to IOT&E.

GAO was asked to review the NSC's initial testing event. This report examines (1) the performance of the NSC and its systems during that test, (2) the Coast Guard's plans for follow-on testing, and (3) the performance of the NSC during regular operations. GAO analyzed NSC requirements and test reports, post operational reports, and Coast Guard and DHS policies. GAO also interviewed officials with the Coast Guard, DHS, and NSC operators.

What GAO Recommends

GAO recommends that DHS ensure that the NSC's cutter boat requirements are clarified, that guidance address the timing of follow-on testing, and that further oversight is conducted as the Coast Guard works to remedy issues revealed in testing and operations. DHS agreed with the recommendations and provided timeframes for actions to address them.

View GAO-16-148. For more information, contact Michele Mackin at (202) 512-4841 or mackinm@gao.gov.

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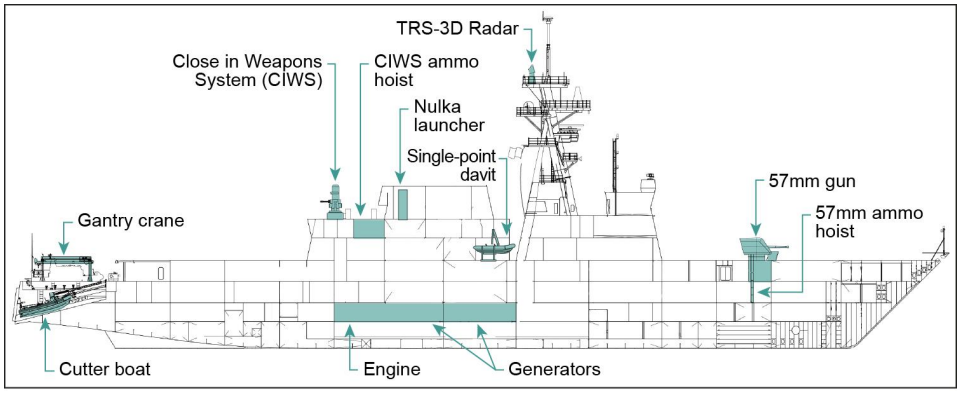
What GAO Found

The U.S. Navy, the Coast Guard's independent test agent, completed initial testing for the National Security Cutter (NSC) in April 2014 and rated the NSC as operationally effective and suitable. Still, testing revealed 10 major deficiencies (some are shown in figure). Initial testing is an event designed to verify performance of critical systems to ensure assets are capable of meeting mission requirements. The event tests critical operational issues and key performance parameters. The NSC fully met 12 of 19 key performance parameters. Tests of one key performance parameter, as well as other critical systems, were deferred to follow-on testing. The Coast Guard and the U.S. Navy disagree on the NSC's requirements for cutter boat operations. Without clear requirements the Navy and Coast Guard will not have a basis for determining actions to resolve any performance issues. Coast Guard officials acknowledged that clarifying these requirements would be beneficial.

The Coast Guard plans to begin follow-on testing in fall 2016. It must submit corrective action plans to the U.S. Navy to close any deficiencies. According to Coast Guard documentation, it may choose not to correct all deficiencies due to the cost of changes. Department of Homeland Security (DHS) acquisition guidance does not specify the timing of follow-on testing or the actions to be taken in response to the findings. Without a definite time frame DHS risks encountering the same problems as the NSC program experienced with future acquisitions and fielding assets without knowing the full capabilities.

During operations, the NSC has experienced performance issues that were not identified during initial testing, and the Coast Guard has planned design changes to some of the cutters' equipment (some are shown in figure). However, the Coast Guard has not yet found the causes for problems affecting the NSC's propulsion systems. As a result of these and other equipment failures, the NSC has been operating in a degraded condition in some mission areas. DHS has no plans for additional acquisition review boards for the NSC, which would provide oversight going forward. Continued management-level oversight by DHS would help ensure that problems identified during testing and operations are addressed.

Examples of National Security Cutter Equipment That Have Encountered Problems in Testing or Operations



Source: GAO presentation and analysis of U.S. Coast Guard data. | GAO-16-148

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Abbreviations

ADM	Acquisition Decision Memorandum
ARB	Acquisition Review Board
C2	Command and Control
C4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance
CIWS	Close-in Weapons System
COI	Critical Operational Issues
COP	Common Operational Picture
COTF	Commander, Operational Test and Evaluation Force
CSSQT	Combat System Ship Qualification Trials
DHS	Department of Homeland Security
DOT&E	Director of Operational Test and Evaluation
FOT&E	Follow-on Operational Test and Evaluation
HEC	High Endurance Cutter
IOT&E	Initial Operational Test and Evaluation
KPP	Key Performance Parameter
LRI-II	Long-Range Interceptor II
NSC	National Security Cutter
OPC	Offshore Patrol Cutter
OTH-IV	Over the Horizon-IV
UAS	Unmanned Aircraft System
USM	Undersecretary for Management

U.S. GOVERNMENT ACCOUNTABILITY OFFICE
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January 12, 2016

The Honorable Duncan Hunter
Chairman
Subcommittee on Coast Guard and Maritime Transportation
Committee on Transportation and Infrastructure
House of Representatives

Dear Mr. Chairman:

As part of the decades-long, multi-billion-dollar effort to replace aging Coast Guard vessels, aircraft, and information technologies, the Coast Guard is building the flagship 418 foot National Security Cutter (NSC). It is intended to be capable of extended deployments, increased endurance, and enhanced communication and surveillance systems compared to the High Endurance Cutters (HEC) it is replacing. The Coast Guard began operating the NSC in 2010 and has accepted delivery of 5 of 8 planned NSCs, while the other 3 are in various stages of construction at Huntington Ingalls Industry shipyard in Pascagoula, Mississippi.[1] Initial Operational Test and Evaluation (IOT&E) was conducted for the NSC in 2014. IOT&E is a key acquisition event designed to test all critical systems that are necessary for successful operations and ensure that the asset is capable of meeting its mission requirements before being approved for full-rate production. In the case of the NSC, this testing took place after 7 of the 8 cutters were under contract, and 3 were operational. We have previously found that delaying critical test events can lead to late discoveries and could result in additional design changes and costs to programs.[2] As we found in June 2014, the Coast Guard continues to

[1]Although the Coast Guard has planned for 8 NSCs, Congress earmarked $640 million for a ninth NSC in the Consolidated Appropriations Act, 2016. Specifically, Congress directed that, of the funds provided by the Act, not less than $640 million be immediately available and allotted to contract for the production of the ninth NSC, notwithstanding the availability of funds for post-production costs. Pub. L. No. 114-113 (Dec. 18, 2015).

[2]GAO, *Navy Shipbuilding: Significant Investments in the Littoral Combat Ship Continue Amid Substantial Unknowns About Capabilities, Use and Cost*, GAO-13-530 (Washington, D.C.: July 22, 2013).

address retrofits and design changes required for the NSC fleet that were identified prior to IOT&E.[3]

You requested that we examine the NSC's IOT&E event. This report examines (1) the performance of the NSC and its systems during IOT&E, (2) the Coast Guard's plans for Follow-on Operational Testing and Evaluation (FOT&E), and (3) the extent to which issues have arisen during NSC operations that might affect the NSC's capabilities.

To assess the performance of the NSC and its systems during IOT&E, we reviewed the NSC's program documentation, including test plans and an acquisition decision memorandum (ADM), and key metrics the Coast Guard uses to evaluate assets: key performance parameters (KPP)—capabilities considered essential for mission success—and critical operational issues (COI)—fulfillment of which determines an asset's operational effectiveness and suitability. We analyzed the IOT&E test report to identify any deficiencies found on the cutter and limitations, if any, to the test event that might have prevented a full evaluation of the cutter's systems. We analyzed program documentation and interviewed Coast Guard officials and officials from the Navy's Commander, Operational Test and Evaluation Force (COTF)—which conducted the testing—to determine areas where the NSC is or is not meeting required capabilities and performance metrics. To add important context to our review, we toured the NSC used for IOT&E (*Stratton*) and interviewed the Commanding Officer of the cutter concerning his experiences operating the vessel and its capabilities. To assess the Coast Guard's plans for FOT&E, we reviewed Coast Guard and Department of Homeland Security (DHS) guidance and Coast Guard documents and interviewed Coast Guard officials to determine the timeline for FOT&E, identify what systems will be tested, and determine what, if any, changes are planned for the NSC fleet based on IOT&E and operations. To assess the performance of the NSC during regular operations, we reviewed after action reports and engineering reports, which are prepared by the cutters' commanding officers, to identify any equipment casualties (i.e., equipment failures) the cutters are experiencing on a regular basis and the effect that these casualties are having on operations. We reviewed the Coast Guard's measure of availability to determine what impact, if

[3]GAO, *Coast Guard Acquisitions: Better Information on Performance and Funding Needed to Address Shortfalls,* GAO-14-450 (Washington, D.C.: June 5, 2014).

any, equipment casualties had on the NSC's performance in operations. We interviewed officials from the NSC's logistics group to discuss these operational issues and the steps they are taking to identify root causes and corrective actions. We also toured the Huntington Ingalls Industry shipyard in Pascagoula, Mississippi where the NSCs are built to gain an understanding of how design changes are incorporated into the production process. Appendix I contains more information regarding our scope and methodology.

We conducted this performance audit from January 2015 to January 2016 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 the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

The Coast Guard is a multi-mission, maritime military service within DHS. The Coast Guard's range of responsibilities includes maintaining the United States' maritime borders, facilitating the global movement of commerce, safeguarding marine resources, and protecting those at sea. To meet its statutory missions, the Coast Guard operates a number of vessels, aircraft, and information technology systems. Many of the assets that the Coast Guard operates were delivered between 1960 and 1992 and are approaching the end of or have exceeded the period for which they were expected to perform—known as the assets' service lives.

The Deepwater Program

The Coast Guard began a recapitalization effort in the late 1990s to modernize a significant portion of its entire surface and aviation fleet by rebuilding or replacing assets. This effort was formerly known as Deepwater, which included the NSC program. DHS approved a baseline in May 2007 that established the total acquisition cost of the Deepwater program at $24.2 billion and projected the Coast Guard would complete the acquisition in 2027. In June 2014, we found that the total cost of the Coast Guard's acquisition portfolio had grown to $30.5 billion, of which $20.7 billion was still needed to finish fielding the assets.[4] The cost of the

[4]GAO-14-450.

NSC program has grown from $3.5 billion in 2007 to $5.6 billion in 2015 due to, among other things, the costs to correct structural issues on the first two cutters and changes in economic factors, such as labor and commodity prices. As of the fiscal year 2012 President's Budget, DHS and the Coast Guard no longer use the term "Deepwater" and instead call this effort Coast Guard recapitalization.

Comparison of the National Security Cutter and High Endurance Cutter Capabilities and Operations

The NSC was designed to replace the legacy HECs, which were first built in the late 1960s, and is to provide several capabilities that the HECs do not have, such as the ability to collect, analyze, and transmit classified information; carry, launch, and recover unmanned aircraft; more easily and safely launch cutter boats from and return them to the NSC; and travel away from shore for longer time periods. The NSC is intended to fulfill the role of the HECs in conducting Coast Guard missions, which include defense readiness, drug interdiction, other law enforcement, living marine resources, port, waterways, and coastal security, migrant interdiction, search and rescue, and marine environmental protection. In addition, the NSCs are designed to enable the Coast Guard to screen and target vessels faster, and more safely and reliably before they arrive in U.S. waters. The NSC also carries helicopters and cutter boats. As a result of the planned increased capabilities of the NSCs, the Coast Guard is in the process of replacing 12 HECs with 8 NSCs. We previously reported on the condition of the Coast Guard's legacy fleet and their efforts to replace them in 2012.[5] Figure 1 provides a comparison of some key operational capabilities between the HEC and its replacement, the NSC.

[5]GAO, *Coast Guard: Legacy Vessels' Declining Condition Reinforce Need for More Realistic Operational Targets*, GAO-12-741 (Washington D.C.: July 31, 2012).

Figure 1: Comparison of High Endurance Cutter and National Security Cutter Capabilities

Capability	High-Endurance Cutter	National Security Cutter
Number in fleet[a]	12 (6 remain in service)	8 planned (3 operational)
Year first-in-class cutter commissioned[b]	1967	2008
Crew size	166 (19 officers, 147 crew)	110 (14 officers, 96 crew)
Length	378 feet	418 feet
Targeted days away from home port	185 days per year	230 days per year
Maximum time at sea without reprovisioning	45 days	60 days
Range	9,600 nautical miles (at an average speed of 15 knots)	12,000 nautical miles (at an average speed of 12 knots)
Maxmium speed	29 knots[c]	28 knots
Patrol speed	12 knots	15 knots
Draft[d]	19 feet	22 feet
Aircraft capabilities	1 aircraft hangar (for helicopter)	Larger flight deck with 2 aircraft hangars (for helicopter and unmanned aerial system)
Cutter boat capabilities	Carries 2 side-mounted cutter boats	Carries 3 cutter boats: 1 side-mounted cutter boat and 2 stern mounted cutter boats

Source: GAO analysis of information provided by the U.S. Coast Guard (data); Defense Video & Imagery Distribution System (photos). | GAO-16-148

[a]This is as of October 2015.

[b]Commissioning follows delivery and is the milestone marking a cutter's entry into active service.

[c]According to the Coast Guard, the age and condition of the high-endurance cutters, coupled with renovation and modernization modifications made to these vessels over the years make many of these vessels unable to achieve a maximum speed of 29 knots.

[d]Draft is the depth of water needed to float the vessel.

In addition to the advanced capabilities of the NSC listed above, according to the Coast Guard, it planned for the NSC to have several capabilities that exceed that of the HECs:

- NSC's engine and propulsion systems are designed to be more efficient than the HEC's, allowing the NSC to transit faster while burning less fuel;

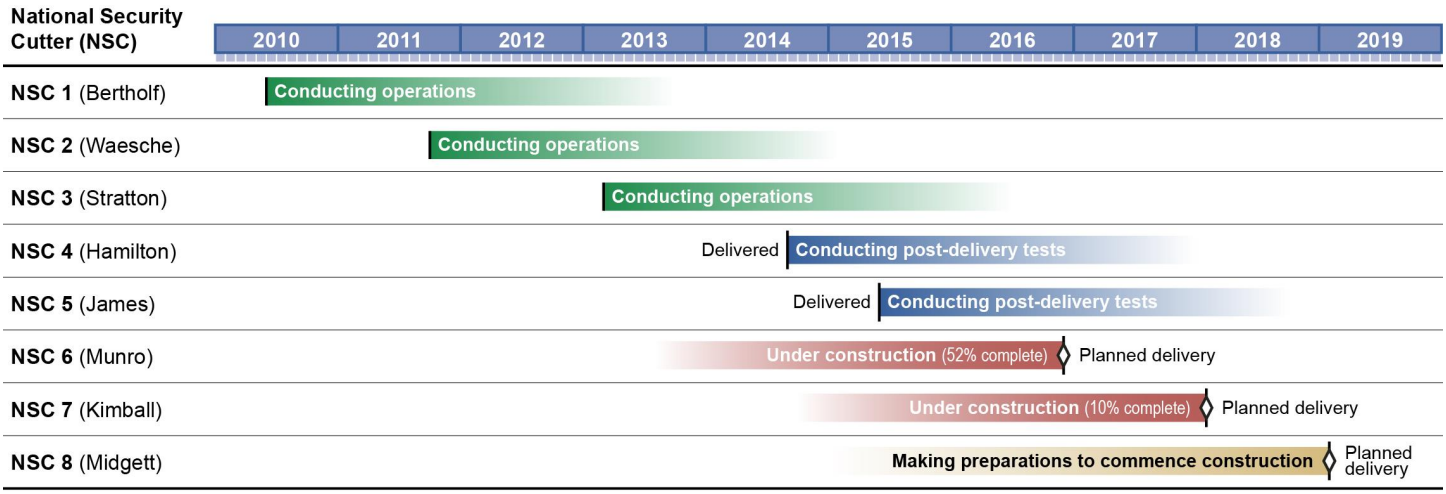
- The NSCs are intended to be able to conduct missions in rougher seas than the HECs; and

- The NSCs are designed to have more comfortable accommodations for the crew, with larger sleeping and living areas that provide more space for modern conveniences such as computers, entertainment systems, and exercise facilities.

In October 2014, the DHS Office of Inspector General found that the NSC's improved intelligence capabilities have resulted in the Coast Guard being able to perform its missions more effectively, including drug interdictions. For example, according to Coast Guard data from 2013 to 2014, the NSC interdicted nearly 60 percent more pounds of drugs (cocaine and marijuana) per day compared to the HECs operating during the same period. The NSC's intelligence capabilities are used across mission areas, including defense readiness, migrant interdiction, and law enforcement. These capabilities are expected to be enhanced by the eventual procurement of unmanned aircraft.

The Coast Guard took ownership of the first NSC in May of 2008, and it became fully operational in May of 2010. The second and third NSCs became operational in October 2011 and March 2013, respectively. Figure 2 shows the current status of the eight NSCs as of September 2015.

Figure 2: Current Status of Eight National Security Cutters as of September 2015



Source: GAO presentation of U.S. Coast Guard data. | GAO-16-148

DHS Acquisition Process

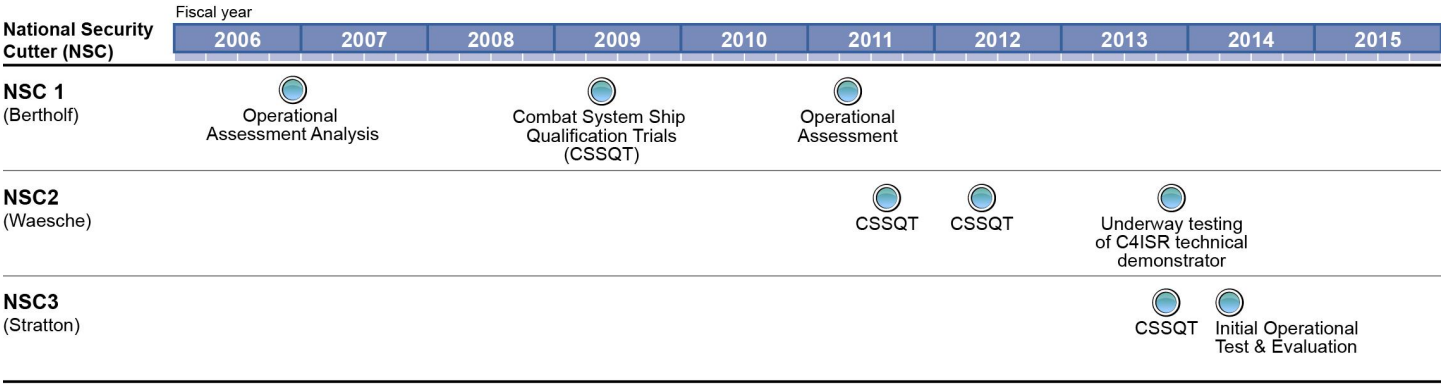
As part of DHS, the Coast Guard is required to follow DHS acquisition policies and processes for managing its major acquisition programs. These requirements are primarily set forth in DHS's Acquisition Management Directive 102-01 and an associated instruction manual. DHS's Under Secretary for Management (USM) is currently designated as the department's Chief Acquisition Officer and, as such, is responsible for managing the implementation of the department's acquisition policies. DHS's Deputy Secretary or USM serve as the Acquisition Decision Authority for the department's largest acquisition programs: those with life-cycle cost estimates of $1 billion or greater, such as the NSC. DHS acquisition policy establishes that a major acquisition program's Acquisition Decision Authority shall review the program at a series of five predetermined acquisition decision events to assess whether the major program is ready to proceed through the acquisition life-cycle phases. The Acquisition Decision Authority is supported by DHS's Acquisition Review Board (ARB), which reviews major acquisition programs for proper management, oversight, accountability, and alignment with the department's strategic functions at acquisition decision events and other meetings as needed. The ARB is chaired by the Acquisition Decision Authority, who issues acquisition decision memorandums approving or rejecting a program's request to enter the next acquisition phase. These memorandums can also provide additional actions that the program must take before proceeding.

Operational Testing

DHS and Coast Guard acquisition guidelines require operational test and evaluation by an independent test agency to confirm that the production configured system meets all requirements before approval for full-rate production. The Coast Guard uses the U.S. Navy's COTF to conduct operational tests and other evaluations for its major acquisition programs according to those programs' requirements. COTF serves as an independent evaluator of an asset's capabilities and has experience testing U.S. Navy assets. The DHS Director of Operational Test and Evaluation (DOT&E) serves as a reviewer of operational tests for DHS and writes a letter of assessment following major test events that assesses whether the test event was adequate and followed the approved test plan and whether the Director agrees with COTF's findings.

Operational testing characterizes the performance of an asset during a discrete period of time—from January to April 2014 in the case of the NSC—but testers may also use actual mission performance data when available and data from previous test events. The NSC conducted several test events prior to IOT&E, which are shown in figure 3.

Figure 3: Timeline of Test Events That Informed National Security Cutter Initial Operational Test and Evaluation



Source: GAO presentation of U.S. Coast Guard data. | GAO-16-148

Note: CSSQT is a comprehensive trial designed to test a cutter's combat systems and includes a live fire exercise.

C4ISR stands for Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance.

In conducting operational testing, COTF evaluates an asset's operational effectiveness and suitability:

- For operational effectiveness, testers determine whether or not an asset can meet its missions.
- For operational suitability, testers determine whether or not the agency can logistically support the asset to an acceptable standard, such as having the asset available for operations 85 percent of its scheduled deployment time.

Critical operational issues (COI) are one metric used to determine an asset's operational effectiveness and suitability and are stated in the form of a question. COIs are examined during testing to evaluate a system's ability to provide the desired capability and perform its mission. The NSC has 19 COIs, which include issues such as maritime law enforcement, defense readiness, reliability, and availability. Some of the specific COIs include "Will the NSC be effective in exercising Coast Guard law enforcement authority?" and "Will the NSC be capable of providing defense readiness to a Combatant Commander?" COIs are assessed by COTF testers by comparing the outcome of the test event against the full scope of the COI to determine whether the COI has been met or not. Unmet COIs are often the result of related deficiencies, which are identified during testing and include any system that is lacking in its ability to meet normal standards or function as intended. Deficiencies are scored based on the severity of the problem and its impact on the asset's ability to accomplish its mission. Table 1 shows the deficiency ratings and definitions.

Table 1: Deficiency Ratings Used to Assess the National Security Cutter during Initial Operational Test and Evaluation

Deficiency Rating	Definition
Severe	Precludes mission accomplishment
Major 1	Critical impact on mission accomplishment
Major 2	Serious impact on mission accomplishment
Major 3	Moderate impact on mission accomplishment
Minor	No significant impact on mission accomplishment

Source: GAO presentation of Navy data. | GAO-16-148

COIs and any deficiencies identified during testing both factor into an asset's overall operational effectiveness and suitability rating.

In addition to verifying that an asset is operationally effective and suitable, operational testing also tests key performance parameters (KPP), which are the capabilities considered essential for mission accomplishment. KPPs are listed by threshold values, which are the minimum acceptable level of performance, and objective values, which are the desired level of performance. For example, a KPP for the NSC is being able to reach a maximum speed of 28 knots for a threshold value and 31 knots for an objective value. KPPs differ from COIs in that KPPs focus on specific performance metrics, while COIs focus on certain types of missions that an asset should be able to conduct or an asset's ability to be ready to perform those missions. Table 2 provides examples of COIs and KPPs for the NSC.

Table 2: Examples of National Security Cutter Critical Operational Issues and Key Performance Parameters

Critical Operational Issue	Key Performance Parameter
Defense Readiness – Will the NSC be capable of providing defense readiness to a combatant commander?	Deliver warning shots
Surveillance and Reconnaissance – Will the NSC effectively conduct the mission of surveillance and reconnaissance?	Exchange information with mission partners
Reliability – Will the reliability of the NSC support completion of its mission?	Endurance – 60 days without replenishment for fuel and subsistence.

Source: GAO presentation of Coast Guard information. | GAO-16-148

Operational testing can occur over many test events. Two of those key test events are:

- Initial Operational Test and Evaluation (IOT&E): This event is meant to gather the data necessary to resolve COIs, determine an asset's operational effectiveness and suitability, and, according to Coast Guard acquisition guidance, occur prior to a full-rate production decision. IOT&E is conducted using realistic threat scenarios involving all mission areas under various environmental conditions. The test event concludes with a rating of operationally effective or not effective, operationally suitable or not suitable.

- Follow-on operational test and evaluation (FOT&E): This event is conducted after IOT&E and an asset's full rate production decision

and focuses on refining the estimates that were made during previous operational test events, evaluating production changes, and re-evaluating the system to ensure that it continues to meet operational needs. It also validates any incomplete or deferred requirements and verifies the correction of deficiencies identified during IOT&E. FOT&E concludes with an operational effectiveness and suitability rating similar to that of IOT&E.

According to DHS and Coast Guard acquisition guidance, results of operational tests are used to evaluate the degree to which the capability or system being acquired meets its requirements and is able to operate in its intended environment, both before and after full-rate production commences. Following IOT&E and FOT&E, COTF writes a test report that focuses on the resolution of the asset's COIs and any deficiencies that were identified during testing. These reports typically include a summary of the resolution of the asset's COIs, including showing the progression of the COIs from previous test events, an explanation of the operational effectiveness and suitability ratings, and a detailed walkthrough of the resolution of each COI, including explaining any deficiencies that were identified.

The NSC completed IOT&E in April 2014, and DHS subsequently approved the program for full rate production in October 2014. IOT&E had originally been planned in 2012 on the second NSC but was delayed, according to Coast Guard officials, so that testing could be conducted on a fleet representative sample and because the cutter would not have performed well with some of the original equipment, specifically the gantry crane, which aids in launching and recovering cutter boats from the stern of the cutter; the single-point davit, which launches and recovers cutter boats from the side of the cutter; and the cutter boats themselves. Thus, the Coast Guard preferred to wait until the new equipment, or prototypes of new equipment, could be installed on the *Stratton*.

While Initial Operational Testing Revealed Some Major Deficiencies, the NSC Met Most of Its Key Performance Parameters

The Coast Guard's independent test agent—COTF—conducted IOT&E from January to April 2014 and rated the NSC as operationally effective and suitable. Still, testing revealed 10 test deficiencies, characterized as "major," including failures in systems related to the combat weapon systems, which could affect the NSC's ability to meet some of its missions. The NSC met a majority of KPPs, but tests of some critical systems were deferred to FOT&E. One issue that remains to be resolved is the conditions in which the NSC's cutter boat can operate; the Coast Guard and COTF have different interpretations of the requirement.

The NSC Demonstrated Its Ability to Conduct Missions, Though Several Systems in the Combat Suite Experienced Failures

The NSC was found to be operationally effective and suitable based on the COIs tested during the IOT&E event. This event was conducted during an operational patrol of the third NSC (*Stratton*) from January 2014 through April 2014 and also included live fire events conducted during previous NSC tests. The NSC successfully demonstrated 18 of its 19 COIs, with one COI—cybersecurity—being deferred to FOT&E. The Director of DOT&E postponed the testing of the NSC's cybersecurity capabilities until a more robust test plan could be developed due to emerging threats. COTF noted several improvements of the NSC over the legacy HEC, including: the height of the flight deck; the size of the hangar, which better protects the helicopter from sea spray; a more stable platform that helps to reduce crew fatigue and sea sickness; and the new dual-point davit for launching cutter boats from the side of the cutter, which provides increased control when launching and recovering the cutter boats.[6]

However, COTF identified 10 major deficiencies on the NSC, 4 of which were known prior to testing. According to COTF officials, the systems with previously known deficiencies were not repaired prior to IOT&E because they had been tested previously. Table 3 describes the 10 major deficiencies found during IOT&E.

[6]Currently the *Stratton* is the only NSC to operate the dual-point davit. The remaining NSCs have a single-point davit that does not provide as much control of the cutter boat during launching and recovering.

Table 3: National Security Cutter Major Deficiencies Identified during Initial Operational Test and Evaluation

Initial Operational Test and Evaluation (IOT&E) deficiency rating	System	Deficiency discussion
Major 1 – Critical Impact on mission accomplishment	**Close-in weapon system (CIWS)** – Part of the combat system, a radar-guided gun used to protect against Anti-ship Cruise Missiles and close-in surface and low flying aircraft.	CIWS suffered an equipment failure that resulted in a loss of capability.
Major 2 – Serious impact on mission accomplishment	**NULKA Launcher** – Part of the combat system, it provides defense against modern radar homing anti-ship missiles by using a rocket-propelled, disposable decoy to lure the missiles away from the NSC.	One of the NSC's two NULKA launchers was inoperable during IOT&E, and was not repaired prior to completing the test event.
Major 2	**TRS-3D Air Search Radar** – Part of the combat system, it detects targets of interest and allows the NSC to clear the airspace around the cutter for safe helicopter operations.	The air search radar suffered an equipment failure that resulted in a loss of capability.
Major 3 – Moderate impact on mission accomplishment	**Access to electronic racks** – The racks are located in the Combat Information Center and contain different information systems used for communications.	Technicians had no direct access to maintenance and test ports which required disabling some critical communication equipment in order to gain access. This results in temporary degraded capability to maintain command and control during assigned missions.
Major 3	**Cutter boat operational parameters** – The NSC is intended to operate three cutter boats, two Over the Horizon-IVs (OTH-IV) and one Long Range Interceptor Mark II (LRI-II). The LRI-II was not tested during IOT&E.	The cutter boat is not designed to operate in all of sea state 5. However, the NSC routinely operates in areas that experience sea state 5 and above; having a cutter boat with different operational limitations could in some instances result in degraded capability if the situation warranted use of a cutter boat to enhance a certain specific mission.[a]
Major 3	**Common Operational Picture** (COP) display – An information display that provides the position and additional information of vessel and aircraft contacts to the Coast Guard and other decision makers.	During 57mm live fire events, the COP suffered an equipment failure that resulted in a loss of capability.
Major 3	**Remote operated valves** – Designed as a manning reduction measure to reduce the number of personnel required to operate the damage control systems.	During testing, the crew was unable to remotely operate damage control valves. This situation degrades the capability of the cutter by inhibiting timely response and increasing the number of crew required to operate fire pumps and fuel transfer valves.
Major 3	**57mm gun weapon system** – An intermediate caliber weapon that fires high-explosive rounds, which can be employed against large and small surface craft as well as low-slow flier air threats.	The 57mm gun suffered a misfire that disrupted the test event.

Initial Operational Test and Evaluation (IOT&E) deficiency rating	System	Deficiency discussion
Major 3	**Command and Control (C2)** embedded training module – The C2 system is required to have the capability to train, sustain, and enhance individual and crew skill proficiencies necessary to operate and maintain the asset.	There was not an available embedded training module within the C2 system to simulate air and surface contacts. This prevented realistic tactical drills and exercises.
Major 3	Rubber electric matting installation – Used to protect crew and equipment from electrical shock hazards.	The gaps in the electrical safety matting were too large, exposing crew and equipment to the metal deck below. The improper installation of the matting presented an electrical shock hazard to personnel and installed equipment.

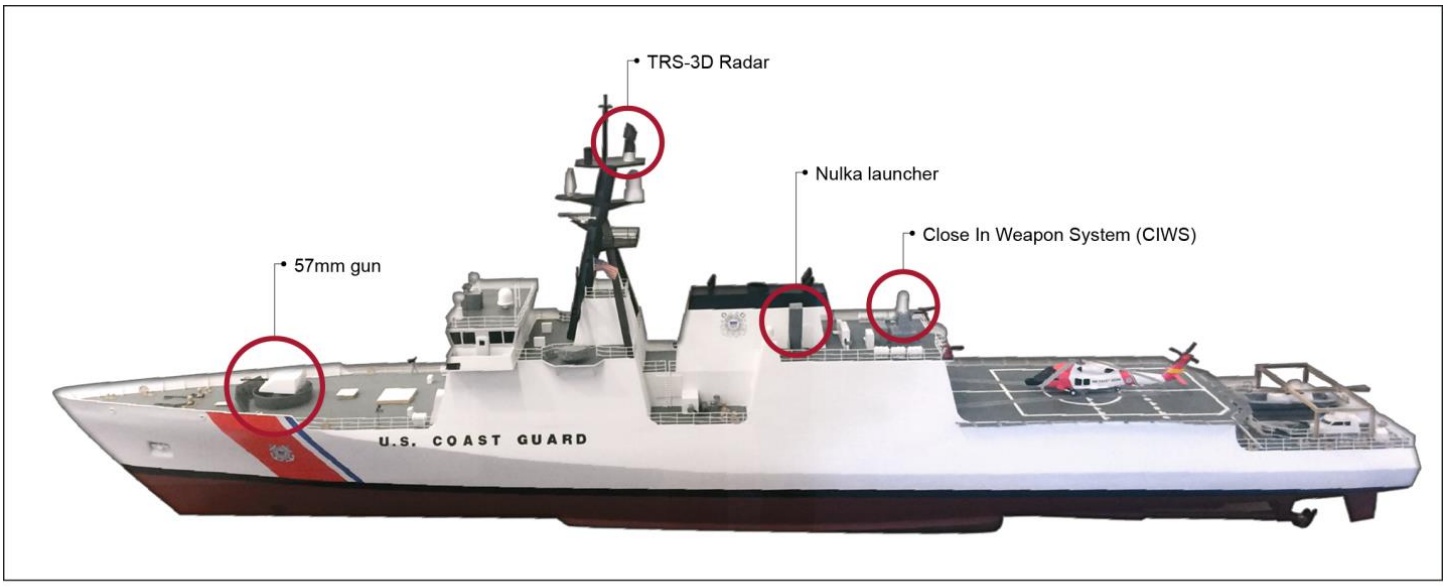
Source: GAO presentation of Navy and Coast Guard data. | GAO-16-148

Note: Shaded rows are deficiencies that were known prior to IOT&E, but not repaired.

[a]Sea state refers to the height, period, and character of waves on the surface of a large body of water.

In its assessment of the NSC's IOT&E event, DHS DOT&E stated that the reliability and operational availability issues of the combat systems suite—the CIWS, NULKA Launcher, TRS-3D air search radar, and the 57-mm gun—affect the overall ability of the NSC to conduct certain missions. Figure 4 shows the location of the NSC's combat systems on the cutter.

Figure 4: National Security Cutter Combat Weapon Systems



Source: U.S. Coast Guard. | GAO-16-148

While the CIWS, NULKA launcher, and air search radar were all repaired following IOT&E, post operational reports indicate that problems persist with these systems as they were often unavailable during operations.[7] For example, the CIWS was inoperable on the *Stratton* for at least 61 days in 2014; the NULKA was inoperable on the *Stratton* from October 2013 through April 2014; and, according to Coast Guard officials, the air search radar has had 18 casualties, or failures, across the three operational NSCs over the past 19 months, with a lead time for repairs of up to 18 months. DHS DOT&E stated that it is imperative for the Coast Guard to work closely with the U.S. Navy, which owns the CIWS and NULKA systems, to improve the systems' reliability because of the overall effect of reliability problems on the NSC. Despite these findings, as noted above, COTF found the NSC to be operationally effective and suitable. According to COTF guidance, these ratings are subjective and account for more than

[7]Post-operational reports include engineering reports and after action reports. Engineering reports are annual reports that address the high priority engineering and sustainability problems with the cutter's equipment and provide an assessment of the condition of the cutter, among other things. After action reports are command-approved reports that provide detailed observations about cutter operations, casualties, and lessons learned, among other things, following deployments.

identified deficiencies because testers are assessing the total scope of the COIs.

Although it was not mentioned as a major deficiency, the IOT&E report also addressed the crewing plan for the NSC and stated that the crew is not sized to handle all types of maintenance. Because of this, the report stated that over time the crew may be unable to keep up with the condition of the cutter, resulting in increased paint failure and degradation in material condition. However, Coast Guard officials stated they have not seen much decay to date, and, if any does occur, they plan to conduct repairs through regularly scheduled maintenance efforts. In fiscal year 2013, the Coast Guard began implementing an interim plan to increase the NSC's operational performance by adding crew members to help bear the increased workload. We reported on the Coast Guard's crew rotation concept and overall manning profile for the NSC in March 2015.[8] We found that the added crew members do not have the skill mix recommended by a 2011 manpower requirements analysis, and that, without the appropriate crew members with the right skill mix, the NSCs may not be able to complete all mission requirements or required maintenance. We recommended that the Coast Guard develop a plan to determine the appropriate number of NSC crew and shore-side support personnel with the right mix of skills and abilities. The Coast Guard concurred with this recommendation and completed analysis specifying the number of shore-side based support personnel, but did not state when those personnel would be in place.

The NSC Met a Majority of Its Key Performance Parameters, but Lacks Clarification on Cutter Boat Requirements

While COIs and deficiencies factor into a system's operational effectiveness and suitability rating, KPPs are measures of the capabilities considered essential to mission accomplishment. During IOT&E and other test events, the NSC fully met 12 of its 19 KPPs.[9] According to Coast Guard officials, even though not all KPPs were met during testing, the NSC has proven its value through the numerous missions it has completed since 2010. However, by not meeting all KPPs, the Coast Guard is not able to demonstrate that the NSC is providing the capabilities that the Coast

[8]GAO, *Coast Guard: Timely Actions Needed to Address Risks in Using Rotational Crews*, GAO-15-195 (Washington, D.C.: March 6, 2015).

[9]By comparison, the Maritime Patrol Aircraft conducted IOT&E in July 2012 and it met or partially met 4 of its 7 KPPs. The Fast Response Cutter conducted IOT&E in July 2013 and it partially met 1 one of its 6 KPPs.

Guard intended to field. Table 4 displays the 7 KPPs not fully met for the NSC, the test results, and a discussion of these results. Of the 7 KPPs not met, 3 pertain to cutter boat operations. Appendix II provides information on the performance and status of all 19 KPPs.

Table 4: Key Performance Parameters Not Fully Met for the National Security Cutter

Key performance parameter (KPP) (threshold requirement)	Was KPP tested?	Was KPP met?	Test result	Discussion
Transit range (12,000 nm)	Yes	Partial	10,967 nm	Insufficient data was collected during Initial Operational Test and Evaluation (IOT&E) to resolve the KPP. NSC 1 and 2 have met the threshold in operations and NSCs 3 through 8 will be tested in the future.
Conduct all missions (sea state 5: up to 13.1 foot waves)[a]	Yes	Partial	The cutter boats are not rated to operate in all of sea state 5.	The operational limitation of the embarked cutter boat during IOT&E was mid sea state 5 (11 foot waves).
Ability to embark, launch and recover a cutter boat (sea state 5: up to 13.1 foot waves)	Yes	Partial	The cutter boats are not rated to operate in all of sea state 5.	The operational limitations of the embarked cutter boat during IOT&E was mid sea state 5 (11 feet).
Ability to embark, launch and recover a cutter boat while towing	Yes	Partial	The NSC demonstrated that it can tow a vessel of similar size.	For the NSC to conduct towing operations, one of the rear cutter boats has to be launched, which will be problematic in higher sea states since the cutter boat is not rated for operations in seas higher than mid sea state 5 (11 feet).
Conduct a minimum of 4 hours of flight operations day and night with manned aircraft and 16 hours with a combination of manned and unmanned aircraft systems (UAS)	Partial	Partial	The manned system requirements were met. The UAS has not been fielded or tested yet.	According to Coast Guard officials, of the 20 UAS programs reviewed, only 2 came close to meeting the requirements. Not having UAS has reduced the aerial surveillance capability of the NSC. NSC operators explained that the cutters regularly deploy with one helicopter.
Achieve hard and soft kill against a subsonic anti-ship cruise missile	No	No	N/A	According to DHS officials, the target drone was not available for IOT&E due to a moratorium on using the target for tests that resulted from a malfunction during a U.S. Navy test using the same target.
Interoperability (exchange information with mission partners)	Yes	Partial	Not all information systems were installed prior to IOT&E, which was cited as a limitation to the test.	According to Coast Guard officials, Link-11, a system used to transmit and receive information with U.S. Navy ships, was only able to receive data. A pending upgrade to the NSC's C4ISR software should allow the cutter to transmit data.

Source: GAO analysis of Navy and Coast Guard data. | GAO-16-148

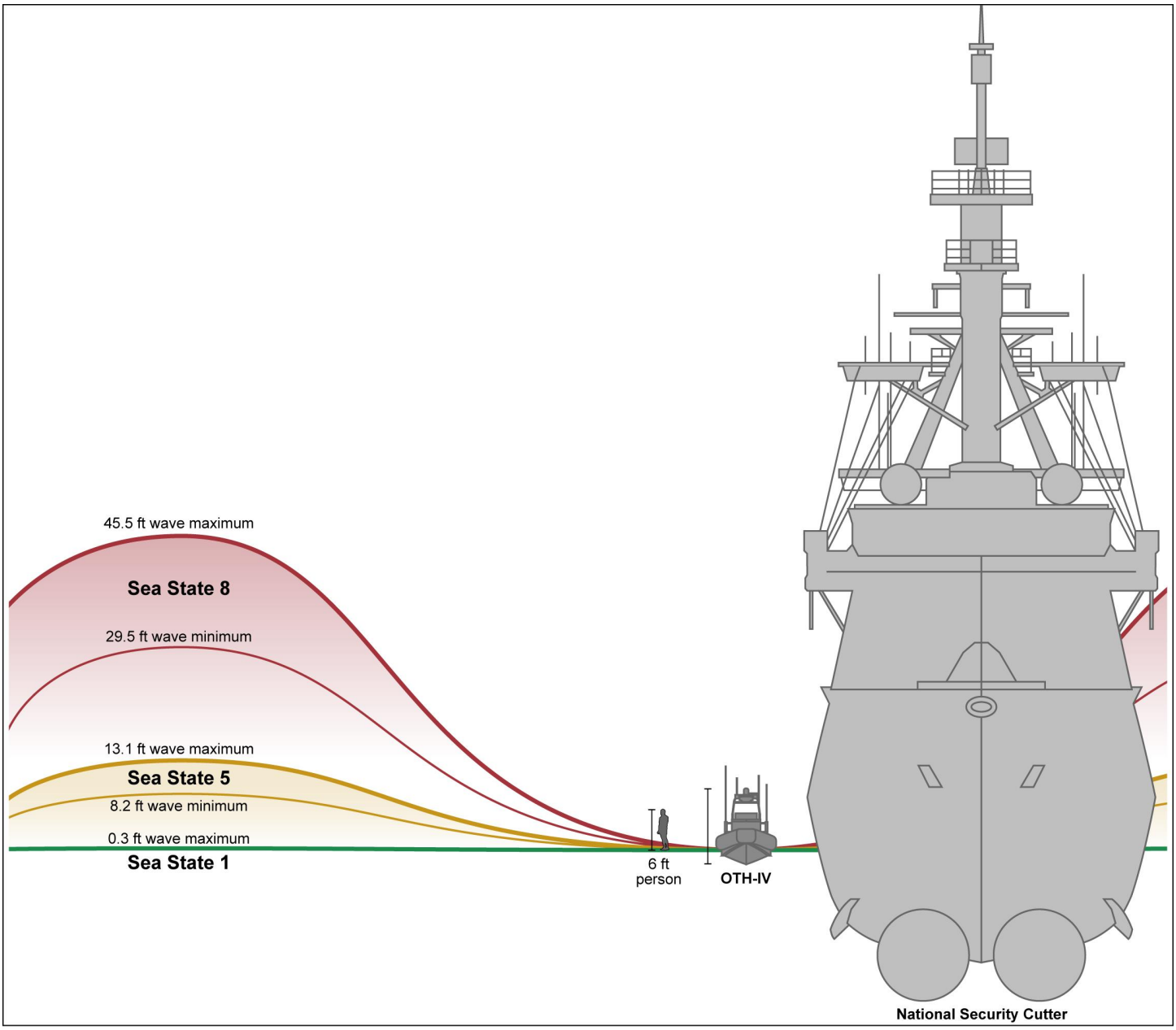
[a]Sea state refers to the height, period, and character of waves on the surface of a large body of water.

The Coast Guard and COTF have different interpretations of the cutter boat KPPs. The NSC is intended to deploy with three cutter boats: two Over The Horizon-IV (OTH-IV) and one Long-Range Interceptor II (LRI-II). These boats are designed to be integral to the NSC's overall capability, operate both within and beyond the visual range of the NSC, and enhance the overall mission effectiveness of the NSC in every mandated mission area.[10] The NSC's requirements state that it should survive through sea state 8 for limited periods of time and be able to launch and recover cutter boats through sea state 5, which includes waves that range from 8 feet to 13 feet. However, the requirements documents for the cutter boats state they will conduct operations only through mid-sea state 5, which is the requirement the Coast Guard believes should apply for these KPPs. COTF conducted IOT&E according to the NSC's test and evaluation plan and determined that the three KPPs involving cutter boats were not fully met since the boats are unable to operate through all sea state 5 conditions. DOT&E agreed with COTF's interpretation. According to Coast Guard officials, however, the Coast Guard never intended for the NSC's sea state KPP to be applicable to the operation of the cutter boats. They explained that the September 2012 requirements document for the NSC should have been written more clearly to convey the sea state expectation for cutter boat launch and recovery operations. After we raised this issue during the course of our audit, Coast Guard officials stated they intend to clarify the NSC's requirements for cutter boat operations.

In the absence of clarified NSC requirements for the cutter boats, the Coast Guard and COTF will continue to have different interpretations of what is needed to resolve the KPPs. According to Coast Guard officials, the decision to launch cutter boats in higher sea states is left to the discretion of the captain of the cutter as he/she determines if the situation warrants the use of the cutter boats. For context, figure 5 shows the minimum and maximum wave height of different sea states relative to the NSC and OTH-IV cutter boat.

[10]The OTH-IV is a 26-foot boat capable of over-the-horizon operations with a range of 200 nautical miles and is capable of achieving speeds of 40 knots. The LRI-II is 35 feet long with a range of more than 200 nautical miles and is capable of sustaining speeds of 38 knots.

Figure 5: Wave Height of Different Sea States Compared to the National Security Cutter and a Cutter Boat



Source: GAO presentation of U.S. Coast Guard data. | GAO-16-148

Note: OTH-IV stands for Over the Horizon Cutter Boat-IV.

The Coast Guard is conducting a study in conjunction with the U.S. Navy to determine the ability to predict a cutter boat's performance in varying sea states, which it expects to complete by September 2016 at the earliest. The study includes the operation of boats in various seas, use of scale models to simulate performance, and development and/or modification of computer models to predict performance in other sea states. The results are to inform the Coast Guard's understanding of cutter boats' ability to safely operate in sea state 5. In addition, the Coast Guard plans on further testing of the cutter boats with the NSC in FOT&E in fiscal year 2017.

Coast Guard Deferred Several Critical Systems to Follow-on Operational Test and Evaluation

Finally, the IOT&E report identified several systems for which test events were deferred. According to Coast Guard officials, these tests were deferred for a variety of reasons, including the ongoing procurement of certain systems and so that a more robust test plan can be developed, and these systems will be addressed during FOT&E. Key deferred systems to be tested include:

- unmanned aerial systems,
- Link-11,[11]
- cybersecurity COI,
- additional testing of the cutter boats, and
- the NSC's intelligence systems

In addition, the NSC's ability to defend itself against a subsonic anti-ship cruise missile was not tested and was classified by COTF as a minor limitation to the test. According to DOT&E officials, the test event uses a U.S. Navy target, which is designed to simulate radar and speed of a cruise missile. During a U.S. Navy test event, the drone struck the side of a ship, resulting in the U.S. Navy issuing a moratorium on the drone, preventing this KPP from being tested during IOT&E. This KPP is intended to be tested as part of FOT&E.

[11]Link-11 provides the Coast Guard with the capability to send and receive information with U.S. Navy ships.

Unclear Guidance on Follow-on Testing May Lead to NSCs and Future DHS Assets Deploying without Having Demonstrated Full Capabilities

The Coast Guard expects to begin FOT&E in the fall of 2016. While the Coast Guard has already resolved some of the deficiencies that were identified during IOT&E, it has not yet submitted any of the corrective action plans to COTF—which is required by COTF's guidance to formally close the deficiencies. Further, the Coast Guard may not correct all of the deficiencies due to the cost involved with making fleet-wide changes. As a result, the Coast Guard may move forward with cutters that are not as capable as intended. The Coast Guard also does not yet have a timeframe for testing its unmanned aerial system (UAS), which is one of the key systems intended to enhance the NSC's overall capability. DHS acquisition guidance does not specify the timing of FOT&E, such as when it should be concluded, and what actions should be taken in response to the findings of that testing. This gap in the guidance could lead to the Coast Guard operating the NSC for several years without knowing its full capability. While the NSC plans to begin FOT&E in the near future and any update to guidance will likely be too late to affect that class of cutters, the Coast Guard is designing the Offshore Patrol Cutter (OPC)—its biggest acquisition program to date. Updated DHS guidance prior to OPC testing could help ensure that the Coast Guard acquires a cutter that has demonstrated its full capabilities.

No Deficiencies Have Been Formally Closed Out and the NSC Will Continue Operating for Several Years without Key Capabilities

According to COTF officials, FOT&E will begin in the fall of 2016 and is scheduled to continue through at least 2017. Following IOT&E, DHS held an ARB to discuss the outcome of IOT&E, which resulted in DHS approving the NSC program for full rate production. At that time 7 of 8 cutters were already under contract, and 3 were operational. The resulting ADM from October 2014 directed the Coast Guard to conduct FOT&E and complete three specific action items: (1) complete testing of the cybersecurity COI; (2) verify the correction of all major deficiencies, including the unmet KPPs; and (3) assess the NSC's cyber-security capabilities. The cybersecurity COI is planned to be tested in 2016, which, if successful, will address the first and third requirements of the ADM. The October 2014 ADM does not require the NSC program to return for an ARB at the conclusion of FOT&E. According to DHS officials, if the FOT&E results document successful resolution of COIs, major deficiencies, and KPPs, DHS does not plan any additional ARBs to provide oversight or specify actions the NSC program should take at the conclusion of FOT&E. If FOT&E results document outstanding issues, the DHS Chief Acquisition Officer has the authority to convene an ARB to provide oversight or specify actions for the NSC program.

The ADM also directed the Coast Guard to verify the correction of all deficiencies, including the 7 unmet KPPs. According to COTF's guidance and Coast Guard officials, verifying the correction of deficiencies requires the Coast Guard to submit a corrective action plan to COTF that identifies the necessary actions to resolve each deficiency. COTF then reviews any corrective actions or conducts test events to verify that the deficiencies have been corrected. According to Coast Guard officials, they have corrected 4 of the 10 major deficiencies from IOT&E that involved equipment failures by restoring the operational status of the related systems on the *Stratton*, and they have plans to correct four more. The Coast Guard plans to work with COTF to close out these deficiencies according to COTF's guidance. However, according to Coast Guard documentation and officials, the Coast Guard may not correct deficiencies related to the electronic equipment rack, due to the cost of making fleet-wide changes, and the remote-operated valves, because the Coast Guard has developed an interim solution. Table 5 shows the Coast Guard's plans for resolving the major deficiencies from IOT&E.

Table 5: Coast Guard Plans to Resolve Initial Operational Test and Evaluation Major Deficiencies

Initial Operational Test and Evaluation deficiency rating	Plan to resolve through Follow-on Operational Test and Evaluation	Deficiency Status
Major 1 – Close-in-weapon system	The Coast Guard has corrected this deficiency and plans to work with the Commander Operational Test and Evaluation Force (COTF) to close-out this deficiency during the third quarter of fiscal year 2016.	Addressed by Coast Guard; pending close-out with COTF
Major 2 – NULKA Launcher	The Coast Guard has corrected this deficiency and plans to work with COTF to close-out this deficiency during the third quarter of fiscal year 2016.	Addressed by Coast Guard; pending close-out with COTF
Major 2 – TRS-3D Air Search Radar	The Coast Guard has corrected this deficiency and plans to work with COTF to close-out this deficiency during the third quarter of fiscal year 2016.	Addressed by Coast Guard; pending close-out with COTF
Major 3 – Access to electronic racks	The Coast Guard is considering alternate configurations of the racks to mitigate access challenges. However, the cost of implementing alternate configurations may make fleet-wide changes an unrealistic option.	No immediate plans
Major 3 – Cutter boat operational parameters	According to Coast Guard officials, a cutter boat safe operating limits study, being conducted in conjunction with the U.S. Navy, is expected to be complete by September 2016. Its results will inform discussions with COTF regarding cutter boat safe operational parameters.	Pending
Major 3 – Common Operational Picture	Problems with the information display were observed again during the *Waesche's* August 2015 Combat System Ship Qualification Trials (CSSQT) and the Coast Guard plans to reconfigure the mounts and retest.	Pending

Initial Operational Test and Evaluation deficiency rating	Plan to resolve through Follow-on Operational Test and Evaluation	Deficiency Status
Major 3 – Remote operated valves	The Coast Guard has developed an interim solution by operating the valves manually, which Coast Guard officials have indicated is a lower priority deficiency to address.	No immediate plans
Major 3 – 57mm gun weapon system	The Coast Guard has corrected this deficiency and plans to work with COTF to close-out this deficiency during the third quarter of fiscal year 2016.	Addressed by Coast Guard; pending close-out with COTF
Major 3 – Command and control	The Coast Guard is completing the design of an upgrade for embedded training and expects to install the upgrade starting in fiscal year 2016. All cutters are expected to receive the upgrade.	Pending
Major 3 – Rubber electric matting installation	The same installation error was observed on the *Waesche* during its August 2015 CSSQT and the Coast Guard is treating this as a class-wide issue. COTF plans to verify correct installation through a visual inspection.	Pending

Source: GAO analysis of Coast Guard data. | GAO-16-148

Further, two other key capabilities that were originally intended to be operational on all NSCs have not yet been tested. These are UAS and the intelligence capabilities. According to Coast Guard documentation, there is not currently a schedule for testing the NSC's UAS capability, which is one of the critical systems intended to provide the NSC with increased capabilities over the legacy HEC. The Coast Guard terminated its first attempt to purchase a UAS in 2007 because the technology was unproven and the projected costs were greater than originally planned. The Coast Guard planned to assess alternative aircraft platforms and select a UAS by fiscal year 2012.[12] According to Coast Guard officials, demonstrations of a UAS were conducted onboard an NSC in fiscal year 2012, 2013, and 2014. In 2014, we found that the UAS, along with the NSC's intelligence capabilities, were key to a number of drug interdictions during a NSC patrol.[13] By delaying the acquisition of a UAS for the NSC, the Coast Guard has fielded a more limited NSC than it originally intended.[14] Additionally, the NSC's intelligence capabilities, which according to Coast Guard officials

[12]GAO, *Coast Guard: Better Logistics Planning Needed to Aid Operational Decisions Related to the Deployment of the National Security Cutter and Its Support Assets*, GAO-09-497 (Washington D.C.: July 17, 2009).

[13]GAO-14-450. Officials said that a small UAS was being demonstrated on the NSC during this mission to determine if such a solution is possible.

[14]In 2009, the DHS Inspector General found that the aerial surveillance capability of the cutter without a UAS was reduced by 68 percent, which made its operational effectiveness comparable to the HEC. 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).

provide the NSC with capabilities to exchange information with other federal agencies that is used in conducting missions, will not be tested until at least 2017. Coast Guard officials have previously stated that even without these capabilities, the NSCs will provide more capability than the HECs although, until testing is complete, it remains unknown if the Coast Guard is receiving the full capability that it intended to field when it purchased the NSCs.

DOT&E officials told us that FOT&E would not incorporate any issues identified during regular operations. Officials described testing as a "snapshot" in time, stating that it is not intended to be able to capture all problems that an asset may experience throughout its lifecycle. Following FOT&E, COTF will write a report similar to that used to culminate IOT&E.

DHS Guidance Does Not Require Actions Following FOT&E, Which Could Have Implications for Future Acquisitions

While the Coast Guard has plans to conduct FOT&E for the NSC, it will have accepted the delivery of at least the 6th NSC before the testing is complete, meaning that the Coast Guard will be operating 6 of its 8 NSCs before it has resolved issues from IOT&E and knows the cutter's full capabilities. DHS's guidance for its major acquisitions does not require programs to conduct FOT&E, nor do they specify the timing of FOT&E or the actions that should be taken following the completion of testing.[15] Specifically, DHS acquisition guidance defines FOT&E as test and evaluation that may be necessary after system deployment to refine estimates made during operational tests, to evaluate production changes, and to re-evaluate the system to ensure it continues to meet operational needs. Further, DHS's directive on test and evaluation does not include any direction or guidance on FOT&E.[16] A DOT&E official said that this gap is a known shortcoming that department officials plan to correct with revisions to the overall acquisition guidance and the directive on test and evaluation. However, the NSC plans to begin FOT&E in the near future and any update to guidance will likely be too late to affect that class of cutters.

Due to this lack of guidance, DHS officials stated that DHS management has included action items for programs approaching FOT&E in their

[15]Coast Guard acquisition guidance specifies that follow-on testing is an objective of the Produce/Deploy Phase of the acquisition process, but does not specify when FOT&E is to conclude.

[16]DHS Directive 026-06, Test and Evaluation (May 22, 2009).

ADMs, as was done with the NSC in October 2014. While the Coast Guard is required to track and complete these action items in order to advance to the next phase of the acquisition process, the NSC program is already in full rate production. According to DHS officials, DOT&E will write an assessment of the NSC's FOT&E event similar to what it did following IOT&E. If the FOT&E results successfully resolve the outstanding COIs, major deficiencies, and KPPs, then the action items from the October 2014 ADM will be closed. While DHS acquisition guidance does not address what further actions would be necessary if the Coast Guard cannot fully address the action items, the DHS Chief Acquisition Officer has the authority to convene an ARB to provide oversight or specify actions for the NSC program.[17]

By not having guidance that is more definitive on the end date for FOT&E and what oversight is needed for any remaining issues, DHS and the Coast Guard are accepting some risk that not all NSC deficiencies or KPPs may be met for several years. For instance, Coast Guard acquisition guidance states that failure to meet a KPP during FOT&E can result in a program breach, acknowledging that the program failed to demonstrate the required performance threshold. When a program files a breach notification, DHS acquisition guidance requires it to either (1) re-validate the original baseline parameters, (2) have a new baseline approved that revises the parameters that were breached, or (3) conduct a program review that evaluates the proposed baseline revisions and makes recommendations to the Acquisition Decision Authority. Without a definite end date for FOT&E, a program could continue pursuing a KPP threshold or attempt to resolve a deficiency for several years without declaring a breach. Given that each program has its own unique challenges, establishing an end date for FOT&E on a program-by-program basis would allow DHS to tailor its oversight to the specific needs of each program.

This gap in DHS guidance also has implications for future DHS assets. Most significantly, the Coast Guard is in the process of designing the OPC, which is the last of the major cutter classes to be built as part of the recapitalization program. This cutter class, which is intended to bridge the mission gap between the Fast Response Cutter and NSC, is estimated to

[17]According to Coast Guard officials, they are planning to update the NSC's Test and Evaluation Master Plan in advance of FOT&E to provide additional guidance for that test event.

cost $12.1 billion, making it the most expensive Coast Guard recapitalization program to date.[18] Without updated guidance that establishes timeframes and responsibilities for completing all testing, the Coast Guard risks encountering the same scenario with the OPC, and other future DHS assets, that it has experienced with the NSC, i.e., continuing to buy assets without having demonstrated their full capabilities in testing.

Performance Issues Discovered Outside of IOT&E Are Preventing the Coast Guard from Operating Fully Capable NSCs

During regular operations, the NSC has experienced performance issues that were not identified during IOT&E, which the Coast Guard documented in post-operational reports intended to provide detailed observations about cutter operations, casualties, and lessons learned. The Coast Guard has planned design changes to some of the cutters' equipment to correct the performance problems for which the cause has been identified, and program officials continue to consider additional design changes for the fleet. However, in some cases, the cause has not yet been definitively identified. In particular, the NSC's engines and generators have experienced persistent problems, the reasons for which are not yet known. As a result of these and other equipment casualties, the NSC has been operating in a degraded condition in some mission areas, even while having spent fewer days away from home port than planned.

The Coast Guard Plans to Implement Some Retrofit Design Changes for the Entire NSC Fleet

The Coast Guard has encountered several issues that require major retrofits and design changes on the NSC to correct problems encountered during operations and discovered during test events outside of IOT&E. The Coast Guard identified several of these concerns after it began to operate the NSCs and has continued to do so.[19] By the time of the IOT&E event, the Coast Guard had nearly four years of experience operating the NSCs. The total cost of changes identified as of June 2015 totals approximately $202 million. According to Coast Guard officials, the Coast Guard must pay for all of these and future changes. Table 6 shows a list of some retrofits and design changes planned for the NSC.

[18]The three classes of cutters are the 418' NSC, the 154' Fast Response Cutter (in production with 15 of 58 planned cutters delivered), and the Offshore Patrol Cutter (in the design phase and planned for 25 cutters total).

[19]GAO-14-450.

Table 6: Retrofits and Design Changes for the National Security Cutter Class with Costs over $1 Million as of June 2015

Retrofits and design changes	Estimated Cost (in millions)
C4ISR upgrade	$88.5
Structural enhancements (National Security Cutters 1 and 2)	$38
Gantry crane that aids in launching cutter boats from stern ramp	$31
Single-point davit for cutter boat operations	$12.5
Upgrade communications system	$12.3
Update cutter monitoring system	$6.3
Upgrade two ammunition hoists	$6.3
Remove Aircraft Ship Integrated Secure and Traverse tracks in flight deck	$5.6
Breathing apparatus replacement	$1.6
Total cost	**$202.1**

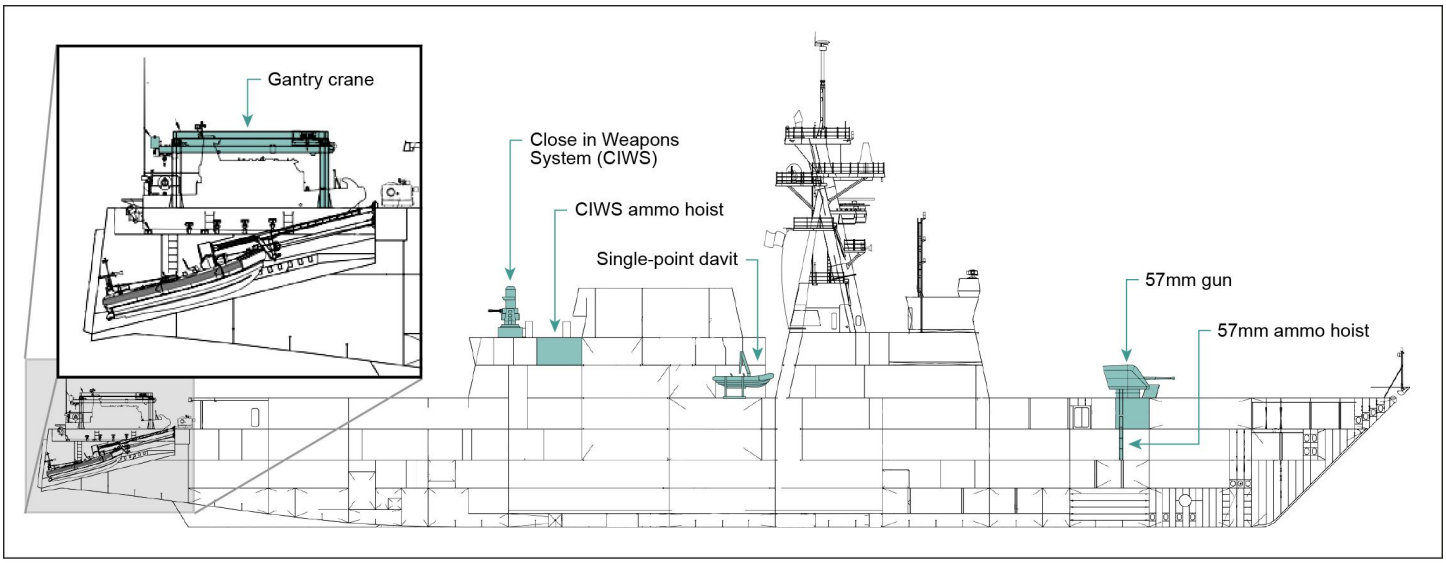
Source: GAO presentation of Coast Guard data. | GAO-16-148

Note: The Coast Guard reported these numbers for all eight hulls. However, not all retrofit designs are currently being implemented because they have not all been finalized.

C4ISR stands for Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance.

The Coast Guard has implemented several of these design changes on the NSC and is evaluating prototypes for additional design changes in order to address performance issues for which the cause has been definitively identified. In order to minimize cost increases for some of these changes, the Coast Guard plans to maintain the original equipment design for the production of the remaining NSCs and plans to conduct retrofits after accepting delivery of the cutters. The problems identified with these systems during operations will continue to impact the NSC until the design changes are implemented across the fleet. Figure 6 shows selected systems that will require retrofits after all eight cutters are built.

Figure 6: Selected National Security Cutter Systems Requiring Retrofitting After Production



Source: GAO presentation and analysis of U.S. Coast Guard data. | GAO-16-148

The following equipment will be included on the cutters currently being built or under contract and later removed or upgraded:

- **Replacement of the Gantry Crane:** The Coast Guard discovered during operations that the cutter's stern gantry crane—a crane on the rear of the cutter that aids in deploying the NSC's cutter boat—experiences frequent casualties due to a lack of water-proofing. According to Coast Guard documentation, the gantry crane was not designed for a maritime environment and is inadequately sealed to prevent water intrusion, leading to accelerated corrosion and the need for excessive repairs not considered sustainable over the NSC's life-cycle. The gantry crane was not tested during the IOT&E event because the *Stratton* was outfitted with a prototype replacement crane. Post-operational reports from the *Bertholf* and *Waesche* stated that the gantry crane requires constant attention for troubleshooting and hundreds of man-hours to keep it operational. According to Coast Guard officials, the new crane system has been successfully prototyped on the *Stratton* and the engineering change has been approved for fleet-wide replacement. The rest of the cutters will be fielded with the gantry crane installed until the Coast Guard retrofits them at a later point in the future. The fleet-wide replacement of the gantry crane is anticipated to cost $31 million. Problems with the

gantry crane have plagued the NSC since it began operations and are expected to continue until all cutters have their gantry crane replaced, which is not planned to be completed for several years.

- **Replacement of the Single-Point Davit:** The crews of the NSCs have expressed concerns over the safety of the single-point davit system—which is used to lift cutter boats for launch and recovery from the starboard side of the cutter—because it is unable to reliably lift the cutter boats in high seas. As a result, use of the single-point davit has been seen as a risky method of launching the cutter boats when operating in higher sea state conditions. Furthermore, one of the types of cutter boats in use on the NSC, the OTH-IV, cannot be recovered by the single-point davit due to compatibility issues. As a result, the cutters have to carry a previous generation cutter boat, resulting in three different types of cutter boats being deployed on the NSCs. All of the operational NSCs—except the *Stratton* which has a replacement prototype dual-point davit that was tested as part of IOT&E but is still under evaluation—are outfitted with the single-point davit. The rest of the operational cutters, as well as those in production, are expected to continue to have the single-point davit until the Coast Guard retrofits them. This replacement of the single-point davit is expected to cost the Coast Guard a total of $12.5 million.

- **Upgrades to Two Ammunition Hoists:** According to Coast Guard officials, the ammunition hoists are difficult to use in their current configuration, and the crew of the NSC prefers to carry ammunition for the CIWS by hand rather than use the hoist. As a result, the Coast Guard plans to modify the design of this equipment. All of the operational NSCs are outfitted with two ammunition hoists: one for the 57-mm gun and one for the CIWS. However, the NSCs under production are to receive the current ammunition hoists and will later be retrofitted with the new design. These changes are expected to cost the Coast Guard a total of $6.3 million.

Early testing can allow performance issues to be discovered at a point when fixes can be incorporated into the design of an asset while it is still in production. As we have previously found for DOD programs, continuing with full-rate production before ensuring that assets meet key requirements risks replicating problems in each new asset until such problems are corrected. The Coast Guard conducted IOT&E several years after it began operating the NSC and after the contracts for the majority of the fleet had been initiated. As a result, the Coast Guard plans to purchase and install equipment with known design flaws on the NSCs that are currently in production. Thus, the Coast Guard will be faced with

paying for the replacement of these systems with new equipment that it must also purchase.

Additional Design Changes for the NSC Are Being Considered

In addition to the design changes listed in table 6, the Coast Guard is considering further design changes to the NSC to improve operational performance, but these design changes have not reached the prototype phase yet and the Coast Guard does not have cost estimates for them.[20] For instance, the Coast Guard is working on a design change for the stern doors—through which the cutter boats are deployed and recovered—to make them open and close more quickly. The doors currently take three minutes to open and close, during which time seawater entering the notch causes the cutter boat to rise and fall in response to the wave action. During this time, until the doors are fully open and the stern launch ramp is completely flooded with water allowing the boat to launch, the crew and equipment can be exposed to potentially dangerous sea conditions.

The Coast Guard is also considering a design change to the side door—which provides access to the cutter for cutter boats and persons in the water—because use of this door in any sea state creates a potential for water intrusion and has the possibility to trap or capsize any boat using the door. The Coast Guard has approved a new design for the side door but has not yet designated funding for the prototype phase. Coast Guard officials indicated that they are considering a number of other design changes for the NSC which vary widely in terms of cost and importance.

The Coast Guard Has Not Yet Identified the Root Cause or Solution to Other Problems Encountered during Operations

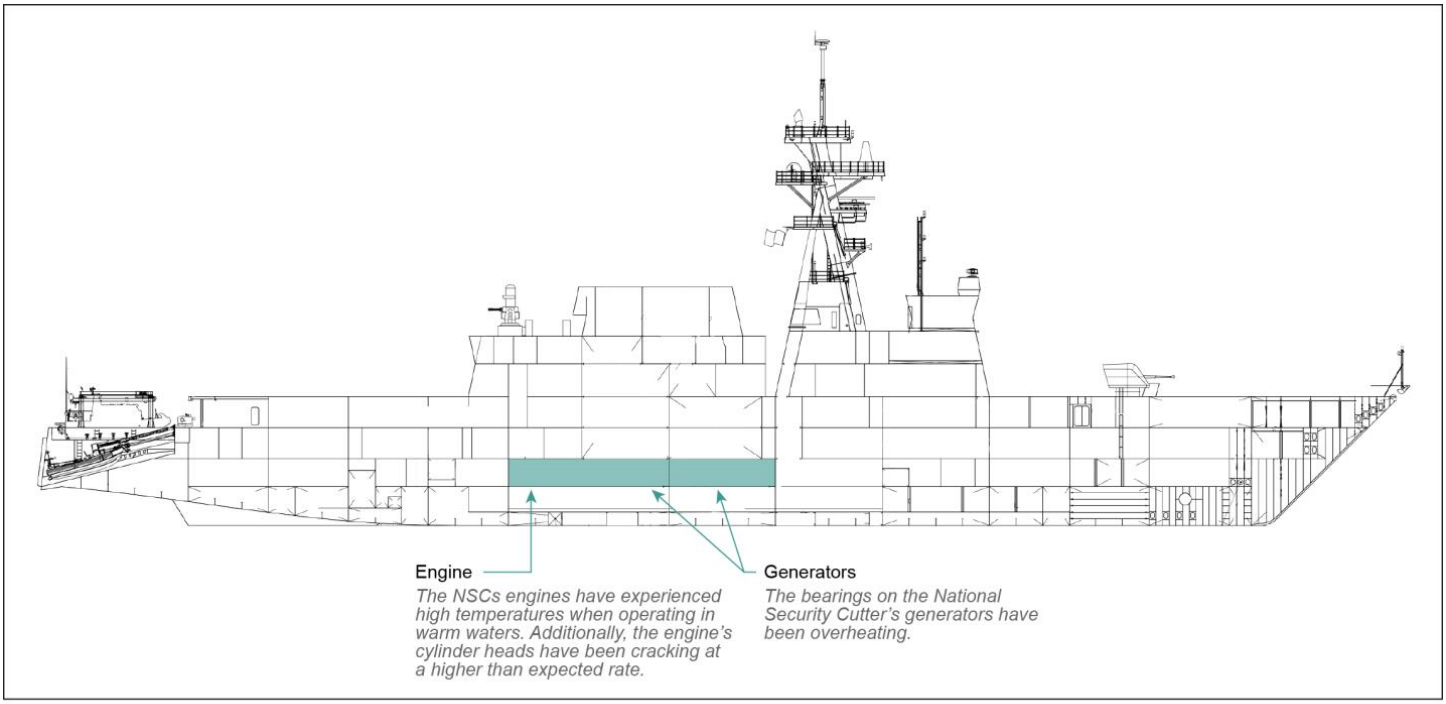
The Coast Guard has encountered a variety of problems with the cutter's propulsion systems during operations and, although there are several factors known to influence these problems, the root causes and the method and cost of potential solutions are not yet known. From July 2012 through February 2015, 14 major casualties were reported for the diesel engines and at least 5 major casualties were reported for the generators across the three operational NSCs, which have reduced the cutters' mission effectiveness.[21] Although the Coast Guard has two studies

[20]The Coast Guard has a process for managing design changes that impact an asset's operational capabilities, weight, or structure, among other things, which can involve the assessment of a prototype design change. Proposed design changes that include prototype testing undergo an evaluation process to determine whether the change is suitable for further implementation across the fleet.

[21]Major casualties are failures of equipment or systems that result in reduced mission effectiveness or a total loss of capability in a mission area.

underway to identify the root causes of these problems, until the causes are identified and corrective actions implemented, the Coast Guard is at risk of experiencing costly and potentially mission-limiting problems with this equipment across the fleet. DHS has no plans for additional ARBs for the NSC to provide additional oversight or specify actions to help correct these propulsion problems. Figure 7 shows the areas on the NSC where the propulsion systems with the operational problems are located.

Figure 7: National Security Cutter (NSC) Propulsion Problems



Source: GAO presentation and analysis of U.S. Coast Guard data. | GAO-16-148

High engine temperatures

The NSC is intended to be a worldwide deployable asset capable of operating in water temperatures ranging from 28 to 90 degrees (F). However, the NSC has experienced problems operating at high engine temperatures when patrolling in warm waters, which have forced the cutter to operate 2 to 4 knots slower than top speed to prevent damaging the engines. For example, in post-operational reports from 2014, the *Waesche* and *Bertholf* reported experiencing problems reaching full power in water temperatures above 74 and 77 degrees F, respectively. According to a 2014 post-operational report, the *Stratton's* problem with

high engine temperatures in warm water has gotten worse. In 2013, the *Stratton* could operate at full speed in water temperatures up to 68 degrees, but now, the cutter experiences high engine temperatures in water temperatures of approximately 50-60 degrees F. As a result, the Coast Guard has been forced to operate the NSCs at reduced speeds during some missions, such as counter drug missions, where reaching maximum speeds would be operationally useful. The cutters' commanding officers can decide to operate the NSC in excess of the engines design temperature parameters, but doing so for a sustained period of time could cause severe damage. Neither the *Waesche* nor the *Stratton* were able to conduct full power trials in 2014 because they were unable to achieve full power without exceeding equipment manufacturer's specified temperature limits under the conditions in which they were operating.[22] Without these tests, the Coast Guard lacks sufficient information that could be useful for assessing propulsion systems and planning maintenance.

A number of factors can influence engine temperatures. For instance, when operating in warm waters, all three operational NSCs have experienced high exhaust pressure, which contributes to the high temperature of the engine.[23] Additionally, according to the Coast Guard, high engine temperatures are influenced by other factors including sea state and air temperature. The Coast Guard is currently conducting a propulsion optimization study in coordination with the engine manufacturer, and officials stated that they have identified a root cause of the problem, but did not provide us documentation to support this determination. According to Coast Guard officials, they plan to continue studying the issue until a resolution has been identified. If resolving the high engine temperature problem requires design changes or retrofits, the Coast Guard has not yet determined who will pay for these changes for the operational NSCs. [24]

[22]Full power trials are two hour tests of the cutter's propulsion plant when operated at maximum power and occur annually. These tests are used to provide information about the cutter's current full power performance and serve as an indicator of necessary maintenance.

[23]High exhaust pressure occurs when pressure prevents exhaust from being pushed out of the engine's cylinders, which should release the exhaust once fuel has ignited to create energy. As exhaust pressure increases, an engine must work harder to push the exhaust gases out of the cylinder.

[24]GAO has ongoing work reviewing how much the government pays for shipbuilder-responsible defects after delivery. GAO plans to issue this report in early 2016.

Post-operational documents indicate that the Coast Guard has had problems receiving spare parts for the NSC's engines in sufficient time to make necessary repairs. In one instance in 2015, the crew of *Bertholf* had to cannibalize parts for the engine from another NSC as a result of long wait times for repair parts. The practice of using used parts as replacement parts, though sometimes necessary as a last resort, is costly in terms of time and labor and increases the chance that the component will break down prematurely. According to Coast Guard officials, the current 5-year parts contract for the main diesel engines reached its $9 million dollar ceiling in two years. This occurred, according to officials, due to the need to restock spare parts after a delay in awarding the parts contract and also frequent equipment casualties.

Cracked cylinder heads

The NSC has encountered casualties with the engines' cylinder heads at a higher than expected rate, averaging four cracked cylinder heads per cutter per year. According to Coast Guard officials, cylinder heads are not normally expected to fail at this rate. The equipment manufacturer has redesigned the cylinder heads in an effort to prevent them from cracking, and all of the operational NSCs have been equipped with the re-designed part, but the NSCs have continued to experience cracked cylinder heads even with the new design, which can result in an inability to conduct operations. For example, in 2014, the *Waesche* missed 11 planned operational days as a result of this problem. The Coast Guard has been inspecting the cylinder heads regularly in order to identify issues and conduct maintenance before they need replacement. However, a post-operational report from 2014 stated that the cylinder heads will likely continue to exhibit a high failure rate until the root cause of the failures are identified and additional changes are implemented.

Coast Guard officials stated that casualties to cylinder heads are currently their number one operational degrader and cost driver for maintenance on the NSC. The equipment manufacturer paid to redesign the cylinder heads, but the Coast Guard pays for the cost of replacements. A recent contract awarded to the engine manufacturer for one replacement cylinder head cost the Coast Guard about $50,000. At the current average rate of four failed cylinder heads per cutter each year, the cost for replacement parts at this price would amount to $1.6 million per year if the problem is unresolved by the time the Coast Guard is operating all eight NSCs.

The root cause of the cracked cylinder heads has not been definitively identified. The engine manufacturer believes that the cylinder heads are cracking as a result of high engine pressure, and Coast Guard officials

stated that operating the engines at low speeds can allow soot to build up, which also exacerbates the issue. The problem with cracked cylinder heads is to be included in the propulsion optimization study being conducted in conjunction with the engine manufacturer. The study is planned to go through at least the fall of 2015, at which time officials stated they would assess their next steps moving forward.

Generator bearings

The Coast Guard has experienced a class-wide problem with overheating generator bearings, which can prevent the NSC crew from using the generator. According to the Coast Guard's safety guidance for the NSC, two of the cutter's three generators must be operational in order for it to be considered "safe to sail." The *Bertholf*, *Stratton*, and *Waesche* all received safe to sail waivers for the generators in 2014. After the failure of two of the generator bearings on the *Stratton* during a 2014 patrol, the cutter reported in after action documents that it was operating without an effective backup generator, and its patrol was cut short by approximately 2 weeks as a result. Overall, the *Stratton* lost 13 planned operational days as a consequence of failures to the diesel generators, which amounted to about 7 percent of its planned days away from home port for that year.[25] Additionally, the failures risked delaying a subsequent patrol because of the complexity of the repair work and long lead times for repair parts.

Coast Guard officials identified generator bearings as the number two operational degrader and cost driver for the NSC. The replacement of each failed generator bearing costs about $100,000, which is paid for by the Coast Guard due to the cutters' warranties having expired, according to Coast Guard officials. As of November 2014, five generators across the fleet required bearing replacements. The cause of the high generator bearing temperatures has not been identified, but the Coast Guard is currently working on a root-cause failure analysis and considers the issue a top priority. Additionally, the Coast Guard is currently prototyping hardware and maintenance procedures on the *Stratton* to address this problem. Officials indicated that it will take at least a year to evaluate the prototype changes. Until this issue has been resolved, the NSC is at risk of reduced availability for operations and costly repairs.

[25]Days Away From Home Port refers to the number of operational days that a cutter spends away from its designated home port. The Coast Guard uses this as a performance metric.

NSC Has Frequently Been Operating in a Degraded Condition in Some Mission Areas and Spending Fewer Days Away from Home Port than Planned

As we found in 2015, during 2013 and 2014 the NSC fleet spent fewer days away from home port than the Coast Guard's interim goal of 210 days.[26] In addition, the NSCs operated in a degraded condition in one or more mission areas during a majority of their time spent in operations from 2010 to 2014 due to major equipment casualties. The Coast Guard's NSC requirements documents states that the cutter may be called upon to execute all mission areas when deployed. Although the NSC was often operating with major casualties during the period we examined, during the period from September 2013 through September 2015 the NSC was not mission capable as a result of maintenance needs only about 2 percent of the time, indicating that the casualties experienced during those years did not prevent the NSC from maintaining at least partial mission capability. The Coast Guard anticipates that the NSC will operate with major casualties less frequently as maintenance support matures and as the Coast Guard determines the root causes for major casualties and works with the manufacturers to make the necessary retrofits and repairs.

Conclusions

The flagship of the Coast Guard's modern surface fleet, the $5.6 billion National Security Cutter program gives the Coast Guard upgraded capabilities and a new, valuable tool in fulfilling its missions, including law enforcement, drug interdiction, and search and rescue. While the cutter represents an advance over the Coast Guard's aging HEC, the issues it has encountered in both testing and operations will limit its capabilities if not addressed. The Coast Guard has uncovered significant deficiencies and is taking appropriate, if costly, steps to correct known problems and determine solutions to persistent problems with as yet unknown causes, such as cracked cylinder heads in the cutter's engines.

Some of the performance measures that had been considered key to the cutter's success have not yet been demonstrated. For example, although Coast Guard officials have acknowledged that the NSC's requirements do not accurately reflect how they would normally expect to operate the cutter boats, the Coast Guard has not yet clarified those requirements. Until that happens, COTF and the Coast Guard will continue to disagree over how the requirements should be tested.

[26]GAO-15-195.

The factors that contributed to decisions not to complete certain tests during IOT&E were reasonable, and further testing may be costly, but rigorous follow-on testing would help ensure the NSC is as capable as originally envisioned. At present, DHS acquisition guidance, and DOT&E's directive do not address when FOT&E is to be concluded, or whether formal oversight is needed regarding any actions that should be taken to address known deficiencies. Without such guidance, the Coast Guard may prematurely consider NSC testing complete. The ADM that will result from DOT&E's assessment of the NSC's FOT&E event is one avenue for DHS to provide the needed oversight following that test event. In addition, without enhanced guidance regarding FOT&E, DHS risks potentially setting a precedent for testing of other major assets going forward. While it is likely too late for planned updates to guidance to affect the NSC's FOT&E events—because all remaining cutters are either in production or under contract—DHS has an opportunity to make changes so that expectations are clear for the OPC and other major DHS programs going forward. Given that each program has its own unique challenges, establishing an end date for FOT&E on a program-by-program basis would allow DHS to tailor its oversight to the specific needs of each program.

Finally, propulsion issues discovered during operations need to be resolved in order for the NSC to operate most effectively. While the Coast Guard is working to resolve these problems, the NSC program is already in full rate production with no other production related reviews or DHS acquisition review boards scheduled. Thus, additional DHS oversight may be necessary to help ensure that the problems are addressed.

Recommendations for Executive Action

To address the findings we identified in this report, we are making five recommendations.

To address different interpretations of cutter boat requirements, we recommend that the Commandant of the Coast Guard:

- Direct the NSC program office to clarify the NSC's key performance parameters for the cutter boat operations (specifically the launch and recovery of cutter boats).

To help ensure that known issues with the program are addressed, we recommend that the DHS Undersecretary for Management take the following two actions with respect to the NSC:

- Specify the activities to be completed for FOT&E to be considered concluded for the NSC, such as when the Coast Guard has addressed the specific actions from the October 2014 Acquisition Decision Memo.

- Conduct one or more acquisition review boards to provide oversight and specify any further actions the NSC program should take (a) at the conclusion of FOT&E and (b) at the conclusion of the Coast Guard's studies related to the propulsion systems. In lieu of an acquisition review board, an acquisition decision memo documenting that no further action is required for either event, if that is the case, may be suitable.

As DHS updates its guidance on test and evaluation, to help ensure that future DHS acquisitions resolve issues from testing in a timely manner, we recommend that the DHS Undersecretary for Management require that the updated guidance:

- Establish factors to be considered when planning for FOT&E, including when test events will be concluded.

- Require that a date be established and an acquisition review board held, if necessary, to provide oversight and specify any further actions programs should take following FOT&E.

Agency Comments and Our Evaluation

We provided a draft of this report to DHS for review and comment. DHS concurred with all our recommendations. DHS's written comments are reprinted in appendix III. DHS and the Coast Guard also provided technical comments that we incorporated into the report as appropriate. In particular, DHS provided technical comments on our recommendations related to completing FOT&E for the NSC and updating the DHS test and evaluation guidance. We incorporated some of these comments as they helped clarify our intentions. We also provided a draft of this report to COTF, which had no comments.

We are sending copies of this report to the Secretary of the Homeland Security, Commandant of the Coast Guard, and Secretary of Defense. In addition, the report is available on our website at http://www.gao.gov.

If you or your staff have any questions about this report, please contact me at (202) 512-4841 or mackinm@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix IV.

Sincerely yours,

Michele Mackin
Director, Acquisition and Sourcing Management

Appendix I: Objectives, Scope, and Methodology

The objectives of this report are to examine (1) the performance of the National Security Cutter (NSC) and its systems during Initial Operational Test and Evaluation (IOT&E), (2) the Coast Guard's plans for Follow-on Test and Evaluation (FOT&E), and (3) the extent to which issues might affect the NSC have arisen during operations.

To examine the performance of the NSC and its systems during IOT&E and the status of its critical operational issues, deficiencies, and key performance parameters (KPP), we reviewed the IOT&E report to identify deficiencies to the cutter and limitations to the test event that might have prevented a full evaluation of the cutter's KPPs. Through reviewing this report, we identified the NSC's major deficiencies, assessed the KPPs to determine if they have been fully met, and analyzed program documentation. We also interviewed officials to determine any areas where the NSC is or is not meeting required capabilities and performance metrics. We toured the NSC used for IOT&E (*Stratton*) and interviewed the commanding officer of the cutter concerning his experiences operating the vessel and its capabilities. We interviewed officials from the Department of Homeland Security (DHS) Director of Operational Test and Evaluation (DOT&E) and Program Accountability and Risk Management Office, and the U.S. Navy's Commander, Operational Test and Evaluation Force (COTF)—the Coast Guard's independent test agent—to discuss the results and limitations of these tests and plans for future testing. We also interviewed officials from the NSC program office officials and operators of the NSC to determine how any identified deficiencies would affect the NSC.

To examine the Coast Guard's plans for FOT&E, we reviewed Coast Guard documents to determine the timeline for FOT&E, to identify what systems will be tested, and to determine what, if any, changes are planned for the NSC fleet based on IOT&E and operations. We reviewed the Coast Guard's plans for correcting deficiencies identified during IOT&E and the status of their efforts to implement corrective actions. We also reviewed the Coast Guard's Major Systems Acquisition Manual and DHS's Acquisition Management Directive (102-01), Instruction Manual (102-01-001), and Directive on Test and Evaluation (026-06) to review guidance and policy for FOT&E. We interviewed officials from the NSC program office, DOT&E, Program Accountability and Risk Management Office, and COTF to determine their plans for the NSC's FOT&E.

To examine the extent to which issues have arisen during operations that might affect the NSC's capabilities, we reviewed after action reports and engineering reports from January 2014 to June 2015 and the Coast

Guard's measure of availability to determine what equipment casualties the cutters are experiencing on a regular basis and the effect that these casualties are having on operations. Additionally, we reviewed information about the NSC's lost cutter days, operational time spent with major casualties, and days away from home port to assess the extent to which the cutter was capable of performing in its mission areas as frequently as expected. We interviewed Coast Guard officials, including officials from the NSC's logistics group, Pacific Area Command, and representatives from Huntington Ingalls Industries to gain a greater understanding of operational challenges and how they are being addressed, including the steps they are taking to identify root causes and corrective actions. We also toured the Huntington Ingalls Industry shipyard in Pascagoula, Mississippi where the NSCs are built to gain an understanding of how design changes are incorporated into the production process.

We conducted this performance audit from January 2015 to December 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 the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Appendix II: Summary of the Key Performance Parameters of the National Security Cutter

Key performance parameter (KPP) (threshold requirement)	Was KPP tested?	Was KPP met?	Test result	Discussion
1. Sprint Speed (28 knots threshold) for 24 hours	Yes	Fully Met	Reached and sustained 29 knots during testing.	Data was collected during the 4 hour Propulsion Plant Performance Test in August 2011. Additional data was used and extrapolated out to show the National Security Cutter (NSC) can sustain 28 knots for 24 hours.
2.1. Transit range (12,000 nm)	Yes	Partial	10,967 nm	Insufficient data was collected during Initial Operational Test and Evaluation (IOT&E) to resolve the KPP. NSC 1 and 2 have met the threshold and NSCs 3 through 8 will be tested in the future.
2.2. Operate for 60 days at low speeds without replenishment	Yes	Fully Met	Test results indicated the NSC is capable of operating 60 days without replenishment of fuel and subsistence.	Data was collected during the Propulsion Plant Performance Test and separate analysis of the food stores capacity was completed.
2.3. Conduct all missions (sea state 5: up to 13.1 foot waves)	Yes	Partial	The cutter boats are not rated to operate in all of sea state 5.	The operational limitations of the embarked cutter boat during IOT&E was mid sea state 5 (11 foot waves).
2.4. Conduct all missions following exposure to Sea State 8 (up to 45.5 foot waves) for 18 hours	Yes	Fully Met	Sea state 8 was encountered during artic patrol in 2012.	The *Bertholf* conducted artic patrol from July to November 2012 during which sea state 8 was experienced.
3.1. Ability to embark, launch and recover a cutter boat (sea state 5: up to 13.1 foot waves)	Yes	Partial	The cutter boats are not rated to operate in all of sea state 5.	The operational limitations of the embarked cutter boat during IOT&E was mid sea state 5 (11 foot waves).
3.2. Ability to embark, launch and recover a cutter boat while towing	Yes	Partial	The NSC demonstrated that it can tow a vessel of similar size.	For the NSC to conduct towing operations one of the rear cutter boats has to be launched or placed on the stern launch ramp, which will be a problem in higher sea states since the cutter boat is not rated for operations in seas higher than mid sea state 5 (11 feet).
4.1. Launch and recover Coast Guard and Navy Helicopters	Yes	Fully Met	The NSC can launch and recover helicopters through mid sea state 5.	The NSC can launch and recover a wide variety of aircraft, including the H-65 and H-60.
4.2. Automatically secure Coast Guard H-65 Helicopters (mid sea state 5: 10.7 foot waves)	Yes	Fully Met	The NSC can secure helicopters through mid sea state 5.	The NSC uses the TALON system to secure helicopters to the flight deck.
4.3. Conduct a minimum of 4 hours of flight operations day and night with manned aircraft and 16 hours with a combination of manned and unmanned aircraft systems	Partial	Partial	The manned system requirements were met. The unmanned aircraft system has not been fielded or tested yet.	According to Coast Guard officials, of the 20 Unmanned Aircraft System (UAS) programs reviewed, only 2 came close to meeting the requirements. Not having a UAS has reduced the aerial surveillance capability of the NSC.

Key performance parameter (KPP) (threshold requirement)	Was KPP tested?	Was KPP met?	Test result	Discussion
5.1. Deliver warning shots against vessels	Yes	Fully Met	The NSC demonstrated its ability to deliver warning shots against vessels.	The *Bertholf* demonstrated during Combat System Ship Qualification Trials (CSSQT) that the NCS is capable of delivering waring shots against vessels.
5.2. Deliver disabling fire against vessels	Yes	Fully Met	The NSC demonstrated its ability to deliver disabling fire against vessels.	The *Bertholf* demonstrated during CSSQT that the NSC is capable of delivering disabling fire against vessels.
5.3. Deliver destructive fire against high speed (35 knots) patrol craft	Yes	Fully Met	The NSC demonstrated its ability to deliver destructive fire against high speed patrol craft.	The *Stratton* CSSQT showed the NSC is capable of delivering destructive fire against high speed patrol craft.
5.3.1. Deliver destructive fire against large merchant vessels	Yes	Fully Met	The NSC demonstrated its ability to deliver destructive fire against large merchant vessels.	The *Stratton* CSSQT showed the NSC is capable of delivering destructive fire against large merchant vessels.
5.4. Achieve hard and soft kill against a subsonic anti-ship cruise missile	No	No	N/A	According to DHS officials, the target drone was not available for IOT&E due to a moratorium on using the target for tests that resulted from a malfunction during a U.S. Navy test using the same target.
5.5. Achieve hard kill against low-slow flying aircraft and unmanned aircraft systems	Yes	Fully Met	The NSC can achieve hard kill against low-slow flying aircraft and unmanned aircraft systems.	The *Stratton* CSSQT showed that the NSC is capable of hard kill against low-slow flying aircraft and unmanned aircraft systems.
6. Provide space, weight, and power for Mine Warfare capability	Yes	Fully Met	The NSC can provide space, weight, and power for Mine Warfare systems.	The NSCs have space, weight, and power for a mine detection system.
7.1. Interoperability (exchange information with mission partners)	Yes	Partial	Not all information systems were installed prior to IOT&E, which was listed as a limitation to the test.	According to Coast Guard officials, Link-11, a system used to transmit and receive information with U.S. Navy ships, was only able to receive data. A pending upgrade to the NSC's C4ISR software should allow the cutter to transmit data.
7.2. Exchange information with other Coast Guard Activities	Yes	Fully Met	The NSCs can exchange information with other Coast Guard activities.	The NSC demonstrated that it can exchange information with other Coast Guard activities.

Source: GAO analysis of Navy and Coast Guard data. | GAO-16-148

Appendix III: Comments from the U.S. Department of Homeland Security

U.S. Department of Homeland Security
Washington, DC 20528

Homeland Security

December 8, 2015

Michele Mackin
Director, Acquisition and Sourcing Management
U.S. Government Accountability Office
441 G Street, NW
Washington, DC 20548

Re: Draft Report GAO-16-148, "NATIONAL SECURITY CUTTER: Enhanced Oversight Needed to Ensure Problems Discovered During Testing and Operations Are Addressed"

Dear Ms. Mackin:

Thank you for the opportunity to review and comment on this draft report. The U.S. Department of Homeland Security (DHS) appreciates the U.S. Government Accountability Office's (GAO) work in planning and conducting its review and issuing this report.

The National Security Cutter (NSC) is the largest and most technologically sophisticated asset in the Coast Guard. Each NSC is capable of operating in the most demanding open ocean environments, including the hazardous fisheries of the North Pacific and the vast approaches of the Eastern Pacific where much of the American narcotics traffic occurs. With robust command, control, communication, computers, intelligence, surveillance and reconnaissance equipment, stern boat launch and aviation facilities, as well as long-endurance station keeping, the NSCs are afloat operational-level headquarters for complex law enforcement and national security missions involving multiple Coast Guard and partner agency participation.

The U.S. Coast Guard is committed to successfully completing Operational Test and Evaluation to measure the overall ability of each NSC to accomplish its missions for operational deployment considering organization, doctrine, tactics, supportability, survivability, vulnerability, and threat.

The draft report contained 5 recommendations with which the Department concurs. Specifically, GAO recommended that the:

Recommendation 1: Commandant of the Coast Guard direct the NSC program office to clarify the NSC's key performance parameters for the cutter boats (specifically the sea state operational parameters).

Response: Concur. The U.S. Coast Guard, Office of Cutter Forces (NSC Sponsor) will submit an Operational Requirements Document (ORD) update request in accordance with the Major Systems Acquisition Manual (COMDTINST M5000.10D), to clarify the key performance parameters for the NSC and cutter boats. Estimated Completion Date (ECD): November 30, 2016.

Recommendation 2: DHS Under Secretary for Management specify when FOT&E [Follow-on Test and Evaluation] must be concluded for the NSC, such as when the Coast Guard has addressed the specific actions from the October 2014 Acquisition Decision Memorandum.

Response: Concur. The Office of Program Accountability and Risk Management (PARM) will coordinate with the Office of Test and Evaluation, the U.S. Navy Commander Operational Test and Evaluation Force, and the U.S. Coast Guard to determine an appropriate date for the conclusion of FOT&E. The FOT&E schedule will be codified in the approved Test and Evaluation Master Plan, and an Acquisition Decision Memorandum will be issued to the U.S. Coast Guard NSC program with an action item to complete the FOT&E within the determined date. Remaining action items from the October 2014 Acquisition Decision Memorandum will be noted as outstanding. ECD: March 31, 2016.

Recommendation 3: DHS Under Secretary for Management conduct one or more acquisition review boards to provide oversight and specify any further actions the NSC program should take (a) at the conclusion of FOT&E and (b) at the conclusion of the Coast Guard's studies related to the propulsion systems. In lieu of an acquisition review board, an acquisition decision memo documenting that no further action is required for either event, if that is the case, may be suitable.

Response: Concur. PARM will coordinate with the Office of Test and Evaluation, the U.S. Navy Commander Operational Test and Evaluation Force, and the U.S. Coast Guard to determine acceptable outcomes, appropriate submittals to document the outcomes, and follow-on actions pending the outcome of both FOT&E and Coast Guard propulsion studies. These conditions will be documented in Acquisition Decision Memorandums, which document Acquisition Review Board decisions, issued to the U.S. Coast Guard NSC program for action. ECD: March 31, 2016.

2

Recommendation 4: DHS Under Secretary for Management require that the updated guidance establish factors to be considered when planning for FOT&E, including when test events will be concluded.

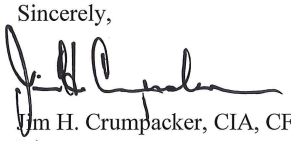
Response: Concur. In alignment with future updates or revisions to DHS Directive 102-01, Science & Technology Directorate/Director of Operational Test and Evaluation will update Test and Evaluation Directive 026-06 series to incorporate FOT&E planning guidance, including requirements to address scope and schedule of required testing. ECD: November 30, 2016.

Recommendation 5: DHS Under Secretary for Management require that the updated guidance require that a date be established and an acquisition review board held, if necessary, to provide oversight and specify any further actions programs should take following FOT&E.

Response: Concur. PARM will add the following language into DHS Directive 102-01: "Note: If a Program is determined to require Follow-on Operational Test and Evaluation (FOT&E), it is to be documented, along with any conditions established for the FOT&E, in an Acquisition Decision Memorandum." This requirement will be codified when the instruction is signed by the Under Secretary for Management. ECD: March 31, 2016.

Again, thank you for the opportunity to review and comment on this draft report. Technical comments were previously provided under separate cover. Please feel free to contact me if you have any questions. We look forward to working with you in the future.

Sincerely,



Jim H. Crumpacker, CIA, CFE
Director
Departmental GAO-OIG Liaison Office

3

Appendix IV: GAO Staff and Acknowledgments

GAO Contact

Michele Mackin, (202) 512-4841 or mackinm@gao.gov

Staff Acknowledgments

In addition to the contact above, Katherine Trimble, Assistant Director; John Crawford, Analyst-in-Charge; Peter W. Anderson; William Carrigg; Lindsey Cross; Kristine Hassinger; Kate Pfeiffer; and Ozzy Trevino all made key contributions to this report.

Appendix V: Accessible Data

Agency Comment Letter

Text of Appendix III: Comments from the U.S. Department of Homeland Security

Page 1

U.S. Department of Homeland Security

Washington, DC 20528

December 8, 2015

Michele Mackin

Director, Acquisition and Sourcing Management

U.S. Government Accountability Office

441 G Street, NW

Washington, DC 20548

Re: Draft Report GA0-16-148, "NATIONAL SECURITY CUTTER: Enhanced Oversight Needed to Ensure Problems Discovered During Testing and Operations Are Addressed"

Dear Ms. Mackin:

Thank you for the opportunity to review and comment on this draft report. The U.S. Department of Homeland Security (DHS) appreciates the U.S. Government Accountability Office's (GAO) work in planning and conducting its review and issuing this report.

The National Security Cutter (NSC) is the largest and most technologically sophisticated asset in the Coast Guard. Each NSC is capable of operating in the most demanding open ocean environments, including the hazardous fisheries of the North Pacific and the vast approaches of the Eastern Pacific where much of the American narcotics traffic occurs. With robust command, control, communication, computers, intelligence, surveillance and reconnaissance equipment, stem boat launch and aviation facilities, as well as long- endurance station keeping, the NSCs are afloat operational-level headquarters for complex law enforcement and national security missions involving multiple Coast Guard and partner agency participation .

The U.S. Coast Guard is committed to successfully completing Operational Test and Evaluation to measure the overall ability of each NSC to accomplish its missions for operational deployment considering organization, doctrine, tactics, supportability, survivability, vulnerability, and threat.

The draft report contained 5 recommendations with which the Department concurs. Specifically, GAO recommended that the:

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Recommendation 1: Commandant of the Coast Guard direct the NSC program office to clarify the NSC' s key performance parameters for the cutter boats (specifically the sea state operational parameters).

Response: Concur. The U.S. Coast Guard, Office of Cutter Forces (NSC Sponsor) will submit an Operational Requirements Document (ORD) update request in accordance with the Major Systems Acquisition Manual (COMDTINST M5000.10D), to clarify the key performance parameters for the NSC and cutter boats. Estimated Completion Date (ECD): November 30, 2016.

Recommendation 2: DHS Under Secretary for Management specify when FOT&E [Follow-on Test and Evaluation] must be concluded for the NSC, such as when the Coast Guard has addressed the specific actions from the October 2014 Acquisition Decision Memorandum.

Response: Concur. The Office of Program Accountability and Risk Management (PARM) will coordinate with the Office of Test and Evaluation, the U.S. Navy Commander Operational Test and Evaluation Force, and the U.S. Coast Guard to determine an appropriate date for the conclusion of FOT&E. The FOT&E schedule will be codified in the approved Test and Evaluation Master Plan, and an Acquisition Decision Memorandum will be issued to the U.S. Coast Guard NSC program with an action item to complete the FOT&E within the determined date. Remaining action items from the October 2014 Acquisition Decision Memorandum will be noted as outstanding. ECD: March 31, 2016.

Recommendation 3: DHS Under Secretary for Management conduct one or more acquisition review boards to provide oversight and specify any further actions the NSC program should take (a) at the conclusion of FOT&E and (b) at the conclusion of the Coast Guard's studies related to the propulsion systems. In lieu of an acquisition review board, an acquisition decision memo documenting that no further action is required for either event, if that is the case, may be suitable.

Response: Concur. PARM will coordinate with the Office of Test and Evaluation, the U.S. Navy Commander Operational Test and Evaluation Force, and the U.S. Coast Guard to determine acceptable outcomes, appropriate submittals to document the outcomes, and follow-on actions

	pending the outcome of both FOT&E and Coast Guard propulsion studies. These conditions will be documented in Acquisition Decision Memorandums, which document Acquisition Review Board decisions, issued to the U.S. Coast Guard NSC program for action. ECD: March 31, 2016.
Page 3	Recommendation 4: DHS Under Secretary for Management require that the updated guidance establish factors to be considered when planning for FOT&E, including when test events will be concluded. Response: Concur. In alignment with future updates or revisions to DHS Directive 102-01, Science & Technology Directorate/Director of Operational Test and Evaluation will update Test and Evaluation Directive 026-06 series to incorporate FOT&E planning guidance, including requirements to address scope and schedule of required testing. ECD: November 30, 2016. Recommendation 5: DHS Under Secretary for Management require that the updated guidance require that a date be established and an acquisition review board held, if necessary, to provide oversight and specify any further actions programs should take following FOT&E. Response: Concur. PARM will add the following language into DHS Directive 102-01: "Note: If a Program is determined to require Follow-on Operational Test and Evaluation (FOT&E), it is to be documented, along with any conditions established for the FOT&E, in an Acquisition Decision Memorandum." This requirement will be codified when the instruction is signed by the Under Secretary for Management. ECD: March 31, 2016. Again, thank you for the opportunity to review and comment on this draft report. Technical comments were previously provided under separate cover. Please feel free to contact me if you have any questions. We look forward to working with you in the future. Sincerely, Jim H. Crumpacker, CIA, CFE Director Departmental GAO-OIG Liaison Office

Related GAO Products

Coast Guard Acquisitions: As Major Assets Are Fielded, Overall Portfolio Remains Unaffordable. GAO-15-620T. Washington, D.C.: May 14, 2015.

Homeland Security Acquisitions: Major Program Assessments Reveal Actions Needed to Improve Accountability. GAO-15-171SP. Washington, D.C.: April 22, 2015.

Coast Guard: Timely Actions Needed to Address Risks in Using Rotational Crews. GAO-15-195. Washington, D.C.: March 6, 2015.

Coast Guard Acquisitions: Better Information on Performance and Funding Needed to Address Shortfalls. GAO-14-650T. Washington, D.C.: June 18, 2014.

Coast Guard Acquisitions: Better Information on Performance and Funding Needed to Address Shortfalls. GAO-14-450. Washington, D.C.: June 5, 2014.

Coast Guard: Portfolio Management Approach Needed to Improve Major Acquisition Outcomes. GAO-12-918. Washington, D.C.: September 20, 2012.

Coast Guard: Legacy Vessels' Declining Conditions Reinforce Need for More Realistic Operational Targets. GAO-12-741. Washington, D.C: July 31, 2012.

Coast Guard: Action Needed as Approved Deepwater Program Remains Unachievable. GAO-11-743. Washington, D.C.: July 28, 2011.

Coast Guard: Observations on Acquisition Management and Efforts to Reassess the Deepwater Program. GAO-11-535T. Washington, D.C.: April 13, 2011.

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Coast Guard: Deepwater Requirements, Quantities, and Cost Require Revalidation to Reflect Knowledge Gained. GAO-10-790. Washington, D.C.: July, 27, 2010.

Coast Guard: Better Logistics Planning Needed to Aid Operational Decisions Related to the Deployment of the National Security Cutter and its Support Assets. GAO-09-497. Washington, D.C.: July 17, 2009.