

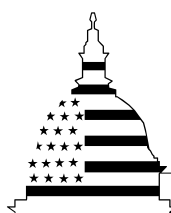
GAO

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

September 2003

COAST GUARD

New Communication System to Support Search and Rescue Faces Challenges



G A O

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Highlights of [GAO-03-1111](#), a report to the Subcommittee on Coast Guard and Maritime Transportation, Committee on Transportation and Infrastructure, House of Representatives

Why GAO Did This Study

Search and rescue—one of the Coast Guard’s oldest missions— involves minimizing the loss of life, injury, and property damage by aiding people and boats in distress. The Coast Guard has previously reported that its 30-year-old search and rescue communication system, called the National Distress and Response System, has several deficiencies and is difficult to maintain. Thus, the Coast Guard contracted to replace and modernize it with a new system, called Rescue 21.

GAO was asked to identify the status and plans of the Coast Guard’s acquisition of Rescue 21 and the technical and program risks associated with Rescue 21.

What GAO Recommends

GAO recommends, in part, that the Secretary of Homeland Security direct the Commandant of the U.S. Coast Guard to establish a new schedule for critical testing phases and initial operating capability and ensure that milestones are established for completing test plans for formal qualification testing, system integration testing, and operational testing and evaluation.

In commenting on a draft of our report, Coast Guard officials generally agreed with GAO’s findings and recommendations and provided technical corrections, which were incorporated as appropriate.

www.gao.gov/cgi-bin/getrpt?GAO-03-1111.

To view the full product, including the scope and methodology, click on the link above. For more information, contact David A. Powner at (202) 512-9286 or pownerd@gao.gov.

COAST GUARD

New Communication System to Support Search and Rescue Faces Challenges

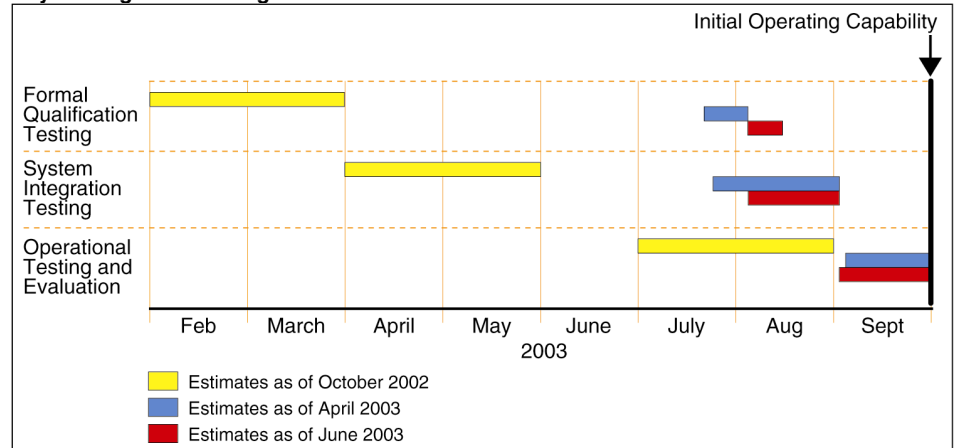
What GAO Found

Rescue 21’s original schedule, which called for it to achieve initial operating capability by September 2003, has been postponed, and the Coast Guard has not yet finalized a new schedule. This postponement was due in part to the development of the system taking longer than planned.

GAO reviewed the Coast Guard’s management of three risk areas associated with Rescue 21:

- *Test management.* Scheduled completion dates for key tests are still being determined. These key tests (formal qualification testing, system integration testing, and operational testing and evaluation) are incremental tests that the Coast Guard is planning to perform before reaching initial operating capability. Completion dates are not yet set because the Coast Guard decided to postpone initial operating capability due to delays in the original test schedule, which resulted in increased risks associated with compressing and overlapping key tests (see figure). In addition, key deliverables, including test plans, are still outstanding, and no scheduled completion dates exist.
- *Requirements management.* The Coast Guard has a process in place for managing system requirements.
- *Risk management.* The Coast Guard has a program in place for identifying, prioritizing, and minimizing risks. Two high risks identified by the Coast Guard are software development and environmental concerns related to the construction of new antenna sites, which may delay the implementation of Rescue 21.

Key Testing Dates through June 2003



Source: Coast Guard data, GAO analysis.

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United States General Accounting Office
Washington, D.C. 20548

September 30, 2003

The Honorable Frank A. LoBiondo
Chairman
The Honorable Bob Filner
Ranking Minority Member
Subcommittee on Coast Guard and Maritime Transportation
Committee on Transportation and Infrastructure
House of Representatives

The National Distress and Response System is a significant component of the United States Coast Guard's search and rescue program. However, Coast Guard officials have reported that the 30-year-old system has several deficiencies and is difficult to maintain. In September 2002, the Coast Guard contracted with General Dynamics Decision Systems (General Dynamics) to modernize and replace the National Distress and Response System with a system called Rescue 21. As you requested, our objectives were to identify the (1) status and plans of the Coast Guard's acquisition of Rescue 21 and (2) technical and programmatic risks associated with Rescue 21.

To identify the status and plans for acquiring Rescue 21, we analyzed Rescue 21's acquisition strategy and cost and schedule estimates. We also compared original Rescue 21 plans with current strategies. To identify the technical and programmatic risks associated with Rescue 21, we reviewed key Coast Guard acquisition documents, including test plans, requirements documents, the risk watch list, and risk mitigation plans. We performed our work at the Coast Guard headquarters in Washington, D.C.; the Coast Guard group site in Chincoteague, Va.; and General Dynamics in Scottsdale, Ariz. We conducted our work from November 2002 through June 2003 in accordance with generally accepted government auditing standards.

On August 13, 2003, we provided your offices with a status briefing on the results of this review, which is included as appendix I. The purpose of this letter is to provide the published briefing slides to you and to officially transmit our recommendations to the Secretary of Homeland Security.

In brief, we reported that the Coast Guard's original schedule for reaching initial operating capability by September 2003 had been postponed and that the Coast Guard had not yet finalized a new schedule. The postponement of the schedule for reaching initial operating capability was due in part to the system's development taking longer than planned. In reviewing the Coast

Guard's test management practices, we found that the Coast Guard postponed key tests in part because prior schedules showed delay, overlap, and compression of tests, which increased the risk that all requirements would not be tested. In addition, schedules for key tests and deliverables, including test plans, were still outstanding. These key tests (formal qualification testing, system integration testing, and operational testing and evaluation) are incremental tests that the Coast Guard is planning to perform before reaching initial operating capability. We also determined that the Coast Guard has developed key documentation used for managing system requirements and that the Coast Guard has a program in place for identifying, prioritizing, and minimizing risks.

Recommendations

To mitigate Rescue 21 risks and ensure that adequate testing occurs and all requirements are fulfilled so that the deployed system will work as specified, we are recommending that the Secretary of Homeland Security direct the Commandant of the United States Coast Guard to

- establish a new schedule for critical testing phases and initial operating capability and
- ensure that milestones are established for completing test plans for formal qualification testing, system integration testing, and operational testing and evaluation and that test plans address all requirements of the system.

Agency Comments

In providing oral comments on a draft of this report, Coast Guard officials, including the Coast Guard's Rescue 21 Project Manager, stated that they generally agreed with our findings and recommendations. Coast Guard officials also stated that the Coast Guard is actively working with General Dynamics to jointly develop a new schedule that considers all the risk factors identified in this report. In addition, Coast Guard officials provided technical corrections that we incorporated in this report, where appropriate.

As we agreed with your staff, unless you publicly announce the contents of this report earlier, we plan no further distribution of it until 30 days from the date of this letter. At that time, we will send copies to the Secretary of Homeland Security, the Commandant of the United States Coast Guard,

and other interested parties. Copies will be made available to others upon request. In addition, the report will be available at no charge on the GAO Web site at <http://www.gao.gov>.

If you have any questions about this report, please contact me at (202) 512-9286 or by e-mail at pownerd@gao.gov. Sophia Harrison, Richard Hung, David Noone, Colleen Phillips, Karl Seifert, and Eric Winter were major contributors to this report.

A handwritten signature in black ink that reads "David A. Powner". The signature is written in a cursive style with a long horizontal flourish at the end.

David A. Powner
Director (Acting), Information Technology
Management Issues

The Coast Guard's Rescue 21 Acquisition: An Update



The Coast Guard's Rescue 21 Acquisition: An Update

August 13, 2003





Briefing Outline

- Introduction
 - Objectives, Scope, and Methodology
 - Results in Brief
 - Rescue 21 Background
 - Status and Plans
 - Key Risk Areas
 - Conclusions
 - Recommendations
-



Introduction

Search and rescue is one of the Coast Guard's oldest missions and one of its highest priorities.* The search and rescue mission involves minimizing the loss of life, injury, and property damage by aiding people and boats in distress.

The National Distress and Response System (NDRS) is a significant component of the Coast Guard's search and rescue program. NDRS is a short-range communication network used to communicate over U.S. Coastal waters and inland waterways. NDRS allows Coast Guard officers to monitor the radio distress frequency and to coordinate search and rescue missions in response to mariner distress calls.

Coast Guard officials have previously reported that the 30-year-old NDRS has several deficiencies and is difficult to maintain. Therefore, the Coast Guard contracted with General Dynamics Decision Systems (General Dynamics) to develop and implement a modernized NDRS, called Rescue 21.

*14 U.S.C. § 90; 6 U.S.C. § 468.



Objectives, Scope, and Methodology

Objectives

- Identify the status and plans of the Coast Guard's acquisition of Rescue 21.
- Identify the technical and programmatic risks associated with Rescue 21.



Objectives, Scope, and Methodology (cont'd)

Scope and Methodology

To identify the status and plans for acquiring Rescue 21, we analyzed the Rescue 21 acquisition strategy and cost and schedule estimates. We also compared original Rescue 21 plans with current strategies.

To identify the technical and programmatic risks associated with the Rescue 21 acquisition, we reviewed the Coast Guard's acquisition plans and policies. Specifically, we reviewed

- test management plans, including the test and evaluation master plan and formal qualification test plan;
 - requirements management plans, including the mission needs statement, operational requirements document, and contract performance specification; and
 - risk management plans, including risk watch list and risk mitigation strategies.
-



Objectives, Scope, and Methodology (cont'd)

We also evaluated the Coast Guard's policies for managing Rescue 21 risks, requirements, and testing by comparing them to industry best practices and Coast Guard policies. In addition, we interviewed program managers and contract officials.

We performed our work at the United States Coast Guard headquarters in Washington D.C.; the Coast Guard group site in Chincoteague, Va.; and General Dynamics in Scottsdale, Ariz. We conducted our work from November 2002 through June 2003, in accordance with generally accepted government auditing standards.



Results in Brief

Rescue 21 Status and Plans

- The original Rescue 21 schedule for reaching initial operating capability by September 2003 has been postponed and the Coast Guard has not yet finalized a new schedule.

Rescue 21 Technical and programmatic risks

- Test management – Effective test management ensures that system functions meet their specified requirements. Scheduled end dates for formal qualification testing, system integration testing, and operational testing and evaluation are still being determined, and key deliverables are still outstanding, including test plans. The Coast Guard decided to postpone these tests and IOC because of delays in development and the resulting risks associated with compressing and overlapping key tests.
-



Results in Brief (cont'd)

Rescue 21 Technical and programmatic risks (cont'd)

- Requirements management – Effective requirements management ensures that the minimum functions and performance levels needed to satisfy user needs are met. The Coast Guard has developed key documentation used for managing requirements.
- Risk management – Effective risk management typically includes identifying, prioritizing, resolving, and monitoring project risks. The Coast Guard's plans for identifying, prioritizing, and minimizing risks are in place.



Background: The Existing NDRS

NDRS is a significant component of the Coast Guard's current search and rescue program. This system

- is the Coast Guard's primary short-range communication network, with a range of about 20 nautical miles;
- provides communications for command and control missions, such as maritime safety, maritime law enforcement, national security, and marine environmental protection; and
- is composed of VHF-FM radios, communication towers, and communication centers.



Background: The Existing NDRS (cont'd)

Much of the existing system was installed in the 1970's, making many of the system's components expensive to maintain and difficult to upgrade. In addition, the Coast Guard has previously reported that the existing NDRS has several other critical deficiencies:

- numerous gaps in the coverage of communication, affecting 14 percent of Coast Guard's total area of responsibility; in these areas, the Coast Guard cannot hear calls from mariners in distress;
- limited direction-finding capabilities and no digital selective calling capabilities;*
- no effective way to track Coast Guard assets;
- limited interoperability with other federal and state communication systems; and
- no means for secure/protected communication.

*A digital selective calling radio has the ability to send a mayday signal that identifies the vessel and when connected to a Global Positioning System, sends the vessel's location.



Background: Rescue 21

In September 2002, the Coast Guard awarded a contract to General Dynamics for developing and implementing a modernized NDRS, called Rescue 21. The contract and original schedule call for the following:

- two initial Coast Guard locations to be operating with full functionality, scheduled for September 2003, referred to as achieving initial operating capability (IOC), and
- continuing deployment to additional locations through 2006.

Rescue 21 is to be a short-range communication system with a range of about 20 nautical miles. The system is to include VHF-FM radios, communication towers, and hardware and software at the communication centers. Rescue 21's primary functions are to provide the Coast Guard with communication for

- maritime search-and-rescue functions, such as monitoring distress calls from boaters and coordinating the response or rescue, and
- command and control missions.



Background: Rescue 21 (cont'd)

According to the Coast Guard's contract with General Dynamics, the Rescue 21 system is to:

- limit the number of communication coverage gaps in the United States to less than 2 percent;
- use direction finding and digital selective calling to locate boaters;
- allow the Coast Guard to track its mobile assets;
- meet interoperability standards to allow communication with other federal and state systems;
- allow secure/protected communication of sensitive information; and
- archive voice and data communications and have them instantly accessible.



Status and Plans

Rescue 21 is currently under development. As of June 2003, the Coast Guard's testing and schedule for reaching initial operational capability (IOC) was as follows:



Source: Coast Guard data, GAO analysis.

The Coast Guard has received funding of \$182.4 million for the Rescue 21 acquisition through fiscal year 2003, and the projected funding through fiscal year 2007 is \$569.2 million.

*Formal qualification testing (FQT), system integration testing (SIT), and operational testing and evaluation (OT&E) are incremental tests the Coast Guard is planning to perform before reaching IOC. 13



Status and Plans (cont'd)

In July 2003, the Coast Guard delayed IOC from the original September 30, 2003, date to a January to March 2004 timeframe.

According to agency officials and test documents, the causes for delaying IOC and preceding test were as follows:

- General Dynamics had taken longer than expected to obtain developers and subcontractors for Rescue 21,
- the development of the system software continues to take longer than planned.

Since postponing IOC, the Coast Guard has not developed a schedule for formal qualification testing, system integration testing, operational testing and evaluation, or IOC.



Key Risk Areas: Test Management

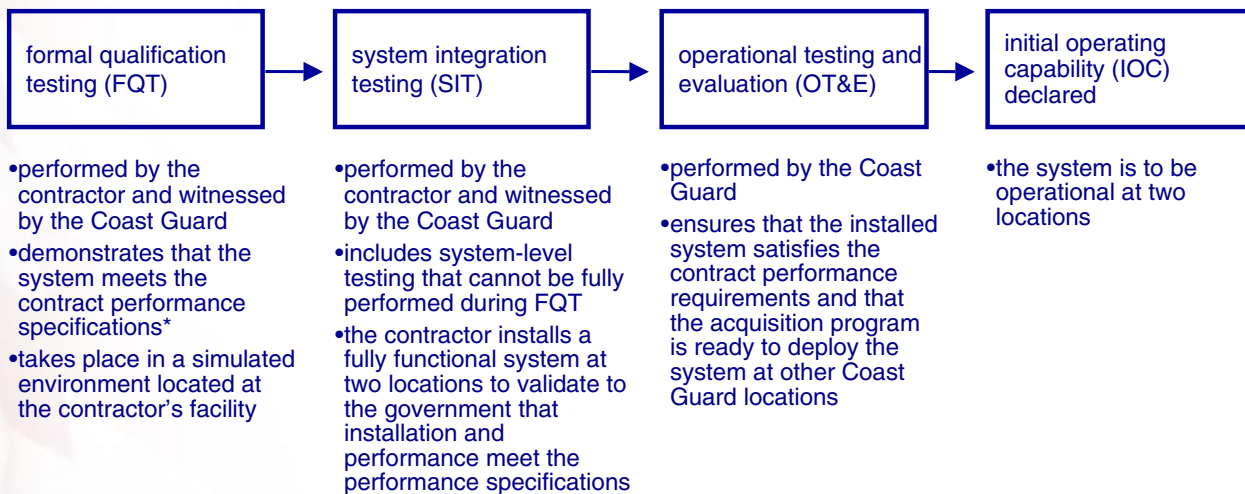
Test management is used to ensure that system functions meet their specified requirements. According to leading information technology organizations*, to be effective, software testing practices should be planned and conducted in a structured and disciplined fashion. Typically, this involves testing increasingly larger increments of a system until the complete system is tested and accepted and resolving critical problems before moving to the next phase of testing.

*U.S. General Accounting Office *Year 2000 Computing Crisis: A Testing Guide* (GAO/AIMD-10.1.21, Washington, D.C.: November 1998).



Key Risk Areas: Test Management (cont'd)

Rescue 21 is planned to go through the following stages of testing before achieving IOC:



*The contract performance specifications define system level requirements for communications as well as information and data processing.



Key Risk Areas: Test Management (cont'd)

Since early 2003, the Coast Guard began postponing formal qualification testing and subsequent testing for Rescue 21. In order for the Coast Guard and General Dynamics to meet scheduled end dates, they planned to compress and overlap testing schedules. Specifically,

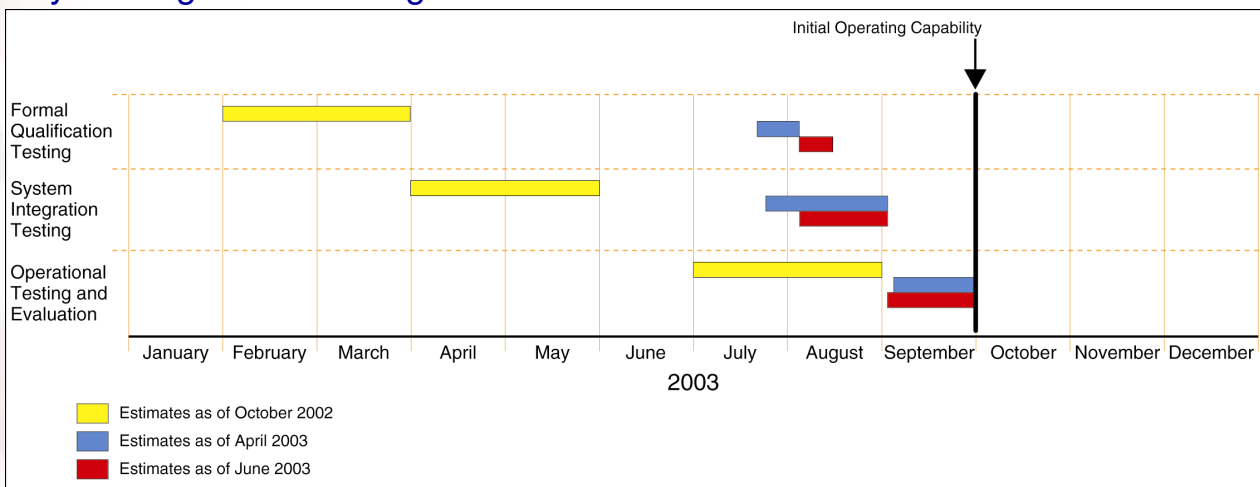
- formal qualification testing and system integration testing were delayed by 6 and 4 months, respectively;
- the Coast Guard had originally scheduled 2 months to perform formal qualification testing, but was planning less than a month; and
- formal qualification testing and system integration testing were planned to be performed in sequence, but were scheduled concurrently.

The graphic on the following slide depicts Rescue 21's schedule at various dates and demonstrates delays and compression of the timing of key tests through June 2003.



Key Risk Areas: Test Management (cont'd)

Key Testing Dates Through June 2003





Key Risk Areas: Test Management (cont'd)

Schedule delays, test compression, and testing overlap increase the risk that

- all requirements will not be tested during formal qualification testing, system integration testing, and operational testing and evaluation because of the lack of time, and
- system anomalies that could be found in one testing phase could carry over to another testing phase or may not be fully resolved before the next testing cycle begins.

We raised these testing concerns to the Coast Guard in April 2003 and later discussed whether these concerns could increase the likelihood that the Coast Guard would not be able to test the full functionality of the system and deploy the system in the initial sites by September 2003 as was originally planned.



Key Risk Areas: Test Management (cont'd)

Due to the previously stated delays in development and resulting risks associated with compressing and overlapping key tests, the Coast Guard decided to postpone IOC.

In addition, key actions remain incomplete. The test plans for formal qualification testing, system integration testing, and operational testing and evaluation are incomplete, and no scheduled completion dates exist.



Key Risk Areas: Requirements Management

System requirements define the minimum functions and performance levels needed to satisfy user needs. According to leading industry experts an effective requirements management process should establish and maintain a common agreement among the project team, including the end user, and supplier team.* The mismanagement of requirements can result in an unwanted change in a project's scope or a system that does not meet user expectations.

*Software Acquisition Capability Maturity Model Version 1.03, March 2002.



Key Risk Areas: Requirements Management (cont'd)

The Coast Guard has requirements management practices in place. Specifically, it developed the following requirements documents:

- Mission Needs Statement
- Operational Requirements
- Work Breakdown Structure
- Contract Performance Specification

Coast Guard officials reported that Rescue 21 requirements have not changed as a result of the Coast Guard's moving from the Department of Transportation to the Department of Homeland Security.



Key Risk Areas: Risk Management

According to leading management practices, risk management is a key component of a sound system development approach. An effective risk management approach typically includes identifying, prioritizing, resolving, and monitoring project risks. In support of this approach, the Coast Guard's risk management plan calls for

- assigning a severity rating (high, medium, or low) to risks that bear particular attention and placing these risks on a "risk watch list;"
- prioritizing these risks;
- planning a response or strategy for each risk on the risk watch list, and drafting a detailed response plan; and
- reviewing and evaluating all risks on the risk watch list during monthly management meetings.



Key Risk Areas: Risk Management (cont'd)

The Coast Guard is managing risks with Rescue 21 by

- developing and monitoring a Rescue 21 risk watch list,
- prioritizing and assigning a severity rating for each risk on the watch list,
- creating a risk management team that meets once every 4 months, and
- developing a risk mitigation strategy for each risk.



Key Risk Areas: Risk Management (cont'd)

High risks identified by the Coast Guard include:

- software development may delay the schedule, and
- acquiring antenna sites may be affected by environmental concerns and National Environmental Protection Act requirements, which may delay the schedule.

Medium risks identified by the Coast Guard include:

- Rescue 21 operating expenses are uncertain, and
- the performance specification and the statement of work could be misinterpreted, which could have a negative impact on the technical performance of Rescue 21.

Coast Guard plans for identifying, prioritizing, and minimizing risks are in place.



Conclusions

Development and testing of key Rescue 21 components have been delayed, and the Coast Guard has not yet established new schedules for key tests or for initial operating capability. In addition, key deliverables, such as detailed test procedures used to perform key tests, have not been completed. Although the Coast Guard has developed key documentation used for managing system requirements, it is unknown whether all Rescue 21 requirements will be fulfilled until detailed testing procedures are completed and executed.



Recommendations

To mitigate Rescue 21 risks and to ensure that adequate testing occurs and all requirements are fulfilled so that the deployed system will work as specified, we are recommending that the Secretary of the Department of Homeland Security direct the Commandant of the United States Coast Guard to

- establish a new schedule for critical testing phases and initial operating capability;
- ensure that milestones are established for completing test plans for formal qualification testing, system integration testing, and operational testing and evaluation and that test plans address all requirements of the system.

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