

GAO

Report to the Chairman, Subcommittee
on Transportation and Related Agencies,
Committee on Appropriations, U.S.
Senate

August 1992

COAST GUARD

Progress in the Marine Safety Network, but Many Uncertainties Remain



■

**Resources, Community, and
Economic Development Division****B-248714**

August 28, 1992

**The Honorable Frank R. Lautenberg
Chairman, Subcommittee on Transportation
and Related Agencies
Committee on Appropriations
United States Senate**

Dear Mr. Chairman:

This report responds to your August 8, 1991, request that we review efforts by the Coast Guard to develop a new information system for its vessel inspection and other marine safety programs. The new system, the Marine Safety Network (MSN), is being developed to overcome recognized problems with the current system, such as obsolete hardware. As agreed with your office, we examined factors that might affect the system's cost and implementation schedule and reviewed steps taken to meet system users' information needs and improve program management.

Results in Brief

The Coast Guard has made progress in planning and designing a new, more effective information system; however, delays in meeting project milestones have occurred, and many uncertainties remain that could substantially affect the system's cost and implementation schedule. For example, key contracts for system development and hardware have not been awarded, and major decisions are forthcoming on (1) whether to change the type of computer language planned to develop MSN software and (2) whether to incorporate additional applications into the system to meet anticipated future needs. These decisions could add millions of dollars to MSN's estimated development cost of \$34.6 million and increase the time required to develop the system.

The Coast Guard has taken and plans to take many steps to help ensure that MSN will meet users' information needs. The agency is working with outside experts to develop the system in keeping with governmentwide regulations and guidance; also, it is consulting extensively with groups of users to help define information needs. Detailed designs and prototypes have been completed for 2 of 40 system applications. Because testing of these two applications is under way, the Coast Guard should soon be able to begin analyzing its initial success in overcoming some of the problems of the old system.

As planned, MSN has the potential to improve information system support for the Coast Guard's management of marine safety programs. The design plan is to enhance the current capability to request and analyze data and provide relevant management reports. Coast Guard officials believe that MSN enhancements will strengthen their ability to (1) evaluate the causes of, and trends in, marine accidents; (2) allocate resources effectively; and (3) develop goals and measures of performance for programs.

While the Coast Guard and its outside experts are optimistic that the new system will meet the agency's needs, MSN has not yet been sufficiently developed for us reasonably to determine whether the completed system will perform as intended. Many of the system's components are not scheduled to be developed for several years.

Background

The Coast Guard conducts many marine safety activities to promote the safety of life and property on the high seas and waters subject to U.S. jurisdiction. The activities—such as inspecting vessels, licensing crews, investigating marine accidents, and monitoring oil spills—are performed at Coast Guard marine safety offices in major U.S. ports. Coast Guard headquarters provides program direction and oversight through its Office of Marine Safety, Security, and Environmental Protection.

In 1984, the Coast Guard implemented the Marine Safety Information System (MSIS) to support a limited number of marine safety functions. MSIS was based on earlier systems and technology developed in the 1970s. The system's scope was originally narrow, but now—after many modifications and expansions—MSIS serves as the primary information system for marine safety programs.

Studies by the Coast Guard and GAO have identified serious limitations associated with MSIS. For example, a 1989 Coast Guard report on vessel inspections found that MSIS was difficult for field personnel to use and did not eliminate the need for inspectors to rely on manual records.¹ The report also said that managers overseeing the vessel inspection program found the system of little use to them. In 1990, GAO reported problems with MSIS, such as limited analytical ability, difficulties in transferring information to other Coast Guard systems, unreliable data, obsolete hardware, and inflexible software that did not meet users' needs.² The

¹Report of the Tanker Safety Study Group, U.S. Coast Guard (Oct. 6, 1989).

²Coast Guard: Strategic Focus Needed to Improve Information Resources Management (GAO/IMTEC-90-32, Apr. 24, 1990).

report also identified several weaknesses in the Coast Guard's past approach to developing information systems that may have contributed to some specific MSIS problems. The weaknesses included the lack of (1) a strategic information resources management plan for helping to ensure that information systems serve the Coast Guard's long-range goals and (2) agencywide policies, standards, and procedures for developing, implementing, and evaluating information systems. (See app. I for a further description of problems with MSIS and the Coast Guard's past development of information systems.)

To address basic inadequacies of MSIS, the Coast Guard began developing MSN in 1986. This new system is being developed in 6 modules, which contain a total of 40 applications.³ (See app. II for a description of the 6 modules and 40 applications.) The development is now proceeding as part of a major acquisition under a process defined in the Office of Management and Budget's (OMB) Circular A-109. This process is designed to prevent premature commitments to production and reduce cost increases, schedule delays, and performance deficiencies. In accordance with OMB Circular A-109, the Coast Guard is to evaluate the cost, schedule, and performance of a major project at each acquisition stage to determine whether the project is ready to move to the next phase.

The Coast Guard estimated costs of \$34.6 million through fiscal year 1996 to develop the system's 40 applications; it plans to have the last module fully operational early in fiscal year 1997. An implementation plan and a high-level analysis of system requirements were completed in late 1989, and field testing of prototype designs for part of the first system module began in April 1992, according to the MSN project manager. Partly on the basis of the analysis and the expected results from the testing, Coast Guard officials believe that MSN requirements will be sufficiently defined to award a contract for full-scale system development in May 1993. Through March 31, 1992, the Coast Guard reported expenditures of about \$3.1 million to develop MSN. (See app. III for additional detail on the estimated costs of developing MSN.)

³This total figure includes a module for the Vessel Identification and Documentation System (VIDS), which the Congress ordered developed in 1988 to make certain vessel information available to the public for law enforcement and other purposes. The Coast Guard accounts for VIDS separately but views it as part of MSN, as do we throughout this report.

Many Remaining Uncertainties Could Affect MSN's Cost and Implementation Schedule

The MSN project manager was unsure whether the 40 MSN applications could be completed within the \$34.6-million cost estimate because many uncertainties remain that could affect future costs.⁴ One significant uncertainty concerns the type of computer language to be used in developing software for MSN and other large Coast Guard information systems. (See app. IV for additional discussion of this issue.) The cost implications of such a change could be substantial. According to the MSN project manager, a change in the type of language could increase MSN's development costs by over \$36 million—about double the current estimate to develop the entire system—because programming costs would be higher. However, officials emphasized that the estimated cost increase was preliminary because many alternatives and possible benefits had not yet been considered.

Coast Guard officials said that they would evaluate from an agencywide and long-term perspective the costs and benefits of types of programming languages and decide, as a matter of policy, what type of language should be used. They said that an agencywide perspective was needed partly because many other Coast Guard information systems were being developed or planned that would be affected by the choice of language. Officials expected the policy decision to be reached in October 1992.

Other uncertainties may also affect MSN's cost, according to the MSN project manager. For example, he said that the Coast Guard has not yet advertised the major contract for system development or awarded key hardware contracts. In addition, the estimated cost of MSN's development may increase by about \$6 million if anticipated future changes in marine safety programs require the addition of 12 MSN applications.⁵ According to the Coast Guard, these applications would meet possible future needs by, among other things, (1) improving public education and information on Coast Guard activities; (2) assessing the potential impacts of proposed legislation on the environment, economy, local governments, and businesses; and (3) assessing the effectiveness of potential changes in programs for inspecting vessels and issuing merchant mariner licenses. According to the MSN project manager, the applications would be developed only after the prerequisite program changes had been made and

⁴This total is principally from the Coast Guard's Acquisition, Construction, and Improvements (AC&I) budget and includes appropriations made to date and estimated future appropriations through fiscal year 1996. It includes \$14.0 million for VIDS and \$20.6 million for the other MSN modules. The MSN project manager said that AC&I appropriations are multiyear funds and that the funding to complete the project in fiscal year 1997 will come from the anticipated 1996 appropriation.

⁵The Coast Guard's preliminary cost estimate of \$6 million to develop the 12 additional applications is not included in MSN's current cost estimates.

requests for additional funding had been fully justified. As of June 1992, the Coast Guard did not know to what extent the additional applications would be developed.

Many factors also affect MSN's schedule for implementation. Some milestones have already been missed. For example, the award of the major development contract has already been delayed over 1-1/2 years and is now planned for May 1993, according to the MSN project manager. He attributed the slippage in awarding this contract to actions needed by the Coast Guard to comply with the documentation and review requirements of OMB Circular A-109. The delay in awarding the major development contract will postpone the development of some modules and the date for phasing out MSIS. The MSN manager said that completion of the final module, once expected in fiscal year 1996, is not expected now until early fiscal year 1997. Also, the scheduled year for terminating MSIS has been postponed from 1995 to 1996.

According to the project manager, remaining uncertainties could cause further delays. For example, he said that delays could result from (1) future contracting for system development and hardware, (2) the impact of a planned reorganization of responsibilities within headquarters for developing MSN, and (3) a change in the type of language to be used to develop MSN software. The project manager also noted that completing the first module would take about 6 months longer than estimated. Since this is the least complex module, he said, the completion of other modules might also be delayed. Finally, development of the additional 12 applications would probably add about 2 years to the current development schedule. However, the project manager does not view the additional development time as a schedule slippage, since the applications are not now within the project's scope and their development will not affect the completion of the 40 MSN applications currently planned. The additional applications are tentatively planned for development during fiscal years 1995 through 1998. (See app. V for more detail on the current schedule for implementing the MSN modules.)

Although the Coast Guard has given some cost and schedule information to the Congress during oversight hearings, it has not systematically provided detailed information on the potential increases in costs or delays in implementing MSN discussed in this report. According to the MSN project manager, since DOT approved MSN's mission needs statement under the A-109 process in June 1992, the Coast Guard will soon provide the Congress with more specific cost and schedule information on MSN, as

required by the Department of Transportation and Related Agencies Appropriation Act of 1992.⁶ However, since these reports have not yet been prepared, the extent to which they will fully identify MSN cost and schedule problems and uncertainties is unknown.

Many Steps Have Been Taken or Planned to Meet Users' Information Needs

The Coast Guard is drawing on outside expertise in developing information systems in the federal government to help ensure that users' information needs can be met. The Coast Guard has used and plans to continue using the Federal Systems Integration and Management Center (FEDSIM) to help develop MSN in accordance with applicable federal regulations and guidance.⁷ FEDSIM, which is part of the General Service Administration's Office of Technical Assistance, assists agencies in developing information systems.

The Coast Guard has taken or plans to take many specific steps to help ensure that MSN meets users' needs. Some of these steps are discussed below within the framework of four broad categories.

- **Develop a comprehensive understanding of information needs.** The 1989 requirements analysis, which was done by FEDSIM, included a high-level assessment of the information requirements for the marine safety programs. FEDSIM's assessment included in-depth interviews with representatives of the Coast Guard (1) headquarters offices responsible for operations and management and (2) field units responsible for implementing marine safety programs. As planned, project teams that include users from headquarters and field units will work with FEDSIM and contractors to update and further define the information needs in the requirements analysis as the specific MSN applications are developed. These refinements are to provide the basis for designing working prototypes. As of June 1992, this process for updating and further defining

⁶Section 331 of the Department of Transportation and Related Agencies Appropriation Act of 1992 (P.L. 102-143) specifies that none of the funds provided for Coast Guard acquisition, construction, and improvements shall be available after 1991 unless the Coast Guard submits a quarterly report to the House and Senate appropriations committees on all major Coast Guard acquisition projects. These reports are to include an acquisition schedule and an estimate of current and future year funding requirements. Also, the reports are to rate on a relative scale the cost, schedule, and technical risks associated with each acquisition.

⁷Numerous federal regulations and guidance exist on acquiring and developing information systems. These include the Federal Information Resources Management Regulations contained in 41 C.F.R. 201, Federal Acquisition Regulations contained in 48 C.F.R. part 7, Federal Information Processing Standards publications (particularly numbers 28, 31, 38, and 45), and several OMB circulars: A-11, A-109, and A-130. Also, GAO has summarized critical factors for developing information systems in a guide entitled Information Technology: A Model to Help Managers Decrease Acquisition Risk (GAO/IMTEC 8.I.6, Aug. 1990).

- needs has been used to develop prototypes for two applications in the first module. According to plans, other applications will be defined in detail under the system development contract planned for award in May 1993.
- Develop strategies for resolving past problems. Relying in part on FEDSIM's assessment of past MSIS problems, including problems that GAO and the Coast Guard had previously identified, the Coast Guard has developed strategies to address major system problems. For example, the Coast Guard expects that MSN will be compatible with other information systems and more easily expandable. Also, the Coast Guard has planned applications to address many needs for information not met under MSIS, and it has established standards to help ensure the accuracy and completeness of data entered into MSN. These and other related efforts to address past problems are described in appendix I.
 - Provide for users' testing of prototype applications. According to the MSN project manager, as prototypes for each application are developed, end users and contractors will perform extensive field testing. The project manager told us that the testing will evaluate an application's success in meeting defined information needs and ease of use, and it will help identify requirements for training users. He also stated that after the testing, applications will be modified as necessary before being fully deployed. In April 1992, field testing began for two applications in the first module; this testing will allow the Coast Guard to begin reporting on its actual success in meeting information needs and overcoming past problems.
 - Allow for future change and growth. FEDSIM and Coast Guard officials believe that MSN will accommodate change more easily than MSIS because it is being designed to meet government standards that facilitate system expansion. Coast Guard officials expect MSN, unlike MSIS, to be portable and compatible with a variety of hardware platforms and operating systems available from multiple vendors. The Coast Guard also plans to use existing procedures to identify needs for system changes and to incorporate changes into MSN. According to Coast Guard officials, these procedures will allow users of MSN to submit formal proposals for needed changes to a configuration control board for evaluation and testing.

Coast Guard and FEDSIM officials are optimistic that their approach will resolve past problems and meet current and future information needs. However, since detailed designs have been completed for only a small number of the planned applications, the system has not yet been sufficiently developed for us to determine whether it will perform as intended. Also, potential cost increases and possible delays in achieving project milestones may, as we have indicated, affect the date of the

system's completion and the extent to which users' future needs will be met.

The new congressional reporting requirements for major acquisitions discussed in the previous section do not clearly require detailed reporting on a project's progress in achieving results. Although reports covering MSN have not yet been developed, reports that we have reviewed for other major acquisitions have usually not contained detailed information on the acquisitions' progress. Our review suggests that future MSN reports may contain little information on the project's progress in overcoming past problems in meeting users' needs.

Steps Have Been Taken to Improve Support for Program Management

Compared to MSIS, MSN has greater potential to assist managers in identifying program weaknesses, allocating resources, and evaluating program performance. Unlike MSIS, MSN is designed to improve program oversight by providing relevant reports and enabling headquarters and field units to readily request and analyze data. These steps can enhance managers' ability to identify potential problems and improve operations. According to Coast Guard officials, MSN enhancements are expected to

- help managers better evaluate the causes and trends of marine accidents and devise preventative actions to reduce future casualties,
- provide detailed comparisons of units' work loads to new staffing standards and thereby allow managers to allocate resources more effectively among field units, and
- allow more effective evaluation of unit performance. For example, managers told us that they will be more readily able to (1) compare unit performance to performance standards (e.g., the extent to which field units are conducting required safety-related boardings on high-priority vessels) and (2) monitor operations for potential problems not covered by standard MSN reports, such as the extent to which vessels with outstanding deficiencies are allowed to leave port. (See app. II for further description of applications to help manage marine safety activities.)

Also, officials expressed optimism that MSN's data and analytical tools could enhance the Coast Guard's ability to address a long-standing need to develop realistic program goals and performance measures—called measures of effectiveness (MOE). In two previous reports, we identified problems in developing MOEs.⁸ The Coast Guard has recognized its need to

⁸Department of Transportation: *Enhancing Policy and Program Effectiveness Through Improved Management* (GAO/RCED-87-3, Apr. 1987) and Coast Guard: *Reorganization Unlikely to Increase Resources or Overall Effectiveness* (GAO/RCED-90-132, July 1990).

better develop goals and MOEs. For example, a 1990 Coast Guard assessment of marine safety programs reported that most of the 21 defined program goals were not measurable or attainable and only 1 MOE was adequate.⁹ To illustrate problems in developing MOEs, Coast Guard officials said that changes in vessel casualty rates—a measure that has been used to assess performance—may not necessarily illustrate performance because many other factors can influence these rates.

It is still too early in MSN's development to fully assess the system's potential for improving management of the Coast Guard's marine safety programs. For example, the two modules with significant management applications are not slated for testing until fiscal year 1995.

Conclusions

Although the Coast Guard has made progress in developing MSN to meet users' information needs and to improve support for managing marine safety programs, the Coast Guard will not know for some time whether MSN will provide the benefits expected. The system is still in an early stage of development, and many uncertainties remain. The ultimate success of MSN will depend largely on the Coast Guard's ability to overcome many serious limitations of MSIS and successfully manage the project through a potentially difficult acquisition and development process. Substantial delays in attaining milestones have already occurred, and significant cost increases and further delays are possible, given that (1) the choice of computer language remains to be made, (2) additional applications may have to be developed, (3) major development and hardware contracts still have to be awarded, and (4) the completion of the more complex modules to be designed in the future may be delayed as long or longer than the completion of the first module. An important measure of MSN's success will be how well the system helps the Coast Guard develop realistic goals and measures of program performance.

It is unclear whether the Coast Guard will provide future reports to the Congress that will permit effective oversight of the Coast Guard's progress in dealing with the many remaining problems and uncertainties associated with MSN. For example, although new congressional reporting requirements have been established for major acquisitions, our review of these requirements and of reports submitted for other Coast Guard acquisitions indicates that future reports for MSN may contain little

⁹Assessment of the Coast Guard Marine Safety, Security, and Environmental Protection (M) Program; NKF Engineering, Inc.; March 1990.

information on the Coast Guard's progress in overcoming past problems and meeting users' information needs.

Recommendation

To help provide the Congress with adequate information for effectively overseeing MSN, we recommend that the Secretary of Transportation direct the Commandant of the Coast Guard to provide the Congress with specific information on MSN's development and implementation. This information should include the extent to which MSN is overcoming past MSIS problems and meeting users' information needs as well as the extent of known and potential cost increases and schedule delays. To the extent that this information is not fully presented in future quarterly reports on major acquisitions, the Coast Guard should provide the information by other means.

Agency Comments

We discussed the information in this report with Coast Guard headquarters officials, including the Deputy Chief of the Office of Marine Safety, Security, and Environmental Protection; the Chief of the Information Management Division; and the MSN project manager. These officials agreed with the facts as presented. As requested, we did not obtain written agency comments on a draft of this report.

Scope and Methodology

We conducted our audit work between October 1991 and June 1992 in accordance with generally accepted government auditing standards. We discussed MSIS system problems with Coast Guard headquarters officials responsible for managing marine safety programs and MSIS and with officials using MSIS at the Marine Safety Office in Seattle, Washington. We also reviewed pertinent GAO and Coast Guard reports discussing past problems and discussed MSN development plans and MSN progress and problems with officials at the Coast Guard headquarters unit responsible for system development, project teams assisting in the development of two modules, and a representative of FEDSIM. We also reviewed documents describing the development of MSN. As agreed with your office, because of FEDSIM's involvement and technical expertise, our work did not include a detailed technical analysis of MSN's specifications and design, such as an analysis of the appropriateness of particular hardware specifications for the system or of software developed for the system's applications, or a review of the extent to which all standards for developing information systems were being followed.

As arranged with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days after the date of this letter. At that time, we will send copies of the report to the appropriate congressional committees, the Secretary of Transportation, the Commandant of the Coast Guard, and other interested parties. We will make copies available to others on request.

Our work was performed under the direction of Kenneth M. Mead, Director, Transportation Issues, who can be reached at (202) 275-1000. Other major contributors to this report are listed in appendix VI.

Sincerely yours,

A handwritten signature in black ink, appearing to read "J. Dexter Peach". The signature is written in a cursive, flowing style with a large initial "J" and a long, sweeping underline.

J. Dexter Peach
Assistant Comptroller General

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Abbreviations

AC&I	Acquisition, Construction, and Improvements
DOT	Department of Transportation
FEDSIM	Federal Systems Integration and Management Center
GAO	General Accounting Office
IRM	information resources management
MOE	measure of effectiveness
MSIS	Marine Safety Information System
MSN	Marine Safety Network
OE	Operating Expense
OMB	Office of Management and Budget
VIDS	Vessel Identification and Documentation System

Information System Problems and Coast Guard Strategies to Address Them

Coast Guard, Federal Systems Integration and Management Center (FEDSIM), and GAO reports have identified many serious and wide-ranging information system problems, which we discussed with Coast Guard officials during this review.¹ These problems fall into two main categories. In the first category are problems specific to the Marine Safety Information System (MSIS) itself, such as inadequate hardware and software. In the second category are broad problems with the Coast Guard's approach to managing information resources, such as the lack of a strategic information resources management plan to ensure that information systems serve the Coast Guard's long-range goals. We found that the Coast Guard has developed strategies for addressing these problems.

MSIS Problems and Coast Guard Strategies to Address Them

This section focuses on many of the problems specific to the MSIS system itself. Information about these problems was largely developed by FEDSIM, whose report covered problems identified in the reports we reviewed as well as by Coast Guard officials with whom we spoke. In addition to describing the problems, this section presents the Coast Guard's strategy for addressing them. Marine Safety Network (MSN) project management officials have reviewed this section and agreed that it accurately describes the problems and the Coast Guard's strategies.

Failure to Meet Program Information Needs

Problem description: Perhaps the most significant of the MSIS problems is the failure of the system to meet the information needs identified for the marine safety programs. The Coast Guard reported to the Congress in 1991 that MSIS met the information needs for only about one-third of the activities in need of automated support. Program activities that FEDSIM identified as having limited or no support included facility inspections, contingency planning for oil spills or other pollution events, investigations of vessel casualties or other incidents, vessel construction inspections, vessel safety examinations, equipment approval, platform inspections, licensing of merchant vessel personnel, and various management-related functions. According to Coast Guard officials, MSIS did not support their operations largely because (1) MSIS was not originally planned to comprehensively meet the needs of marine safety activities and (2) the

¹The Coast Guard report is the Report of the Tanker Safety Study Group (Oct. 6, 1989). The FEDSIM report is MSIS II Requirements Analysis Report, (Federal Systems Integration and Management Center: Nov. 1989); MSN was formerly named MSIS II. The GAO reports are Coast Guard: Management Improvement Could Enhance Enforcement of Coast Guard Marine Safety Programs (GAO/RCED-85-59, Aug. 15, 1985) and Coast Guard: Strategic Focus Needed to Improve Information Resources Management (GAO/IMTEC-90-32, Apr. 24, 1990).

system's unique design and outdated technology effectively limited the extent to which MSIS could be expanded to meet additional needs.

Coast Guard's strategy: Some actions have been taken and others planned to help ensure that current and future information needs are identified and met through MSN. Unlike MSIS, MSN is planned to (1) have sufficient capacity to support all important existing marine safety needs and (2) be expandable to meet additional needs that may be identified in the future. To determine the requirements for the new system, FEDSIM and contractor personnel carried out comprehensive interviews with Coast Guard field and headquarters personnel. In this way, FEDSIM determined the various information needs and specific applications to be developed under MSN to meet the needs. Subsequently, Coast Guard headquarters personnel, as part of a strategic planning process, independently validated the need for all the planned applications and identified additional applications that might be necessary to support possible changes in future operations. In designing specific prototypes for each MSN application, teams of Coast Guard personnel from applicable headquarters and field units are to work with FEDSIM and contractor personnel to ensure that all important needs are defined and incorporated into prototype designs. As planned, the prototypes are to be thoroughly tested and enhanced as necessary to ensure that they work as intended and meet the defined needs. After the applications are fully deployed, users are to be able to submit suggested changes for consideration to solve problems that develop or address new needs that arise. The proposed changes are to be thoroughly evaluated and tested before being incorporated into the system. Additionally, headquarters personnel plan to periodically update their strategic plans and evaluate MSN's continued adequacy in meeting current and future needs.

Poor Management Support

Problem description: MSIS does not provide adequate support to the Coast Guard to manage its marine safety programs. FEDSIM reported this lack of management support as a major MSIS deficiency. MSIS does not provide management with basic information on marine safety activities and results or on activities associated with training, personnel scheduling, project management, and budget/expenditure control. Weaknesses in providing management data appear to stem in part from MSIS's original design. Coast Guard officials told us that MSIS was not initially designed to provide management-level data. For example, they said that the system was not designed to allow managers to request or analyze data in the system that would help them oversee operations. This problem was highlighted in the

Coast Guard's 1989 study of the agency's vessel inspection program, which reported managers' frustration at being unable to access data needed for effective unit management. Coast Guard officials told us that some improvements have been made in recent years to enhance MSIS's ability to support management needs, such as the addition of a limited capability to request/analyze MSIS data. However, they emphasized that other capabilities were needed to enhance managers' ability to carry out their responsibilities for overseeing operations, allocating resources, evaluating performance, and performing other management-related tasks.

Coast Guard's strategy: The Coast Guard plans to work with FEDSIM and contractors to determine what management support is needed. FEDSIM and contractors are to interview managers and operational personnel to help ensure that managers' needs are defined and addressed. Many specific management applications have been planned. These are largely contained in modules 4 and 5 (see app. II for descriptions of these applications). For example, MSN is to provide managers with a series of reports for overseeing program activities and evaluating performance. Also, a greatly enhanced capability to query and analyze the MSN database is planned to further managers' ability to identify potential problems and improve operations. Other developments for improving management are also planned. For example, new unit staffing standards have been developed to allow detailed comparisons of unit workloads, which should help managers allocate resources. Also, a more detailed analysis of the causes of marine accidents is planned, which is intended to enhance the Coast Guard's capability to evaluate accident trends and to help managers devise preventative actions for reducing future casualties.

Inadequate Hardware and Software

Problem description: According to FEDSIM, many MSIS problems result from the inadequacy of the system's hardware and software. GAO's 1990 report characterized the hardware as "obsolete" and the software as inflexible and not meeting users' needs. FEDSIM similarly found the system's hardware and software to be outdated and in need of replacement. More specifically, MSIS is based on technology developed in the 1970s and has a unique, proprietary design that does not conform to current government standards. Also, the system can handle only a limited number of files and users at one time, and all of the system's data processing is done at one central location. Consequently, the system can be overloaded during periods of heavy use, or service can be interrupted while the system is being maintained at the central location. These factors have limited the system's ability to expand to meet critical information needs and to

communicate with other information systems, and they have hindered users' access to, and timely response from, the system.

Coast Guard's strategy: To provide an adequate foundation for MSN, new application software will be developed, and existing hardware will be replaced. This strategy was based on an analysis by FEDSIM of alternatives for addressing hardware and software needs of the new system. Coast Guard procurement plans call for the acquisition of up-to-date hardware and software that meet applicable government standards and requirements. These open-systems standards and requirements generally have been established to ensure portability of software and data communications among computer systems. In addition, the Coast Guard plans initially to design the system, unlike MSIS, to be able to meet critical information needs. If future needs require changes or additional capacity, multiple vendors are expected to be able to compete to modify or expand the system. Finally, much of MSN's data processing and storage are to take place at unit levels rather than at one central location—a change intended to improve the system's availability and response time for users.

Burdensome System Lacking Users' Acceptance

Problem description: FEDSIM found that, in general, users lacked confidence in MSIS and viewed the system as awkward to use and more of a burden than a benefit to their work. However, the views of individual users varied significantly by program area. Users who felt that they had derived direct benefits from MSIS tended to have a favorable attitude toward it. For example, port safety personnel, whose program needs were largely supported by MSIS, perceived a real benefit to using the system in performing their work and thought that the system was relatively easy to use. The port safety function was the first program area for which MSIS provided support, and FEDSIM regarded it as the most successful of MSIS's support functions. Users whose programs were not as well supported by MSIS—such as personnel performing investigations, responding to pollution incidents, and inspecting vessels—held markedly different views. These users saw no advantages offered by MSIS and were not enthusiastic about using it. They often viewed the time spent with MSIS as “feeding the machine” without any apparent benefit. In particular, they noted that MSIS did not eliminate the need to keep manual records previously maintained, such as vessel inspection books. As a result, according to FEDSIM, implementing MSIS often meant having to transcribe some data from required manual records onto an MSIS data entry form for subsequent entry into the MSIS system. Hence, many “automated” tasks required more time and effort than were necessary before MSIS was implemented.

Coast Guard's strategy: To improve users' acceptance, the Coast Guard plans to ensure that MSN is easy to use and that it supports the information needs and work processes of user groups. Teams of actual or potential users are to work closely with contractors in developing the requirements and design of each application and in testing and enhancing the prototypes to make sure that they work as intended. This process is intended to help ensure that information needs are adequately defined and addressed; that entering information into MSN does not, to the extent possible, duplicate manual practices; and that the use of the system is comfortably integrated into the everyday work of marine safety personnel. To avoid duplication in data entry and manual record keeping, for example, the Coast Guard is studying the feasibility of using scanning techniques or portable data entry devices, such as hand-held computers. To help ensure that the system will be easy to use, easy-to-understand menus, improved screen displays, and other aids are planned to be designed and tested.

**Lack of Complete,
Accurate, and Timely Data**

Problem description: A lack of complete, accurate, and timely data—also referred to as a lack of data integrity—has also significantly compromised MSIS's usefulness. Significant problems and concerns about this deficiency were raised in all of the cited reports. FEDSIM, for example, reported that its staff heard many complaints about the integrity of MSIS data from users who entered data into the system and from users who analyzed that information. According to FEDSIM, many factors contributed to this problem, including the following:

- **Lack of incentive:** The ultimate work product of many activities did not depend on data entered into MSIS. As a result, users were not inconvenienced by errors and lacked incentive to ensure that the data were complete and accurate.
- **Difficulty of usage:** Many MSIS operations were difficult to perform. Screen designs did not encourage correct data entry.
- **Inadequate procedures for users:** Users of MSIS were not working from consistent, standardized procedures. Interpretations of field definitions varied from one unit to another and led to erroneous and untimely data entry.
- **Inadequate validation and controls:** MSIS software performed little validation of data entries, and the system lacked adequate controls to ensure that transactions were properly and completely processed.

Coast Guard's strategy: Several steps are planned to improve the integrity of MSN's data and to gain greater acceptance among users for MSN than for

MSIS. As previously noted, actions are planned to help ensure that the system is easy to use and that it supports, rather than hinders, operations. Also, several actions are planned to improve and standardize procedures. For example, clear policies are to be set forth in the Marine Safety Manual to indicate how the system will be used, when data must be entered, and what supervisory checks for data accuracy will be required. Also, Coast Guard-wide "data element naming standards" have been developed to help provide a consistent, agencywide approach for identifying, defining, and representing data in information systems. Finally, MSN is to incorporate extensive internal checks of the accuracy and completeness of the data entered into the system, including checks to help ensure that all needed information has been entered for each type of operation being performed.

Inadequate Training and Support

Problem description: FEDSIM found that MSIS users were not adequately trained and that some problems existed in the system's support structure for resolving hardware and software problems. Regarding training deficiencies, FEDSIM reported that of the approximately 5,000 personnel involved with marine safety activities, only 128 received formal classroom training each year. Although supervisors often received training, the training was general, focusing on all aspects of MSIS rather than on how to use MSIS to carry out specific jobs. FEDSIM did not believe that the supervisors had either adequate training or the instructional materials needed to train personnel after returning to their units. Regarding support problems, FEDSIM found inadequate local support for resolving hardware and system software problems. Unit commanders selected an "MSIS coordinator" from among unit personnel on the basis of experience, aptitude, or interest in computers; these assignees received no specific training or other preparation for this responsibility. FEDSIM considered this problem particularly significant because needs for adequate support are expected to grow in the future.

Coast Guard's strategy: A number of actions are planned to help ensure the adequacy of the training and support provided under MSN. For example, a new, expanded support network is to be developed to resolve hardware and software problems and to assist system users. This network is to include (1) full-time regional system managers responsible for supporting information resources management (IRM) and for assisting their local units in resolving problems, (2) unit system managers responsible for ensuring the proper operation and maintenance of local systems, and (3) unit application managers responsible for helping local users carry out specific MSN applications. These managers are to receive formal training

focused on their areas of responsibility. Also, a "hot-line" service operated by headquarters staff under MSIS is to continue under MSN to provide users with needed assistance. Improving training and instructional materials is also to be emphasized. As each application is tested, training needs and draft user manuals are to be evaluated. Before each module is fully implemented throughout the Coast Guard's marine safety programs, user manuals are to be completed and a training plan established. Also, the formal classroom training program is to be significantly revised. The broadly focused MSIS training course is to be replaced by MSN training incorporated into existing courses for specific duties (e.g., vessel inspection), and instructions are to focus on using MSN in carrying out these jobs.

Agencywide Information System Problems and Strategies to Address Them

Problem description: In our 1990 report on IRM, we found a number of broad, agencywide problems that may have contributed to weaknesses in the Coast Guard's information systems, including MSIS. Among these problems was a lack of involvement by top leaders in planning the Coast Guard's approach to IRM. In addition, the Coast Guard lacked a strategic IRM plan for ensuring that existing and proposed systems support agency missions and goals. Also missing were IRM policies, standards, and procedures to ensure that Coast Guard systems are compatible and meet standards for development and performance.

Coast Guard's strategy: A number of actions have been taken to improve top-level IRM leadership. First, the Coast Guard has established a leadership structure to involve top-level managers in the development of information systems. The Commandant of the Coast Guard has designated the Chief of the Office of Command, Control, and Communications—a senior Coast Guard manager—as responsible for IRM. Furthermore, an executive IRM Board of Office deputies is being formed to review information system projects. This board is to provide overall direction, obtain resources and organizational support for Coast Guard IRM projects, and make decisions at the executive level. Second, the Coast Guard has initiated an education program to provide top leadership with periodic training in both IRM and Total Quality Management. (Total Quality Management is a management philosophy of continuous improvement guided by the collection and analysis of data.) Third, the group involved with information resources management within the Office of Marine Safety, Security and Environmental Protection was elevated from the branch level to the division level to help provide increased visibility and management support for information systems and related functions.

**Appendix I
Information System Problems and Coast
Guard Strategies to Address Them**

The Coast Guard has also developed a Strategic Information Resources Management Plan that outlines agencywide missions, objectives, strategies, policies, standards, and procedures for building information systems and managing information resources. The plan consists of a technology architecture, which helps guide the development and acquisition of hardware and software for the Coast Guard's information systems; data element naming standards, which help provide a uniform basis for identifying, defining, and representing data in information systems; an applications architecture, which describes the overall strategic vision of the Coast Guard and its strategic IRM planning process and procedures for developing applications; and an organizational structure, which outlines roles and procedures for managing information resources.

Coast Guard Descriptions of MSN Applications

The Coast Guard is developing MSN in 6 modules that contain 40 applications. These modules are listed below, together with the Coast Guard's descriptions of the applications.

MODULE 1: MERCHANT MARINER LICENSING AND DOCUMENTATION SYSTEM

1. Seamen Documentation: supports the Coast Guard's Regional Examination Centers in issuing merchant mariner documents and Coast Guard headquarters in recording seamen discharges. The documents establish the fitness of seamen to be engaged in nonlicensed positions. This application, which records requests for new mariner documents or for upgrades to existing documents, will assist Coast Guard personnel at the examination centers in scheduling required tests and in determining an applicant's relevant experience. Letters of discharge issued by vessel operators to seamen will also be recorded to document seamen's employment history.

2. Seamen Licensing: supports the Regional Examination Centers in issuing seamen licenses for personnel in certain skill positions, such as masters, mates, and chief engineers. This application, which records requests for new licenses or for upgrades to existing licenses, will assist examination center personnel in scheduling required tests and in determining an applicant's relevant experience. The status of each application will be maintained, and status reports will be available as needed.

3. Seamen Test Scoring: supports the scoring of tests administered to applicants for seamen documents and licenses and provides statistical analysis of the responses to individual questions on the tests. This application will record the correct answer to all questions used on the various tests for seamen. The responses of each applicant to the test questions will be entered (presumably through some automated answer sheet reader), and a score will be calculated for the test. These responses will be stored in a database and used to support analysis of individual questions.

MODULE 2: PORTS AND WATERWAYS MANAGEMENT INFORMATION SYSTEM

4. Incident Response: supports the emergency response program for incidents reported to the Coast Guard and aids investigations of these

incidents to determine their cause and identify possible violations of federal regulations. This application, which records the initial notification of the incident, will assist personnel in (1) determining the scope of the problem, (2) initiating immediate remedial action, (3) assigning response team personnel, (4) maintaining a record on the status of the response and the subsequent investigation, (5) initiating violation actions, and (6) preparing reports of investigations.

5. Contingency Planning: supports the preparation of contingency plans for defense mobilization, major pollution incidents, and similar emergency situations. This application will maintain information describing projects used to develop these contingency plans and will record the status of these projects.

6. Investigation Status (Management): supports the investigation of marine casualties to determine their cause and to identify possible violations of federal regulations. This application, which records initial reports of casualties, will assist managers in assigning investigating officers, tracking the status of investigations, and preparing final reports of findings.

7. Port Security Card (Access Control): supports the issuance of port security cards to qualified dock workers. This application will record requests for identification cards from dock workers who require access to critical port facilities in national emergencies or disasters. The application will be used to maintain the status of pending requests, track the eventual approval or rejection of requests, and print the actual cards. It will also support card renewal and provide on-line access to records describing current cardholders.

8. Facility Inspection: supports the inspection of U.S. port facilities for safety and potential pollution hazards. This application will be used to record descriptive information about each facility, schedule inspections, record the results of inspections, and maintain a history of each facility's incidents, violations, and inspections.

9. Facility Certification: supports the program to certify qualified port facilities subject to inspection for safety and potential pollution hazards. This application will be used to record requests for certification from facility owners and operators, provide status reports on the processing of these requests, and show the eventual disposition of the requests. The application will also be used to process renewals of certificates and amend

existing certificates to reflect changes (e.g., new types of materials handled by the facility).

10. Container Inspection: supports the inspection program for containers used on cargo ships calling on U.S. ports. The inspection program is intended to ensure that containers are safely loaded and container manifests are accurate. Under this application, a database on shippers of cargo containers will be maintained that includes the results of container inspections. The database will assist Coast Guard personnel in targeting container inspection efforts on the basis of the performance history of the shippers, port facilities, and vessels.

11. Port Status: supports the management of port activities. This application will maintain and display information concerning vessels in U.S. ports, such as the location of vessels, the activities being performed on vessels (e.g., bunkering, cargo loading or unloading), and the known plans for the vessels' future use of the port (such as departure dates).

12. Exercise Activity: supports Coast Guard monitoring of field exercises, such as mock oil-spill response drills. This application will maintain descriptions of field exercises, including the activities performed, the personnel assigned, and the results achieved. The application will also prepare summary reports.

13. Cleanup Fund Management: supports field, district, and headquarters personnel in monitoring the disbursement, expenditure, and reimbursement of funds for cleaning up pollution incidents. This application will record initial district and unit budgets for cleanup efforts, track actual expenditures, and bill cleanup expenses to parties responsible for the incident.

14. Financial Responsibility: supports the issuance of certificates of financial responsibility to the operators of vessels carrying oil and chemicals to ensure that the operators have sufficient financial resources for cleaning up pollution incidents. This application will be used to record requests from vessel owners and operators for certificates and notices of coverage from insurance companies. It will also provide information on the status of the application and generate the certificate.

15. Response Equipment Inventory: supports the congressional requirement to maintain a list of available oil spill removal resources, personnel, and equipment (including firefighting equipment). Marine

safety field offices will inventory the equipment within their zones and supply this information to the district offices and the national response unit in Elizabeth City, North Carolina. The national response unit will combine this information with an international response equipment inventory to provide a listing of available resources.

16. Liability Fund Management: supports headquarters personnel in administering the liability fund programs for pollution incidents involving offshore platforms or deep-water port vessels. This application will be used to maintain a database describing the financial ability of participating platform and vessel owners to withstand large liability claims for pollution incidents. It will also be used to record fees collected for the liability funds and any disbursements made, and it will produce financial statements for the funds.

MODULE 3: VESSEL INSPECTION AND CERTIFICATION SYSTEM

17. Plan Review Project Control: supports the Coast Guard's Marine Safety Center personnel in their review of designs for newly constructed or extensively modified vessels. This application will show the allocation of project review tasks to assigned groups and personnel, the status of the review tasks, and the review results. It will also prepare letters and reports to communicate the results.

18. Vessel Construction Inspection: supports the inspection of vessels under construction or undergoing major modification. This application will be used to record each vessel's construction schedule, the inspection plan, and actual construction inspection activities. The results of each inspection and the corrective actions taken by the builder will also be recorded. In addition, the application will track the accomplishment of required actions stemming from the plan review application described above.

19. Vessel Inspection: supports the inspection program for certain vessels registered in the United States and engaged in trade. In general, inspections are scheduled, periodic visits to look in depth at the safety and material condition of U.S. vessels. This application will be used to record requests for inspections from a vessel owner or operator and to provide information useful in scheduling the inspection, assigning personnel, and carrying out the inspection. For example, the application will maintain descriptive background information on the vessel and the results of

previous inspections, including any outstanding discrepancies needing inspection follow-up.

20. Vessel Boarding: supports the program for boarding vessels to conduct safety and pollution prevention inspections for U.S.- and foreign-registered vessels. In general, boardings are unscheduled visits to ensure that vessel operations are being conducted safely and that the vessel is still safe. Boarding examinations are not as extensive as inspections. Expected port arrivals will be shown and other information, including the names of owners and operators, will be available on all vessels that are subject to boarding examinations. These data will be used to help select vessels to be boarded and to assign boarding personnel. This application will also be used to record results of the boarding and to assist in tracking unresolved discrepancies.

21. Special-Interest Vessel Monitoring: supports the monitoring and inspection of special-interest vessels (for example, vessels from former Soviet republics or from nations that sponsor terrorism) as they visit U.S. ports. This application will be used to record a vessel's planned itinerary, communicate arrival/departure and vessel status data, record the results of Coast Guard examinations, and provide status reports whenever needed.

22. Letter of Compliance/Tank Vessel Safety Examination: supports the inspection of vessels before the issuance of letters of compliance and addendum letters of tank vessel safety examinations. A letter of compliance examination is a scheduled, periodic visit to a vessel carrying a product or products that pose an unusual risk to a port, such as natural gas or hazardous chemicals. A tank vessel examination is a scheduled, periodic inspection of a foreign tank vessel to verify the vessel's fitness for carrying oil. This application will be used to record the initial notification to conduct these types of examinations, the personnel assigned, and the results of the inspections. It also will track corrective actions by the owner, develop reports on the status of inspection activities at units, and prepare appropriate letters for issuance.

23. Platform Inspection: supports the program to conduct safety inspections of offshore platforms, such as platforms used to retrieve oil from the outer continental shelf. This application will be used to maintain information on offshore platforms and their owners and operators. It will record inspection schedules, summarize inspection results, track follow-up corrective actions, and provide status reports on specific inspections.

24. Equipment Approval: supports the Coast Guard's process for approving vessel safety equipment, electrical equipment, and other critical vessel machinery. This application will be used to record each request for approving equipment and to track the status of the request during the approval process. It will also provide information to process renewals of equipment approval certificates and provide immediate access to lists of approved equipment.

MODULE 4: MARINE MANAGEMENT INFORMATION SYSTEM

25. Vessel Casualty Analysis: supports inquiries into vessel casualty statistics. This application will be used to load casualty statistics from the databases associated with marine casualties and investigations into a database that users can access. Users will be able to customize requests for these data to meet their needs.

26. Marine Safety Analysis: supports inquiry into general marine safety data. This application will be used to load information from the various MSN applications into a database that users can access. Users will be able to customize requests for these data to meet their needs.

27. Management Reporting: supports the provision of management-level reports to unit, district, and headquarters personnel. This application will rely on activity statistics generated by other applications supporting the Office of Marine Safety, Security, and Environmental Protection. The application will compare performance at unit and district levels against specific standards and provide a series of reports on performance to meet the needs of management personnel at various levels within this office.

28. System Performance Monitoring: supports headquarters personnel responsible for operating MSN and monitoring the performance of the system's hardware and software. This application will be used to collect statistics from MSN system-level software indicative of system performance. This information will be stored and retrieved, as needed, to prepare reports of performance trends in critical areas.

29. System Configuration Control: supports headquarters personnel responsible for operating MSN, controlling its hardware and software configuration, and tracking any failure of system components. This application will be used to describe the various MSN system hardware and software components and record reports of failure or problems submitted

by users of the system. The application will also produce reports on the system's configuration and on the causes and rates of system failures.

30. Violation Processing: supports unit and district personnel in processing violation actions. This application will be used to record information necessary to initiate a violation action and management decisions on the type of violation to pursue and the penalty to assess. The application will also provide updated information on the status of the case, including the final disposition. A series of reports and displays is planned to describe the specific and general status of violation actions.

31. Policy Distribution: supports the distribution of policy guidelines within the Office of Marine Safety, Security, and Environmental Protection by providing an automated, centralized repository for documents defining Coast Guard policies. This application will be used to record entire policy documents as well as brief abstracts of each document organized by subject topic codes. Users will be able to search for all policy documents on a particular topic, review the abstracts, and display or produce hard copies of complete policy documents.

MODULE 5: "M" (Office of Marine Safety, Security, and Environmental Protection) RESOURCE MANAGEMENT SYSTEM

32. Time Reporting: supports the collection and analysis of information on time used by personnel within the office. Data on how time is used by all personnel will be organized by type of activity and organizational element. Reports will be produced to analyze personnel activities for various management levels within the office.

33. Personnel Requirements Planning: supports office management in evaluating personnel resource requirements. Comparisons will be made between the authorized manning levels for each organizational element in the office and the theoretical manning requirements for that element. This application will provide various reports on resource utilization by organizational element.

34. Personnel Training: supports the training of office personnel. This application will be used to maintain training histories of assigned personnel and will produce reports and display screens of training information for users.

35. Personnel Exposure Tracking: supports the need to maintain records of possible exposure of office personnel to hazardous materials. This application will be used to record information on incidents of possible or actual exposure and to provide reports on total exposure over time.

36. Budget/Expenditure Control: supports the preparation of budgets and the tracking of corresponding expenditures within the office. This application will be used to record budget requisitions from organizational elements and summarize budget allocation decisions by management. It will also track adjustments to previously established budgets. Various reports will be produced to show the status of expenditures against the budget.

**MODULE 6: VESSEL IDENTIFICATION AND DOCUMENTATION
SYSTEM**

37. Vessel Documentation: supports the issuance of vessel documentation certificates to qualified applicants for registering their vessels in the United States. This application will be used to record the initial requests of vessel owners for vessel documentation and related data necessary to process the request, including verifications of citizenship and measurements of vessel tonnage. If the request is incomplete, the application will assist personnel in preparing a notification letter. It will also be used to prepare appropriate documentation certificates, produce documentation renewal notices, and process renewal transactions.

38. Vessel Encumbrance Recording: supports the maintenance of financial lien records for documented vessels. This application will be used to record liens on vessels and lien satisfactions or releases. The application will also be used to prepare statements of ownership on the basis of vessel lien information.

39. User Fee Collection: supports the collection and processing of fees paid by users for Coast Guard services. This application will be used to record information on the fee payment, including the type of service provided, the identity of the payee, and the amount of the payment. The application will also be used for summarizing daily deposits and preparing forms for transferring funds from local units to district accounts. It will also prepare reports on user fee collection activities.

40. Vessel Identification: supports the need to maintain data on the owners and characteristics of recreational vessels titled and registered at the state

**Appendix II
Coast Guard Descriptions of MSN
Applications**

level. Data will be recorded on such vessel characteristics as length, construction material, type of propulsion, and coloring. Detailed ownership identification data, including social security numbers, will also be maintained for each vessel. In addition, this application will be used to maintain data important to law enforcement activities.

Estimated MSN Development Costs as of June 1992

Table III.1: Estimated MSN Development Costs by Expenditure Type

Dollars in millions

Type of expenditure	Estimated development costs		
	MSN (excluding VIDS)	VIDS ^a	Total
Preliminary studies	\$ 0.4	\$ 2.0	\$ 2.4
Equipment ^b and commercial off-the-shelf software	7.3	5.1	12.4
Software development	12.0	6.1	18.1
Independent verification and validation	0.9	0.8	1.7
Total	\$20.6	\$14.0	\$34.6

^aThe Vessel Identification and Documentation System (VIDS) module, which has been mandated by the Congress, is accounted for separately.

^bThe principal equipment items are computers for local sites and the Coast Guard's central computer processing facility and telecommunications equipment.

Source: Coast Guard.

**Appendix III
Estimated MSN Development Costs as of
June 1992**

**Table III.2: Estimated MSN
Development Costs by Year and
Funding Source**

Dollars in millions

Fiscal year	Estimated development costs				Total
	Funding source				
	MSN (excluding VIDS)		VIDS ^a		
	OE ^b	AC&I ^c	OE ^{b, d}	AC&I ^c	
1987-90 (actual)	\$0.4	\$ 0.0	\$1.2	\$0.0	\$ 1.6
1991 (actual)	0.0	2.5	0.5	0.0	3.0
1992 (actual)	0.0	3.5	0.3	0.0	3.8
1993 (President's budget request)	0.0	5.3	2.0	7.5	14.8
1994 (Coast Guard estimate)	0.0	2.0	1.5	1.0	4.5
1995 (Coast Guard estimate)	0.0	5.7	0.0	0.0	5.7
1996 (Coast Guard estimate)	0.0	1.2	0.0	0.0	1.2
Total^e	\$0.4	\$20.2	\$5.5	\$8.5	\$34.6

^aThe VIDS module, which has been mandated by the Congress, is accounted for separately.

^bOE: Operating Expense account funding for MSN/VIDS.

^cAC&I: Acquisition, Construction, and Improvements account funding for MSN/VIDS.

^dRecurring OE funding for VIDS has been included in the Coast Guard base since fiscal year 1990. This has been the sole source of funding for VIDS in fiscal years 1990-1993. Congressional cuts of AC&I requests (development funds) in fiscal years 1991, 1992, and 1993 were based on congressional views that sufficient funding existed in the base (OE).

^eThrough March 31, 1992, total obligations and expenditures for MSN (including VIDS) were about \$3.1 million. These costs were principally for studies, such as the requirements analysis prepared by FEDSIM.

Source: Coast Guard.

Additional Information on the Computer Language to Develop MSN Software

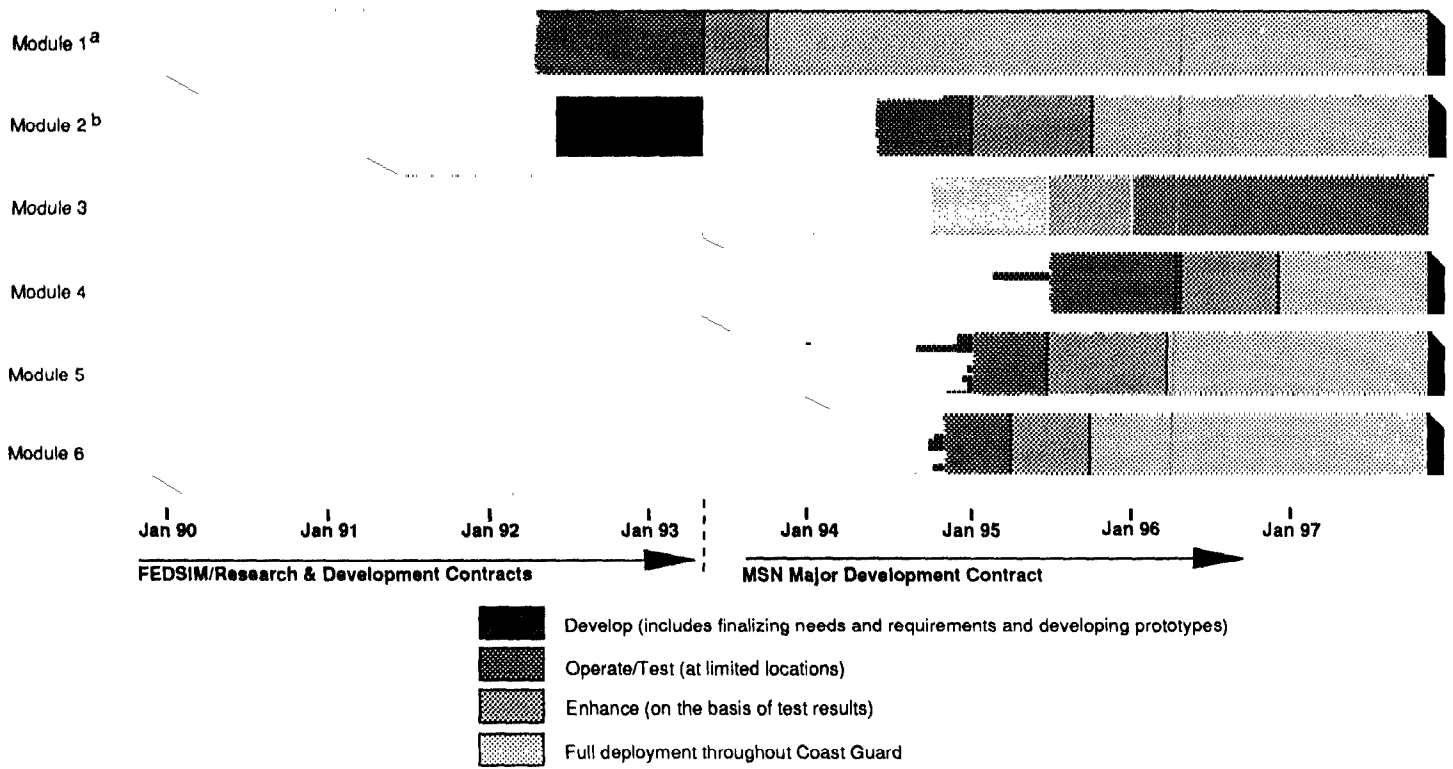
The MSN project manager said that the Coast Guard planned until recently to use a "fourth-generation" language to develop MSN software applications.¹ He said that this decision was based on existing agencywide policy and recommendations by FEDSIM. In May 1992, however, the Office of Command, Control, and Communications, which is responsible for planning information systems throughout the Coast Guard, suggested the use of a third-rather than a fourth-generation language for MSN and other major information systems.² An official from that office said that the proposal was made in part because a third-generation language can at this time be transferred more easily among different computer systems than a fourth-generation language.

To resolve this issue, Coast Guard officials told us that the Office of Command, Control, and Communications will evaluate and compare, from an agencywide perspective, the costs and benefits of using a third- and a fourth-generation language. The officials expected the study to be completed and a policy decision reached in October 1992. The MSN project manager said that he has asked FEDSIM for help in evaluating the cost implications of using third-generation languages for MSN applications. He said that FEDSIM's analysis for MSN will be useful to the Office of Command, Control, and Communications in performing the agencywide evaluation.

¹Computer languages are classified according to generation on the basis of the relative sophistication of their capabilities. Each succeeding generation typically improves upon characteristics of an earlier generation. A fourth-generation language is usually, for example, faster and/or more capable and versatile than a third-generation language for specific applications, such as database management.

²The suggestion was to use the third-generation "C" language combined with a graphical user interface standard, according to Coast Guard officials.

MSN Implementation Schedule as of May 1992



^aSee appendix II for a description of these modules.

^bBreak in development phase to await award of major development contract.

Source: GAO presentation of Coast Guard data.

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