
# NDS Modernization Project - Requirements Analysis Report

April 9, 1997

**Prepared for:**

U. S. Coast Guard

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## EXECUTIVE SUMMARY

The National Distress System (NDS) Modernization Project envisions replacing/modernizing the present VHF-FM based system with an integrated state-of-the-art commercial/government-off-the-shelf (COTS/GOTS) or non-developmental item (NDI) solution. As part of this effort, internal and external customer/user requirements were validated and analyzed as written in the draft Preliminary Operational Requirements Document (PORD). This was accomplished with site visits, in person interviews, telephone interviews, written surveys, and a Commerce Business Daily (CBD) announcement soliciting comment. In the interview/survey stage, responses were solicited that resulted in one of three determinations for a requirement (critical, useful, or non-essential).

The Coast Guard through NDS is providing a service that is desired and required by the public. There is support in the Coast Guard for a modernization project that would substantially improve and expand NDS services.

### Critical Requirements

Results and analysis showed that the draft (PORD) contains the critical and useful requirements for the NDS modernization. The following table is the list of requirements that were adjudged from the project analysis to be critical to NDS. (See Section 3.13.1, which also includes the complete list). A short description of the requirement is included.

Generally 75% of the applicable question responses were in the critical area. In some cases those criteria were modified when consensus of questionnaire comments indicated another conclusion.

| Ref. No. | PORD Reference | Question Interview | Requirement |
|---|---|---|---|
| 1 | I.A | II.20 | Allow command and control of responding facilities for all operational missions that occur in coastal areas. |
| 2 | I.A. | II.4. | Receive maritime distress and emergency response alerts. |
| 3 | I.A. | II.17. | Will provide communications between CG resources, customers, and partners. |
| 4 | I.A. | II.6.b | Some localized areas require a greater system availability, up to 99.9%, to meet local mission requirements (e.g. VTS). |
| 5 | I.B. | II.4. | Provide coastal maritime distress and emergency response alerting. |
| 6 | I.B. | II.7. | Depending on the alternative selected, the system must provide a continuous guard on distress and calling frequencies. |
| 7 | I.B. | II.17. | Provide C3 between the CG and Partners. |
| 8 | II.A. | II.31. | The system design must address component and system obsolescence and allow for future upgrades. |
| 9 | II.E | II.33 | The system's design must be field repairable to the assembly/subassembly level. |
| 10 | II.E. | II.32. | The system's design must provide self and remote access diagnostics for maintenance functions that are to be performed by Coast Guard personnel. |
| 11 | II.E. | II.32.a. | Diagnostics should include diagnostic self-tests. |
| 12 | II.E. | II.32.b. | Diagnostics should include automated system monitoring. |
| 13 | II.F. | B.2. | The system must remain operable through a category four hurricane, or comparable typhoon. |

| Ref. No. | PORD Reference | Question Interview | Requirement |
|---|---|---|---|
| 14 | II.F. | B.2. | The system must remain operable continuously in the temperature, barometric pressure, and humidity ranges found in all coastal areas of Alaska, Hawaii, Guam, Caribbean, and continental U.S. in addition to the Great Lakes region and U.S. internal river system. |
| 15 | II.G. | II.28. | The system design must not introduce undue operator fatigue during extended usage over a 12 hour period every 24 hours. |
| 16 | II.G. | II.29. | For mobile assets, system equipment components must be usable with personal environmental protection equipment (e.g., gloves and helmets). |
| 17 | II.G. | II.30. | For mobile assets, system equipment components must be usable by operators in all operating environments (e.g., explosive and hazardous). |
| 18 | II.G. | II.33. | (A goal of) This acquisition is to minimize required preventative and casualty response maintenance performed by Coast Guard technicians and contract personnel. |
| 19 | II.G. | II.33. | The system must be safe to maintain using accepted/approved maintenance practices. |
| 20 | III.A. | II.27. | The system will function in surface resources that operate within the following environmental ranges: elevation 0 to 3350 meters above sea-level; temperature -30 to +50 degrees Celsius; windspeed 0 to 135 kts; humidity 0 to 100%; and barometric pressure 880 to 1080 mb. |
| 21 | III.A. | II.30. | Equipment installed on mobile platforms or detachments must function in all their operating environments; this includes hazardous (e.g., explosive, surf, and temporary submersion) environments. |
| 22 | III.B | II.20. | NDS will allow command and control of Coast Guard facilities responding to the scene. |
| 23 | III.B. | II.9. | NDS will receive first alert notifications from mariners and mobile resources of the CG and other federal, state, and local agencies. |
| 24 | III.B. | II.19. | NDS will provide follow-on communications to obtain additional information and coordinate on scene operations. |
| 25 | III.B. | II.14. | NDS will enable the CG to contact mariners and potential response resources in the area of concern to notify them of the situation and request assistance, as appropriate. |
| 26 | III.B. | II.17. | NDS will provide communications between CG units and the service's customers and partners. |
| 27 | III.B. | II.24.b. | NDS must provide accurate position information. |
| 28 | III.B. | II.40. | The system must be capable of providing the ability to protect communications with and between CG resources and units of other governmental agencies. |
| 29 | III.B. | II.35. | All communications must be recordable for immediate retrieval/playback. |
| 30 | III.B. | II.36. | The system must provide long-term archival. |
| 31 | III.C. | II.11. | The system must provide C3 and interoperability with other federal, state, and local agencies. |
| 32 | III.D.1 | II.4. | The system must receive distress and emergency response alerts. |
| 33 | III.D.1 | II.6.a. | The replacement system is required to have an average availability for critical functions of at least 99.5% over a monthly period within a specified geographic area. |

| Ref. No. | PORD Reference | Question Interview | Requirement |
|---|---|---|---|
| 34 | III.D.1 | II.17. | The system must provide timely communications (voice and data) between CG forces and its customers and partners in all required areas. |
| 35 | III.D.1 | II.33 | The system must be operable, maintainable, and logistically supportable within the planned funding base. |
| 36 | III.D.2 | II.24.b | The system must provide position location. |
| 37 | III.D.2 | II.30. | The system must be safe to operate in all expected operating environments. |
| 38 | III.D.2 | II.35 | The system must provide a communications record. |
| 39 | III.D.2 | II.36 | The system must provide a time stamp. |
| 40 | III.D.3 | II.28. | The system must consider human factors during system integration. |
| 41 | III.D.4 | II.18. | The system must allow adaptation to future regulatory and technological changes in telecommunications. |
| 42 | III.D.4 | II.12. | The system must effectively interface with the rest of the CG's telecommunications system. |
| 43 | IV.A.1 | II.11. | The system must provide voice and data communications between shoreside and mobile CG resources and detachments, mariners, and other federal, state, and local agencies. |
| 44 | IV.A.2 | II.1 | The system must provide information dissemination. |
| 45 | IV.A.2 | II.4. | The system must receive distress and emergency response alerts. |
| 46 | IV.A.3 | II.24.b. | The system must passively determine absolute and relative position of calling unit. |
| 47 | IV.A.5 | II.35. | The system must record, time stamp, and allow the instant playback of communications. |
| 48 | IV.A.6 | II.37. | The system must protect sensitive information, and allow protection of classified information as appropriate, with requisite level of security. |
| 49 | IV.A.6 | II.40. | The system must protect sensitive information, and allow protection of classified information as appropriate, with requisite level of security. |
| 50 | IV.A.8 | II.15 | The system must provide sufficient voice and data communications capacity to support multiple operations in the same or different geographic areas. |
| 51 | IV.A.8 | II.16 | The system must provide sufficient voice and data communications capacity to support multiple operations in the same or different geographic areas. |
| 52 | IV.B.10 | II.23. | The system must allow receipt of vessel movement reports via Automatic Dependent Surveillance (ADS) systems in selected areas. |
| 53 | IV.B.11 | II.35. | The system must record and time stamp communications for instant playback. |
| 54 | IV.B.11 | II.36. | The system must allow recorded communications to be archived for future reference. |
| 55 | IV.B.12 | II.12. | The system must provide an interface to the rest of the CGTS that is transparent to the user. |
| 56 | IV.B.13 | II.13. | The system must provide standard interface for connection to existing/planned information processing equipment for data transfer. |
| 57 | IV.B.14 | II.41. | The system must be capable of protected control of communication equipment from a remote site. |

| Ref. No. | PORD Reference | Question Interview | Requirement |
|---|---|---|---|
| 58 | IV.B.15 | II.21. | The system must automatically select the appropriate communications protocol based on mode/method of communications (e.g. duplex if duplex mode/channel of communication is selected). |
| 59 | IV.B.17 | II.42. | The system must provide time-out capability to prevent unnecessary or unwanted transmissions (e.g., stuck key). |
| 60 | IV.B.19 | II.32. | The system must provide for remote and local system monitoring of critical and major system components. |
| 61 | IV.B.3 | II.15. | The system must provide sufficient voice/data transmission capacity for the transfer of operational information/data reports. |
| 62 | IV.B.3 | II.16. | The system must provide sufficient voice/data transmission capacity for the transfer of operational information/data reports. |
| 63 | IV.B.4 | II.40. | The system must, throughout the area of coverage, provide protection for the transmission of sensitive but unclassified (SBU) information using standardized encryption techniques. |
| 64 | IV.B.5 | II.37. | The system must allow protection of classified information (up to secret). |
| 65 | IV.B.5 | II.38. | The system must provide necessary interfaces for connection of encryption equipment. |
| 66 | IV.B.5 | II.38. | The system must support the transmission of information encrypted using standard encryption formats. |
| 67 | IV.B.6 | II.39. | The system must detect/receive both clear and encrypted transmissions despite mode (clear or encrypted) of operation. |
| 68 | IV.B.7 | II.24.a. | The system must, throughout the area of coverage, determine position of caller within 2 nm of calling location; a goal is to determine position within 0.1 nm. |
| 69 | IV.B.8 | II.25. | The system must, allow correlation of position location information and other communications, both live and recorded. |
| 70 | IV.B.9 | II.10. | The system must provide digital selective calling (DSC) services in accordance with the Global Maritime Distress and Safety System (GMDSS) in selected areas; system-wide implementation of DSC is required if an alternative using VHF-FM marine radio is selected. |
| 71 | IV.D.1 | II.8. | Mobile resources are required to maintain a communications guard on distress and calling frequencies when engaged in communications. |
| 72 | IV.D.2 | II.24.a. | For selected shore facilities, the system must meet the position accuracy requirement detailed in Section IV.B of the PORD. |
| 73 | IV.D.2 | II.24.b. | The system must provide the passive ability (i.e. user input/assistance not required) to determine the location of the calling party. |
| 74 | IV.D.2 | II.24.d. | The system must allow the incorporation of LOB information from other fixed or mobile resources. |
| 75 | IV.D.2 | II.24.e. | Depending on the alternative selected, the system must provide at least one line of bearing (LOB) on brief or intermittent signals. |
| 76 | IV.D.2 | II.25. | The system must provide the ability to save/recall/transfer information concerning the caller's position. |
| 77 | IV.D.3 | II.26. | For mobile platforms, the system must provide homing capabilities on line-of-sight international and national distress, calling, and homing frequencies. |
| 78 | IV.D.4 | II.22. | Depending on the alternative selected, allow monitoring of multiple frequencies. |
| 79 | NEW REQUIREMENT | II.5. | The system must transmit distress and emergency response alerts. |

### Useful Requirements

The following table illustrates the complete list of requirements that were adjudged from the project analysis to be useful to NDS. (This table also appears in Section 3.13.2). At least 50% of the applicable question responses were "useful." In some cases those criteria were modified when a consensus of questionnaire comments indicated another conclusion.

| Ref. No. | PORD Reference | Question Interview | Requirement |
|---|---|---|---|
| 80. | II.E. | II.32.c. | Diagnostics should include recording of major component status. |
| 81. | II.H. | II.44. | (A goal of) the system is to reduce the level and amount of required training for those who operate, maintain, and manage the system while maintaining optimal skill levels among personnel. |
| 82. | III.D.5 | II.44 | Coast Guard personnel must be able to operate maintain, and manage the system to support all missions performed in coastal areas. |
| 83. | IV.A.4 | II.24.c. | The system must assist in verifying the identity of the calling party. |

### Requirements in PORD, but Not Validated

None of the requirements listed in the draft PORD were concluded to be non-essential.

### Other Significant Findings

The major finding involved the issue of geographic coverage provided by NDS. Some areas are not currently covered by the NDS. These coverage "gaps" can occur for several reasons: sparsely inhabited areas, impassable terrain, extreme weather conditions, and limited maritime activity. All of these circumstances can appear in many sections of the country, but are found in the greatest abundance in Alaska. Another reason for coverage "gaps" may be limited Coast Guard presence in a geographic area (Western Rivers). Full coverage under the current system has not been achieved, due to the reasons stated. Alaska has the largest amount of coast line and inland waterways that are not covered because the terrestrial VHF-FM is not an economically feasible alternative in the most rugged portions of the Alaskan environment. The conclusion reached here is that the PORD does not effectively describe the unique requirements for NDS in many Alaskan areas.

Covering all these gaps is a major policy and financial decision for the system modernization project. There is a broad range of opinions regarding the Coast Guard's responsibility to provide NDS coverage over all areas of the United States and its territories. Some responses even suggested a need for NDS coverage beyond Coast Guard jurisdiction (Caribbean). Policy will be affected by economics and ease of implementation of alternative solutions. These decisions may result in a hybrid solution or a mixture of different technologies such as terrestrial VHF-FM to cover typical topography and satellite systems to cover more difficult topographies.

# 1. SCOPE

The scope of the current task has been to validate and analyze the internal and external customer/user requirements of the National Distress System (NDS). These requirements include the capabilities to receive distress alerts and coordinate search and rescue response operations, communicate with commercial and recreational vessels and provide command, control, and communications (C3) for U. S. Coast Guard (CG) units (active, reserve, and Auxiliary) performing other missions.

## 1.1 Identification

The CG, through the R&D Center, has contracted ANTEON CORPORATION (formerly OGDEN PROFESSIONAL SERVICES) to analyze and validate NDS requirements. The Office of Search and Rescue (G-OPR) is representing the sponsor, the Assistant Commandant for Operations (G-O), throughout the development and acquisition of the National Distress System Modernization Project (NDSMP). The Acquisition Directorate, Information Resource Management Projects (G-AIR) is supporting the NDSMP in the role of acquisition project manager.

## 1.2 The Coast Guard Telecommunications System (CGTS)

The current CG Telecommunications System (CGTS) consists of radio and landline facilities owned, controlled and/or used by the CG. It provides connectivity for C3 of operational CG forces and administrative functions. It ensures connectivity, compatibility, and interoperability with the National Command Authorities (NCA) and Federal Executive Agencies (FEA). To perform its mission, the CG also uses the CGTS to provide an effective interface with the maritime industry, state and local resources, and the boating public.

The CGTS consists of two subsystems: the Long Range Communications System (LRCS) and the Short Range Communications System (SRCS). The SRCS supports CG Activities, Groups, Sections, Marine Safety Offices (MSO), Air Stations (AIRSTAs), Captains of the Port (COTP), Vessel Traffic Services (VTS), and their subordinate units. This list will be referred to as CG NDS units in the remainder of this document. NDS is the backbone of the Short Range Communications System (SRCS).

The NDS provides the CG with maritime distress alerting and C3 for all operational missions that occur in coastal areas. This system provides communications for and between CG NDS units and the CG's customers and partners (e.g. recreational and commercial mariners, commercial service providers, and other federal, state, and local agencies). The CG’s reliance on the current NDS for C3, combined with the system's current operational limitations, increasing maintenance difficulties, and insufficient capacity necessitates the need for a system-wide replacement or upgrade in NDS capabilities.

## 1.3 Document Overview

The goal of the NDSMP is to provide an updated communications system to improve the capability of the aging Very High Frequency (VHF) Frequency Modulated (FM) network of the current NDS.

An early step in the acquisition process involved the development of a draft Preliminary Operational Requirements Document (PORD). ANTEON was tasked with validating the

requirements contained in the draft. To accomplish this, ANTEON used four data collection methods to gather information regarding NDSMP requirements. These methods included:

- ∑ interviews conducted at seven CG sites (71 interviews),
- ∑ telephone interviews with 27 CG personnel,
- ∑ survey of 150 external customer/user organizations, (51 returned) and
- ∑ responses to the Request for Information/Request for Comments (RFI/RFC) synopsis published in the Commerce Business Daily (CBD)(18 responses).

This document provides summaries and analysis of all the completed instruments that were returned prior to December 26, 1996.

This document describes the current system from Government Furnished Information (GFI) and on site observation and interviews, and then evaluates the draft PORD. As part of the analysis, the requirements in that draft PORD are categorized as critical, useful, or non-essential for inclusion in the PORD. Those to be included are prioritized. Additional requirements not previously included are recommended for the PORD.

# 2. CURRENT SYSTEM OPERATIONAL CONCEPT

## 2.1 Background, Objectives, Scope

The NDS is the backbone of the current SRCS providing VHF-FM coverage in coastal areas and navigable waterways where commercial and/or recreational traffic exists. The primary function of the NDS is to provide the CG with a means to monitor the international VHF-FM distress and calling frequency (Channel (CH) 16), coordinate search and rescue response operations, and communicate with commercial and recreational vessels. Its secondary function is to provide C3 for CG units (active, reserve, and Auxiliary) performing other operational missions such as maritime law enforcement, national security, maritime safety, and marine environmental protection.

## 2.2 Operational Policies and Constraints

Various communications policies and constraints are in place by federal agencies (CG, Federal Communications Commission (FCC), Department of Commerce, etc.) to implement various international treaties and requirements of U. S. statute. These are listed below:

- The International Convention for the Safety of Life at Sea (SOLAS) requires certain vessels to carry VHF radiotelephones and keep watch on CH 16.
- The 1988 amendment to the SOLAS Convention IMPLEMENTS Digital Selective Calling by 1 Feb 1999
- Various statutes have been implemented:
  - Develop, establish, maintain, and operate facilities for the promotion of SAR (14 USC 2)
  - Maintain radio transmitting and receiving stations (14 USC 93)
  - Assist federal and state agencies (14 USC 141)
  - Port security and coastal defense (14 USC 145)
  - Procure and maintain communications facilities and disseminate weather (14 USC 147)
  - Bridge to Bridge Radiotelephone Act(33 USC 1201-1208)
  - Vessel traffic services and requirements (33 USC 1223)
  - Communications Act of 1934 (47 USC 351-386)

The SRCS must be compatible with the communications equipment used by the maritime public and allow an effective interface with other government agencies.

### 2.2.1 Operating Requirements

NDS must provide communications to enable the effective and efficient performance of CG missions. This capability must also include the performance of missions related to special operations (e.g., regattas, Olympics, and marine shows) and large-scale multi-mission operations (e.g. airline catastrophes) that are not considered national emergencies. Watchstanders at operations and communications centers located at CG NDS units must be able to communicate with and coordinate CG resources, commercial and recreational vessels, and response units from commercial service providers and other federal, state, and local agencies.

In a typical scenario, the CG receives notice of a situation (e.g. search and rescue, oil spill, potential law enforcement, vessel entering port) that requires the CG to coordinate response efforts and/or respond with resources. These notifications and available supporting data are received by a communications or operations watchstander who relays the information to the

appropriate operations center for coordination. Subsequently, the operations center dispatches CG resources, as appropriate, and maintains C3 throughout the response. This is accomplished either directly or via a communications center. The operations center often requests assistance from non-CG resources that may be in the area. In addition, the operations center requests and/or receives additional information from the scene of the situation and coordinates the actions of responding CG units, non-CG resources, and the parties involved, as appropriate. In addition to the coordination received from the operations center, responding CG resources directly coordinate on scene operations with other responding facilities and the parties involved, as appropriate. Coordination between the operations center, responding units, and the parties involved continues until the situation is resolved.

### 2.2.2 Critical Operational Issues

NDS performs several vital functions in the above scenario. The system receives distress alerts and first alert notifications from mariners and mobile resources. NDS facilitates the command and control of units responding to the scene. NDS also provides communications between CG units, customers and partners. Due to the sensitive nature of many operations, the system must be capable of providing the ability to protect communications with and between CG resources and units of other governmental agencies. Accurate position information is required to respond to situations in a timely manner. Lastly, due to the brief and emergent nature of many calls and the legal importance of communications, all communications must be recorded for retrieval/playback and long-term storage.

The concept of operations for national emergencies (e.g., major storms, floods, earthquakes, and human-caused catastrophes) is similar to those described above with increased emphasis placed on the system's ability to allow C3 and interoperability with other federal, state, and local agencies. Frequency incompatibility among agencies and state and local governments can make this very difficult. During times of war or unrest, the volume of secure and protected communications within the CG and with other federal defense agencies will substantially increase in support of coastal defense and port security missions.

## 2.3 Description

The NDS is a collection of independently controlled VHF-FM multi-channel transceivers located at approximately 300 sites in the continental U.S., Puerto Rico, the Caribbean, Alaska, Hawaii, and Guam. Each site is controlled by CG personnel at a Group, Activity or Section office (primary) (via remote control equipment and dedicated phone lines) or small boat station (secondary) communications center. Locations were selected and distributed to provide the widest coverage possible. The system was designed to provide short-range (VHF range of approximately 20 nautical miles (nm) from the coast line) distress, safety and command and control communications in most of the areas of boating activity where the CG had SAR responsibilities. NDS hardware is frequently collocated with other non-CG communications equipment. The CG has attempted to locate these sites to provide the greatest possible antenna height. As a result, NDS sites are frequently referred to as ”High Sites”. This network is augmented by many local low-level sites, “Low Sites” that operate in the same marine bands.

### 2.3.1 Operational Environment and Characteristics

#### 2.3.1.1 Space Requirements

The High Sites are antennas of various sizes with transceivers in small shelters. The High Sites are generally situated at high points (greater than 100 feet high) to maximize maritime coverage. These sites typically require less than 2000 sq. ft. of land. The command/communications centers are of varying sizes depending on the mission of the unit and the number of workers assigned to the space. The size of the operating consoles and

equipment racks again vary according to those factors also. In nearly all cases, the communications centers are situated in less than 1000 sq. ft. adjacent to the operations centers.

The mobile unit radios are generally placed in standard ship, boat, and aircraft designs. In all cases, minimum weight and size are of utmost concern. Standard rack and console mountings determine the space required for these installations.

Mobile radios are used in many different environments with the primary concern being portability.

### 2.3.2 Major Components and Interconnections Between Components

The following functional requirements are summarized from the NDS Modernization Mission Needs Statement (MNS). The list has some future requirements deleted so that it represents current system requirements. Note that some of the current requirements are not being met by the present system.

#### 2.3.2.1 Critical Technical Parameters

- ∑ Provide voice and data communications between shoreside and mobile CG facilities and detachments, mariners, and other Federal, state, and local agencies.
- ∑ Receive distress and emergency response alerts.
- ∑ Record, time stamp, and allow the instant playback of communications.
- ∑ Disseminate operational coordination messages and urgent marine information to localized geographic areas.
- ∑ Provide sufficient voice communications capacity to support multiple operations in the same or different geographic areas.

#### 2.3.2.2 Communication Requirements

- ∑ Provide comprehensive coverage, without localized gaps, in all coastal regions and navigable waterways serviced by the existing NDS or similar CG operated system. It is a goal to provide comprehensive coverage in all coastal regions and navigable waterways over which the CG has jurisdiction.
- ∑ Provide coverage to at least 20 nm offshore or to the extent of existing system coverage, whichever is greater. It is a goal to provide coverage out to the maximum offshore operating range of mobile CG facilities that rely on the current system as their primary source of communications.
- ∑ Provide sufficient voice transmission capacity for the transfer of operational information reports.
- ∑ Throughout the area of coverage, determine position of caller within 2 nm of calling location; a goal is to determine position within 0.1 nm.
- ∑ Record and timestamp communications for instant playback. Allow recorded communications to be archived for future reference.
- ∑ Automatically select the appropriate communications protocol based on the mode/method of communications (e.g. duplex if duplex mode/channel of communication is selected).
- ∑ Operate on auxiliary services (e.g., electrical power) available on/at current and planned shoreside and mobile facilities.
- ∑ Provide for remote and local system monitoring of critical and major system components.
- ∑ Depending on the alternative selected, provide a continuous guard on the distress and calling frequency. Mobile facilities are required to maintain a communications guard on the distress and calling frequency when engagedin communications.
- ∑ Depending on the alternative selected, allow monitoring of multiple frequencies.

#### 2.3.2.3 Data Processing Requirements

The transmission of data is a potential addition to the NDS capabilities that can provide fast and reliable transfer of information. In one geographic area, the Ninth CG District (D9), data communications are used over VHF-FM frequencies. This communication method is used since D9 Buoy Tenders do not operate High Frequency (HF) communications.

#### 2.3.2.4 Sensor Requirements

- ∑ Meet the position accuracy requirement for selected shore facilities. Depending on the alternative selected, provide at least one line of bearing (LOB) on brief or intermittent signals and allow the incorporation of LOB information from other fixed or mobile facilities.
- ∑ Provide homing capabilities on line-of-sight international and national distress, calling, and homing frequencies for mobile platforms.

#### 2.3.2.5 Technical Trade-offs

Economic and technological constraints require prioritization of system characteristics/capabilities. The prioritization categories include considerations for providing a baseline level of service, economic realities, enhanced operational capabilities, and system support. The system characteristics/capabilities have the following relative priorities within existing life cycle cost constraints:

- ∑ Coverage, availability, and voice/data communications (for C3 and receipt of distress and emergency response alerts)
- ∑ Other performance criteria
  - ‡ Information dissemination
  - ‡ Position location
  - ‡ Information protection
  - ‡ Recording/playback
  - ‡ Digital Selective Calling (DSC)
  - ‡ Caller identification
- ∑ Maintainability and logistics support
- ∑ System configuration and integration

### 2.3.3 Interfaces to External Systems or Procedures

#### 2.3.3.1 Human Interface

A systems approach to the design is required to provide necessary ergonomic and efficiency considerations into the new design. In the existing system efficiency considerations are somewhat lacking as evidenced by the current system's inability to automate operationally routine reporting requirements (e.g., position and ops normal reports). The VHF-FM NDS is not directly interfaced with the CGTS.

The current shoreside NDS is continuously staffed and operated by one watchstander at each Group communications center who often performs additional communications related duties depending on other mission requirements. This watch is occasionally supplemented by additional personnel during periods of high intensity operations. Continuous communications watches are also maintained by VTSs. Periodic communications watches are maintained at

other commands that rely on the system for C3 (e.g. MSOs, COTPs, AIRSTAs, Stations) and to provide backup monitoring of distress circuits as required.

System integration (e.g., centralized control of various system components) is a critical ergonomic factor for the communications watchstander. For mobile assets, system equipment is used by operators in all operating environments (from boat and ship pilot houses, airplane cockpits and land vehicles.)

### 2.3.4 Capabilities/Functions

The primary mission of the NDS is to maintain a distress monitoring system on VHF-FM Channel 16 and to support CG search and rescue operations. In addition to distress traffic, the NDS is the primary tactical, short range command and control voice communications system. Additionally, the CG transmits voice marine information broadcasts on CH 22A.

This function has primarily been carried out by the current NDS and numerous localized systems that provide communications to Groups, VTSs and selected MSO/COTPs and Air Stations. The current NDS network provides coverage out to 20 nm from shore in most areas. However, the present systems do not provide complete coverage of continental U.S. coastal areas, bays, inlets, and river systems. Presently, there are approximately 65 gaps and numerous localized coverage deficiencies identified by local operational commanders. (Note: The systems in Alaska and Hawaii were exempted from complete coverage in 1975.) Geography and topography have a direct effect on the system coverage since the VHF-FM signal is limited to line of sight transmission.

NDS has the capability to guard the VHF-FM international distress frequency, however, the distress watch is interrupted during any transmission by the monitoring site. (Note: The systems in the Western Rivers and Alaska do not have CH 16 guard receivers.) In addition to the guard receiver, the system can transmit or receive on any one of six predesignated maritime VHF-FM channels. C3 is often jeopardized because the system does not have adequate channel capacity and allows only one conversation on one frequency at a time. Essential communications with other federal, state, and local agencies are often hindered or unavailable due to the lack of compatible communications equipment.

### 2.3.5 Reliability, Maintainability, Availability

The CG's reliance on the current NDS for C3 combined with the system's unsatisfactory reliability and coverage, increasing maintenance difficulties, and insufficient capacity dictates a system-wide modernization of capabilities in the shortest possible time frame.

Much of the existing equipment was installed in the 1970s and is no longer commercially available off-the-shelf; therefore, it is becoming increasingly difficult to support. The expected service life of electronic equipment installed during this period was 15 years. Equipment failures have necessitated the replacement of many system components that are no longer commercially available, resulting in a lack of standardization. Non-standardized multi-channel recorders, instant playback recorders, and localized direction finding equipment were installed in some locations to meet needs identified after the original system's construction. These changes have contributed to the lack of system integration and standardization. Additionally, many of the current system's outages are attributable to commercially provided support services (e.g. telephone lines, electricity).

Operational commanders, CG mobile facilities (boats, cutters, aircraft, etc.) and mariners rely on the NDS for vital communications 24 hours a day, 7 days a week. Historically, system usage varies by location and time of year, week, and day. While system use is not constant, it must be available to receive distress and emergency response alerts and provide operational

communications at any time. This requires that the system demonstrate a high state of operational availability. Operational availability is defined as follows:

$$A_0 = \frac{(T_o + T_s)}{(T_o + T_s + T_m + T_l + T_a)}$$

where

$T_o$ = operating time

$T_s$ = standby time

$T_m$ = maintenance time (preventive and casualty)

$T_l$ = logistical delays

$T_a$ = administrative delays

Certain subsystems may have different availabilities depending on the function they provide. System designers must balance reliability and maintainability to ensure subsystem performance.

### 2.3.6 Safety, Security, Privacy, and Continuity of Operations

#### 2.3.6.1 Safety

Maritime Safety, which is the cornerstone of the NDS, is of predominant concern. The efficiency and effectiveness of NDS will determine how well it can respond to the public needs for maritime safety. Another consideration is the safety of the actual equipment installations for the operators and maintainers.

#### 2.3.6.2 Security

There are stated needs for processing classified information on the current system, but there are no effective equipment and procedures to implement it within NDS. The physical security issues are straightforward for the communications centers and the mobile resources. These units are usually staffed around the clock and are in sheltered areas. The High Sites are normally in more isolated and rugged terrain and subject to adverse weather conditions. These locations may lead to weather or vandalism related damages.

#### 2.3.6.3 Privacy

Some voice privacy has been instituted on small segments of NDS. This is accomplished on portable units and at some local low-sites. It involves the installation of Digital Encryption Standard (DES) equipped radios to allow transmission of sensitive but unclassified information. These protected systems are used for operations requiring voice privacy such as law enforcement.

#### 2.3.6.4 Continuity of Operations

The need for the NDS increases when natural or man-made disasters affect the maritime environment. Disasters, such as hurricanes, earthquakes, plane crashes, etc., can create a greater need for communications capability. Under these adverse conditions, the CG's partners and customers expect the CG to maintain an active listening watch on Channel 16 and respond to calls of distress. Consequently the CG's shoreside presence must continue even though there may be problems with the infrastructure (telephones, electricity, etc.).

## 2.4 Types of Users

The CGTS consists of the radio and landline facilities controlled and/or used by the CG. The CGTS provides connectivity for C3 of operational CG forces; ensures connectivity, compatibility, and interoperability with the other government agencies, such as: National Command Authorities (NCA) and Federal Executive Agencies (FEA); provides an effective interface with the maritime industry, state and local governments and the boating public; and provides telecommunications services for the administrative support of CG units. Within the CG, users may fall into the following categories: operations personnel, communications watchstanders, and service providers. Closely related to the direct users are the support categories: policy makers, technicians, designer/engineers, and general support.

### 2.4.1 Organizational Structures

Within NDS there are several organizations that interact with each other. The CG is the operator of the NDS and provides a large amount of resources for prosecution of distress cases. Other federal government agencies and state and local governments may have resources that use compatible communications and respond to maritime distress situations. Private individuals are the other segment of customers for the NDS. These individuals may be represented by any number of private organizations (i. e. Boat/US, Power Squadron, etc.).

### 2.4.2 Training and Skills

Optimal use of the NDS is reliant on the skill level of system operators, maintenance personnel, and system managers. The level and type of training required will depend on the system design and entry level skills of personnel using the system. A goal of the system is to reduce the level and amount of required training for those who operate, maintain, and manage the system while maintaining optimal skill levels.

In the current system, training is provided through two methods: formal classroom and on the job. The Group, Activity, and Section communications centers are staffed by Telecommunications Specialists (TCs). Before arrival at these communications centers, each TC goes through formal performance-based communications training, including NDS training, and is qualified as a group communications watchstander. After arrival at a new unit break-in (on-the-job) training may last 45 days for familiarization with local equipment, policies, and environment.

Other CG personnel receive on the job training as required by their jobs and NDS requirements. They may be operations watchstanders, station communication watchstanders, boat coxswains or crew, or aircraft pilots or crew.

### 2.4.3 Responsibilities

The CG has the responsibility to keep a listening watch on the distress frequency of the NDS. Proper maintenance of the High Site system is also a responsibility borne by the CG. Users of the system are expected to comply with the applicable laws and regulations and properly use the system. Individual customers of the NDS are expected to respond appropriately to calls and offer assistance as requested.

### 2.4.4 Interactions Between Users

There are several interactions possible in the NDS. The obvious interaction is between the distress system and the user. This contact can be a distress alert, a first alert, response to a distress call, or simply a call to establish contact, that likely results in a shift to another frequency. Calls among users can assume any of the three types discussed above. Service providers may contact users of the system to coordinate their search and rescue activities.

### 2.4.5 Workload

The NDS requires staffing for the following activities: distress monitor, search and rescue, other CG missions, maintenance, and support. In providing a listening watch, at least one person is occupied at each communications center monitoring one or more High Site receivers. Maintenance personnel are required to be on call and available to meet the needs of the system. A support infrastructure must be in place to ensure that the necessary people and materials are available for the equipment maintenance and the monitoring of activities.

## 2.5 Support Concept and Support Environment

Some standardization exists in the basic equipment of the NDS (Motorola transceivers), but some have been updated and others have not. Additions for direction finding, recording, and other local agendas have disrupted configuration control of the system equipment.

# 3. ANALYSIS

## 3.1 Introduction

### 3.1.1 Purpose

This section contains an analysis of the available data, validates NDS requirements, prioritizes them in comparison with all other requirements and suggests the need for previously unrecognized requirements.

### 3.1.2 Methodology

Four distinct data collection techniques were used to identify NDS requirements.

1. On-site field, and headquarters interviews of CG personnel.
2. Telephone interviews of other CG sources.
3. Survey of CG customer and partner groups.
4. A request for comment (RFC) solicited through a notice in the Commerce Business Daily.

#### 3.1.2.1 Data Analysis:

All interview and survey results (3 variant forms tailored for different audiences) were normalized to the on-site interview form (Appendix C). Respondent data is documented in terms of orders of magnitude (trends and most common responses), and is presented in tabular form for the reader as frequency counts and percentages. The reader may notice that the value "n" (the number of responses) varies throughout this report. This variation was a result of respondents who did not answer a particular subsection, question or statement, or where the analyzed group was a sub-set of the whole sample population.

Although comments are presented in tabular form, they have been summarized in the discussion sections of each issue. For brevity, some redundant or similar comments have been omitted from the tables. All comments from users external to the Coast Guard are included in Appendix F.

It was noted that the respondents' knowledge on certain NDS subjects varied according to training, experience and current perspective (what their involvement with NDS entails). The analysis centered on selecting the most knowledgeable respondents for each set of questions. The respondents were categorized according to their relationship to the NDS and CG operations. These categories provided the information to sort the interview and survey responses. The various categories follow in Table 3-1. A marked box indicates the applicable category of respondent (i.e., CG, Public, Private), their primary function (e.g., Operations, Communications, etc.,) and where applicable, their location. The composition of the categories are:

- **CG** (including CG military and civilian employees),
- **Public** (including other federal government agencies, state and local government agencies),
- **Private** (including private individuals and organizations).

Where multiple boxes in a row are marked, the groups are linked by a logical AND statement. For example, under Subject Area, DSC/GMDSS is shown to be of concern only to the CG—under the heading Affiliation. In terms of Function, one can readily see that DSC/GMDSS is a Subject Area primarily of interest to Policy Makers and Engineers. The analysis groups are also discussed in the issues section of each subject area.

**Table 3-1. Groups selected for analysis**

| | Affiliation | | | | | Function | | | | | Location | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | |
| **DSC/GMDSS** | ● | | | | | | ● | | ● | | | | | | |
| **System Capabilities** | | | | | | | | | | | | | | | |
| **Capacity** | ● | | | ● | ● | ● | | | ● | | | | | | |
| **Operational characteristics** | ● | | | ● | ● | | ● | | ● | | | | | | |
| **Adaptability** | ● | | | | | | ● | | ● | | | | | | |
| **Areas of coverage** | | | | | | | | | | | | | | | |
| **Coastal regions** | ● | ● | ● | ● | | ● | ● | | ● | | | ● | | | |
| **Inland regions** | ● | ● | ● | ● | | ● | ● | | ● | | ● | | | | |
| **Alaskan region** | ● | ● | ● | ● | | ● | ● | | ● | | | | ● | | |
| **Hawaii and Guam** | ● | ● | ● | ● | | ● | ● | | ● | | | | | ● | |
| **Puerto Rican region** | ● | ● | ● | ● | | ● | ● | | ● | | | | | | ● |
| **Extent of off-shore coverage** | ● | ● | ● | ● | | ● | ● | | ● | | | ● | | | |
| **Maintenance and Logistics** | | | | | | | | | | | | | | | |
| **Monitoring and diagnostics** | ● | | | | | | | ● | ● | | | | | | |
| **Maintainability** | ● | | | | | | ● | ● | ● | | | | | | |
| **Reliability** | ● | | | ● | ● | | ● | | | | | | | | |
| **Distress and Emergency Alerts** | ● | ● | ● | ● | ● | ● | ● | | | | | | | | |
| **Command and control** | ● | | | ● | ● | ● | ● | | | | | | | | |
| **Ops w/other service providers & public** | ● | ● | ● | ● | ● | ● | ● | | | | | | | | |
| **Human systems integration** | ● | | | ● | ● | ● | ● | ● | ● | ● | | | | | |
| **Secure communications** | ● | ● | ● | ● | ● | ● | ● | | | | | | | | |
| **Position Location/Caller identification** | ● | ● | ● | ● | ● | ● | ● | | | | | | | | |
| **Record Keeping** | ● | | | ● | ● | | ● | | | | | | | | |

### 3.1.3 Scope

The remainder of this section is organized in terms of NDS requirements categories. The categories are further sub-divided by specific issues. Within the issues the individual interview and survey questions and responses are listed. An analysis of collected data and comments is accomplished in a discussion section. This involves a statistical analysis where applicable and a substantive look at the comment fields associated with the questions. The last section will be a conclusion for the subject area and a judgment as to the necessity of the requirements for inclusion in the PORD.

## 3.2 Distress And Emergency Alerts

### 3.2.1 Issues

The core purpose behind the NDS is the ability to receive and transmit distress related voice calls. The implicit assumption is that someone is listening to or guarding the distress frequencies. These two statements introduce the two issues regarding this subject area. In

analyzing the questions, the responses from those associated with the actual distress operations were considered. Specifically, these included the communications watchstanders, operations personnel, service providers and policy makers. All three organizational affiliations were included: public, private, and CG.

#### 3.2.1.1 Distress Alerts

It is very important that a system of this type provides for the transmission, receipt, and relay of distress calls. Additionally, the system must provide for the exchange of information (alerts) about distress cases.

#### 3.2.1.2 Communications Guard

The critical aspect of any communications system is the ability of the operators to hear and understand the information being sent. The CG is required to guard the channel 16 maritime distress frequency. This is affected by several factors: equipment and personnel quality on both ends of the transmission and the coverage of the particular area concerned.

### 3.2.2 Questions

#### 3.2.2.1 Receive And Transmit Distress Alerts

| Question Number | Requirement | Question Text |
|---|---|---|
| II.4. | IV.A.2 | Receive maritime distress and emergency response alerts. |
| II.5. | New | Transmit maritime distress and emergency response alerts. |
| II.9. | III.B. | Receive first alert notifications from mariners and mobile resources of the CG and other federal, state, and local agencies. |

#### 3.2.2.2 Communications Guard

| Question Number | Requirement | Question Text |
|---|---|---|
| II.7. | IV.D.1 | Provide a continuous guard on distress and calling frequencies. |
| II.8. | IV.D.1 | Mobile resources must be required to maintain a communications guard on distress and calling frequencies when engaged in communications on other frequencies. |

### 3.2.3 Grouping And Display Of Data

#### 3.2.3.1 Receive And Transmit Distress Alerts

| Question Number | Number of Responses | Number of Critical | | Number of Useful | | Number of Not Essential | |
|---|---|---|---|---|---|---|---|
| | | Number | Percent | Number | Percent | Number | Percent |
| II.4. | 76 | 76 | 100% | | | | |
| II.5. | 77 | 76 | 99% | 1 | 1% | | |
| II.9. | 72 | 66 | 92% | 6 | 8% | | |

#### 3.2.3.2 Communications Guard

| Question Number | Number of Responses | Number of Critical | | Number of Useful | | Number of Not Essential | |
|---|---|---|---|---|---|---|---|
| | | Number | Percent | Number | Percent | Number | Percent |
| II.7. | 75 | 73 | 97% | | | 2 | 3% |
| II.8. | 78 | 54 | 69% | 19 | 24% | 5 | 6% |

### 3.2.4 Comments

#### 3.2.4.1 Receive And Transmit Distress Alerts

There were no comments for this question.

#### 3.2.4.2 Communications Guard

| Question Number | Interviewee ID | Comment |
|---|---|---|
| II.7. | 117 | Critical, assuming we keep the same kind of system. |
| II.7. | 89 | Separate the calling and distress frequencies. |
| II.8. | 62 | Should also consider the secondary speaker to back up primary operator and scanning capabilities (programmable). |
| II.8. | 22 | Critical at Sault Ste. Marie to maintain a communications guard on distress and calling frequencies when engaged in communications on other frequencies because when transmitting at Sault Ste. Marie channel 16 is muted out. |
| II.8. | 85 | Useful if the mobile resources are within a group area, the group would guard Channel 16. |
| II.8. | 54 | Must maintain guard because of hailing not for distress. The group guards for distress and could relay if necessary. |
| II.8. | 6 | Mobile resources should be required to maintain a communications guard on the distress and calling frequency when engaged in communications on working frequencies. Operators can hear and recognize the word Mayday even if they are involved in a conversation with another unit on another frequency. This capability is a must. |
| II.8. | 101 | The CG can currently monitor to 20 NM offshore, but mobile units also need to guard Channel 16. It needs to be monitored while they are on the air with other units on other frequencies. |
| II.8. | 117 | System must have full coverage, therefore, shore units can keep the guard for mobile units. |

| Question Number | Interviewee ID | Comment |
|---|---|---|
| II.8. | 97 | An on/off switch would be desirable, so distress calling can be heard while another frequency is disabled. However, this approach could be dangerous in some situations. |
| II.8. | 7 | Mobile resources do not need to maintain a guard if the command center has complete coverage. |
| II.8. | 65 | CG wants to be relieved of manning so many communications watchstanders who are on watch 24 hours per day. Fickle coverage is unpredictable, and may be responsible for additional watchstanders. |

### 3.2.5 Discussion

#### 3.2.5.1 Distress Alerts

There is an overwhelming perception among distress system operators that transmission and receipt of distress voice messages are critical parts of the system. All of the 76 respondents agreed that receiving distress and emergency response alerts was critical. In the same regard only one response was below critical (useful) for the same question regarding transmission of those messages. These questions were very straightforward and no significant comments were noted for either one. One question concentrated on the ability to receive first alert notifications of distress. Over ninety percent of the respondents (n=66, 92%) thought this was a critical requirement.

#### 3.2.5.2 Communications Guard

These questions sought opinions on the CG's perceived requirements to listen to the distress frequencies. The first was an inquiry regarding continuous requirements to monitor distress and calling frequencies, which almost all of the respondents (n=73, 97%) thought was critical. This conforms with the widely-held belief in the CG that the primary method of meeting NDS requirements is an effective distress frequency guard. The other question zeroed in on the mobile unit's ability to guard the distress frequency while engaged on other frequencies. About seventy percent of the respondents (n=54, 69%) felt this capability was critical. Twenty-four percent said useful and five (six percent) felt it was not essential. The comments pointed out that these mobile units provide a necessary, but ad hoc, extension or enhancement to the coverage of the NDS. In some areas High Site broadcasts temporarily mute the group receivers in their area of responsibility, over which the mobile units provide some coverage. Many of those who thought the mobile unit guard was not critical, felt that the High Site units maintain, or should maintain, an adequate listening post and the augmentation by the mobile units is not necessary.

### 3.2.6 Conclusion

#### 3.2.6.1 Distress Alerts

Among the responding operationally-oriented parties, the consensus was that an NDS should include the capability to receive and transmit distress calls. The system should also be able to convey first alerts or Mayday relays as needed by the operating personnel.

#### 3.2.6.2 Communications Guard

There was overwhelming support for providing a continuous guard on distress and calling frequencies. The requirement for mobile units to have continuous guard even when on working frequency was softer than the first conclusion, however, it was in the two-thirds majority of critical answers by the respondents. The support is strong enough to validate the requirement, but a switchable option could provide system flexibility.

## 3.3 Command And Control

### 3.3.1 Issues

A secondary purpose (to distress) of NDS has been the command and control aspects of the system. This includes the tracking, communicating with and directing the service providers' resources (ships, boats, aircraft and land vehicles). The communications procedures have developed over time and have come to be a necessary service to the CG and other service providers. Since this is primarily a process that takes place within the CG all operationally oriented CG respondents were analyzed (operations personnel, communications watchstanders, service providers and operational policy makers. The following two issues explore the command and control aspects of the NDS.

#### 3.3.1.1 Coast Guard Communications

The radio equipment used by CG for NDS is also used for communications within the CG for other missions. These communications for other missions are carried out over working frequencies in the VHF-FM marine band. The use of the same equipment provides easy access for both CG mission and distress communications. All boats, ships and airplanes are equipped with various configurations of fixed-station and mobile versions of VHF-FM equipment. Many other agency service providers have similar systems. Some of these agencies have authorization for use of the maritime radio bands, while others are limited to communications on separate bands or frequencies not compatible with NDS. The incompatibilities sometimes create communications problems among CG and other agency resources.

#### 3.3.1.2 Interface To CG Telecommunications System

Other parts of the CG telecommunications system are distinctly separate from the VHF-FM system, such as classified systems and national defense based programs. Some incompatibilities are based on technological problems and others grew or remained separate by evolution. These incompatibilities resulted in duplicated tasks. For example, distress information exchange over VHF-FM may have to be translated to a manual or electronic case file and then transferred again to a situation report that must be transmitted via voice, landline teletype, high frequency (HF) radio teletype or satellite communications. There may even be more transitions as the information is passed through the chain of command. The CG's general long-term goal is one-time data entry which avoids several of these translations.

### 3.3.2 Questions

#### 3.3.2.1 Coast Guard Communications

| Question Number | Requirement | Question Text |
|---|---|---|
| II.1. | IV.A.7<br>III.D.2 | Allow for dissemination of operational coordination messages to and within localized geographic areas. |
| II.19. | III.B | Provide follow-on communications in order to obtain additional information and coordinate on scene operations. |
| II.20 | III.B<br>I.A | Dispatch and coordinate the actions of mobile resources to patrol or to provide surveillance in areas of interest. |

#### 3.3.2.2 Interface To CG Telecommunications System

| Question Number | Requirement | Question Text |
|---|---|---|
| II.12. | III.D.4 | The future system should provide an interface to the rest of the CGTS that is transparent to the user. |

### 3.3.3 Grouping And Display Of Data

#### 3.3.3.1 Coast Guard Communications

| Question Number | Number of Responses | Number of Critical | | Number of Useful | | Number of Not Essential | |
|---|---|---|---|---|---|---|---|
| | | Number | Percent | Number | Percent | Number | Percent |
| II.1. | 77 | 68 | 88% | 9 | 12% | | |
| II.19 | 70 | 62 | 89% | 8 | 11% | | |
| II.20. | 71 | 59 | 83% | 12 | 17% | | |

#### 3.3.3.2 Interface To CG Telecommunications System

| Question Number | Number of Responses | Number of Critical | | Number of Useful | | Number of Not Essential | |
|---|---|---|---|---|---|---|---|
| | | Number | Percent | Number | Percent | Number | Percent |
| II.12. | 65 | 44 | 68% | 20 | 31% | 1 | |

### 3.3.4 Comments

#### 3.3.4.1 Coast Guard Communications

| Question Number | Interviewee ID | Comment |
|---|---|---|
| II.1. | 85 | Critical to allow for dissemination of operational coordination messages to and within localized geographical areas. If a broadcast is throughout a large region it may create interference. |
| II.1. | 62 | Fax to pilots in anchorage areas. |
| II.1. | 75 | Non-proprietary is important. |
| II.1. | 64 | Boating safety is important. This watches over which CG has jurisdiction. |
| II.1. | 72 | Envisions more of a global communication that will allow CG to disseminate |

| Question Number | Interviewee ID | Comment |
|---|---|---|
| | | much more info. |

#### 3.3.4.2 Interface To CG Telecommunications System

| Question Number | Interviewee ID | Comment |
|---|---|---|
| II.12. | 96 | It would be a great help in the movement of data, if the NDS were interfaced to the rest of the CGTS. |
| II.12. | 6 | We are talking about the VHF short range NDS here. It is not critical, nor desirable in most cases, that small boats and aircraft have the capability to interface directly with the rest of the CGTS. These units usually work for the Group, and all communications should be relayed through the Group for screening and approval, prior to being introduced into the CGTS. |
| II.12. | 30 | EPIRB signals should be integrated with the future system. |
| II.12. | 117 | This includes data, video, etc. |
| II.12. | 84 | VTS cooperates with command centers in all sorts of operations. |

### 3.3.5 Discussion

#### 3.3.5.1 Coast Guard Communications

For each of the three questions under this issue, at least 83% of the respondents judged that the issues were critical. In the first (n=68, 88%) they felt the future system should allow for the dissemination of operational coordination messages to and within localized geographic areas. The mode (voice or data) for these messages was not addressed. Some comments indicated that some record message (data exchange) communications are required for this segment of command and control. This may include the exchange of graphics over the command and control network (imagery transmission, photo exchange, and search area chartlets) Currently only voice messages are transmitted on VHF-FM (with the exception of Great Lakes CG units where they have limited record message capability). Several comments pointed toward the inadequacy of the current High Site system to adequately support command and control, broadcast and distress communications. In the second question (n=62, 89%) follow-up communications were considered critical to coordinate on scene operations. The third question was very similar and a natural follow-on where the respondents (n=59, 83%) felt that it was critical to dispatch and coordinate the actions of mobile resources.

#### 3.3.5.2 Interface To CG Telecommunications System

A majority (n=65, 68%) counted it critical to provide an interface to the CG Telecommunications System that is transparent to the user. The phrase “transparent to the user” is very vague and consequently the respondents could have very wide ranging views on what the question actually meant. One indicated that, “It would be a great help in the movement of data....” Others would like to see integration of the following: EPIRBs, data, and video. Another suggestion was the interface of VTS and NDS systems. One dissenter stated, “It is not critical, nor desirable in most cases,.....to interface directly with the rest of the CGTS.” Although this was a minority opinion, it is one held by many, that better communication systems present the opportunity for units to jump the chain of command (judged by many to be a negative factor).

### 3.3.6 Conclusion

#### 3.3.6.1 Coast Guard Communications

In the responses, the majority of operations oriented personnel feel that the command and control capability is needed and that the NDS is a large part of the solution. The majority

believe that the ability to disseminate operational coordination messages is critical Similarly, most operations or test personnel responded that the ability for follow-on communications for the continued prosecution of distress cases is a critical factor in success of the mission. An additional required capability to dispatch and coordinate resources was also deemed to be critical. Therefore, it is critical that these requirements be included in the PORD.

#### 3.3.6.2 Interface To CG Telecommunications System

For a majority of the respondents, the CG's future relates to its ability to interface communication systems. The question for this issue was not specific, but it stimulated enough comments to give a flavor toward CG view of telecommunications and information systems. The capability of a transparent interface should be considered in the design of the NDS. This design should consider an interface to the rest of the CG telecommunications system that is transparent to the user. This should include one time data capture that is demonstrated by prototypes like the Operational Information System (OIS). The interface to the CGTS is a critical requirement that should be discussed in more detail in the PORD.

## 3.4 Operations With Other Service Providers And The Public

### 3.4.1 Issues

The CG, public, and private respondent groups were analyzed for the operations issues involved with other service providers and the public. Similar to other operational questions, the analysis considered the responses from operations personnel, communications watchstanders, service providers, and operations policy makers.

#### 3.4.1.1 Timely Communications

In addition to the communications required for command and control and receipt/transmission of distress messages, there exists a capability to convey information on a regular basis among the CG, the public, and other agency service providers. This information flow falls into a category of CG command and control of those external entities, but by nature is more advisory. This part of the system is most affected by frequency compatibility among the different groups using NDS.

#### 3.4.1.2 Urgent Marine Information Broadcasts (UMIB)

CG has established a broadcast capability to transmit urgent information to anyone listening to the distress channel. This information is, in most cases, distress related, but can be calling attention to potential hazards in the maritime environment. The call usually goes out on the distress frequency and then is broadcast on a CG public liaison channel.

### 3.4.2 Questions

#### 3.4.2.1 Timely Communications

| Question Number | Requirement | Question Text |
|---|---|---|
| II.11. | IV.A.1 | On scene CG mobile resources must be able to communicate directly with commercial and recreational vessels and response units from commercial service providers and other federal, state, and local agencies. |
| II.14. | | Enable the CG to contact mariners and potential response resources in the area of concern to notify them of the situation and request assistance, as appropriate. |
| II.17. | III.D.1 | Provide timely communications between the CG forces and its customers and partners in all required areas. |

### 3.4.2.2 Urgent Marine Information Broadcasts

| Question Number | Requirement | Question Text |
|---|---|---|
| II.2. | IV.A.7 | Allow for unscheduled and urgent marine information to and within localized geographic locations. |

### 3.4.3 Grouping And Display Of Data

### 3.4.3.1 Timely Communications

| Question Number | Number of Responses | Number of Critical | | Number of Useful | | Number of Not Essential | |
|---|---|---|---|---|---|---|---|
| | | Number | Percent | Number | Percent | Number | Percent |
| II.11. | 73 | 70 | 96% | 3 | 4% | | |
| II.14. | 76 | 73 | 96% | 3 | 4% | | |
| II.17. | 78 | 73 | 94% | 5 | 6% | | |

### 3.4.3.2 Urgent Marine Information Broadcasts

| Question Number | Number of Responses | Number of Critical | | Number of Useful | | Number of Not Essential | |
|---|---|---|---|---|---|---|---|
| | | Number | Percent | Number | Percent | Number | Percent |
| II.2. | 79 | 75 | 95% | 4 | 5% | | |

### 3.4.4 Comments

### 3.4.4.1 Timely Communications

| Question Number | Interviewee ID | Comment |
|---|---|---|
| II.14. | 37 | This is the key between cellular telephone and radio-if a call is put out by cellular telephone the boat next door is unaware of the problem. |

### 3.4.4.2 Urgent Marine Information Broadcasts

| Question Number | Interviewee ID | Comment |
|---|---|---|
| II.2. | 66 | For official message traffic, data transmission capacity is needed. HF data communications takes too much maintenance and is labor intensive. Video transmissions would improve effectiveness. This is also needed for coordination of NMFS Individual Fishing Quota's System. |
| II.2. | 62 | For MSIS-vessel information and port operations. |
| II.2. | 65 | State and local rescue and response in particular (different VHF/FM frequencies), should be provided by the future system. |
| II.2. | 7 | NDS also is used for public affairs. |
| II.2. | 25 | Useful. Should be a joint venture with other government agencies, national and state. |

### 3.4.5 Discussion

#### 3.4.5.1 Timely Communications

Each of the three questions in this section were overwhelmingly judged critical. In the first question (n=70, 96%) respondents want the CG to have the ability to communicate directly with commercial and recreational vessels and commercial and other agency service providers. They judged it critical (n=73, 96%) to have CG communications with mariners and potential response resources in the area to notify of the situation and request assistance. One comment particularly pointed out that cellular telephones do not enhance this ability because they lack a broadcast mode. These questions based on different requirements in the PORD appear to be duplicated. The last question merely adds a timeliness requirement to the communications among the CG, its customers and partners (n=73, 94% critical).

One comment from an external survey seems to represent the economic issues of a system modernization. The user stated, “Any system must be inexpensive enough so that private boaters can participate if only at the most basic level, enjoying the benefits of large scale production of equipment. A similar requirement for local agencies is probably important, too, as it is unrealistic to expect the government to provide funding for every vehicle that could use the system. A system should be compatible with world wide standards so that foreign vessels can transit to and from the US. The system should be as simple as possible, even at the cost of some capability and not every location needs the robust characteristics of Alaska, for example, Don't shut out the recreational boater from the system! (by “pricing it above his means...).”

#### 3.4.5.2 Urgent Marine Information Broadcasts (UMIB)

Most of the responses to the question of UMIB were critical (n=75, 95%). A respondent felt this responsibility should be shared among CG, other agencies, and state and local governments. Other expansions of the UMIB service were suggested such as MSIS vessel information and port operations, and coordination of NMFS Individual Fishing Quota’s System. These appear to fall in the area of routine operations that would not require urgent communications. Another comment suggested the need for record message traffic over this system. Examples exist like Navigational Telex (NAVTEX) and Simplex Teletype Over Radio (SITOR) in today’s merchant fleet. However, some of the boating public may avoid these systems due to their high cost.

### 3.4.6 Conclusion

#### 3.4.6.1 Timely Communications

The clear consensus among the three questions for this issue was that the CG needs a system to communicate with the public and other service providers. At least three different portions of the PORD address this and could be consolidated for simplicity. Of greatest concern is the inability of the current system to provide compatibility across the gamut of potential users. Other government agencies including state and local governments often do not have common working frequencies and sometimes not even the same radio bands (maritime bands vs. public service bands). It is critical that the PORD address this compatibility issue, while keeping in mind the economical issues of equipment cost for government and the private user.

#### 3.4.6.2 Urgent Marine Information Broadcasts (UMIB)

There is a clear indication from the surveys that the UMIB function is a critical issue and should be continued in a new system. The nature of UMIB, by definition, is urgent information. This philosophy should be maintained in any future expansions of the UMIB function (e.g., similar to NAVTEX or SITOR).

## 3.5 Position Location/Caller Identification

### 3.5.1 Issues

The two pertinent issues addressed within this section involve the identification and position/location, of calling vessels using NDS. This section addresses the issues from the perspective of all CG, public and private organizations. Job descriptions of the analyzed group were: operations, communications watchstanders, service providers and policy makers.

#### 3.5.1.1 Caller ID

In the prosecution of search and rescue cases, identity of the calling unit is extremely important. A profile of the distressed unit and persons involved is critical. Perhaps equally critical is the determination of a valid distress situation.

#### 3.5.1.2 Position Location

The most effective and efficient search and rescue case minimizes the search phase so the rescue can be accomplished as soon as possible. Consequently, an accurate initial position is the goal in any SAR situation. Additionally, position location will help determine if the case is a valid distress situation.

### 3.5.2 Questions

#### 3.5.2.1 Caller ID

| Question Number | Requirement | Question Text |
|---|---|---|
| II.24.c. | IV.A.4 | Assist in verifying the identity of any calling party. |

#### 3.5.2.2 Position Location

| Question Number | Requirement | Question Text |
|---|---|---|
| II.24.a. | IV.B.7<br>IV.D.2 | Determine position of a caller within (0.1 nm or 2.0 nm) throughout the coverage area. |
| II.24.b. | IV.A.3<br>IV.D.2<br>III.D.2 | Passively determine relative positions of calling units. |
| II.24.d. | IV.D.2 | Allow the incorporation of Line of Bearing (LOB) information from other fixed and mobile resources. |
| II.24.e. | IV.D.2 | Provide at least one line of bearing (LOB) on brief or intermittent signals. |
| II.26. | IV.D.3 | Provide homing capabilities on line-of-sight international and national distress calling and homing frequencies for mobile platforms. |

### 3.5.3 Grouping And Display Of Data

#### 3.5.3.1 Caller ID

| Question Number | Number of Responses | Number of Critical | | Number of Useful | | Number of Not Essential | |
|---|---|---|---|---|---|---|---|
| | | Number | Percent | Number | Percent | Number | Percent |
| II.24.c. | 76 | 41 | 54% | 34 | 45% | 1 | 1% |

#### 3.5.3.2 Position Location

| Question Number | Number of Responses | Number of Critical | | Number of Useful | | Number of Not Essential | |
|---|---|---|---|---|---|---|---|
| | | Number | Percent | Number | Percent | Number | Percent |
| II.24.a. | 76 | 70 | 92% | 6 | 8% | | |
| II.24.b. | 76 | 53 | 70% | 22 | 29% | 1 | 1% |
| II.24.d. | 75 | 50 | 67% | 25 | 33% | | |
| II.24.e. | 59 | 41 | 69% | 16 | 27% | 2 | 3% |
| II.26. | 72 | 59 | 82% | 11 | 15% | 2 | 3% |

### 3.5.4 Comments

#### 3.5.4.1 Caller ID

| Question Number | Interviewee ID | Comment |
|---|---|---|
| II.24.c. | 7 | Caller ID for NDS communications could keep some people from making a distress call. |

#### 3.5.4.2 Position Location

| Question Number | Interviewee ID | Comment Text |
|---|---|---|
| II.24.a. | 209 | In heavy seas the requirement for determining location should be less than one mile. |
| II.24.a. | 30 | DF and position reporting from the signal alone are critical features of the future system. |
| II.24.a. | 133 | Small search objects (person in water) require tighter positioning accuracy. |
| II.24.a. | 132 | Small search objects (person in water) require more accurate positioning. |
| II.24.a. | 87 | Cold water is a problem that demands more accuracy in a potentially dangerous situation (hypothermia). |
| II.24.a. | 89 | If you can get within two miles of them you can find them. |
| II.24.a. | 98 | 2 NM is too large an area for a patrol boat to perform SAR effectively. |
| II.24.a. | 92 | For hoax identification we need to know where these calls are coming from. |
| II.24.a. | 42 | When people are in the water you have to have as accurate a position as possible. Position should be determine within 0.1 nm if feasible-or as close as possible. |
| II.24.a. | 112 | A 1/2 mile would be fine - the next selection of 2 nm is too much - a 1/2 to 1 nm would be good. |
| II.24.a. | 37 | Position should be determine within 0.1 nm if feasible-or as close as possible. |
| II.24.a. | 91 | Not applicable for Upper Mississippi River, all others .1 mile. |

| Question Number | Interviewee ID | Comment Text |
|---|---|---|
| II.24.a. | 39 | The objective is to eliminate the search from SAR. |
| II.24.a. | 17 | The system should determine the position of the caller somewhere in between 0.1 nm and 2 nm. |
| II.24.a. | 61 | One-half mile would be adequate for the determination of the position of a caller, but 2 nm is too great, especially in limited visibility. |
| II.24.a. | 100 | 2 NM is too much area to cover during search efforts. 0.1 NM is unrealistically tight. 1 NM is appropriate. |
| II.24.a. | 16 | The position of a caller should be determined within 0.1 nm. If the caller is a sinker, you want to know exactly where they are. |
| II.24.a. | 99 | 2 NM is too large an area for a patrol boat to perform SAR effectively. |
| II.24.a. | 97 | 2 NM would be adequate, but cost has to be considered and will be a factor in determining whether 2 NM is acceptable or .1 NM, etc. |
| II.24.a. | 34 | In some situations, 2 miles may be good enough to determine position of caller, 0.1 mile accuracy is preferred.. |
| II.24.a. | 122 | Determining the caller depends on the area of concern and the situation. |
| II.24.a. | 60 | To determine position of caller, 2 miles would be acceptable, although .1 would be best. |
| II.24.a. | 85 | Determine position of a caller within 2 nm is adequate 0.1 nm would be great. |
| II.24.a. | 28 | Determine position of a caller within 0.1 nm. From a small boat operations position it would give a better chance of locating the caller. |
| II.24.a. | 14 | Vessel identification and position determined from the signal alone is the single most critical requirement for the future NDS. |
| II.24.a. | 56 | The Air Force has a vest-carried emergency locator called the Hook 112 that could satisfy position reporting requirements. |
| II.24.a. | 55 | The ability to fix the position of a calling unit by signal alone is the single most critical requirement of the future system. |
| II.24.a. | 12 | Automatic position determination based on the signal alone is the single most critical requirement for the future NDS. |
| II.24.a. | 35 | Accurate position information is especially needed in Alaska because of weather conditions and other special circumstances. |
| II.24.b. | 209 | The determination of positions and identity of callers are needed for hoax and false mayday calls. |
| II.24.b. | 97 | To be able to passively determine relative positions of calling units would help the anti-hoax efforts. |
| II.24.b. | 117 | At the group level they need to know the latitude and longitude (actual position), not the relative position. |
| II.24.b. | 19 | Useful to passively determine relative positions of calling units, especially for hoax calls. |
| II.24.b. | 27 | Critical to have the capability to passively determine relative positions of calling units in search and rescue. |
| II.24.b. | 123 | "Folks would not like it." For SAR and hoaxes, it is critical. This is non-essential for other stuff. |
| II.24.b. | 34 | Assume no position. |
| II.24.b. | 60 | LOB is critical if no position is available. |
| II.24.b. | 122 | Assuring no active system, LOB is least desirable position locator. This is critical if nothing else is available. |
| II.24.d. | 56 | LOB is important only if no position information is available. |
| II.24.d. | 27 | Critical to allow the incorporation of Line of Bearing (LOB) information from other fixed and mobile resources or actual position . The position should be interfaced with GPS. |
| II.24.d. | 117 | Direction finding equipment is not a practical way to solve the problem. Use imbedded GPS. |

| Question Number | Interviewee ID | Comment Text |
|---|---|---|
| II.24.e. | 97 | The CG needs to be able to obtain accurate positions by whatever means are available. |
| II.24.e. | 10 | The future NDS should provide at least one LOB from each High Site that receives the signal. The DF and position capability is the most critical requirement for the future NDS. |
| II.26. | 60 | This should be selective by the operator. |
| II.26. | 122 | Assuming no better method is available. |

### 3.5.5 Discussion

#### 3.5.5.1 Caller ID

Over half of the respondents (n=41, 54%) agreed that the modernized system must have the capability to assist in verifying the identity of any calling party. Almost half saw this as a useful feature (n=34, 45%). Caller-ID was recognized as the primary tool for preventing hoax distress calls. Provided that the receiving party can identify the calling unit, enforcement for hoax cases would be more effective. One comment suggested that caller ID might discourage use of NDS. However, that reluctance would most likely be overcome in a true distress.

#### 3.5.5.2 Position Location

| Question Number | PORD Reference | Question Choices Number of Responses and Percentage | | |
|---|---|---|---|---|
| II.24.a | IV B 7 | Determine position of a caller within 2 nm or 0.1 nm throughout the calling area. | | |
| **Response Category** | | **2 nm** | **0.1 nm** | **No Response** |
| **Number Responses** | | 45 | 89 | 15 |
| **Percentage** | | 30% | 60% | 10% |

Respondents were asked whether the future system should be able to determine the position of a caller within 2 nm or 0.1 nm, throughout a designated coverage area. Responses to this question (n=149) were received from all but fifteen study participants (n=15, 10%). A preponderance of respondents chose 0.1 nm (n=89, 60%) as the better requirement while slightly less than a third (n=45, 30%) opted for the 2 nm choice. A considerable number of comments were received in response to this particular issue. Respondent rationale for the more accurate position were based largely on size of target, weather, sea temperature, or sea condition. Many comments suggested accuracy between 0.1 mile and 2 miles depending on the variables discussed in the previous sentence. Overall, the comments received indicated that position accuracy is an issue of considerable importance. A predominant comment was “the closer the better.”

Almost three-fourths of the respondents (n=53, 70%) said that the ability to passively determine relative positions of calling units was critical for the success of the modernized system. About thirty percent (n=22, 29%) saw this ability as useful. A third of the comments centered on the problem of hoax calls. Respondents who were concerned about hoax calls felt that the ability to passively determine caller position would effectively stem this problem. Two comments considered LOB to be the least desirable method for position location. A direct read or embedded position within the signal or automating crossing of LOBs were preferable to manual correlation of lines of bearing. However, LOB was considered to be a critical capability in instances where other locators were unavailable. Overall, the ability to passively determine position was seen as extremely helpful to both SAR and hoax reduction.

More than two thirds (n=75, 67%) of the respondents agreed that a critical feature of the

modernized system would be to allow the incorporation of Line of Bearing (LOB) information from both fixed and mobile resources. The remaining third (n=25, 33%) thought incorporation of LOB would be a useful NDS feature.

For the question regarding at least one line of bearing (LOB) on brief or intermittent signals, nearly seventy percent (n=41, 69%) regarded this proposed feature as critical. Twenty seven percent (n=16, 27%) thought that the feature would be useful. All commenters agreed that having at least one LOB could be critical in determining caller position. One respondent stated that the CG needs to have the ability to determine accurate positions through whatever means available. Still another respondent saw direction finding and position location as the most critical requirements for the modernized system.

In terms of providing homing capabilities for line-of-sight international and national distress calling and homing frequencies for mobile platforms, over eighty percent (n=59, 82%) of the respondents saw this capability as being critical to the new system. Fifteen percent (n=11, 15%) classified the proposed feature as useful.

### 3.5.6 Conclusion

#### 3.5.6.1 Caller ID

A majority of the respondents thought that the modernized system should have the ability to assist in verifying the identity of any calling party. Major concerns centered around reducing the number of hoax calls and enabling the accurate collection of unit data. The respondent data and supporting comments identified caller identification as a useful function for the modernized NDS.

#### 3.5.6.2 Position Location

Overall, the respondent data and associated comments underscored the importance of the Position Location issue. Each question regarding this issue was rated as critical. Consequently, it is clear that position location is a capability that should be included in the PORD. At issue is the accuracy the system should provide in position location. Of the two choices, the nearest 0.1 nm was selected more often than the nearest 2 nm. Several comments showed that other choices between those two numbers would be acceptable. Operators want the most accurate and precise location information that the system can provide affordably.

At the very least, the system should allow the incorporation of Line of Bearing (LOB) data from other fixed and mobile resources and be able to provide at least one line of bearing (LOB) on brief or intermittent signals. For mobile platforms, the system must provide homing capabilities on both line-of-sight international and national distress calling and homing frequencies.

## 3.6 Secure Communications

### 3.6.1 Issues

Secure communications entails the protection of “classified” and “sensitive but unclassified” (SBU) information and is a topic of concern to the CG, the public, and the private sector. For all three of these groups, the data and comments regarding secure communications that were collected from cognizant personnel (communications watchstanders, service providers, operations policy makers, technicians, designer/engineers, and support personnel) have been analyzed and are presented and discussed below.

#### 3.6.1.1 Protection Of Classified Data

Over time, the NDS use by the CG broadened to other missions in addition to search and rescue (SAR). Law enforcement and defense operations are the most significant added mission areas. These missions demand encrypted systems to handle classified information.

#### 3.6.1.2 Protection Of Sensitive But Unclassified Data (SBU)

Within law enforcement, another level of data sensitivity has been developed. SBU information is not as protected as classified, but requires encryption none the less. SBU is used mostly in law enforcement operations but other operations may benefit if there is a privacy requirement.

#### 3.6.1.3 Reception Of Clear And Classified Calls When In Opposite Mode

When working in all modes, an occasional problem arises concerning the ability to maintain a distress guard while working on an encrypted frequency. As a result, search and rescue, receives the highest priority among CG units. This results in a higher priority for distress frequency listening over other activities.

### 3.6.2 Questions

#### 3.6.2.1 Protection Of Classified Data

| Question Number | Requirement | Question Text |
|---|---|---|
| II.37. | IV.B.5 | Allow protection of classified information. |
| II.38. | IV.B.5 | Provide interfaces for the connection of encryption equipment, and support the transmission of encrypted information using standard encryption formats. |

#### 3.6.2.2 Protection Of Sensitive But Unclassified Data

| Question Number | Requirement | Question Text |
|---|---|---|
| II.40. | IV.B.4<br>IV.A.6. | Provide protection for the transmission of sensitive but unclassified (SBU) information using standard encryption techniques throughout coverage area. |

#### 3.6.2.3 Receive Clear And Classified Calls When In Opposite Mode

| Question Number | Requirement | Question Text |
|---|---|---|
| II.39. | IV.B.6 | Detect and receive clear and encrypted transmissions despite mode (clear or encrypted) of operation. |

### 3.6.3 Grouping And Display Of Data

#### 3.6.3.1 Protection Of Classified Data

| Question Number | Number of Responses | Number of Critical | | Number of Useful | | Number of Not Essential | |
|---|---|---|---|---|---|---|---|
| | | Number | Percent | Number | Percent | Number | Percent |
| II.37. | 76 | 61 | 80% | 11 | 14% | 4 | 5% |
| II.38. | 76 | 59 | 78% | 14 | 18% | 3 | 4% |

#### 3.6.3.2 Protection Of Sensitive But Unclassified Data

| Question Number | Number of Responses | Number of Critical | | Number of Useful | | Number of Not Essential | |
|---|---|---|---|---|---|---|---|
| | | Number | Percent | Number | Percent | Number | Percent |
| II.40. | 75 | 60 | 80% | 13 | 17% | 2 | 3% |

#### 3.6.3.3 Receive Clear And Classified Calls When In Opposite Mode

| Question Number | Number of Responses | Number of Critical | | Number of Useful | | Number of Not Essential | |
|---|---|---|---|---|---|---|---|
| | | Number | Percent | Number | Percent | Number | Percent |
| II.39. | 74 | 58 | 78% | 14 | 19% | 2 | 3% |

### 3.6.4 Comments

#### 3.6.4.1 Protection Of Classified Data

| Question Number | Interviewee ID | Comment |
|---|---|---|
| II.37. | 46 | Requirement for classified coverage varies according to unit. |
| II.37. | 122 | Secure communications is operations, not distress. May not be a part of NDS. |
| II.37. | 19 | Useful to allow protection of classified information if the information is going to be transmitted but most communications are not classified. |
| II.37. | 35 | DES is required on all High Sites. |
| II.37. | 7 | High Sites must have secure capability throughout AOR. Complete DES coverage is second only to complete clear coverage (no gaps) as the most critical requirement for the future NDS. |
| II.38. | 33 | NDS is apt, when dealing with classified. You must err on the side of caution. |
| II.38. | 119 | Cannot economically extend DES capability to High Sites. |
| II.38. | 56 | Greater range is required for secure communications. |

#### 3.6.4.2 Protection Of Sensitive But Unclassified Data

There were no comments in the responses to these questions from the group of interviews selected for analysis.

#### 3.6.4.3 Receive Clear And Classified Calls When In Opposite Mode

| Question Number | Interviewee ID | Comment |
|---|---|---|
| II.39. | 36 | The reception of unencrypted transmissions should be identified as such while the system is in the encrypted mode. |
| II.39. | 16 | The future system should receive clear and encrypted transmissions despite mode but there should be an indication to notify the operator that the received transmission is in the clear. |
| II.39. | 15 | The reception of unencrypted transmissions should be identified as such while the system is in the encrypted mode. |
| II.39. | 12 | Automatic reception of clear and encrypted communications will require an indicator to show which mode of communications is active. |
| II.39. | 7 | The future NDS should provide a visual indicator revealing clear or secure transmissions. |

### 3.6.5 Discussion

#### 3.6.5.1 Protection Of Classified Data

Eighty percent (n=61, 80%) of those responding saw the protection of classified data as a critical issue. Only four respondents saw the protection issue as not essential to the success of the modernized system. In a related question, nearly 80% (n=59, 78%) of those responding said that it was critical for the modernized system to provide interfaces for the connection of encryption equipment and that the system should be designed to support the transmission of encrypted information using standard encryption formats. Several useful comments were received regarding the issue of classified data protection. Among those responses was an observation that classified coverage requirements vary across units. One respondent noted that while protection was useful for some transmitted information, most communications are not classified. In a dissenting view, another respondent stated that the need for secure communications was essentially an operations issue and not a distress related one and as such, should not be considered as a necessary feature for NDS. All of these comments reflect the policy issue that exists within the CG regarding the use of NDS for anything that is not distress related.

#### 3.6.5.2 Protection Of Sensitive But Unclassified Data

In terms of protecting sensitive but unclassified data, eighty percent (n=60, 80%) of those responding expressed a critical need for the modernized system to provide protection for the transmission of sensitive but unclassified (SBU) information using standard encryption techniques. Other comments received were concerned with Data Encryption Standards (DES). DES was seen as a necessity to NDS modernization since High Sites are tasked with providing protected transmissions throughout the AOR. Overall, complete DES coverage for the modernized system was thought to be second only in importance to the need for complete and clear coverage. However, one respondent did not think that DES capability for High Sites was economically feasible. An external user of NDS had the following comment, “Voice encryption needs to be addressed in some forum.” Another stated, “ The system should be interoperable between all federal state and local law enforcement agencies. The voice and data transmissions should be encrypted.”

#### 3.6.5.3 Receive Clear And Classified Calls When In Opposite Mode

Almost eighty percent (n=58, 78%) of the analysis group who responded to this issue agreed that the ability to receive clear and encrypted calls, when in opposite mode, was critical to the success of the modernized system. Only two respondents saw this aspect of proposed system capability as a nonessential feature. Several respondent comments were received regarding this question. Overall, the respondents agreed that the modernized system should receive clear and encrypted transmissions regardless of transmission mode. These respondents identified a need for some type of system indication to notify an operator that received transmissions are in the clear.

### 3.6.6 Conclusion

#### 3.6.6.1 Protection Of Classified Data

The respondent data and comments indicated that the protection of classified data should be of critical concern in the design of the modernized NDS. In addition, the respondents agreed that the successfully modernized system should include interfaces for the connection of encryption equipment and use standard encryption formats to support encrypted transmissions. The modernized system must be designed with interfaces that can readily accommodate encryption equipment and be able to support the transmission of encrypted information using standard encryption formats. The protection of classified data over the NDS is contingent upon the CG

and possibly higher policy decisions to use NDS for missions other than maritime distress purposes. The use of NDS for other than maritime distress has been commonplace.

#### 3.6.6.2 Protection Of Sensitive But Unclassified Data

The modernized system must provide reliable protection for the transmission of SBU information using standard encryption techniques throughout designated coverage areas. Overall, the respondent data and associated comments underscored the importance of ensuring that the modernized system must provide protection for the transmission of SBU information using standard encryption techniques

#### 3.6.6.3 Receive Clear And Classified Calls When In Opposite Mode

It is critical that the system have the ability to detect and receive clear and encrypted transmissions regardless of operational mode (clear or encrypted). As with the other two issues considered in this section, the respondent data and allied comments suggest that a critical aspect of the modernized system should include an ability to receive clear and encrypted calls when operating in opposite mode.

## 3.7 Areas of Coverage

### 3.7.1 Issues

The issues of future NDS coverage, and the distance offshore that the coverage should extend, are complex. The future system is to provide coverage of sea area A1 of the Global Maritime Distress and Safety System (GMDSS). There are 65 documented gaps in the coverage provided by the existing NDS. For this analysis it was assumed that those personnel currently involved in operations in an area have the best knowledge of where coverage is needed. (This does significantly reduce the sample size for some of the categories.) It was also assumed that the designers/engineers have significant insight into current and future problems concerning coverage. Therefore, the responses from these groups have been selected for analysis. To better define the coverage of the diverse areas supported by NDS, this issue is being divided into five regions:

- ∑ Continental U.S. coastal areas where NDS should be available
- ∑ Inland areas where NDS should be available
- ∑ Alaskan areas where NDS should be available
- ∑ Areas of Hawaii and Guam where NDS should be available
- ∑ Puerto Rican areas where NDS should be available

The existing NDS generally provides coverage up to 20 nm off shore. The future system is to provide coverage of sea area A1. In 47 CFR 80, Subpart W-Global Maritime Distress and Safety System (GMDSS) of the Federal Communications Commission Regulations, sea area A1 is defined as:

> *An area within the radiotelephone coverage of at least one VHF coast station in which continuous DSC alerting is available as defined by the International Maritime Organization.*

### 3.7.2 Questions

#### 3.7.2.1 Continental U.S. Coastal Areas Where NDS Should Be Available

| Question Number | PORD Reference | Question Text |
|---|---|---|

| Question Number | PORD Reference | Question Text |
|---|---|---|
| B.1.a. | III,A<br>IV,B,1 | All coastal regions serviced by the existing NDS. |
| B.1.b. | III,A<br>IV,B,1 | All coastal regions where the CG has jurisdiction. |
| B.1.c. | III,A<br>IV,B,1 | All coastal regions of the Continental U.S. |

### 3.7.2.2 Inland Areas Where NDS Should Be Available

| Question Number | PORD Reference | Question Text |
|---|---|---|
| B.1.d. | III,A<br>IV,B,1 | All inland regions of the Continental U.S. |

### 3.7.2.3 Alaskan Areas Where NDS Should Be Available

| Question Number | PORD Reference | Question Text |
|---|---|---|
| B.1.e. | III,A<br>IV,B,1 | All coastal regions of Alaska. |
| B.1.f. | III,A<br>IV,B,1 | All inland regions of Alaska. |

### 3.7.2.4 Areas Of Hawaii And Guam Where NDS Should Be Available

| Question Number | PORD Reference | Question Text |
|---|---|---|
| B.1.g. | III,A<br>IV,B,1 | All coastal regions surrounding Hawaii. |
| B.1.i. | III,A<br>IV,B,1 | All coastal regions surrounding Guam. |

### 3.7.2.5 Caribbean Areas Where NDS Should Be Available

| Question Number | PORD Reference | Question Text |
|---|---|---|
| B.1.h. | III,A<br>IV,B,1 | All coastal regions surrounding Puerto Rico and U.S. Virgin Islands. |

### 3.7.2.6 Extent Of Off-Shore Coverage Questions

| Question Number | PORD Reference | Question Text |
|---|---|---|
| B.3. | IV,B,2 | The future system must provide coverage to: |
| II.B.3.a. | IV,B,2 | 10 nm offshore |
| II.B.3.b. | IV,B,2 | 20 nm offshore |
| II.B.3.c. | IV,B,2 | 30 nm offshore |
| II.B.3.d. | IV,B,2 | 40 nm offshore |
| II.B.3.e. | IV,B,2 | 50 nm offshore |
| II.B.3.f. | IV,B,2 | Other |

### 3.7.3 Grouping And Display Of Data

#### 3.7.3.1 Continental U.S. Coastal Areas Where NDS Should Be Available

| Question Number | Number of Responses | Number of Yes | | Number of No | | Number of Partial | |
|---|---|---|---|---|---|---|---|
| | | Number | Percent | Number | Percent | Number | Percent |
| B.1.a. | 45 | 45 | 100% | | | | |
| B.1.b. | 40 | 38 | 95% | | | 2 | 5% |
| B.1.c. | 39 | 38 | 97% | | | 1 | 3% |

#### 3.7.3.2 Inland Areas Where NDS Should Be Available

| Question Number | Number of Responses | Number of Yes | | Number of No | | Number of Partial | |
|---|---|---|---|---|---|---|---|
| | | Number | Percent | Number | Percent | Number | Percent |
| B.1.d. | 11 | 8 | 73% | 2 | 18% | 1 | 9% |

#### 3.7.3.3 Alaskan Areas Where NDS Should Be Available

| Question Number | Number of Responses | Number of Yes | | Number of No | | Number of Partial | |
|---|---|---|---|---|---|---|---|
| | | Number | Percent | Number | Percent | Number | Percent |
| B.1.e. | 41 | 36 | 88% | 2 | 5% | 3 | 7% |
| B.1.f. | 42 | 23 | 55% | 11 | 26% | 8 | 19% |

#### 3.7.3.4 Areas Of Hawaii And Guam Where NDS Should Be Available

| Question Number | Number of Responses | Number of Yes | | Number of No | | Number of Partial | |
|---|---|---|---|---|---|---|---|
| | | Number | Percent | Number | Percent | Number | Percent |
| B.1.g.&j. | 43 | 39 | 91% | 3 | 3% | 1 | 2% |

#### 3.7.3.5 Caribbean Areas Where NDS Should Be Available

| Question Number | Number of Responses | Number of Yes | | Number of No | | Number of Partial | |
|---|---|---|---|---|---|---|---|
| | | Number | Percent | Number | Percent | Number | Percent |
| B.1.h. | 73 | 71 | 97% | 2 | 3% | | |

### 3.7.3.6 Extent Of Off-Shore Coverage Questions

| Question Number | PORD Reference | Question Choices Number of Responses and Percentage | | |
|---|---|---|---|---|
| B.3. | IV,B,2 | The future system must provide coverage to: | | |
| II.B.3.a. | IV,B,2 | 10 nm offshore | 3 | 2% |
| II.B.3.b. | IV,B,2 | 20 nm offshore | 18 | 12% |
| II.B.3.c. | IV,B,2 | 30 nm offshore | 14 | 9.5% |
| II.B.3.d. | IV,B,2 | 40 nm offshore | 5 | 3.5% |
| II.B.3.e. | IV,B,2 | 50 nm offshore | 56 | 38% |
| II.B.3.f. | IV,B,2 | Other | 35 | 23% |
| | | No Response | 18 | 12% |

## 3.7.4 Comments

### 3.7.4.1 Continental U.S. Coastal Areas Where NDS Should Be Available

| Question Number | Interviewee ID | Comment |
|---|---|---|
| B.1. | 45 | Looking for the most effective system for VHF for distress calls. |
| B.1.a. | 58 | Complete NDS communications coverage (no gaps) is the most critical requirement for the future system. |
| B.1.a. | 123 | At a minimum. |
| B.1.b. | 56 | Coverage is needed only around population centers or where maritime activity warrants. |
| B.1.b. | 55 | Coastal coverage should be balanced with other communications capabilities such as HF. |
| B.1.b. | 34 | Vary by local conditions. |
| B.1.b. | 40 | The future system coverage should include all coastal regions where the CG has jurisdiction. If something is going on there we need to be able to communicate. |
| B.1.b. | 97 | If there is an operational demand. |
| B.1.b. | 119 | Based on cost effectiveness. |
| B.1.c. | 97 | The CG already has jurisdiction in these areas. |
| B.1.c. | 34 | Vary by local conditions. |
| B.1.c. | 56 | Coverage is needed only around population centers or where maritime activity warrants. |

### 3.7.4.2 Inland U.S. Areas Where NDS Should Be Available

| Question Number | Interviewee ID | Comment |
|---|---|---|
| B.1.d. | 201 | Federal navigable waterways. |
| B.1.d. | 250 | NDS should cover major traffic areas in the, Mississippi, Ohio, and Missouri River systems and intracoastal waterways. |
| B.1.d. | 206 | Great Lakes and Eastern Rivers. |
| B.1.d. | 207 | Do not install NDS near a body of water where a vessel is always less than two or five nm from shore. |
| B.1.d. | 221 | Those inland waterways having significant maritime activity should be |

| Question Number | Interviewee ID | Comment |
|---|---|---|
| | | covered. |
| B.1.d. | 203 | Great Lakes and navigable portions of the major rivers. |
| B.1.d. | 234 | NDS should control navigable river systems. Partner with fish and game/wildlife or other agency that regulates inland areas. |
| B.1.d. | 212 | Just the major inland waterways. |
| B.1.d. | 231 | Only interstate inland waterways should be provided NDS coverage. |
| B.1.d. | 31 | Inland coverage of continental US should be for western rivers, Great Lakes, and major areas where we have stations. |
| B.1.d. | 85 | The future system should include areas on a case by case basis. |
| B.1.d. | 21 | The future system coverage should include everything usable by CG vessel (any CG resource a unit may have.) |
| B.1.d. | 26 | The future system coverage should include inland regions of the Continental U.S. where there are navigable waters. |
| B.1.d. | 112 | The coverage of the inland regions of the Continental US does not have to include those areas where there is concurrent jurisdiction. |
| B.1.d. | 108 | The coverage of inland regions of the Continental US should be only navigable inland waterways where the CG has jurisdiction. |
| B.1.d. | 11 | The future system coverage should include only major rivers, i.e., Mississippi, Missouri, and rivers utilized by large ships and fishing fleets. |
| B.1.d. | 6 | All inland regions of the Continental U.S. with the exception of the areas for which the Air Force has SAR responsibility. The CG should cover navigable waters only. This includes the Great Lakes, and certain other inland lakes and rivers. |
| B.1.d. | 44 | Not where there is no presence of rescue resources. |
| B.1.d. | 123 | Navigate waters as defined in CFR. |
| B.1.d. | 30 | Over navigable waters. |
| B.1.d. | 120 | Navigable waters of the US. |
| B.1.d. | 58 | Inland continental US NDS coverage should be limited to local areas where such coverage is justified. |
| B.1.d. | 60 | Where CG has resources. |
| B.1.d. | 56 | Coverage is needed only around population centers or where maritime activity warrants. |
| B.1.d. | 20 | The future coverage should include federal inland waterways. |
| B.1.d. | 22 | The future system coverage should include all inland waters of the Continental US that are navigable by major vessels. |
| B.1.d. | 95 | Inland regions of the Continental US should be covered only if there are navigable waterways in those areas. |
| B.1.d. | 96 | Inland maritime regions only. |
| B.1.d. | 97 | Inland regions of the Continental US should be covered if there are waters which have federal requirements or laws. |
| B.1.d. | 107 | For navigable waters only. |

| | | |
|---|---|---|
| B.1.d. | 97 | Only where there are federal requirements. |
| B.1.d. | 61 | There are reservations about coverage of all navigable waters where the CG does not have a significant presence. The communications site should be justified by CG presence. |

### 3.7.4.3 Alaskan Areas That NDS Should Be Available

| Question Number | Interviewee ID | Comment |
|---|---|---|
| B.1.e. | 221 | Those coastal regions of Alaska having significant maritime activity should be covered. |
| B.1.e. | 207 | Based on usage. Ultra low usage areas may be omitted. |
| B.1.e. | 250 | NDS should cover targeted Alaskan areas of high traffic with backup systems in other locations. |
| B.1.e. | 16 | The future system coverage should include the southern coastal areas of Alaska, not the North shore. |
| B.1.e. | 15 | Future system coverage should include coastal regions of Alaska except for the north shore. |
| B.1.e. | 114 | The coverage of coastal regions of Alaska may be determined by defining where coverage is reasonable considering usage. A cost benefit analysis should be accomplished. |
| B.1.e. | 31 | Coastal regions of Alaska should include only the areas where there is known marine activities. |
| B.1.e. | 27 | The future system coverage should partly include coastal regions of Alaska where the US vessels are located and may need assistance and if resources are available. |
| B.1.e. | 111 | The coastal and inland regions of Alaska coverage should have coverage provided on a case-by-case basis. |
| B.1.e. | 117 | Coverage of the coastal regions of Alaska should be determined by cost effectiveness. |
| B.1.e. | 122 | Where CG is willing to respond and take some action. |
| B.1.e. | 56 | Coverage is needed only around population centers or where maritime activity warrants. |
| B.1.f. | 207 | Do not install NDS near a body of water where a vessel is always less than ten nm from shore. |
| B.1.f. | 221 | Those Alaskan inland waterways having significant maritime activity should be covered. |
| B.1.f. | 234 | NDS should control navigable river systems. Partner with fish and game/wildlife or other agency that regulates inland areas. |
| B.1.f. | 16 | The future system coverage should include only those inland regions of Alaska close to the southern coastal areas. |
| B.1.f. | 6 | The future system should cover the southeast Alaska (inside passage) region, the Gulf of Alaska and the Bering Sea, but the CG should not be responsible for any of the inland area west of Juneau. |
| B.1.f. | 85 | The future system should include areas on a case by case basis. |
| B.1.f. | 26 | The future system coverage should include inland regions of Alaska where there are navigable waters. |
| B.1.f. | 58 | Inland Alaska NDS coverage should be limited to local areas where such coverage is justified. |
| B.1.f. | 122 | Where CG is willing and capable of taking some action. |
| B.1.f. | 121 | In all navigation water where there is a threat. |
| B.1.f. | 120 | Inland SAR. This includes support with Air Force, SAR units, and pre-stage AF Units. |
| B.1.f. | 60 | Where CG has resources. |

| Question Number | Interviewee ID | Comment |
|---|---|---|
| B.1.f. | 30 | Where CG has jurisdiction. |
| B.1.f. | 56 | Coverage is needed only around selected areas. |
| B.1.f. | 123 | Navigate waters. |
| B.1.f. | 22 | The future system coverage should include all inland regions of Alaska that are navigable by major vessels. |
| B.1.f. | 97 | Inland regions of the Alaska should be covered if there are waters which have federal requirements or laws. |
| B.1.f. | 96 | Inland maritime regions only. |
| B.1.f. | 95 | Inland regions of Alaska should be covered only if there are navigable waterways in those areas. |
| B.1.f. | 107 | For navigable waters only. |

#### 3.7.4.4 Areas Of Hawaii And Guam Where NDS Should Be Available

| Question Number | Interviewee ID | Comment |
|---|---|---|
| B.1.g. | 110 | The seven major islands of Hawaii only. |

#### 3.7.4.5 Caribbean Areas Where NDS Should Be Available

There were no comments in the responses to these questions from the group of interviews selected for analysis.

#### 3.7.4.6 Extent Of Off-Shore Coverage Questions

| Question Number | Interviewee ID | Comment |
|---|---|---|
| B.3. | 122 | The future system must provide coverage to 200 mi. |
| B.3. | 119 | Coverage must be provided for variable distances, depending on cost effectiveness of coverage. |
| B.3. | 33 | It should provide coverage to 100 miles. |
| B.3. | 54 | Coverage should be as far off shore as technically possible. |
| B.3. | 113 | Assuming the systems is VHF-FM - off-shore coverage should be the limit of most response assets. |
| B.3. | 31 | From a distress view point, 20 nm is fine. |
| B.3. | 36 | The future system should provide off shore coverage as far as VHF-FM can extend. |
| B.3. | 32 | 20 nm minimum and nice if to 50 nm |
| B.3. | 15 | The future system should provide off shore coverage as far out as pleasure boaters go. |
| B.3. | 61 | Most SAR cases are within 20 NM off shore. |
| B.3. | 115 | As far as we go now and further. |
| B.3. | 38 | Coverage to 50 nm off shore would provide communications with merchant vessels before getting close to U.S. coast. Now they must wait until within VHF range or otherwise use INMARSAT. |
| B.3. | 17 | Future system coverage should be to 40 nm off shore because boats are currently at the edge of coverage at 20 nm but they are going out to 30 and 40 nm. |
| B.3. | 26 | The future system must provide coverage to 60 nm - VTS orientation. The farther the coverage, the better. |
| B.3. | 92 | Anything more than 50 miles is outside the boaters range of movement. |
| B.3. | 53 | Can one system cover the world? |
| B.3. | 43 | 30 nm is the limit of the mobile resources available from the coast. After that distance HF should be used. |

| Question Number | Interviewee ID | Comment |
|---|---|---|
| B.3. | 132 | Most of the vessel activity is within fifty miles of the coast line. One system should be able to cover that zone, while only one other radio system should be required to cover the deep water areas. |
| B.3. | 133 | Most of the vessel activity is within fifty miles of the coast line. |
| B.3. | 93 | The greater distance the better. From past experience the middle of Lake Ontario requires coverage. |
| B.3. | 45 | The majority of vessel traffic is within 20 nm of the coast. The 41 foot UTB should be limited to within ten miles of the coast. |
| B.3. | 48 | Recreational fisherman will go fifty miles off shore. |
| B.3. | 87 | Fisherman go out to 50 miles. |
| B.3. | 94 | The greater distance off-shore the better. |
| B.3. | 6 | The future system should provide off-shore coverage as far off shore as possible. |
| B.3. | 37 | The future system should provide off-shore coverage as far as off shore as technically feasible. |
| B.3. | 44 | Most vessels outside 20 nm are not recreational and will likely have HF. |
| B.3. | 89 | Based on the range of the resources. |
| B.3. | 40 | So much of what we do has users out more then 20 nm and its a big jump between VHF to HF system coverage. Fishermen go out further. |
| B.3. | 97 | The further out that the NDS extends the better... beyond 50 NM if necessary. |
| B.3. | 90 | Recreational vessels are the clients and they stay within 50 miles of the coast. |
| B.3. | 47 | Should be 12 miles off shore since that is the traditional jurisdiction. |
| B.3. | 27 | The future system must provide coverage to 100 nm. Especially for east coast and where the continental shelf goes out so far and Alaskan fishing vessels go out that far. Coverage should be as far as CG boats assets go. |
| B.3. | 23 | The future system should cover the commercial shipping lanes in the Great Lakes and any area where the CG does ice operations. |
| B.3. | 85 | The future system should provided coverage as far as technically reasonable. |
| B.3. | 28 | The future system must provide coverage to 200 nm and must include fishery areas. |
| B.3. | 24 | The future system should cover 30 nm. 30 nm is a distance within adequate response time. |
| B.3. | 126 | 50 nm. In certain areas 20 miles is adequate for most. This depends on operations. |
| B.3. | 123 | Coverage should be 100 nm offshore. HF is considered part of NDS. Kodiak handles most listening guard. |
| B.3. | 120 | 200 nm offshore. |
| B.3. | 30 | The future system must provide coverage to 200 miles (offshore). |
| B.3. | 121 | The threat is in coverage 25 nm offshore. Farther off when GPS is widely used. |
| B.3. | 98 | More than 50 NM. Should cover out to 100 NM. |
| B.3. | 11 | Twenty nautical miles is about the limit required to hear distress calls. |
| B.3. | 116 | Coverage should be 60 to 100 nm off shore because the boaters are going out further then the 10 t 15 nm that is used to be. |

### 3.7.5 Discussion

#### 3.7.5.1 Continental U.S. Coastal Areas Where NDS Should Be Available

Interviewees were asked three questions relating to coverage of the continental U.S. coastal areas. The questions considered the area currently covered by the existing NDS, the coastal regions where the CG has jurisdiction, and all coastal regions of the continental U.S. All respondents indicated that the new system should cover at least as much as the existing system. A vast majority of respondents believed that the new system should cover coastal regions where the CG has jurisdiction (n=38, 95%) and all coastal regions of the continental U.S. (n=38, 95%). Comments from the interviewees show they believe that complete coverage of the coastal regions of the U.S. may not be necessary. One comment indicates “Complete NDS communications coverage (no gaps) is the most critical requirement for the future system.” NDS is to provide coverage for sea area A1 which is defined as “An area within the radiotelephone coverage of at least one VHF coast station in which continuous DSC alerting is available as defined by the International Maritime Organization.” Recreational boaters and some small craft will have VHF-FM capability, but may not have MF/HF or DSC capability; therefore without complete NDS coverage they may not be able to communicate successfully with appropriate stations in a distress situation.

#### 3.7.5.2 Inland Areas Where NDS Should Be Available

In response to the question concerning coverage of all inland waterways of the continental U.S., a majority (n= 8, 73 %) of the interviewees believed that they should be covered by the future NDS. The small sample size in this area is due to the limited number of operational/service providers interviewed at the inland locations (Keokuk, IA and Sault St. Marie, MI). Their answers were qualified by comments limiting that coverage in several ways, such as:

- ∑ Federal navigable waterways,
- ∑ Major traffic areas in the Mississippi, Ohio, and Missouri River systems,
- ∑ Only where there is significant maritime activity, and
- ∑ Great Lakes and navigable portions of major rivers.

The only pattern that emerged from the comments was the observation that despite a high percentage of the Yes responses to the question, most respondents did not believe that all inland waterways required coverage.

#### 3.7.5.3 Alaskan Areas Where NDS Should Be Available

The inland waterways and coastal regions of Alaska have been analyzed together because preliminary analysis indicated that the two issues and the responses to them are very similar. Both regions have large areas that are sparsely inhabited, have impassable terrain, experience extreme weather conditions, and have limited maritime activity. A majority (n=41, 88 %) of respondents answered “yes” to the coverage question regarding all coastal areas of Alaska and more than half of the respondents (n=42, 55%) believed that all inland waterways should be covered by NDS. Some respondents included comments characterized by the following:

- ∑ NDS should provide coverage of areas having significant maritime activity,
- ∑ not cover ultra low usage areas,
- ∑ not provide coverage of the North shore,
- ∑ provide a cost benefit analysis to determine where coverage is necessary,
- ∑ provide coverage on a case-by-case basis, and
- ∑ provide coverage where the CG is willing to take some action.

#### 3.7.5.4 Areas Of Hawaii And Guam Where NDS Should Be Available

The areas of Hawaii and Guam received a strong (n=43, 91 %) response indicating that coverage should be provided to all the area surrounding these islands. One comment stated that Hawaiian coverage should be provided for the seven major islands only.

#### 3.7.5.5 Caribbean Areas Where NDS Should Be Available

The response was nearly unanimous (n=71, 97%) that NDS coverage should be provided for the areas surrounding Puerto Rico. No comments were provided by the interviewees concerning this coverage.

#### 3.7.5.6 Extent Of Off-Shore Coverage Questions

Responses (N=149) to the question regarding the future system's needed area of coverage was categorized in terms of discrete, ten mile increments, and is presented in tabular form above. Specifically, the respondents were asked to choose one of the following offshore distances: 10 nm, 20 nm, 30 nm. 40 nm, 50 nm. In addition, they were given the option of choosing a category called "other," that prompted them to write in any coverage area they believed to be appropriate. Eighteen (n=18, 12%) of the respondents, did not respond to the coverage question. As evidenced by a number of comments, some of the respondents in the largely heterogeneous subject pool did not see the coverage issue as a topic within the purview of their technical competence.

Only three respondents selected 10 nm (n=3, 2%). A considerably larger group (n=18, 12%) thought that 20 nm was a reasonable goal for NDS coverage and about a tenth chose 30 nm (n=14, 9.5%) as the ideal distance. Five respondents (n=5, 3.5%) thought that 40 nm was best while the largest percentage (n = 56, 38%) selected 50 nm as the ideal. This was the highest number that could be specifically selected.

The other category constituted almost a quarter of the responses regarding the coverage question (n=35, 23%). Out of the thirty five responses, eleven (N=11) specified 200 NM (n=6, 4%) as the ideal area of coverage and six thought that 100 NM was optimal (n=11, 7%). Four other respondents recommended coverage areas that ranged between 12 and 125 miles. However, these latter four were not included in the analysis since they are essentially statistical outliers. Twelve respondents checked the Other category, but either neglected to suggest a coverage range or entered comments that typically read something to the effect of, "the further the better".

### 3.7.6 Conclusion

#### 3.7.6.1 Continental U.S. Coastal Areas Where NDS Should Be Available

Considering the majority response for complete coverage of U.S. coastal areas, and the need for NDS coverage by recreational boaters and some small craft, complete coverage of U.S. coastal areas is an absolute requirement.

#### 3.7.6.2 Inland Areas Where NDS Should Be Available

Considering the comments made in response to this requirement, it is apparent that the statement all inland waterways is too broad. This requirement needs to be better qualified to promote an understanding of which inland waterways require NDS coverage. Depending on the alternative selected, it would be possible to have command and control communications coverage of all inland waterways and distress (VHF-FM) of a portion of inland waterways. CG presence is significantly less in the inland waterways than the coastal areas. This puts the CG in an advisory command and control capacity for SAR cases. The reliance is heavy on the

public and private users of the waterways for SAR response, while the CG assumes the coordinator/communicator role.

#### 3.7.6.3 Alaskan Areas Where NDS Should Be Available

The comments reveal that some respondents do not believe that total coverage of the Alaskan area is necessary. However, the majority of respondents do believe that all of the Alaskan coastal areas should be provided NDS coverage. Only a little more than half of the respondents felt that all of the inland waterways of Alaska should be provided with NDS coverage. If the same coverage standards apply in CONUS and Alaska, then more effective (improved over current) coverage must be applied in Alaska.

#### 3.7.6.4 Areas Of Hawaii And Guam Where NDS Should Be Available

A majority of respondents stated that full coverage of the areas surrounding Hawaii and Guam should be provided. These are major maritime and recreational boating areas with significant CG presence. Coverage of these areas is a necessity.

#### 3.7.6.5 Puerto Rican Areas Where NDS Should Be Available

A majority of respondents indicated that coverage should be provided for the areas around Puerto Rico. This is a major maritime and recreational boating area with significant CG presence. Coverage of the area is a necessity.

#### 3.7.6.6 Extent Of Off-Shore Coverage Questions

A majority of respondents indicated that coverage should extend out to 50 nm. Several comments stated that coverage should be provided at least out to the range of CG resources communicating only in the VHF-FM marine bands. The extent of the area of coverage is largely dependent on the NDSMP alternative selected. Therefore, a quantitative distance cannot be realistically be stated. However, it can be expressed in terms of range of CG resources communicating only in the VHF-FM marine bands.

## 3.8 System Capabilities

### 3.8.1 Issues

#### 3.8.1.1 System Capacity

The capacity of the system for voice and data communications is a major issue. The system must be able to provide for the communications required by the public and commercial users. To determine the priority of this requirement, interviewees were asked at all on site and telephone interviews about the capacity required for voice and data communications. Similar questions were asked in the user surveys. Responses from all operational personnel, communications watchstanders, service providers, and communications designers/engineers were considered for deriving the statistical data used in the analyses of this issue. A review of how the respondents used the system revealed that they were particularly knowledgeable regarding the required capacity and plans that may impact future capacity requirements.

#### 3.8.1.2 Operational Characteristics

The requirements pertaining to the operational characteristics of the future NDS are: the capability of multiple frequency operation, the need for protected control from a remote site, the ability for automated dependent surveillance reporting capability, the ability for automatic mode selection, and for transmission time outs to help prevent unwanted transmissions. To determine the priority of this requirement, interviewees were asked about operational characteristics at all on-site and telephone interviews. The operational characteristics included issues such as

communications protocol selection, monitoring of multiple frequencies, preventing unwanted transmissions, and automated dependent surveillance systems. Responses from all operational personnel, communications watchstanders, communications designers/engineers, and communications policy makers were considered for developing the statistical data in this issue. A review of how the respondents used the system revealed that these groups were most knowledgeable of system operational characteristics required and of plans that may impact these characteristics requirements.

#### 3.8.1.3 System Adaptability

The requirements pertaining to future NDS adaptability and the ability of the future system to interface with planned information processing equipment, and the need to upgrade the future system as a result of future regulatory and technological changes. These issues were presented to the respondents to determine the priority and need for these requirements. Responses from communications designers/engineers and communications policy makers were considered for developing the statistical data used for the analyses for these issues.

### 3.8.2 Questions

#### 3.8.2.1 System Capacity

| Question Number | PORD Reference | Question Text |
|---|---|---|
| II.15. | IV,B,3<br>IV.A.8 | Provide sufficient voice transmission capacity for transfer of operational information reports in the same or different geographic location. |
| II.16. | IV,B,3<br>IV.A.8 | Provide sufficient data transmission capacity for transfer of operational information reports in the same or different geographic location. |

#### 3.8.2.2 Operational Characteristics

| Question Number | PORD Reference | Question Text |
|---|---|---|
| II.21. | IV,B,15 | Automatically select the appropriate communication protocol based on the mode and method of communications (e.g. duplex if duplex mode/channel selected). |
| II.22. | IV,D,4 | Allow monitoring of multiple frequencies. |
| II.23. | IV,B,10 | Allow transmission of vessel movement reports via Automated Dependent Surveillance (ADS) systems in Vessel Traffic Service (VTS). |
| II.41. | IV,B,14 | Capable of protected control of communication equipment from a remote site. |
| II.42. | IV,B,17 | Provide the capability to prevent unnecessary or unwanted transmissions (e.g. stuck key). |

#### 3.8.2.3 System Adaptability

| Question Number | PORD Reference | Question Text |
|---|---|---|
| II.13. | IV.B.13 | Provide standard interfaces for connection to existing or planned information processing equipment for data transfer. |
| II.18. | III.D.4<br>III.D.6<br>IV.B.18 | Allow for adaptation to future regulatory and technological changes in telecommunications. |
| II.27. | III.A | Function in surface resources that operate within the following environmental ranges: elevation 0 to 3350 meters above sea-level; temperature -30 to +50 Celsius; windspeed 0 to 135 kts; humidity 0 to 100%, and barometric pressure 880 to 1080 mb. |

| Question Number | PORD Reference | Question Text |
|---|---|---|
| B.2. | III.A | Where implemented, the future system should operate continuously in temperature, barometric pressure, and humidity ranges and remain operable under degraded conditions ranging from accidents and natural disasters to limited conventional war (i.e. Category Four, hurricane, or comparable typhoon in susceptible regions). |

### 3.8.3 Grouping And Display Of Data

#### 3.8.3.1 System Capacity

| Question Number | Number of Responses | Number of Critical | | Number of Useful | | Number of Not Essential | |
|---|---|---|---|---|---|---|---|
| | | Number | Percent | Number | Percent | Number | Percent |
| II.15. | 106 | 94 | 89% | 11 | 11% | | |
| II.16. | 108 | 61 | 57% | 45 | 43% | | |

#### 3.8.3.2 Operational Characteristics

| Question Number | Number of Responses | Number of Critical | | Number of Useful | | Number of Not Essential | |
|---|---|---|---|---|---|---|---|
| | | Number | Percent | Number | Percent | Number | Percent |
| II.21. | 70 | 48 | 69% | 21 | 30% | 1 | 1% |
| II.22. | 79 | 65 | 82% | 13 | 17% | 1 | 1% |
| II.23. | 66 | 33 | 50% | 32 | 48% | 1 | 2% |
| II.41. | 63 | 52 | 82% | 10 | 16% | 1 | 2% |
| II.42. | 69 | 55 | 80% | 14 | 20% | | |

#### 3.8.3.3 System Adaptability

| Question Number | Number of Responses | Number of Critical | | Number of Useful | | Number of Not Essential | |
|---|---|---|---|---|---|---|---|
| | | Number | Percent | Number | Percent | Number | Percent |
| II.13. | 10 | 7 | 70% | 3 | 30% | | |
| II.18. | 15 | 13 | 87% | 2 | 13% | | |
| II.27. | 13 | 11 | 85% | 2 | 15% | | |
| B.2. | 14 | 11 | 79% | 3 | 21% | | |

### 3.8.4 Comments

#### 3.8.4.1 System Capacity

| Question Number | Interviewee ID | Comments |
|---|---|---|
| II.15. | 8 | The system should expand the usefulness of data sharing during operations. Once the data has been entered then it does not have to be entered for other systems (SARMIS, Abstract of Operations, etc.) He was pointing toward OIS type systems. |
| II.15. | 32 | It is critical in the same geographic location but only useful in different geographic locations. |

| Question Number | Interviewee ID | Comments |
|---|---|---|
| II.15. | 123 | This is particularly with consolidation of communication centers (e.g. Ketchikan to Juneau). |
| II.15. | 126 | A new VHF/FM system may be a waste of money, because technology 5 years from now will surpass anything that VHF/FM may provide. Consider buying service toolbar rather than system. |
| II.16. | 28 | Useful but not critical for small units. The unit in the field does not have the man power or time to process the information that would be provided by data communications. |
| II.16. | 23 | Critical to provide sufficient data transmission capacity for transfer of operational information reports in the same or different geographic location. Can get print out graphics of ice pictures from Internet. |
| II.16. | 109 | The capability for data transmission does not exist now. |
| II.16. | 8 | Data transmission is as important as Voice, (I. e. search plans, technical information, etc.) |
| II.16. | 114 | Sufficient data transmission capacity will become critical in the future. |
| II.16. | 39 | The need for data transmission capacity depends on the kinds of data to be sent. He envisions image transmission of search patterns. |
| II.16. | 7 | Video data transfer is particularly important, particularly in context of natural disaster operations. If not real-time video, capability for transmission of still photographs is critical. The video capabilities are also important to the LE mission, particularly for live links with mobile boarding teams. |

### 3.8.4.2 Operational Characteristics

| Question Number | Interviewee ID | Comments |
|---|---|---|
| II.23. | 19 | Allow transmission of vessel movement reports via ADS systems in VTS is useful for VTS and maybe add in a button distress call. |

### 3.8.4.3 System Adaptability

| Question Number | Interviewee ID | Comment Text |
|---|---|---|
| II.18. | 60 | NDS needs to allow for easy upgrade paths. |
| II.18. | 8 | SATCOM systems are coming and should be investigated thoroughly as alternatives. |
| II.18. | 16 | The allowance for adaptation to future regulatory and technological changes in telecommunications is a current problem. Equipment is out dated and difficult to operate. |
| II.18. | 32 | The old system did not provide for adaptation to change and we are paying the price now. |
| II.18. | 108 | The current system is deficient in allowing for adaptation to change. |
| II.18. | 117 | By following the standards it will be adaptable. |
| II.27. | 250 | Most emergencies seemingly occur in bad conditions. |
| II.27. | 33 | Environmental criteria should be dictated by local conditions. |
| II.27. | 122 | NDS does need to function in local environmental conditions (e.g.-icing, salt spray, etc.), but it does not need a MILSPEC. |
| II.27. | 120 | Alaska needs higher than 150+ KTs. |
| II.27. | 121 | It is critical to have operation for heavy snow loads, sea water, ice, and power units. |
| II.27. | 126 | Must be compatible with salt water environment. Alaska needs higher windspeed-175 KT. |
| II.27. | 119 | Too much to operate within but, yes for survivability. 3100 feet is the highest Alaska site. Support facilities do not meet criteria, so this may be a |

| Question Number | Interviewee ID | Comment Text |
|---|---|---|
| | | weak link. |
| II.27. | 20 | It is critical for the function in surface resources that operate within the following environmental ranges except for Alaska. |
| II.27. | 112 | The entire system does not have to be built to these parameters because the entire system will not be installed where they are needed. |
| II.27. | 11 | The interviewee did not know of a need for NDS to function to an elevation of 3,350 meters. |
| II.27. | 115 | Discussion: Also need to consider salt corrosion etc. |
| II.27. | 104 | Environmental and safety issues are a major problem for the current system. |
| II.27. | 56 | Environmental specifications may be too weak for conditions found in Alaska. |
| II.27. | 35 | NDS must be required to stand up to Alaska weather including snow, ice, earthquakes, bears and beavers chewing through cables. Equipment reliability is the most critical requirement for the future system. |
| II.27. | 7 | Earthquake forces should be included in NDS surface facility specifications. |
| B.2. | 61 | The future system must operate and be compatible with all agencies under emergency conditions. |
| B.2. | 93 | CG assistance is required during these catastrophes and they need the NDS equipment to function properly. |
| B.2. | 43 | People rely on the CG in those times of distress. |
| B.2. | 94 | Distress situations come up in those situations and the NDS may be the only means of communication. |
| B.2. | 92 | When these disasters strike others will be looking to communicate with the CG. |
| B.2. | 33 | It is not essential for NDS to operate during accidents and natural disasters. It is critical that it operates immediately after. |
| B.2. | 122 | Disaster communications is a critical function, but NDS may not be the system that has to provide the service. |
| B.2. | 30 | This is only critical if continuous availability is not too costly. System should survive and be immediately available after disaster. |
| B.2. | 60 | NDS should be operable under Category 5 hurricane. |
| B.2. | 21 | It is critical for the future system to operate in degraded conditions because this is where it will be needed the most. |

### 3.8.5 Discussion

#### 3.8.5.1 System Capacity

From comments to other questions, it is clear that sufficient voice capacity is absolutely required for the prosecution of search and rescue cases and for the successful completion of most other missions. This is especially true when small boats are involved. The importance of sufficient voice capacity is supported by the overwhelming critical response to question II.15, (n= 94, 89%). Observation of unit operations showed that voice (VHF-FM) is the primary mode used for communications with small units in inland waterway areas (HF is not used in inland waterways). It was also noted that the vast majority of recreational boaters (in all areas) do not have the capability for data communications. No attempt was required or made to quantify what sufficient voice capacity represents. The statistical data shows that data communications, is considered as critical by just over half, (n=61, 57%) of respondents. However, all but two percent of the remainder believe that data communications is useful. The comments to this question reveal that although data transmission is not presently available in many units, its future importance is known and several potential uses were presented.

Although the respondents indicated that data communications are not considered as important as voice communications, it still must be recognized as data communications technologies mature and become more affordable. Examples of data communications improvements are:

∑ Capability to transmit real time and still video from on-scene. This capability will allow personnel who are not at the scene to better understand the situation. Remote personnel can then be involved in the decision making process. The US Navy has been using video transmission (provided through the Joint Tactical Information Distribution System (JTIDS)) for the damage assessments, medical assistance, imagery reconnaissance, and situational awareness.

∑ Capability to transmit graphic information such as ice reports, search plans, charts, and photographs for the identification for vessels and aircraft.

### 3.8.5.2 Operational Characteristics

The five parts of this issue, (1) selection of appropriate communications protocol, (2) monitoring of multiple frequencies, (3) transmission of vessel movement reports via automated dependent surveillance (ADS), (4) protected control of communications equipment from a remote site, (5) and capability to prevent unnecessary transmissions, earned a varied responses without many comments. No part of this issue was deemed non-essential. The automatic selection of the appropriate communications protocol was thought to be critical by a large margin (n=48, 69 %) over the useful responses (n= 21, 30%). Most of the time after interviewers asked this question they had to explain how automatic selection of the communications protocol impacted VHF-FM communications. Many users did not realize the significance of protocol selection.

The ability to monitor multiple frequencies was judged critical by a large margin (n=65, 82%). Although no comments about this part of the issue were made by the analysis group, it is noted that a frequent complaint by some interviewees was that they could not receive channel 16 while transmitting on another channel. Some interviewees did not perceive this as a problem because another station maintained the distress guard. However, it was noted that all stations had this problem, including group offices.

The ability to transmit vessel movement reports via Automated Dependent Surveillance (ADS) was believed to be critical by exactly half (n=33, 50%) of the respondents. Most of the other questions answered as useful (n= 32, 48%). A review of the use of this capability shows that it is used by only a small segment of the interviewed population. However, in that unique area of usage (Valdez, AK VTS), it becomes important due to the lack of other vessel tracking capabilities. If an alternative to VHF-FM communications is selected for the NDS, this capability would become obsolete unless existing or new equipment is maintained specifically for this purpose or the alternative is designed to accommodate this capability.

The capability of providing protected control of communications equipment from a remote site was seen as critical (n=52, 82%).

The capability to prevent unnecessary transmissions (such as that arising from a stuck key) was found critical by 80 percent of the interviewees and as useful by the other 20 percent.

### 3.8.5.3 System Adaptability

The future NDS must be able to adapt to its environment, both technically and physically. The first two requirements relate to technical adaptation. Providing standard interfaces for connection to existing or planned information processing equipment for data transfer is considered critical (n=7, 70%). No comments were generated from this question. Since the

existing and planned information processing equipment interfaces are known, this requirement can be implemented.

The second requirement, to allow for adaptation to future regulatory and technological changes, was believed to be critical (n=13, 87%). One comment noted the current system has suffered due to its inability to keep up with advancements. Another indicated that by following standards the future system will be upgradable. This may reflect over confidence since future changes that are not known about are difficult to plan for.

The last two requirements are related to the physical environment. As seen from the statistical summary of responses in the table, the majority of interviewees believe these requirements are critical. The comments indicate that some adjustment to the parameters may be needed for specific areas. For example, one comment states that the wind speed for the Alaskan area should be increased to 150+ knots and another said 175 knots. Other comments show that the physical environment changes in different areas. The platform that NDS is installed on also creates a different environment, for example, aircraft, shipboard, or shore communications center.

The ability of NDS to withstand catastrophy is expected by personnel both internal and external to the Coast Guard. In a public service the expectation of the customers is important. Some comments from surveys of NDS external users:

- "During bad weather is when the NDS system is usually needed."
- "NDS is needed especially in the aftermath of a disaster."
- "Depending on cost vs. funding available, NDS should withstand severe environmental conditions."
- "An easy reconstruction capability may be preferable and more cost effective then a hardened, robust system."

### 3.8.6 Conclusion

#### 3.8.6.1 System Capacity

From the comments and supporting data, it is readily apparent that voice communications are an absolute necessity in the NDS. It has been the backbone of distress communications in the coastal areas. Considering the cost, space and weight required for other communications capabilities, voice will continue to be the primary communications mode for recreational boaters, fishing vessels, and other small craft with limited crew.

Data communications was not identified as an absolute requirement by many of the respondents. Its importance to distress communications is becoming apparent, but there is not wide spread experience with wireless data communications among the interviewees. Data communications have more potential use in command and control applications than distress.situations. This requirement should be included as a useful item in the PORD.

#### 3.8.6.2 Operational Characteristics

The need for NDS to automatically select the appropriate communications protocol is critical. Although this is not supported by the interviewee responses, automatic selection is already a feature in the current system that operators rely upon heavily. Generally these features are invisible to the user and consequently have come to be expected. During emergencies or other times of stress, operators may not know or remember what protocol is needed.

The capability for monitoring of multiple frequencies is required at many installations, but it varies according to operational environment. If the distress guard for a mobile unit is handled at a communications facility, such as the group communications center, then that mobile unit does not require a distress monitor while communicating on another frequency. This premise is based on 100 percent coverage of the mobile unit's operating area. The 100 percent coverage requirement is a necessity for the system, but not for each unit within the system.

The ability to transmit vessel movement reports via ADS is a necessity for those ships transiting an area (VTS) where this capability is required. It is also a requirement that the system monitoring that area be able to trigger the ADS response and to receive it and decode it. This requirement is necessary only for the units that must transmit or receive ADS reports. Coast Guard use of ADS as a C2 tool is a possibility, but was not mentioned as a requirement.

The capability of protected control of communications equipment from a remote site is a necessary requirement to ensure reliable and continuous operations of the system. The system should be protected from natural and intentional disruption of control information.

The capability to prevent unnecessary transmission (such as that arising from a stuck key) is considered necessary due to the majority response of critical by interviewees.

#### 3.8.6.3 System Adaptability

As revealed in the discussion about system adaptability, the requirement for technical adaptability is necessary to ensure the ability to interface with existing and planned information processing systems. The requirement for technical adaptability is considered as critical by the majority of those responses to those related questions. The ability to interface with information processing systems is necessary for the transmission of data. To allow for the adaptation to future regulatory and technological changes is a necessary requirement but more difficult to implement. This flexibility should remain as a requirement to minimize system obsolescence.

The requirements to operate in the physical environment are considered necessary for the future NDS. However, not all of the system must meet the requirements as stated. Only those parts of the system that will be exposed to the extremes stated in the PORD need to comply. The parts of the system that will be protected from the environment or installed in areas where the environment is less extreme do not have to be as hardened.

## 3.9 DSC/GMDSS

### 3.9.1 Issues

The SOLAS Convention specified the development of a global search and rescue plan. This group also passed a resolution calling for the Global Maritime Distress and Safety System (GMDSS) development by the International Maritime Organization (IMO) to provide the communication support needed to implement the search and rescue plan. GMDSS is based upon a combination of satellite and terrestrial radio services. Sea Area A1 of the GMDSS provides for communications in the littoral areas. For these issues the interviewee responses selected for analysis are those from policy makers and engineers. These two categories have knowledge of the requirements and technology to implement the requirements of GMDSS into the future NDS. There are two issues concerning the implementation of GMDSS.

#### 3.9.1.1 Regulatory

After February 1, 1999, SOLAS class vessels will not be required to guard channel 16, but will be required to maintain DSC. Therefore, it will be necessary for the CG to be compatible with the GMDSS specifications.

#### 3.9.1.2 Criticality

This issue concerns the criticality of the GMDSS capability. The issue also concerns DSC, a subpart of GMDSS. After 1 February 1999 SOLAS class vessels will no longer be required to guard CH 16. SOLAS class vessels will be required to maintain a DSC guard. In order for the CG to communicate with those vessels the CG will need GMDSS/DSC capability. The future NDS will require DSC capability to provide communications with SOLAS class vessels operating in sea area A1.

### 3.9.2 Questions

| Question Number | PORD Reference | Question Text |
|---|---|---|
| II.10. | IV,B,9 | The CG intends to have the future NDS meet requirements for the Sea Area A1 component of the Global Maritime Distress and Safety System (GMDSS). The future system should provide capability to meet the Sea Area A1 (Coastal ) requirements for the GMDSS. This includes Digital Selective Calling, when and where Sea Area A1 if implemented by the United States. |
| II.10.a. | | How critical is this capability? |
| II.10.b. | | To what degree do you feel the CG should be responsible for this capability? |

### 3.9.3 Grouping And Display Of Data

| Question Number | Number of Responses | Number of Critical | | Number of Useful | | Number of Not Essential | |
|---|---|---|---|---|---|---|---|
| | | Number | Percent | Number | Percent | Number | Percent |
| II.10 | 9 | 8 | 89% | | | 1 | 11% |
| II.10.a.. | 8 | 6 | 75% | | | 2 | 25% |
| II.10.b. | 7 | 6 | 86% | | | 1 | 14% |

### 3.9.4 Comments

There were no comments in the responses to these questions from the group of interviews selected for analysis. The analysis group for these questions was small. One external user responded that the Coast Guard should have 100 percent responsibility for the implementation of GMDSS including DSC. This question was not well understood by most of the interviewees. More often than not interviewers had to give a mini-GMDSS/DSC briefing to consider the question. Even then the concepts were not well enough established to yield a high reliability on the answers, hence the small analysis group.

### 3.9.5 Discussion

#### 3.9.5.1 Regulatory

Most (n=8, 89 %) believed that it was critical to have NDS meet the requirements for sea area A1 of GMDSS. The remainder believed it is non-essential. However, to maintain the compatibility to communicate with the SOLAS class vessels it is necessary for the CG to be compatible with the GMDSS specification.

#### 3.9.5.2 Criticality

Concerning the importance of GMDSS/DSC, three-fourths (n= 6, 75 %) of the responses from interviewees indicated that it is critical for the CG to have this capability. Asked if the CG should

be responsible for this capability, a substantial majority(n=6, 86%) of interviewees responded that it is critical.

### 3.9.6 Conclusion

#### 3.9.6.1 Regulatory

The need for NDS to meet the requirements for sea area A1 of GMDSS is critical. This is due to the statutory requirement resulting from the United States' agreement to the SOLAS Convention which requires distress communications to comply with the GMDSS. A strong majority of the small group of responses analyzed on this issue were in support of GMDSS requirements, but that seems immaterial given the treaty requirements previously noted.

#### 3.9.6.2 Criticality

GMDSS/DSC will be required to communicate with SOLAS class vessels after 1 February 1999; therefore, GMDSS/DSC capability is a critical requirement. Since the DSC capability is required to establish communications with SOLAS class vessels operating in sea area A1, it must be part of NDS and therefore, should be a key element within the PORD.

## 3.10 Human Systems Integration (HSI)

ANTEON has embedded the NDS-related human performance issues within an HSI framework against which the human performance issues of the current effort can be examined. HSI is an established methodology for integrating human performance considerations into the design and acquisition of new systems. Within the context of the NDS Modernization effort, HSI means developing and procuring equipment and systems that facilitates NDS-user interaction within the physiological tolerance limits, training time, personnel aptitudes and skills, and physical capabilities of the anticipated system users. Consequently, a number of pertinent Survey and Interview guide questions were designed to capture the relative criticality of these HSI issues as they relate to the NDS modernization effort. The application of HSI principles can be expected to impact NDS system design, development, and deployment from three distinct perspectives or domains: Training - including manpower and personnel issues, Ergonomics/Human Factors, and Safety and Environmental Protection).

### 3.10.1 Issues

Since HSI is a CG design related issue, the questions were directed toward CG participants. CG responses were collected and analyzed pertaining to the HSI issue from operations personnel, communications watchstanders, service providers, operations policy makers, technicians, designer/engineers and other support personnel.

#### 3.10.1.1 Training

Within the Training domain, issues regarding the time and costs involved in providing system users with the requisite skills and knowledge to operate, maintain, and support the new system are considered. Issues that surround the ability to support entry-level training requirements of the new system, and those necessary for sustaining that training, are within the purview of this domain. The following are applicable: the formulation and selection of engineering design alternatives that can be supported from a training perspective, and any additional training support needed to field the new system. The training domain is of particular importance since the PORD has specified that any initial or follow-on training must not disrupt CG mission performance and be in accordance with COMDTINST 1550.9, *Management of the Coast Guard's Training System*, a document that stresses the need for effective communication and interrelationships among Training Managers (TM), Program Managers (PM), Force Managers (FM), Acquisition Project Managers (AM), training sources, Workforce Planning Division personnel. From an HSI perspective, this instruction is particularly significant since it

underscores the importance of considering Manpower and Personnel issues in conjunction with Training.

Manpower issues are integral to training because of the emphasis on affordability of fielding new systems (personnel costs.) The number of military billets/civilian positions/contractor man-hours and the organizational structure needed to operate, maintain, and support a new system are the main issues to be addressed when integrating training into the design of any new system.

In addition to Manpower, the HSI domain of Personnel is integral to training due to its emphasis on issues regarding the quality (i.e., experience, specific capabilities, and other characteristics) of military/civilian/contractor personnel that may be required to operate, maintain, and support a new system. The modernized system should be designed to accommodate the capabilities of the personnel projected to be available once it becomes operational.

#### 3.10.1.2 Ergonomics/Human Factors

The draft PORD has specified that the new design must address any necessary ergonomics/human factors issue that will significantly affect or enhance the new system's operational effectiveness and efficiency. These principles are applied to the design, operation, or use of equipment or systems for optimizing human performance, safety, and/or habitability through the avoidance or elimination of design-induced error.

#### 3.10.1.3 Safety/Environmental Protection

The draft PORD states that system safety and environmental issues must be considered in the design of the new system. The draft PORD also states that the requirements contained in RTCA/DO-160C*, Environmental Conditions and Test Procedures for Airborne Equipment,* must be included as design criteria for any NDS equipment designated for use aboard airborne platforms to ensure safe and efficient system operation across the expected range of environmental extremes. The Safety and Environmental domains deal with both the safety of the new system and the safety of system operators, and maintenance personnel. Safety issues, when considered early in the system acquisition/design process, will improve the ability of system operators and maintenance personnel to perform to specified standards without undue risk of injury, death, equipment or environmental damage. The goal is to maximize total system performance by protecting operators and maintenance personnel from unnecessary risks while safeguarding the environment.

### 3.10.2 Questions

#### 3.10.2.1 Training

| Question Number | PORD Reference | Question Text |
|---|---|---|
| II.44 | II.H<br>III.D.5 | The future system should not increase training requirements for system operators, maintenance personnel, and system managers while maintaining optimal skill levels. |

### 3.10.2.2 Ergonomic/Human Factors:

| Question Number | PORD Reference | Question Text |
|---|---|---|
| II.28 | II G | The future system should not induce operator fatigue during extended usage over 12 hour period every 24 hours (system features of operator control of sensitivity and incoming audio, visual indications of status and operation, automated and manual muting of selected signals, operator adaptable user interfaces, ability for automated broadcasts). |
| II.29 | II G | The future system and its user-operated components should be usable by mobile resource personnel wearing personnel protective equipment wearing personnel protective equipment in all operating environments (e.g., explosive, hazardous, etc.) |

### 3.10.2.3 Safety/ Environmental Protection

| Question Number | PORD Reference | Question Text |
|---|---|---|
| II.30 | III A | The system must function in all operating environments including hazardous environments (explosive, surf, and temporary submersion). |

### 3.10.3 Grouping And Display Of Data

| Question Number | Number of Responses | Number of Critical | | Number of Useful | | Number of Not Essential | |
|---|---|---|---|---|---|---|---|
| | | Number | Percent | Number | Percent | Number | Percent |
| II 44 | 93 | 31 | 33% | 50 | 54% | 12 | 13% |
| II 28 | 93 | 90 | 97% | 3 | 3% | 0 | 0 |
| II 29 | 94 | 74 | 79% | 18 | 19% | 2 | 2% |
| II 30 | 125 | 104 | 83% | 20 | 16% | 1 | 1% |

### 3.10.4 Comments

### 3.10.4.1 Training

| Question Number | Interviewee ID | Comment |
|---|---|---|
| II.44. | 126 | System must consider contract requirements of out sourced maintenance and training impact. |
| II.44. | 26 | Training would be easy for basic functions and adequate for maintaining more advanced functions. |
| II.44. | 102 | Training for NDS will be required. |
| II.44. | 99 | Training for the new NDS is required. |
| II.44. | 105 | Training for the new NDS will be required to teach operators new skills. |
| II.44. | 8 | Projects tend to underestimate the requirements for training. In this case care should be taken to ensure that training requirements are limited. |
| II.44. | 95 | Additional training will be required to meet user needs during system implementation. It is expected that more training will be required with any new system. |
| II.44. | 100 | Training for the new NDS is needed. |
| II.44. | 87 | KISS! |
| II.44. | 114 | The future system will require more training. |
| II.44. | 39 | About training: For any gains there is pain, but how much is impact compared to gain. Build training into equipment; a good bit of consumer |

| Question Number | Interviewee ID | Comment |
|---|---|---|
| | | electronics does this. |
| II.44. | 6 | Operator training currently takes up to 45 days. If the new NDS will add more time to that, it will be unacceptable. |
| II.44. | 31 | The training is optimistic to the point of being foolish. Must expect there will be new training requirements. |
| II.44. | 111 | I do not agree with not increasing the training requirements for the future system. |
| II.44. | 98 | Training will most likely increase to teach users new skills, if they are required. |
| II.44. | 96 | Training requirements should not be increased with the new system. |
| II.44. | 7 | CG maintenance personnel will require additional training. |
| II.44. | 35 | NDS equipment should be easy to use and maintain. |
| II.44. | 56 | The single most critical requirement for NDS is to provide for follow-on and continuous training for controllers and communications center personnel. |

### 3.10.4.2 Ergonomics/Human Factors

| Question Number | Interviewee ID | Comment |
|---|---|---|
| II.28. | 16 | The use of manual muting of selected signals to reduce operator fatigue is better than automated muting. |
| II.28. | 31 | Muting of selected signals needs the decision process of a human. |
| II.28. | 15 | Muting of selected signals should be by manual means only. |
| II.28. | 16 | Automated broadcasts allow the watchstander to monitor other frequencies while the broadcast is being sent. |
| II.28. | 119 | This is useful. |
| II.28. | 123 | Notes: Strength of signal indication, which site is best (or progression scale for site). VU meter is critical. No automated muting-manual muting with timer to automatically pick back up. Operator adaptable user interfaces and ability for automated broadcasts are excellent ideas. The future system should improve reliability if equipment. It is frustrating when equipment is not working. Habitability-critical. Need better soundproofing-no outside sound. Ergonomically designed chairs and console. Need to minimize distractions as tearing down walls and construction. Good speakers are better than headphones (no good). Voice activators are no good. Too much noise, always activating wrong. Mouthpiece headset must be durable; could not keep working. No on darkened windows in sound booth or on no windows-must see onto rest of watch, etc. |
| II.28. | 10 | The NDS should be very user friendly to the extent that Radiomen are not required to operate the equipment and system. |
| II.28. | 84 | Touch screen controls offer complete control of VHF and telephone communications. |
| II.28. | 35 | Adequate human factors design of the watchstander workstation is critical. VOBRA is a very useful tool for automated broadcasts. |
| II.28. | 7 | Mobile units should have NDS equipment integrated into apparel. NDS controls must be integrated into the overall function of the command and control watchstander. |
| II.29. | 122 | Foul weather gear is critical. |
| II.29. | 117 | At least a subset of the system. |
| II.29. | 103 | It is critical for the NDS to operate in hazardous conditions. |
| II.29. | 7 | Special features for NDS equipment should be limited to selected units for particular operations. Special features are not required for ALL NDS mobile equipment. |

#### 3.10.4.3 Safety/ Environmental Protection

| Question Number | Interviewee ID | Comment |
|---|---|---|
| II.30. | 39 | The system must safely function in all operating environments for pollution response, at least for the mobile units. |
| II.30. | 117 | Those parts that need to function in all operating environments must do so. |
| II.30. | 35 | Specialized equipment is required for specialized applications only. |
| II.30. | 7 | Special features for NDS equipment should be limited to selected units for particular operations. Special features are not required for ALL NDS mobile equipment. |

### 3.10.5 Discussion

#### 3.10.5.1 Training

All of those who commented on this topic agreed that training will be required for the modernized system. More than half of the survey participants (n=50, 54%) thought that training requirements should not increase above those of the existing system while a third (n=31, 33%) said that this should be a Critical requirement. Only twelve respondents (n=12, 13%) saw this issue as being not critical to system success. However, those who provided comments generally recognized that training will be an issue requiring careful consideration throughout the system development cycle.

Twenty comments were received regarding the training issue. All who commented on this topic agreed that training will be required for the modernized system. Typical of the comments were statements like, “training is required when any new system becomes operational.” One respondent noted that current system operator training takes about 45 days and felt that additional training would be necessary to successfully implement the modernized system. Another respondent thought that, “CG maintenance personnel would need additional training as well,” and still another foresaw a potential training issue emerging from contractual requirements associated with out sourced maintenance. In short, those commenting generally recognized that training will be an issue that will require careful consideration throughout the system development cycle.

#### 3.10.5.2 Ergonomics/Human Factors

Those responding to and commenting on this issue overwhelmingly agreed on the need to incorporate ergonomics/human factors into the design of the modernized system. In relation to the operator fatigue question, the biggest percentage of survey participants (n=90, 97%) saw this as a requirement that will be critical to the success of the modernized NDS system.

Respondent opinion concerning the future system’s ability to be operated while wearing protective gear was solicited. Almost three quarters of the respondents (n=74, 79%) saw this issue as being critical to the success of a new NDS system and about a fifth (n=18, 19%) saw it as useful.

The Ergonomics/Human Factors issues invoked by the draft PORD elicited a considerable number of respondent comments. The draft PORD stated that the future system should not induce undue operator fatigue and addressed ergonomic/human factors issues regarding operator control of sensitivity and incoming audio, visual indications of status and operation, automated and manual muting of selected signals, operator adaptable user interfaces, and automated broadcast capability.

Those who commented on the ergonomics/human factors issue saw the design of the watchstander workstation as being of particular importance. Most respondents recommended that the ability to mute selected signals should be allocated to the system operator in order to minimize watchstander fatigue. A number of comments expressed the need for operator adaptable user interfaces and an operator selectable automated broadcast capability. Ergonomically designed chairs and consoles were also seen as integral features of an optimal system. Equipment reliability was another respondent concern. One respondent emphasized habitability issues (e.g., soundproofing ) as a way to enhance system effectiveness Another suggested that the incorporation of touch screen controls into the modernized system would enable full operator control of VHF and telephone communications. In short, the broad consensus of those commenting on the ergonomics/human factors issues was the need to effectively integrate NDS controls into watchstander command and control functions.

The draft PORD also addressed a related NDS ergonomic/human factors issue. It stated that the user-operated components must be *usable* by mobile resource personnel wearing personnel protective equipment in all operating environments (e.g., explosive, hazardous, etc.). Those who commented on this topic agreed that the modernized system should meet this requirement. However, one respondent suggested that special safety/hazard features for NDS equipment should be limited to selected units for particular operations. Overall, the comments received regarding this issue supported the draft PORD.

#### 3.10.5.3 Safety/Environmental Protection

Those responding to and commenting on this issue overwhelmingly agreed that issues regarding Safety & Environmental Protection should be accommodated during the design of the modernized system. Regarding the ability of the system to function in all operating environments, the largest percentage of respondents (n=104, 83%) rated the importance of this environmental issue as critical to the success of a new NDS system. A fifth of them (n=16, 20%) saw it as a useful requirement.

### 3.10.6 Conclusion

#### 3.10.6.1 Training

In terms of training (relative to the existing NDS system), the future system should not increase requirements for system, maintenance personnel, and system managers while maintaining optimal skill levels. Any necessary initial and/or follow-on training should be designed into the system not so as to disrupt CG mission performance. Finally, all training must be developed in accordance with COMDTINST 1550.9 (series). This instruction is particularly significant since it underscores the importance of considering Manpower and Personnel issues in conjunction with Training.

Overall, the respondents were in agreement that training issues should be addressed during the design and saw them as useful to overall system success. The respondent data and the proffered comments supported the notion that training considerations should be effectively integrated into the modernized system throughout the life cycle to improve total system performance and to reduce ownership costs.

#### 3.10.6.2 Human Factors/Ergonomics

NDS modernization should incorporate human factors/ergonomics design principles where applicable for both operators and maintenance personnel. In particular, the system should be designed to minimize operator fatigue during periods of extended usage over a 12-hour period (every 24 hours). Specifically, the modernized system should be designed so that the operator can readily control sensitivity and the incoming audio. Visual indications of system component status and operation should be a standard feature of the design. Finally, the modernized

system should allow the operator to toggle between both automated and manual muting of selected signals, should have operator adaptable user interfaces, and have an automated broadcast capability.

Overall, the respondents agreed that the requirements for ergonomics/human factors were critical to overall system success. The broad consensus of those commenting on the ergonomics/human factors issues was the need to effectively integrate NDS controls into watchstander command and control functions. In short, the Human Factors/Ergonomics issues should be addressed during the design of the modernized system.

#### 3.10.6.3 Safety/ Environmental Protection

The future system and its user-operated components should be safely usable by mobile resource personal wearing personnel protective equipment in any necessary operating environments (e.g. explosive, hazardous, etc.). In addition, requirements contained in RTCA/DO-160C*, Environmental Conditions and Test Procedures for Airborne Equipment,* must be included as design criteria for any NDS equipment designated for use aboard airborne platforms to ensure safe and efficient operation within the expected range of environmental extremes. In light of the respondent data and associated comments, Safety & Environmental Protection requirements are necessary and should be incorporated into the modernized NDS design.

In summary, HSI requirements regarding, Human Factors/Ergonomics, and Safety/ Environmental Protection are critical to the success of the modernized system. Integrating these considerations into the modernized system can be expected to improve total system performance while reducing ownership costs. From interpretation of the training question, the results and the comments, training is extremely important to the users. However, It is only useful to keep the training requirements of the new system at current training levels. Many of the respondents considered that more training was inevitable and were willing to accept that increase if the system capability reflected a corresponding enhancement.

## 3.11 Record Keeping

### 3.11.1 Issues

The three primary issues associated with Record Keeping involve the archiving, recording and retrieval of NDS communications. From the standpoint of NDS modernization, archiving entails both the recording and time stamping of NDS communications for instant playback. Recording will allow NDS communications to be archived for future reference. Retrieval will include the ability to correlate any given position/location or line of bearing with a corresponding communications signal. This section addresses the three record keeping issues from the perspective of the respondent questionnaire data and incorporates associated respondent comments into the analysis where applicable.

### 3.11.2 Questions

#### 3.11.2.1 Archiving

| Question Number | PORD Reference | Question Text |
|---|---|---|
| II.36. | III.D.2<br>IV.B.11 | Allow recorded communications to be archived for future reference. |

#### 3.11.2.2 Recording

| Question Number | PORD Reference | Question Text |
|---|---|---|
| II.25. | IV.B.8<br>IV.D.2 | Allow correlation of position location information and other communications, both live and recorded. (Note: correlation means to allow determination whether each position location with the correct corresponding comms signal). |

#### 3.11.2.3 Retrieval

| Question Number | PORD Reference | Question Text |
|---|---|---|
| II.35. | III.D.2<br>IV.A.5<br>IV.B.11 | Record and time stamp communications for instant playback. |

### 3.11.3 Grouping And Display Of Data

#### 3.11.3.1 Archiving

| Question Number | Number of Responses | Number of Critical | | Number of Useful | | Number of Not Essential | |
|---|---|---|---|---|---|---|---|
| | | Number | Percent | Number | Percent | Number | Percent |
| II.36. | 67 | 55 | 82% | 11 | 16% | 1 | 1% |

#### 3.11.3.2 Recording

| Question Number | Number of Responses | Number of Critical | | Number of Useful | | Number of Not Essential | |
|---|---|---|---|---|---|---|---|
| | | Number | Percent | Number | Percent | Number | Percent |
| II.25. | 66 | 48 | 73% | 18 | 27% | | |

#### 3.11.3.3 Retrieval

| Question Number | Number of Responses | Number of Critical | | Number of Useful | | Number of Not Essential | |
|---|---|---|---|---|---|---|---|
| | | Number | Percent | Number | Percent | Number | Percent |
| II.35. | 63 | 49 | 78% | 13 | 21% | 1 | 2% |

### 3.11.4 Comments

#### 3.11.4.1 Archiving

| Question Number | Interviewee ID | Comment |
|---|---|---|
| II.36. | 21 | Useful to allow recorded communications to be archived for future reference for 48 hours. Nonessential for the recorded communications to be archived for long term storage. |
| II.36. | 90 | Storage is a problem, How long should the tapes be held? |

#### 3.11.4.2 Recording

| Question Number | Interviewee ID | Comment |
|---|---|---|
| II.25. | 60 | Recording of the LOB is critical if no position is available. |

#### 3.11.4.3 Retrieval

| Question Number | Interviewee ID | Comment |
|---|---|---|
| II.35. | 121 | Notes: Need digital enhancing, filtering, and to use DAT tapes. |
| II.35. | 19 | Critical to record and time stamp communications for instant playback because it may need to be replayed for clarification. |
| II.35. | 107 | Currently, message traffic is recorded and held for thirty days. The requirement and ability to hold it for three months would be more desirable for historical purposes. |

### 3.11.5 Discussion

#### 3.11.5.1 Archiving

More than eighty percent (n=55, 82%) of those who responded to this issue thought that the ability to archive recorded communications for future reference should be a critical capability of the modernized system.

One comment stated that the modernized system should have the capability to archive recorded communications for 48 hours. Another did not identify long term storage as an essential. Overall, however, the comments and data show archiving to be an essential feature of the modernized NDS.

#### 3.11.5.2 Recording

Over seventy percent (n=48, 73%) of the respondents agreed that the ability to correlate position/location information with communications, both live and recorded, is a capability of critical importance to the success of the modernized NDS. Almost 30% (n=18, 27%) thought that this position-communication correlation capability would be a useful feature. Not one respondent saw the feature as nonessential to modernized system success. The only comment received regarding recording stated that Line of Bearing (LOB) information will be of critical importance when other position data is unavailable.

#### 3.11.5.3 Retrieval

Almost 80% (n=49, 78%), of the respondents agreed that a critical feature of the modernized system would be an ability to record and time stamp communications for instant playback. More than twenty percent (n=13, 21%) said that this ability would be useful. Several comments

were volunteered regarding retrieval. One respondent's comments concerned improving the quality of the retrieved communications, e.g., digital enhancement of archived communications, filtering (presumably to eliminate noise), and use of DAT tapes. Only one dissenting respondent saw the instant playback feature as non-essential. One respondent saw the ability to record and time stamp communications for instant playback as a potentially critical feature of the modernized system since playback could be necessary for clarification. The final comment received regarding retrieval stated that message traffic is currently recorded and archived for thirty days, but that in his opinion, retention in excess of three months would only be desirable for historical purposes.

### 3.11.6 Conclusion

#### 3.11.6.1 Archiving

In short, the respondent data and comments indicated that the issues surrounding archiving should be of critical concern in the design of the modernized NDS. Both the recording and time stamping of NDS communications for instant playback were considered critical to the success of the modernized system.

#### 3.11.6.2 Recording

Overall, the respondent data and associated comments underscored the importance of ensuring that the modernized system provide an ability to record NDS communications for archival and subsequent future reference. In short, recording was seen as critical to the success of the modernized system.

#### 3.11.6.3 Retrieval

Those who considered this issue agreed that retrieval should include the ability to correlate any given position/location with a corresponding communications signal. As with the other two issues considered in this section, both the respondent data and allied comments avowed retrieval to be a critical component of effective NDS record keeping.

## 3.12 Maintenance and Logistics

### 3.12.1 Issues

A goal of the NDS modernization is to reduce the time when the system is not available to meet system requirements. Therefore, it is imperative that maintenance (preventive and casualty) does not create or prolong system outages.

#### 3.12.1.1 Monitoring And Diagnostics

The ability of the system to self-diagnose problems is an aid to the technician and operators who maintain the system. This feature enhances the ability of personnel to identify and locate problems. The ability to monitor critical and major system components, either at the equipment site or at a remote operating position, provides the operator with up-to-the-minute status of how the system is functioning, thereby inducing confidence that transmissions and reception are proper. Recording the monitoring results provides a record of system operation. For this subject analysis was made of the technical personnel and engineers within the CG.

#### 3.12.1.2 Maintainability

To reduce the time required to restore a malfunctioning system to normal operation, the system must be easily maintainable. The use of familiar maintenance practices eases the transition to maintaining a new system. The maintenance staff may be composed of CG personnel or

contractor personnel or some combination of both. Here analysis was made of responses from policy makers, technical personnel and designer/engineers within the CG.

#### 3.12.1.3 Reliability

The reliability of a system is a measure of the time it is available for use. The goals for system reliability are: overall system reliability of 99.5 percent, and localized reliability of specified system segments of 99.9 percent. In this analysis, evaluation was made of the operator personnel, communications watchstanders and policy makers, all within the CG.

### 3.12.2 Questions

#### 3.12.2.1 Monitoring And Diagnostics

| Question Number | PORD Reference | Question Text |
|---|---|---|
| II.32. | IV.B.19 | Provide for remote and local system monitoring of critical and major system components. |
| II.32.a. | II.E | Include self diagnostic of critical or major system components status. |
| II.32.b. | II.E | Include system monitoring of major components. |
| II.32.c. | II.E | Include recording (or archiving) of the monitoring results. |

#### 3.12.2.2 Maintainability

| Question Number | PORD Reference | Question Text |
|---|---|---|
| II.33. | II.E<br>II.G<br>III.D.1 | Maintainable using approved maintenance practices and with minimized preventive and casualty maintenance. |
| II.43.a. | II.B | Should NDS maintenance be provided by the USCG alone? |
| II.43.b. | II.B | By contract maintenance alone? |
| II.43.c. | II.B | By a combination of the two? |
| II.31. | II.A | Address component and system obsolescence and allow for future upgrades. |

#### 3.12.2.3 Reliability

| Question Number | PORD Reference | Question Text |
|---|---|---|
| II.6.a. | II.D | For the overall system, receive distress alerts and provide operational communications at any time (availability of at least 99.5% over a monthly period within a specified geographic area). The above includes outages due to preventive and casualty maintenance and administrative and logistics delays. |
| II.6.b | II.D | The future system should be available to receive distress alerts and emergency response alerts, and provide operational communications at any time for certain localized systems that require up to 99.9% availability, including outages due to preventive and casualty maintenance and administrative and logistics delays. |

### 3.12.3 Grouping And Display Of Data

#### 3.12.3.1 Monitoring And Diagnostics

| Question Number | Number of Responses | Number of Critical | | Number of Useful | | Number of Not Essential | |
|---|---|---|---|---|---|---|---|
| | | Number | Percent | Number | Percent | Number | Percent |
| II.32. | 10 | 10 | 100% | | | | |
| II.32.a. | 12 | 9 | 75% | 3 | 25% | | |
| II.32.b. | 11 | 9 | 82% | 2 | 18% | | |
| II.32.c. | 11 | 1 | 9% | 9 | 82% | 1 | 9% |

#### 3.12.3.2 Maintainability

| Question Number | Number of Responses | Number of Critical | | Number of Useful | | Number of Not Essential | |
|---|---|---|---|---|---|---|---|
| | | Number | Percent | Number | Percent | Number | Percent |
| II.31 | 17 | 14 | 82% | 3 | 18% | | |
| II.33. | 18 | 17 | 94% | 1 | 6% | | |
| **Question Number** | **Number of Responses** | **Number of Yes** | | **Number of NO** | | **Number of Partial** | |
| | | Number | Percent | Number | Percent | Number | Percent |
| II.43.a. | 16 | 4 | 25% | 12 | 75% | | |
| II.43.b. | 15 | 5 | 33% | 10 | 67% | | |
| II.43.c | 16 | 14 | 87% | 2 | 13% | | |

#### 3.12.3.3 Reliability

| Question Number | Number of Responses | Number of Critical | | Number of Useful | | Number of Not Essential | |
|---|---|---|---|---|---|---|---|
| | | Number | Percent | Number | Percent | Number | Percent |
| II.6.a. | 77 | 73 | 95% | 4 | 5% | | |
| II.6.b. | 59 | 53 | 90% | 4 | 7% | 2 | 3% |

### 3.12.4 Comments

#### 3.12.4.1 Monitoring And Diagnostics

| Question Number | Interviewee ID | Comment |
|---|---|---|
| II.32. | 119 | Not needed if NDS services are out sourced. |
| II.32. | 122 | NDS does not need to be both local and remote. |
| II.32. | 7 | NDS should include a maintenance kit that provides capability to monitor remote and local system components. |
| II.32. | 22 | Critical to include self diagnostics of critical or major system components status. It is currently difficult to tell where some equipment has malfunctioned. |
| II.32. | 119 | Does not need to be continuous . |

### 3.12.4.2 Maintainability

| Question Number | Interviewee ID | Comment |
|---|---|---|
| II.31. | 122 | Backward compatibility is critical. |
| II.31. | 126 | Connectivity, security, etc., should be included. |
| II.33. | 126 | This should be standardized. |
| II.43.a. | 111 | The future system preventive maintenance and trouble shooting should be accomplished by CG personnel. Repairs to the system should be sent back to the contractor. |
| II.43.a. | 6 | Maintenance should be provided by the CG alone because, from past experience with commercial maintenance providers, the reliability and speed of service will be much better. Speed of service is critical on SAR circuits. |
| II.43.a. | 37 | Maintenance should be provided by the CG alone because of the capability to transmit SBU information. And most systems are located in communications centers that are classified. |
| II.43.a. | 39 | CG can perform minor maintenance quickly and provide quick response with follow up maintenance done by a contractor. |
| II.43.a. | 115 | Whatever method is expedient. |
| II.43.a. | 90 | Not enough ET's in the CG to maintain the whole system. |
| II.43.a. | 108 | The division of responsibility for maintenance of the future system should be agreed to under contract prior to installation. |
| II.43.a. | 51 | CG technicians are more knowledgeable about system requirements and operations. There is a distrust of non-CG technicians |
| II.43.a. | 89 | Contractor response is not a 24 hour capability. |
| II.43.a. | 51 | Willing to live with more training if it means that the system is more compatible. |
| II.43.a. | 44 | Maintenance should be provided by contractors because it simplifies the approach to the problem. |
| II.43.a. | 16 | Routine maintenance should be done by CG personnel with a contractor available for assistance. |
| II.43.a. | 45 | Dedicated CG maintenance is more reliable and responsive than contract maintenance. A mixed maintenance organization doesn't work. |
| II.43.a. | 88 | I put more faith in CG people and their responsiveness. |
| II.43.a. | 32 | Major repairs should be done by a contractor, CG personnel should be involved by swapping out failed equipment with spare equipment. This could be done by an ET or non-technical personnel. |
| II.43.a. | 114 | Maintenance can be supplied by either CG or contractor personnel. |
| II.43.a. | 31 | Maintenance of towers must be on a case-by-case bases. CG personnel should perform black box replacement and contractor repair boxes and other problems. |
| II.43.a. | 87 | They don't get the level of commitment from the contract people . |
| II.43.a. | 109 | The future system should be maintained by both CG personnel and contractor personnel. The division of responsibility should be based on the operational environment. |
| II.43.a. | 17 | Maintenance should be provided by a contractor alone because it is easier to hold a contractor accountable then to continually train CG electronic technicians. Contractors provide continuity. Getting school quotas for CG personnel is difficult. Current experience is that Motorola response time is good; within 2 hours. |
| II.43.a. | 52 | Maintenance by multiple organizations leads to finger pointing and disagreements on responsibility. |
| II.43.a. | 61 | A contractor should be used for maintenance of High Sites and links and CG personnel for unit level and basic maintenance. |

| Question Number | Interviewee ID | Comment |
|---|---|---|
| II.43.a. | 38 | Experienced delays getting equipment malfunctions corrected with contract maintenance. Contractor Support was not responsive to operational needs. Maintenance may be needed now-not within two hours. CG maintenance personnel could be held accountable. |
| II.43.a. | 36 | A combination of CG and contractor maintenance will reduce CG man hours that are needed for other CG assets that require maintenance. Contractor provides continuity that CG personnel can not. CG personnel provide maintenance from demark strip back to the station. But high level sites are contractor maintenance only. |
| II.43.a. | 11 | CG personnel should provide a quick response maintenance for all NDS causalities. The remaining maintenance can be provided by either CG or contractor personnel. |
| II.43.a. | 46 | Contractors are not available 24 hours per day and initial response could come from CG technicians. |
| II.43.a. | 104 | Logistics support should be done by either contract maintenance or the CG, but not both because there would be conflicts between the two. |
| II.43.a. | 110 | Future system maintenance should be done by both contractor and CG personnel. Some places are harder to get contractor support but contractor support should be emphasized. |
| II.43.a. | 54 | CG personnel should have primary responsibility for maintenance with the contractor available if required. |
| II.43.a. | 122 | Two controlling factors-best business case and if contracted out once, you lose capability to bring it back in house at a later date (you lose the skilled people). |
| II.43.a. | 34 | CG personnel should be trained to assess or respond to operational casualty maintenance. |
| II.43.a. | 117 | Maintenance should be accomplished by a mix of CG personnel and contractor personnel depending on existing infrastructure. Do not require additional contractors where A76 contracts are currently working. All remote site maintenance should be with only on contractor. |
| II.43.a. | 95 | Neither the CG alone nor a contractor alone would be the best solution. A combination of the two would provide the best, most reliable maintenance for the overall system. |
| II.43.a. | 96 | NDS maintenance should be provided by a combination of CG and contracted maintenance. |
| II.43.a. | 97 | Whatever is best for the CG. |
| II.43.a. | 27 | NDS maintenance should be provided by contractor alone. Far High Sites should be maintained by contractor because the contractor spec can be written to get better service from contractors then from personnel because the USCG personnel put the problem into a priority queue where the contractor will meet the obligations of the contract. Also, USCG personnel require training each time a new person in transferred into the group. |
| II.43.a. | 23 | Combination of CG and contractors should provide NDS maintenance. Contractor personnel where feasible. Contractor have corporate knowledge of sites and areas, equipment, history of problems. This also ties contractors into providing spares. This is proved out by Canadian LORAN stations where the same crews provide maintenance and have better performance records than US LORSTAS. The maintenance of towers and antennas and the effective use of CG personnel must be considered. The possible use of other owned towers and leasing space on CG towers should be considered. |
| II.43.a. | 19 | NDS maintenance should be provided by contract maintenance alone. In this area USCG could not get there soon enough to repair in a timely manner. |

| Question Number | Interviewee ID | Comment |
|---|---|---|
| II.43.a. | 25 | Both the CG and contractors should provide NDS maintenance. CG personnel provide the maintenance. Contractor personnel provide assistance for work beyond the scope of the CG personnel. |
| II.43.a. | 24 | Combination of CG and contractors should provide NDS maintenance. Contractors should be used for major upgrades and major maintenance. Routine maintenance should be completed by the USCG personnel. |
| II.43.a. | 28 | The CG alone should provide NDS maintenance. CG personnel can be held more accountable for maintenance. CG personnel are usually more accessible and can provide a timely response. |
| II.43.a. | 85 | NDS maintenance should be provided by the USCG and contractor jointly. The USCG personnel need to be able to trouble shoot and locate problems and correct simple problems and call in contractor assistance if necessary. This would save time and money. |
| II.43.a. | 22 | Combination of CG and contractors should provide NDS maintenance. CG would maintain the majority of the system; however, contractor personnel probably will know more about the system. |
| II.43.a. | 21 | NDS should be provided by the USCG alone as long as it works well. |
| II.43.a. | 60 | There needs to be immediate response to casualties. |
| II.43.a. | 126 | System Maintenance- Maintenance is more than just fixing radios, the interconnection must be covered by contract. Wording of contract scope determines acceptability of contractor maintenance. |
| II.43.a. | 84 | ESU presently supports VTS communications. VTS has a separate contractor to support the VTC computers and software. |

### 3.12.4.3 Reliability

| Question Number | Interviewee ID | Comment |
|---|---|---|
| II.6.a. | 250 | 100%, we must be able to initiate and receive communications directly with US recreational vessels. |
| II.6.a. | 113 | Overall system availability should be at least 99.5% as the lower limit. |
| II.6.a. | 117 | This is a minimum. It should be 99.9% per site. |
| II.6.a. | 6 | The system should be available at least 99.5% of the time. It should be much better than that. |
| II.6.a. | 37 | The system should be as available as possible for SAR. |
| II.6.a. | 50 | The system should be available even though the local phone system is down. |
| II.6.a. | 7 | 99.5% availability is not good enough for receiving NDS distress alerts, 100% is required. |
| II.6.a. | 60 | NDS system is needed 100% of the time. |
| II.6.b | 31 | 99.9% is very optimistic. From a maintenance point of view this is difficult. |
| II.6.b | 117 | At least 99.99% available. Microwave paths are engineered to 99.999%. |
| II.6.b | 37 | System reliability is not as necessary for VTS as SAR. |
| II.6.b | 16 | Future NDS for certain localized systems need to be reliable but 99.5% is adequate. |
| II.6.b | 114 | For localized systems, to have them accepted it must be at least 99.5%. |
| II.6.b | 6 | A minimum requirement of 99.5% system reliability is needed and considered critical. |
| II.6.b | 7 | NDS communications must not compete with VTS communications. |
| II.6.b | 84 | The maximum downtime allowed for the VTS system is 8 hours per year. Downtime is tracked in quarterly reports. Standards for calculating downtime are evolving. |

| Question Number | Interviewee ID | Comment |
|---|---|---|
| II.6.b | 25 | Critical for the overall system to receive distress alerts and emergency response alerts and provide operational communications at any time. Largest problem with new equipment is there is more down time than there should be. |
| II.6.b | 23 | Currently the most critical outages at land lines. Could use a dial up number if land line is out. |
| II.6.b | 97 | Backup or redundant systems should allow for coverage if a High Site goes down, so when there is an outage, there is coverage in the area of responsibility. Would recommend no more that 1-hour maximum downtime per month. |
| II.6.b | 25 | Critical for overall system to be available to receive distress alerts and emergency response alerts, and provide operational communications at any time for certain localized systems, especially during bad weather. |

### 3.12.5 Discussion

#### 3.12.5.1 Monitoring And Diagnostics

Interview responses show that all (n=10, 100%) of the interviewees in the group selected for analysis believe that there is a definite need for remote and local system monitoring of critical and major system components. The responses also indicated that three-fourths (n=9, 75%) of the interviewees think that a self diagnostic capability for critical or major system components is critical, a large majority (n=9, 82%) also think that system monitoring of major system components is critical. Considering the overall response to these three questions, it is apparent that the related requirements are absolutely necessary to maintain system availability. However, the capability to record or archive the monitoring results was only thought to be critical by 9 percent of the respondents. It was thought to be useful by 82 percent of the respondents. Therefore, it is apparent that the related requirement is useful, but not necessary to system availability.

#### 3.12.5.2 Maintainability

Responses to the questions concerning maintainability show that the majority of interviewees believe that the system must be maintainable using approved maintenance practices (n=14, 82%) and it must allow for future upgrades (n=17, 94%). The responses concerning who should maintain the system, contractor personnel or CG personnel, elicited the most comments of all the issues. The results showed that the majority of interviewees believe it should be a combination of both CG and contractor support. The comments reveal that there are many thoughts and experiences involved. Such as in the Central United States, CG maintenance personnel are not assigned to areas where they can respond to NDS outages in a timely manner. Therefore, contractor personnel are more efficient in these areas because their commercial application generally allows them to be in more appropriate maintenance locations. In other areas, CG personnel may be a better choice for maintenance due to the remoteness of the area or the lack of contractor personnel within the area.

#### 3.12.5.3 Reliability

The response to the questions on reliability showed that a majority of interviewees agreed with the goals presented: 99.5 percent usable time for the overall system and 99.9 percent usable time for certain localized systems, such as for VTS. Although many comments indicated that a higher rate of usable time may be necessary.

### 3.12.6 Conclusion

#### 3.12.6.1 Monitoring And Diagnostics

The ability to localize a system problem to a specific location is important in order to quickly return a malfunctioning system to operational status. Therefore, system monitoring of critical and major system components is considered as a critical requirement. The ability to use self diagnostic and monitoring of major system components is also an enhancement to trouble shooting and restoration of equipment. Therefore, these requirements are also considered critical. The critical category of these three requirements is supported by the data collected during interviews. The ability to record monitoring results was considered useful by the same interviewees.

#### 3.12.6.2 Maintainability

As the comments show, it is not feasible to use either CG personnel or contractor personnel only for maintenance throughout the NDS system. Differences in locality, and availability of resources must be considered. Therefore, a combination of the two maintenance personnel is critical to system operability. To facilitate rapid restoration of the system, it must be maintainable using approved maintenance practices. As shown by the data results and supported in the comments, it is critical that the system be upgraded to delay obsolescence.

#### 3.12.6.3 Reliability

The reliability of the system is critical to availability. The data results and comments support the goals of 99.5 percent for overall system reliability and 99.9 percent for certain localized systems. The comments show an understanding that NDS availability means that even if one site fails, another site will still provide coverage for that area.

## 3.13 REQUIREMENTS PRIORITY LIST

**There were no requirements from the draft PORD that are frivolous and should be deleted.**

The following is a list of requirements classified as critical or useful for inclusion in the PORD. The order of the requirements in each classification is the sequence they appeared in the question tables in Section 3, Analysis. They are given a sequential number in the first column to easily identify individual requirements.

### 3.13.1 Critical Requirements

| Ref. No. | PORD Reference | Question Interview | Requirement |
|---|---|---|---|
| 1 | I.A | II.20 | Allow command and control of responding facilities for all operational missions that occur in coastal areas. |
| 2 | I.A. | II.4. | Receive maritime distress and emergency response alerts. |
| 3 | I.A. | II.17. | Will provide communications between CG resources, customers, and partners. |
| 4 | I.A. | II.6.b | Some localized areas require a greater system availability, up to 99.9%, to meet local mission requirements (e.g. VTS). |
| 5 | I.B. | II.4. | Provide coastal maritime distress and emergency response alerting. |
| 6 | I.B. | II.7. | Depending on the alternative selected, the system must provide a continuous guard on distress and calling frequencies. |
| 7 | I.B. | II.17. | Provide C3 between the CG and Partners. |
| 8 | II.A. | II.31. | The system design must address component and system |

| Ref. No. | PORD Reference | Question Interview | Requirement |
|---|---|---|---|
| | | | obsolescence and allow for future upgrades. |
| 9 | II.E | II.33 | The system's design must be field repairable to the assembly/subassembly level. |
| 10 | II.E. | II.32. | The system's design must provide self and remote access diagnostics for maintenance functions that are to be performed by Coast Guard personnel. |
| 11 | II.E. | II.32.a. | Diagnostics should include diagnostic self-tests. |
| 12 | II.E. | II.32.b. | Diagnostics should include automated system monitoring. |
| 13 | II.F. | B.2. | The system must remain operable through a category four hurricane, or comparable typhoon. |
| 14 | II.F. | B.2. | The system must remain operable continuously in the temperature, barometric pressure, and humidity ranges found in all coastal areas of Alaska, Hawaii, Guam, Caribbean, and continental U.S. in addition to the Great Lakes region and U.S. internal river system. |
| 15 | II.G. | II.28. | The system design must not introduce undue operator fatigue during extended usage over a 12 hour period every 24 hours. |
| 16 | II.G. | II.29. | For mobile assets, system equipment components must be usable with personal environmental protection equipment (e.g., gloves and helmets). |
| 17 | II.G. | II.30. | For mobile assets, system equipment components must be usable by operators in all operating environments (e.g., explosive and hazardous). |
| 18 | II.G. | II.33. | (A goal of) This acquisition is to minimize required preventative and casualty response maintenance performed by Coast Guard technicians and contract personnel. |
| 19 | II.G. | II.33. | The system must be safe to maintain using accepted/approved maintenance practices. |
| 20 | III.A. | II.27. | The system will function in surface resources that operate within the following environmental ranges: elevation 0 to 3350 meters above sea-level; temperature -30 to +50 degrees Celsius; windspeed 0 to 135 kts; humidity 0 to 100%; and barometric pressure 880 to 1080 mb. |
| 21 | III.A. | II.30. | Equipment installed on mobile platforms or detachments must function in all their operating environments; this includes hazardous (e.g., explosive, surf, and temporary submersion) environments. |
| 22 | III.B | II.20. | NDS will allow command and control of Coast Guard facilities responding to the scene. |
| 23 | III.B. | II.9. | NDS will receive first alert notifications from mariners and mobile resources of the CG and other federal, state, and local agencies. |
| 24 | III.B. | II.19. | NDS will provide follow-on communications to obtain additional information and coordinate on scene operations. |
| 25 | III.B. | II.14. | NDS will enable the CG to contact mariners and potential response resources in the area of concern to notify them of the situation and request assistance, as appropriate. |
| 26 | III.B. | II.17. | NDS will provide communications between CG units and the service's customers and partners. |
| 27 | III.B. | II.24.b. | NDS must provide accurate position information. |
| 28 | III.B. | II.40. | The system must be capable of providing the ability to protect communications with and between CG resources and units of other governmental agencies. |

| Ref. No. | PORD Reference | Question Interview | Requirement |
|---|---|---|---|
| 29 | III.B. | II.35. | All communications must be recordable for immediate retrieval/playback. |
| 30 | III.B. | II.36. | The system must provide long-term archival. |
| 31 | III.C. | II.11. | The system must provide C3 and interoperability with other federal, state, and local agencies. |
| 32 | III.D.1 | II.4. | The system must receive distress and emergency response alerts. |
| 33 | III.D.1 | II.6.a. | The replacement system is required to have an average availability for critical functions of at least 99.5% over a monthly period within a specified geographic area. |
| 34 | III.D.1 | II.17. | The system must provide timely communications (voice and data) between CG forces and its customers and partners in all required areas. |
| 35 | III.D.1 | II.33 | The system must be operable, maintainable, and logistically supportable within the planned funding base. |
| 36 | III.D.2 | II.24.b | The system must provide position location. |
| 37 | III.D.2 | II.30. | The system must be safe to operate in all expected operating environments. |
| 38 | III.D.2 | II.35 | The system must provide a communications record. |
| 39 | III.D.2 | II.36 | The system must provide a time stamp. |
| 40 | III.D.3 | II.28. | The system must consider human factors during system integration. |
| 41 | III.D.4 | II.18. | The system must allow adaptation to future regulatory and technological changes in telecommunications. |
| 42 | III.D.4 | II.12. | The system must effectively interface with the rest of the CG's telecommunications system. |
| 43 | IV.A.1 | II.11. | The system must provide voice and data communications between shoreside and mobile CG resources and detachments, mariners, and other federal, state, and local agencies. |
| 44 | IV.A.2 | II.1 | The system must provide information dissemination. |
| 45 | IV.A.2 | II.4. | The system must receive distress and emergency response alerts. |
| 46 | IV.A.3 | II.24.b. | The system must passively determine absolute and relative position of calling unit. |
| 47 | IV.A.5 | II.35. | The system must record, time stamp, and allow the instant playback of communications. |
| 48 | IV.A.6 | II.37. | The system must protect sensitive information, and allow protection of classified information as appropriate, with requisite level of security. |
| 49 | IV.A.6 | II.40. | The system must protect sensitive information, and allow protection of classified information as appropriate, with requisite level of security. |
| 50 | IV.A.8 | II.15 | The system must provide sufficient voice and data communications capacity to support multiple operations in the same or different geographic areas. |
| 51 | IV.A.8 | II.16 | The system must provide sufficient voice and data communications capacity to support multiple operations in the same or different geographic areas. |
| 52 | IV.B.10 | II.23. | The system must allow receipt of vessel movement reports via Automatic Dependent Surveillance (ADS) systems in selected areas. |
| 53 | IV.B.11 | II.35. | The system must record and time stamp communications for instant playback. |

| Ref. No. | PORD Reference | Question Interview | Requirement |
|---|---|---|---|
| 54 | IV.B.11 | II.36. | The system must allow recorded communications to be archived for future reference. |
| 55 | IV.B.12 | II.12. | The system must provide an interface to the rest of the CGTS that is transparent to the user. |
| 56 | IV.B.13 | II.13. | The system must provide standard interface for connection to existing/planned information processing equipment for data transfer. |
| 57 | IV.B.14 | II.41. | The system must be capable of protected control of communication equipment from a remote site. |
| 58 | IV.B.15 | II.21. | The system must automatically select the appropriate communications protocol based on mode/method of communications (e.g. duplex if duplex mode/channel of communication is selected). |
| 59 | IV.B.17 | II.42. | The system must provide time-out capability to prevent unnecessary or unwanted transmissions (e.g., stuck key). |
| 60 | IV.B.19 | II.32. | The system must provide for remote and local system monitoring of critical and major system components. |
| 61 | IV.B.3 | II.15. | The system must provide sufficient voice/data transmission capacity for the transfer of operational information/data reports. |
| 62 | IV.B.3 | II.16. | The system must provide sufficient voice/data transmission capacity for the transfer of operational information/data reports. |
| 63 | IV.B.4 | II.40. | The system must, throughout the area of coverage, provide protection for the transmission of sensitive but unclassified (SBU) information using standardized encryption techniques. |
| 64 | IV.B.5 | II.37. | The system must allow protection of classified information (up to secret). |
| 65 | IV.B.5 | II.38. | The system must provide necessary interfaces for connection of encryption equipment. |
| 66 | IV.B.5 | II.38. | The system must support the transmission of information encrypted using standard encryption formats. |
| 67 | IV.B.6 | II.39. | The system must detect/receive both clear and encrypted transmissions despite mode (clear or encrypted) of operation. |
| 68 | IV.B.7 | II.24.a. | The system must, throughout the area of coverage, determine position of caller within 2 nm of calling location; a goal is to determine position within 0.1 nm. |
| 69 | IV.B.8 | II.25. | The system must, allow correlation of position location information and other communications, both live and recorded. |
| 70 | IV.B.9 | II.10. | The system must provide digital selective calling (DSC) services in accordance with the Global Maritime Distress and Safety System (GMDSS) in selected areas; system-wide implementation of DSC is required if an alternative using VHF-FM marine radio is selected. |
| 71 | IV.D.1 | II.8. | Mobile resources are required to maintain a communications guard on distress and calling frequencies when engaged in communications. |
| 72 | IV.D.2 | II.24.a. | For selected shore facilities, the system must meet the position accuracy requirement detailed in Section IV.B of the PORD. |
| 73 | IV.D.2 | II.24.b. | The system must provide the passive ability (i.e. user input/assistance not required) to determine the location of the calling party. |
| 74 | IV.D.2 | II.24.d. | The system must allow the incorporation of LOB information from other fixed or mobile resources. |
| 75 | IV.D.2 | II.24.e. | Depending on the alternative selected, the system must provide at least one line of bearing (LOB) on brief or intermittent signals. |

| Ref. No. | PORD Reference | Question Interview | Requirement |
|---|---|---|---|
| 76 | IV.D.2 | II.25. | The system must provide the ability to save/recall/transfer information concerning the caller's position. |
| 77 | IV.D.3 | II.26. | For mobile platforms, the system must provide homing capabilities on line-of-sight international and national distress, calling, and homing frequencies. |
| 78 | IV.D.4 | II.22. | Depending on the alternative selected, allow monitoring of multiple frequencies. |
| 79 | NEW REQUIREMENT | II.5. | The system must transmit distress and emergency response alerts. |

### 3.13.2 Useful Requirements

| Ref. No. | PORD Reference | Question Interview | Requirement |
|---|---|---|---|
| 80. | II.E. | II.32.c. | Diagnostics should include recording of major component status. |
| 81. | II.H. | II.44. | (A goal of) the system is to reduce the level and amount of required training for those who operate, maintain, and manage the system while maintaining optimal skill levels among personnel. |
| 82. | III.D.5 | II.44 | Coast Guard personnel must be able to operate maintain, and manage the system to support all missions performed in coastal areas. |
| 83. | IV.A.4 | II.24.c. | The system must assist in verifying the identity of the calling party. |

Appendix A Interview Guide

The following form was used as the master to map each of the other two forms (Headquarters Interview and External User Survey). This mapping was necessary to present one consolidated database for the analysis process.

NATIONAL DISTRESS SYSTEM MODERNIZATION PROJECT

# INTERVIEW GUIDE

## Demographic Information

| | | | |
|---|---|---|---|
| *Date/Time:* | | *Location:* | |
| *Interviewee:* | | *Organization:* | |
| *Rank/Grade* | | *E-mail Address:* | |
| *Phone:* | | *Interviewer(s):* | |
| *Job Description:* | | *Job Classification* | ❑ Managerial/Supervisory<br>❑ Technical (e.g. Technical Engineer)<br>❑ Operational (e.g. Mariner/Pilot)<br>❑<br>Other:_____ |

## Introduction

The National Distress System (NDS) provides VHF-FM coverage in coastal areas and navigable waterways where commercial or recreational vessel traffic exists. Limitations of the NDS prompted the inception of the NDS Modernization Project. The goal of this project is to permit the Coast Guard to receive maritime distress and emergency response alerts and to allow command and control of responding facilities for all operational missions that occur in coastal areas.

This interview guide serves as a tool to gather information for the National Distress System (NDS) Modernization Project. You will be asked to comment, provide opinions, and make suggestions, based on your unique job perspective, regarding the requirements currently being considered for future implementation. In particular, your assistance is needed to help determine the importance of each requirement. This guide is organized into two parts:

Part I: *NDS Capabilities*
Part II: *Future System Requirements/Considerations*

Part I: *NDS Capabilities* and Part II: *Future System Requirements/Considerations.* Part I includes questions regarding your experience with the VHF-based NDS and the importance you attach to its functionality.

Part II includes the future system requirements and considerations.

# PART I : *NDS Capabilities*

T S O (NDS) 1. Rate the importance of having the current VHF-based National Distress System capability:

❑ Critical ❑ Useful ❑ Nonessential

2. Which of the following ways have you used NDS:

a. For receiving distress alerts from:

T S O ❑ Vessels
O ❑ Aircraft
❑ None

b. For coordination of Search and Rescue operations using:

O ❑ Coast Guard vessels
S O ❑ Coast Guard aircraft
S O ❑ Other-agency vessels
S O ❑ Other-agency aircraft
S O ❑ Commercial assistance providers
S O ❑ Other commercial vessels
S O ❑ Recreational vessels
❑ None

c. For making or receiving broadcasts of urgent marine safety information?

❑ Yes ❑ No

S O d. For command and control of CG aircraft assets involved in other CG missions?

❑ Yes ❑ No

T S O e. Can you think of any additional ways (if any) that you use NDS? If yes, please explain.

_____

_____

_____
_

T S O 3. Do you think your distress alerts are consistently being received by the appropriate unit, command center, or agency?

❑ Yes ❑ No ❑ N/A

S O directly a. How important is the capability to receive distress and emergency alerts (in real-time and without relays)?

❑ Critical ❑ Useful ❑ Nonessential

T S O alerts 4. How valuable is the current cellular telephone services to receive/send distress from vessels?

❑ Critical ❑ Useful ❑ Nonessential

a. How valuable is its use between Coast Guard units (shore to mobile facilities and between mobile facilities)?

❑ Critical ❑ Useful ❑ Nonessential

b. Between Coast Guard and other-agency assets?

❑ Critical ❑ Useful ❑ Nonessential

S O 5. a. Do you determine the location of a distressed vessel or aircraft by the transmission alone?

❑ Yes ❑ No ❑ N/A

b. If yes, how important is this capability?

❑ Critical ❑ Useful ❑ Nonessential

c. Do you think the Coast Guard should have this capability?

❑ Yes ❑ No ❑ N/A

T S O vice 6. How important are direct communications between C2 centers and mobile assets delayed or relayed comms?

❑ Critical ❑ Useful ❑ Nonessential

T S O Guard C2 7. How important do you find the ability to communicate directly between Coast centers and mobile assets of other agencies?

❑ Critical ❑ Useful ❑ Nonessential

S O with: 8. How important is the ability to communicate Search and Rescue instructions

a. Coast Guard aircraft and vessels via **voice** communications?

❑ Critical ❑ Useful ❑ Nonessential

b. Coast Guard aircraft and vessels via **data** communications?

❑ Critical ❑ Useful ❑ Nonessential

c. Non-Coast Guard aircraft and vessels via **voice** communications?

❑ Critical ❑ Useful ❑ Nonessential

d. Non-Coast Guard aircraft and vessels via **data** communications?

❑ Critical ❑ Useful ❑ Nonessential

# PART II : *Future System Requirements/Considerations*

Provided below is a matrix listing the preliminary operational requirements for the future NDS system. Next to each statement are columns for **Critical**, **Useful**, and **Nonessential. Critical** = Critical to System Success, **Useful** = Useful NDS Feature, and **Nonessential** = Not a requirement. For example, if you think that the statement "The future system should be operable from both existing and planned mobile platforms and shoreside facilities" reflects an absolute necessity for the NDS Modernization effort, mark the **Critical** column to indicate that you think this requirement is "Critical". If you feel that the statement is not relevant to NDS, mark the **Nonessential** column. If a statement does not apply, please do not complete the response column.

| NDS Requirement | Critical | Useful | Nonessential |
|---|---|---|---|
| *DistressAlerts and Emergency Response* | | | |
| (SO) 1. Allow for dissemination of **operational coordination messages** to and within localized geographic areas. | | | |
| (SO) 2. Allow for **unscheduled and urgent marine information** to and within localized geographic locations. | | | |
| (SO) 3. Allow for **routine scheduled marine safety information** to and within localized geographic locations. | | | |
| (SO) 4. **Receive** maritime distress and emergency response alerts. | | | |
| (SO) 5. **Transmit** maritime distress and emergency response alerts. | | | |
| (TS) 6. a. For the overall system, receive distress alerts and emergency response alerts, and provide operational communications at any time (availability of at least 99.5% over a monthly period within a specified geographic area). The above includes outages due to preventive and casualty maintenance and administrative and logistics delays. | | | |
| (SO) b. The future system should be available to receive distress alerts and emergency response alerts, and provide operational communications at any time for certain localized systems (e.g. VTS) that require up to 99.9% availability, including outages due to preventive and casualty maintenance and administrative and logistics delays. | | | |

| NDS Requirement | Critical | Useful | Nonessential |
|---|---|---|---|
| (SO) 7. Provide a continuous guard on distress and calling frequencies. | | | |
| (S) 8. Mobile facilities must be required to maintain a communications guard on distress and calling frequencies when engaged in communications on other frequencies. | | | |
| (S) 9. Receive first alert notifications from mariners and mobile facilities of the Coast Guard and other federal, state, and local agencies. | | | |
| *DSC/GMDSS* | | | |
| (SO) 10. The Coast Guard intends to have the future NDS meet requirements for the Sea Area A1 component of the Global Maritime Distress and Safety System (GMDSS). The future system should provide capability to meet the Sea Area A1 (Coastal) requirements of the GMDSS. This includes Digital Selective Calling, when and where Sea Area A1 if implemented by the United States. | | | |
| a. How critical is this capability? | | | |
| b. To what degree do you feel the Coast Guard should be responsible for this capability? | | | |
| *Operations with other Public Service Providers* | | | |
| (TSO) 11. On scene Coast Guard mobile facilities must be able to communicate directly with commercial and recreational vessels and response units from commercial service providers and other Federal, state, and local agencies. | | | |
| (TSO) 12. The future system should provide an interface to the rest of the CGTS that is transparent to the user. | | | |
| (TSO) 13. Provide standard interfaces for connection to existing or planned information processing equipment for data transfer. | | | |
| (SO) 14. Enable the Coast Guard to contact mariners and potential response facilities in the area of concern to notify them of the situation and request assistance, as appropriate. | | | |
| *Voice and Data Communications* | | | |
| (TSO) 15. Provide sufficient voice transmission capacity for transfer of operational information reports in the same or | | | |

| NDS Requirement | Critical | Useful | Nonessential |
|---|---|---|---|
| different geographic location. | | | |
| (SO) 16. Provide sufficient data transmission capacity for transfer of operational information reports in the same or different geographic location. | | | |
| 17. Provide timely communications between the Coast Guard forces and its customers and partners in all required areas. | | | |
| (TS) 18. Allow for adaptation to future regulatory and technological changes in telecommunications. | | | |
| (SO) 19. Provide follow-on communications in order to obtain additional information and coordinate on scene operations. | | | |
| (S) 20. Dispatch and coordinate the actions of mobile facilities to patrol or to provide surveillance in areas of interest. | | | |
| (TSO) 21. Automatically select the appropriate communication protocol based on the mode and method of communications (e.g., duplex if duplex mode/channel selected). | | | |
| (SO) 22. Allow monitoring of multiple frequencies. | | | |
| (SO) 23. Allow transmission of vessel movement reports via Automated Dependent Surveillance (ADS) systems in Vessel Traffic Service (VTS). | | | |
| *Position Location/Caller ID* | | | |
| (TSO) 24a. Determine position of a caller within _____ throughout the coverage area.<br>❑ 2 NM<br>❑ 0.1 NM | | | |
| (SO) b. Passively determine relative positions of calling units. | | | |
| (SO) c. Assist in verifying the identity of any calling party. | | | |
| (SO) d. Allow the incorporation of Line of Bearing (LOB) information from other fixed and mobile facilities. | | | |
| (SO) e. Provide at least one line of bearing (LOB) on brief or intermittent signals. | | | |

| NDS Requirement | Critical | Useful | Nonessential |
|---|---|---|---|
| (SO) 25. Allow correlation of position location information and other communications, both live and recorded. (Note: correlation means to allow determination whether each position location with the correct corresponding comms signal). | | | |
| (SO) 26. Provide homing capabilities on line-of-sight international and national distress calling and homing frequencies for mobile platforms. | | | |
| *Environmental and Safety Issues* | | | |
| (TSO) 27. Function in surface facilities that operate within the following environmental ranges: elevation 0 to 3350 meters above sea-level; temperature -30 to +50 Celsius; windspeed 0 to 135 kts; humidity 0 to 100%; and barometric pressure 880 to 1080mb. | | | |
| (SO) 28. Design should not introduce undue operator fatigue during extended usage over a 12 hour period (every 24 hours). The system will consider the following features:<br>∑ operator control of sensitivity and incoming audio;<br>∑ visual indications of system component status and operation;<br>∑ automated and manual muting of selected signals;<br>∑ operator adaptable user interfaces;<br>∑ ability for automated broadcasts | | | |
| (TS) 29. The future system and its user-operated components should be usable by mobile facility personnel wearing personnel protective equipment in all operating environments (e.g., explosive, hazardous, etc). | | | |
| (SO) 30. Must safely function in all operating requirements including hazardous environments (e.g., explosive, surf, and temporary submersion). | | | |
| *Archiving/Recording/Retrieval/Maintenance* | | | |
| (TS) 31. Address component and system obsolescence and allow for future upgrades. | | | |
| (TS) 32. Provide for remote and local system monitoring of critical and major system components. | | | |
| (TS) a. Include self diagnostics of critical or major system | | | |

| NDS Requirement | Critical | Useful | Nonessential |
|---|---|---|---|
| components status. | | | |
| (TS) b. Include system monitoring of major same components. | | | |
| (TS) c. Include recording (or archiving) of the monitoring results. | | | |
| (TSO) 33. Maintainable using approved maintenance practices and with minimized preventive and casualty maintenance. | | | |
| (TSO) 34. Consider alternatives that minimize the impact of loss of auxiliary services (e.g. telephones, electricity). (TS) | | | |
| 35. Record and time stamp communications for instant playback. | | | |
| (TSO) 36. Allow recorded communications to be archived for future reference. | | | |
| *Information Protection/Secure Comms* | | | |
| (TSO) 37. Allow protection of classified information. | | | |
| (TSO) 38. Provide interfaces for the connection of encryption equipment, and support the transmission of encrypted information using standard encryption formats. | | | |
| (TSO) 39. Detect and receive clear and encrypted transmissions despite mode (clear or encrypted) of operation. | | | |
| (TSO) 40. Provide protection for the transmission of sensitive but unclassified (SBU) information using standard encryption techniques throughout coverage area. | | | |
| (TSO) 41. Capable of protected control of communication equipment from a remote site. | | | |
| (TSO) 42. Provide the capability to prevent unnecessary or unwanted transmissions (e.g., stuck key). | | | |
| *Logistics Support* | | | |
| (TS) 43. a. Should NDS maintenance be provided by the USCG alone?<br>❑ YES ❑ NO<br>b. By contract maintenance alone?<br>❑ YES ❑ NO<br>c. By a combination of the two? | | | |

| NDS Requirement | Critical | Useful | Nonessential |
|---|---|---|---|
| ❑ YES ❑ NO | | | |
| *Training Requirements* | | | |
| (TSO) 44. The future system should not increase training requirements for system operators, maintenance personnel, and system managers while maintaining optimal skill levels. | | | |

# B. *Future System Considerations*

Please select the appropriate response for future system considerations. Skip any questions that do not apply.

***Areas of Coverage***

TSO 1. The future system coverage should include:

a. All coastal regions serviced by the existing NDS.

❑ Yes ❑ No ❑ Partial (Specify)

b. All coastal regions where the Coast Guard has jurisdiction.

❑ Yes ❑ No ❑ Partial (Specify)

c. All coastal regions of the Continental US.

❑ Yes ❑ No ❑ Partial (Specify)

d. All inland waterways of the Continental US.

❑ Yes ❑ No ❑ Partial (Specify)

e. All coastal regions of Alaska.

❑ Yes ❑ No ❑ Partial (Specify)

f. All inland waterways of Alaska.

❑ Yes ❑ No ❑ Partial (Specify)

g. All coastal regions surrounding Hawaii.

❑ Yes ❑ No ❑ Partial (Specify)

h. All coastal regions surrounding Puerto Rico and US Virgin Islands.

❑ Yes ❑ No ❑ Partial (Specify)

i. All coastal regions surrounding Guam.

❑ Yes ❑ No ❑ Partial (Specify)

j. Other:_____

_____

Comments:_____

_____

_____

TS 2. Where implemented, the future system should operate continuously in temperature, barometric pressure, and humidity ranges and remain operable under degraded conditions ranging from accidents and natural disasters to limited conventional war (i.e. Category Four, hurricane, or comparable typhoon in susceptible regions).

❑ Critical ❑ Useful ❑ Nonessential

Comments:_____

_____

_____

SO 3. The future system must provide coverage to (*Check all that apply*):

a. ❑ 10NM offshore
b. ❑ 20NM offshore
c. ❑ 30NM offshore
d. ❑ 40NM offshore
e. ❑ 50NM offshore
f. ❑ Other:_____

Comments:_____

_____

_____

4. Are there any questions we should have asked that we did not?

_____

_____

_____

_____

_____

5. Do you have any suggestions for other organizations, users, or customers that should be allowed to respond to this survey?

_____

_____

_____

_____

_____

Additional
Comments:_____
_____
_____
_____
_____
_____
_____
_____

### 3.14 Appendix B

### 3.15 Preliminary Operational Requirements Document (PORD) (draft)

# U.S. Coast Guard

# Preliminary Operational Requirements

# for the

# National Distress System

# Modernization Project

# Draft - v1.0 - 16 September 1996

# I. INTRODUCTION.

**A. PURPOSE.** The Coast Guard Telecommunications System (CGTS) consists of the radio and landline facilities controlled and/or used by the Coast Guard. It provides connectivity for Command, Control, and Communications (C3) of operational Coast Guard forces; ensures connectivity, compatibility, and interoperability with the National Command Authorities (NCA) and Federal Executive Agencies (FEA); provides an effective interface with the maritime industry and the boating public; and provides telecommunications services for the administrative support of Coast Guard facilities.

The CGTS consists of two subsystems: the Long Range Communications System (LRCS) and the Short Range Communications System (SRCS). The SRCS supports Activities, Groups, Air Stations (AIRSTA), Marine Safety Offices (MSO), Captains of the Port (COTP), Vessel Traffic Services (VTS), and their subordinate units. The backbone of the current SRCS is the National Distress System (NDS) which provides VHF-FM coverage in coastal areas and navigable waterways where commercial or recreational vessel traffic exists. It was built to provide the USCG with a means to monitor the international VHF-FM distress frequency; coordinate search and rescue response operations; and communicate with commercial and recreational vessels. Its secondary function was to provide C3 for USCG units (active, Auxiliary, and reserve) performing Maritime Safety, Maritime Law Enforcement, National Security, and Marine Environmental Protection missions.

The NDS Modernization project will allow the Coast Guard to receive maritime distress and emergency response alerts and will allow command and control of responding facilities for all operational missions that occur in coastal areas. It will provide communications between Coast Guard facilities (e.g., Activities, Groups, AIRSTAs, MSOs, VTSs, COTPs, Stations, Aids to Navigation Teams, Port Security Units, cutters, boats, aircraft, selected vehicles, and detached personnel) and the Coast Guard's customers and partners (e.g., recreational and commercial mariners, commercial service providers, and other Federal, state, and local agencies).

**B. BACKGROUND.** The acquisition will result in a communications system to provide coastal maritime distress and emergency response alerting and C3 between the Coast Guard and its customers and partners as detailed above. This function has primarily been carried out by the current NDS and numerous localized systems which provide communications to Groups, VTSs and selected MSO/COTPs and Air Stations. The current NDS consists of a network of approximately 300 VHF-FM analog transceivers with antenna high-sites which are remotely controlled by regional communication centers and selected stations to provide coverage extending out to 20NM from shore in most areas. The present systems do not provide complete coverage of continental U.S. coastal areas, bays, inlets, and river systems. Presently there are over 65 verified gaps and numerous localized coverage deficiencies identified by local operational commanders. (Note: The systems in Alaska and Hawaii were exempted from complete coverage in 1975.)

The system has the capability to guard the VHF-FM international distress frequency, however, the distress watch is interrupted during any transmission by the monitoring site. (Note: The systems in the Western Rivers and Alaska do not have Channel 16 guard receivers.) In addition to the guard receiver, the system can transmit or receive on any one of six predesignated maritime VHF-FM channels. C3 is often jeopardized because the system does not have adequate channel capacity and allows only one conversation on one frequency at a time. Essential communications with other Federal, state, and local agencies are often hindered or unavailable due to the lack of compatible communications equipment.

Much of the existing equipment was installed in the 1970's; is no longer commercially available off-the-shelf; and is becoming increasingly difficult to support. The expected service life of electronic equipment installed during this period was 15 years. Equipment failures have necessitated the replacement of many system components that are no longer commercially available, resulting in a lack of standardization. Nonstandardized multichannel recorders, instant playback recorders, and localized direction finding equipment were installed in some locations to meet needs identified after the original system's construction. These changes have contributed to the lack of system integration and standardization.

**C. TIMEFRAME.** The Coast Guard's reliance on the current NDS for C3 combined with the system's unsatisfactory reliability and coverage, increasing maintenance difficulties, and insufficient capacity dictates a system-wide replacement and upgrade in capabilities in the shortest possible timeframe.

1. Initial Operational Capability (IOC) date: Q3, FY-99. Justification is as described above. In addition, the Global Maritime Distress and Safety System (GMDSS) implementation deadline for SOLAS class vessels is February 1999. Q3 FY-99 is the earliest possible IOC date allowed by current funding spendplans.

2. Support Date (all logistics support in place): Coast Guard logistics support, if required, will be in place prior to the expiration of any warranties on a unit-by-unit basis. If logistical support is provided by a contractor, the Coast Guard logistics support date does not apply.

3. Date when last unit must be operational: 4th quarter, FY-01.

# II. PHILOSOPHY.

**A. DESIGN.** To date, the only system design constraints are that the implementation must be consistent across operating units of the same type and it must be operable from existing and planned mobile platforms and shoreside facilities. A primary design requirement will be the current and future communications equipment (both voluntary and required) used by the Coast Guard's customers and partners.

A major objective of this acquisition will be to gain use of a complete and integrated system that will improve operational performance and reduce life cycle costs. Every effort will be made to use Commercial Off The Shelf (COTS) and Non-Developmental Item (NDI) equipment using existing, proven, or rapidly maturing technology. Depending on the alternative selected, a limited amount of system development and prototype evaluation is expected in order to provide integration of the various system components. This will be performed by a systems integrator who will be the single point of contact for the various system components and their interaction. In addition, the system design must address component and system obsolescence and allow for future upgrades.

**B. LOGISTIC SUPPORT.** Equipment standardization and supportability are primary logistics considerations. The wide range of facilities in which system components will be installed and the high degree of availability and capability required pose logistical support challenges. Support considerations will be integrated into the system design, schedule, cost, and acquisition through a formal Integrated Logistics Support (ILS) program and Integrated Logistics Support Plan (ILSP). The ILSP will detail the ILS program and its relationship with the overall program management. The ILSP will serve as the basis for preparation of the ILS sections of the procurement package. Logistics support will be provided by either a contractor, the Coast Guard, or some combination of the two as developed in the ILSP.

**C. RELIABILITY.** Reliability against critical and major failures will be designed to meet the availability requirements outlined in section II.D. Since many of the current system's outages are attributable to commercially provided support services (e.g. telephone lines, electricity), alternatives that minimize the impact of the loss of auxiliary services will be considered.

**D. AVAILABILITY.** Operational commanders and mariners in general rely on the NDS 24 hours a day, 7 days a week for vital communications. Historically, system usage varies by location and time of year, week, and day. While system use is not constant, it must be available to receive distress and emergency response alerts and provide operational communications at any time. This requires that the system demonstrate a high state of operational availability. Operational availability is defined as follows:

$$A_0 = \frac{(T_o + T_s)}{(T_o + T_s + T_m + T_l + T_a)}$$

where

$T_o$ = *operating time*

$T_s$ = *standby time*

$T_m$ = *maintenance time (preventive and casualty)*

$T_l$ = *logistical delays*

$T_a$ = *administrative delays*

The replacement system is required to have an average availability for critical functions of at least 99.5% over a monthly period within a specified geographic area. Some localized areas require a greater system availability, up to 99.9%, to meet local mission requirements (e.g., VTSs). The system design will consider the use of redundancies and/or alternate communication paths to achieve the required availability.

Certain subsystems may have different availabilities depending on the function they provide. System designers must balance reliability and maintainability to ensure subsystem performance.

**E. MAINTAINABILITY.** Since the new system will be the only means of vital communications for mariners and Coast Guard units in many areas and/or situations, the maintenance plan must reduce the time the system is not available to meet system availability requirements. This includes outages associated with preventive and casualty maintenance in addition to logistic and administrative delays. Redundancy of critical systems to ensure the necessary level of availability will be balanced against the need to minimize maintenance. It is a goal to minimize maintenance costs, including costs associated with personnel, while providing the required level of system availability. The level of maintenance required by Coast Guard personnel must fall at or below planned personnel rate structure and expertise levels. Responsibility for specific levels of maintenance will be specified in the ILSP.

The system's design must be field repairable to the assembly/subassembly level and provide self and remote access diagnostics for maintenance functions that are to be performed by Coast Guard personnel. Diagnostics should include automated system monitoring, recording of major component status, and diagnostic self-tests.

**F. SURVIVABILITY.** The system must provide essential connectivity and restoration of key operational circuits under degraded conditions ranging from accidents and natural disasters to limited conventional war. It must remain operable through a category four hurricane, or

comparable typhoon, and operate continuously in the temperature, barometric pressure, and humidity ranges found in all coastal areas of Alaska, Hawaii, Guam, Caribbean, and continental U.S. in addition to the Great Lakes region and U.S. internal river system.

**G. PERSONNEL, SAFETY, AND ENVIRONMENTAL.** A systems approach to the design is required to provide necessary human ergonomic and efficiency considerations. The system design will consider improvements in operational effectiveness and efficiency; this includes the automation of operationally routine reporting requirements (e.g., position and "ops normal" reports).

**Shoreside Personnel:** The current NDS is continuously staffed and operated by one watchstander at each Group communications center who often performs additional communications related duties depending on other mission requirements. This watch is occasionally supplemented by additional personnel during periods of high intensity operations. Continuous communications watches are maintained by VTSs. Periodic communications watches are maintained at other commands that rely on the system for C3 (e.g. MSOs, COTPs, AIRSTAs, Stations) and to provide backup monitoring of distress circuits as required.

For the new system, Coast Guard personnel requirements must fall within planned rate structure and expertise levels; a goal of this acquisition is to reduce communications watch requirements on Coast Guard personnel. Improvements in system integration that increase watchstander effectiveness and span of control will be considered. System integration (e.g., centralized control of various system components) is a critical environmental factor for the communications watchstander. The system design must not introduce undue operator fatigue during extended usage over a 12 hour period every 24 hours. To accomplish this, the following features will be considered in the system design:

∑ operator control of equipment sensitivity and incoming audio levels;
∑ visual indication of system component status and operation;
∑ automated and manual muting of selected audio signals;
∑ system interfaces adaptable to user preferences;
∑ and the ability to make automated broadcasts and/or pre-record and playback prolonged broadcasts.

**Mobile Facility Personnel:** For mobile assets, system equipment components must: be usable by operators in all operating environments (e.g., explosive and hazardous); include ergonomic concerns for use with personal environmental protection equipment (e.g., gloves and helmets); be immediately available to the operator; and conform with existing user/equipment interfaces.

**Maintenance Personnel:** Maintenance support is currently provided through a combination of contract and Coast Guard electronics technician support. Coast Guard personnel requirements must fall at or below planned rate structure and expertise levels; a goal of this acquisition is to minimize required preventative and casualty response maintenance performed by Coast Guard technicians and contract personnel. The system must be safe to maintain using accepted/approved maintenance practices.

**Environmental:** An environmental assessment will be completed to analyze the potential environmental impacts of the various alternatives per the National Environmental Policy Act (NEPA), as required. This assessment will serve as an input into the acquisition decision process.

**H. TRAINING REQUIREMENTS.** Optimal use of the National Distress System is reliant on the skill level of system operators, maintenance personnel, and system managers. The level

and type of training required will depend on the system design and entry level skills of personnel needing training. A goal of the system is to reduce the level and amount of required training for those who operate, maintain, and manage the system while maintaining optimal skill levels among personnel. Training for this system will be developed in accordance with Coast Guard instruction, Management of the Coast Guard's Training System, COMDTINST 1550.9 (series). Initial and follow-on training must not disrupt Coast Guard mission performance.

## III. MISSION REQUIREMENTS.

The system will support Coast Guard operations for all mission areas that occur in the littoral, or near coastal, zone.

**A. OPERATING REQUIREMENTS.** The new system must operate in all coastal and inland regions of the continental U.S., Alaska, Hawaii, Caribbean, and Guam. Equipment installed on mobile platforms or detachments must function in all their operating environments; this includes hazardous (e.g., explosive, surf, and temporary submersion) environments. These varied operating environments require a system that will function in surface facilities that operate within the following environmental ranges: elevation 0 to 3350 meters above sea-level; temperature -30 to +50∞ Celsius; windspeed 0 to 135 kts; humidity 0 to 100%; and barometric pressure 880 to 1080 mb. Equipment installed in airborne facilities must meet environmental conditions set forth in RTCA Standard DO-160B.

**B. CONCEPT OF OPERATIONS - PEACETIME.** The system must provide communications to enable the effective and efficient performance of missions performed in coastal areas including maritime safety (Search and Rescue, vessel traffic services, AToN, domestic ice, commercial vessel safety, and recreational boating safety), maritime law enforcement, and marine environmental protection. This includes the performance of missions related to "special operations" (e.g., regattas, Olympics, and marine shows) and large-scale multi-mission operations (e.g. airline catastrophies) that are not considered national emergencies. Watchstanders at operations and communications centers located at Activities, Groups, AIRSTAs, MSOs, VTSs, COTPs, and multi-mission Boat Stations communicate with and coordinate the activities of Coast Guard forces, commercial and recreational vessels, and response units from commercial service providers and other Federal, state, and local agencies. In addition, on scene Coast Guard mobile facilities communicate directly with commercial and recreational vessels and response units from commercial service providers and other Federal, state, and local agencies. An example scenario is described below.

In general, the Coast Guard receives notice of a situation (e.g. search and rescue case, oil spill, potential law enforcement case, vessel entering port) that requires the Coast Guard to coordinate response efforts and/or respond with facilities. These notifications and available supporting data are received by a communications or operations watchstander who relays the information to the appropriate operations center for coordination. The operations center dispatches Coast Guard facilities, as appropriate, and maintains C3 throughout the response. This is done either directly or via a communications center. The operations center often requests assistance from non-Coast Guard facilities that may be in the area. In addition, the operations center requests and/or receives additional information from the scene of the situation and coordinates the actions of responding Coast Guard facilities, non-Coast Guard facilities, and the parties involved, as appropriate. In addition to the coordination received from the operations center, responding Coast Guard facilities directly coordinate on scene operations with other responding facilities and the parties involved, as appropriate. Coordination between the operations center, responding facilities, and the parties involved continues until the situation is resolved.

It is envisioned that the NDS will perform several vital functions in the above scenario. It will receive first alert notifications from mariners and mobile facilities of the Coast Guard and other federal, state, and local agencies. It will provide follow-on communications to obtain additional information and coordinate on scene operations. It will allow the command and control of Coast Guard facilities responding to the scene. It will enable the Coast Guard to contact mariners and potential response facilities in the the area of concern to notify them of the situation and request assistance, as appropriate. In addition, it will provide communications between Coast Guard units and the service's customers and partners. Due to the sensitive nature of many operations, the system must be capable of providing the ability to protect communications with and between Coast Guard facilities and units of other governmental agencies. Accurate position information is required to respond to situations in a timely manner. Lastly, due to the brief and emergent nature of many calls and the legal importance of communications, all communications must be recordable for immediate retrieval/playback and long-term archival.

The Coast Guard also dispatches and coordinates the actions of mobile facilities to surveil areas of interest. These operations are similar to those described above except they do not rely on a notification to initiate action.

**C. CONCEPT OF OPERATIONS - NATIONAL EMERGENCY.** The concept of operations for national emergencies (e.g., major storms, floods, earthquakes, and human-caused catastrophes) is similiar to those described above with increased emphasis placed on the system's ability to allow C3 and interoperability with other federal, state, and local agencies. In addition, this may require a greater capacity for communications services than as described above due to an increased level of widespread operations and response efforts. During times of war or unrest, the volume of secure and protected communications within the Coast Guard and with other federal defense agencies will substantially increase in support of coastal defense and port security missions.

**D. CRITICAL OPERATIONAL ISSUES.** Critical operational issues are the operational effectiveness and suitability issues (not parameters, characteristics, or thresholds) that will be examined during Operational Test and Evaluation (OT&E) of the system to evaluate and assess the system's ability to perform as required to support Coast Guard missions.

**Effectiveness Issues:**

1. Does the system receive distress and emergency response alerts and provide timely communications (voice and data) between Coast Guard forces and its customers and partners in all required areas?

2. Does the system meet other performance/functional requirements (e.g., position location, information protection, information dissemination, and communications record, time-stamp, and playback)?

3. Are communications automatically routed to the appropriate/responsible operations center?

4. Does the system effectively interface with the rest of the Coast Guard's telecommunication system?

**Suitability Issues:**

1. Will the system be operable, maintainable, and logistically supportable within the planned funding base, personnel rate structure, and expertise level?

2. Will the system components be safe to operate in all expected operating environments?

3. Does the system provide adequate human factor considerations and systems integration?

4. Does the system allow adaptation to future regulatory and technological changes in telecommunications?

5. After completing prescribed training, will Coast Guard personnel be able to operate, maintain, and manage the system to support all missions performed in coastal areas?

6. Is the system design/architecture adaptable to future Coast Guard infrastructure and organizational changes (e.g. unit openings/closures and changes in responsibility)?

# IV. CRITICAL TECHNICAL PARAMETERS.

**A. BASIC REQUIREMENTS.** The following functional requirements are summarized from the NDS Modernization MNS and the C4I Baseline Architecture:

1. Provide voice and data communications between shoreside and mobile Coast Guard facilities and detachments, mariners, and other Federal, state, and local agencies.

2. Receive distress and emergency response alerts.

3. Passively determine absolute and relative position of calling unit.

4. Assist in verifying the identity of the calling party.

5. Record, time stamp, and allow the instant playback of communications.

6. Protect sensitive information, and allow protection of classified information as appropriate, with requisite level of security.

7. Disseminate operational coordination messages and urgent marine information to localized geographic areas.

8. Provide sufficient voice and data communications capacity to support multiple operations in the same or different geographic areas.

This is a summary of existing requirements

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**B. COMMUNICATIONS / DATA PROCESSING.**

1 Provide comprehensive coverage, without localized gaps, in all coastal regions and navigable waterways serviced by the existing NDS or similar Coast Guard operated system. It is a goal to provide comprehensive coverage in all coastal regions and navigable waterways over which the USCG has jurisdiction.

2 Provide coverage to at least 20NM offshore or to the extent of existing system coverage, whichever is greater. It is a goal to provide coverage out to the maximum offshore operating range of mobile Coast Guard facilities that rely on the current system as their primary source of communications.

3 Provide sufficient voice/data transmission capacity for the transfer of operational information/data reports.

4 Throughout the area of coverage, provide protection for the transmission of sensitive but unclassified (SBU) information using standardized encryption techniques.

5 Allow protection of classified information (up to Secret). Provide necessary interfaces for connection of encryption equipment, and support the transmission of information encrypted using standard encryption formats.

6 Detect/receive both clear and encrypted transmissions despite mode (clear or encrypted) of operation.

7 Throughout the area of coverage, determine position of caller within 2 NM of calling location; a goal is to determine position within 0.1 NM.

8 Allow correlation of position location information and other communications, both live and recorded.

9 Provide digital selective calling (DSC) services in accordance with the Global Maritime Distress and Safety System (GMDSS) in selected areas; system-wide implementation of DSC is required if an alternative using VHF-FM marine radio is selected.

10 Allow receipt of vessel movement reports via Automatic Dependent Surveillance (ADS) systems in selected areas.

11 Record and timestamp communications for instant playback. Allow recorded communications to be archived for future reference.

12 Provide an interface to the rest of the CGTS that is transparent to the user.

13 Provide standard interface for connection to existing/planned information processing equipment for data transfer.

14 Be capable of protected control of communication equipment from a remote site.

15 Automatically select the appropriate communications protocol based on the mode/method of communications (e.g. duplex if duplex mode/channel of communication is selected).

16 Have system response/transmission times short enough to insure that no information is lost.

17 Provide "time-out" capability to prevent unnecessary or unwanted transmissions (e.g., stuck key).

18 Operate on auxiliary services (e.g., electrical power) available on/at current and planned shoreside and mobile facilities.

19 Provide for remote and local system monitoring of critical and major system components.

**C. NAVIGATION.** None.

**D. SENSORS.**

1. Depending on the alternative selected, provide a continuous guard on distress and calling frequencies. Mobile facilities are required to maintain a communications guard on distress and calling frequencies when not engaged in communications.

2. Provide the passive ability (i.e. user input/assistance not required) to determine the location of the calling party. For selected shore facilities, meet the position accuracy requirement detailed in Section IV.B. Provide the ability to save/recall/transfer information concerning the caller's position. Depending on the alternative selected, provide at least one line of bearing (LOB) on brief or intermittent signals and allow the incorporation of LOB information from other fixed or mobile facilities.

3. For mobile platforms, provide homing capabilities on line-of-sight international and national distress, calling, and homing frequencies.

4. Depending on the alternative selected, allow monitoring of multiple frequencies.

**E. TRADE-OFFS.** Economic and technological constraints require prioritization of system characteristics/capabilities. The prioritization categories include considerations for providing a baseline level of service, economic realities, enhanced operational capabilities, and system support. The system characteristics/capabilities have the following relative priorities within existing life cycle cost constraints:

1. Coverage, availability, and voice/data communications (for C3 and receipt of distress and emergency response alerts)

2. Other performance criteria

∑ information dissemination
∑ position location
∑ information protection
∑ recording/playback
∑ Digital Selective Calling (DSC)
∑ caller identification

3. Maintainability and logistics support

4. System configuration and integration

# Appendix C External User/Customer Comments

Below is a complete listing of the comments on survey forms distributed to users external to the Coast Guard:

*Italicized Question Numbers* indicate that question appeared exclusively on the external user survey form. All others were normalized into the database according to the On-site Interview Form (Appendix C).

| Question Number | Interviewee ID | Comment Text |
|---|---|---|
| II.A.6.a. | 250 | 100%, we must be able to initiate and receive communications directly with US recreational vessels. |
| II.A.10.a. | 205 | 100% |
| II.A.24.a. | 209 | In heavy seas the requirement for determining location should be less than one mile. |
| II.A.24.b. | 209 | The determination of positions and identity of callers are needed for hoax and false mayday calls. |
| II.A.27. | 250 | Most emergencies seemingly occur in bad conditions. |
| II.B.1.d. | 250 | NDS should cover major traffic areas in the, Mississippi, Ohio, and Missouri. River systems and intercoastal waterways. |
| II.B.1.d. | 206 | Great Lakes and Eastern Rivers |
| II.B.1.d. | 207 | Do not install NDS near a body of water where a vessel is always less than two or five NM from shore. |
| II.B.1.d. | 221 | Those inland waterways having significant maritime activity should be covered. |
| II.B.1.d. | 203 | Great Lakes and navigable portions of the major rivers |
| II.B.1.d. | 234 | NDS should control navigable river systems. Partner with fish and game/wildlife or other agency that regulates inland areas. |
| II.B.1.d. | 212 | Just the major inland waterways. |
| II.B.1.d. | 231 | Only interstate inland waterways should be provided NDS coverage. |
| II.B.1.d. | 201 | Federal navigable waterways. |
| II.B.1.e. | 221 | Those coastal regions of Alaska having significant maritime activity should be covered. |
| II.B.1.e. | 207 | Based on usage. Ultra low usage areas may be omitted. |
| II.B.1.e. | 250 | NDS should cover Targeted Alaskan areas of high traffic with backup systems in other locations. |
| II.B.1.f. | 207 | Do not install NDS near a body of water where a vessel is always less than ten NM from shore. |
| II.B.1.f. | 221 | Those Alaskan inland waterways having significant maritime activity should be covered. |
| II.B.1.f. | 234 | NDS should control navigable river systems. Partner with fish and game/wildlife or other agency that regulates inland areas. |
| II.B.3.f. | 216 | 100 NM offshore |
| II.B.3.f. | 248 | SSB Communications |
| II.B.3.f. | 251 | NDS should cover territorial waters of the United States. |
| II.B.3.f. | 250 | NDS should cover to 12 NM limit and fishing zones. |

| Question Number | Interviewee ID | Comment Text |
|---|---|---|
| II.B.3.f. | 228 | NDS coverage should include any area where a vessel or aircraft may travel. |
| II.B.3.f. | 230 | Offshore coverage should be out to 200 NM. |
| II.B.3.Comments | 220 | Maximum VHF range with 2000 foot shore antenna. |
| II.B.3.Comments | 213 | Great Lakes areas. |
| II.B.3.Comments | 250 | The newest Gulf of Mexico drill rigs go to 3000 ft depth; outside the 12 NM limit and should also be served by NDS. |
| II.B.3.Comments | 204 | Maximum range possible. |
| II.B.3.Comments | 229 | It is critical to provide NDS coverage of the approach to Tampa Bay for both commercial distress response and national security. |
| B.4 | 215 | Although its covered in other ways, why not ask "Should current distress and calling channels (ch 16 and 2182) be monitored on a continuing basis after GMDSS is implemented?" The recreational boater is concerned with this. |
| B.4 | 223 | Other questions you should have asked are: 1. Any future plans for monitoring of VHF Ch 9 (alternate calling channel) by recreational vessels in lieu of Ch 16? 2. Will all recreational vessels be required to have DSC radio to make emergency calls; or will a watch on Ch 16 be maintained by USCG, if not by commercial vessels? |
| B.4 | 244 | A question I did not hear was: Who is primary search and rescue agency for coastal, for inland rescue within each state. |
| B.5. | 220 | Assure adequate input from non-commercial operators. |
| B.6 | 212 | Continue fine tuning the Marine Assistance Resources available, plus someone from Coast Guard should coordinate/mediate between proposed licensing and equipment regulations that inadvertently affect Marine Assistance providers. The last two years regulations for the tug and barge industry have inappropriately affected Marine Assistance. TSAC was not able to help. There should be a formal committee/liaison between CG SAR and Marine Assistance providers. |
| B.6 | 217 | Any system must be inexpensive enough so that private boaters can participate if only at the most basic level, enjoying the benefits of large scale production of equipment. A similar requirement for local agencies is probably important, too, as it is unrealistic to expect the government to provide funding for every vehicle that could use the system. A system should be compatible with world wide standards so that foreign vessels can transit to and from the US. The system should be as simple as possible, even at the cost of some capability and not every location needs the robust characteristics of Alaska, for example, Don't shut out the recreational boater from the system! (by pricing it above his means...) |
| B.6 | 229 | The system should be as completely available for all sources but yet strongly controlled to prevent unlawful uses. The data exchange feature can save allot of voice traffic and yet free up the airwaves for specific voice traffic necessities. |

| Question Number | Interviewee ID | Comment Text |
|---|---|---|
| B.6 | 218 | Whatever system is implemented must be publicized. The current term "National Distress System" is UNKNOWN in the maritime community. |
| B.6 | 224 | I did not answer all the questions since I feel that I do not have the information, knowledge, or operational experience in various areas. Items related to spectrum matters I did answer. One area that needs to be defined is the system capacity requirements (e.g., number of voice channels in a certain area, data/voice requirement). |
| B.6 | 220 | Smaller low-cost vessels need a low-cost system (terminal) for NDS services (perhaps only MAYDAY). Other vessels may need higher cost (more complex)) terminals for increased level of service. Assure simple, low-cost systems are available for minimum service level! |
| B.6 | 241 | Voice encryption needs to be addressed in some forum - the FLEWUG attempted to address the issue but got "bogged" down with the logistics of handling a "NATION WIDE FEDERAL ENCRYPTION CODE." |
| *II.B.5.b.* | 224 | Additional frequencies needed are in the VHF High Band. |
| *II.B.5.b.* | 216 | Additional frequencies needed are local police and fire |
| *II.B.5.b.* | 237 | Alaskan inland waterways should receive NDS coverage only upon specific request. |
| *II.B.5.b.* | 244 | Additional frequencies needed are in the 800 MHz band. |
| *II.B.5.b.* | 213 | Additional frequencies needed are whatever (Law Enforcement) frequency is used in that area. |
| *II.B.5.b.* | 236 | Additional frequencies needed are in the 800 MHz band. |
| *II.B.5.c.* | 227 | Cellular phone capability. |
| *II.B.5.c..* | 247 | All communications should be encrypted. |
| *II.B.5.c.* | 218 | Channel 6 - (backup for channel 16) should be controlled in the same way channel 16 is. No extraneous comms. channel 6 is presently used as a "working" frequency by many stations. |
| II.B.6. | 221 | System could usefully provide nodes with access to them through above - not necessary for all points on the basic system. |
| II.A.24.a2 | 215 | To determine a callers position within 0.1 NM would be great, but can it be done and funded? |
| *II.A.8.* | 209 | Critical, assuming mobile means SAR vessels and aircraft. |
| *II.A.Comments* | 247 | The system should be interoperable between all federal, state, and local law enforcement agencies. The voice and data transmissions should be encrypted. |
| *II.A.Comments* | 250 | From the mariner's perspective, NDS should assist with vessel location as a critical element and provide enough communications options to provide for an effective coordinated response. |
| *II.B.2.Comments* | 217 | An easy reconstruction capability may be preferable and more cost effective then a hardened, robust system. |
| *II.B.2.Comments* | 204 | During bad weather is when the NDS system is usually needed most. |
| *II.B.2.Comments* | 239 | Depending on cost vs. funding available, NDS should withstand sever environmental conditions. |

| Question Number | Interviewee ID | Comment Text |
|---|---|---|
| *II.B.2.Comments* | 212 | NDS is needed especially in the aftermath of a disaster. |
| *II.B.2.Comments* | 213 | The one time when you need the NDS the most is during a disaster. |
| *II.B.2.Comments* | 231 | Disasters are times when need for NDS will be greater. |
| *II.B.2.Comments* | 250 | Critical to have a base back-up system, such as VHF voice distress and EPIRB. |
| *II.B.4.Comments* | 229 | Considering recent history of funding NDS operation may end up in a partnership. |
| *II.B.4.Comments* | 219 | The Coast Guard should investigate private sector partners in major port areas for the industry to share costs of using the major port.. |
| *II.B.4.Comments* | 238 | NDS should be operated by partnering because the USCG is understaffed and has too many duties. |
| *II.B.4.Comments* | 231 | A partnering for NDS operation will allow the flexibility needed when working with different agencies with different needs. |
| *II.B.4.Comments* | 241 | Would "FEMA" be a logical choice for partnering for NDS operation? Six of one, etc. Depends on how USCG wants to handle it. |
| *II.B.4.Comments* | 213 | When working with partnering it could end up with lots of communications between the two. |
| *II.B.4.Comments* | 218 | The primary user of a system should also operate the system. There is a stronger feeling of ownership and thus a higher level of concern for the proper operation and maintenance. The USCG is also not bound by standard "working hours" and thus would be able to respond to system casualties in a rapid, efficient, round the clock manner. |
| *II.B.4.Comments* | 244 | Both the USCG and partnering should be used to operate NDS. |
| *II.B.4.Comments* | 235 | NDS operation should be a partnering with local government - counties and cities. |
| *II.B.5.b.* | 213 | Additional frequencies needed are whatever (Law Enforcement) frequency is used in that area. |
| *II.B.5.b.* | 214 | An additional channel needed is a secure (scrambled) channel for law enforcement coordination. |
| *II.B.5.b.* | 244 | Additional frequencies needed are in the 800 MHz band. |
| *II.B.5.b.* | 225 | Additional frequencies needed are Law Enforcement Frequencies. |
| *II.B.6.Comments* | 222 | Cellular phone can handle interface with emergency vehicles. |
| *II.B.6.Comments* | 215 | Foreign vessels entering the NDS area must have the equipment compatible with the US. We should not have to equip to meet their needs. |
| *II.B.6.Comments* | 244 | To initiate and receive communications with other units, NDS must provide a net which may be based on multi-channels but have this ability in one radio, not 3 or 4 radios. |
| *II.B.6.Comments* | 241 | All the in its listed in question II.B.6 would need reliable access to NDS. |

| Question Number | Interviewee ID | Comment Text |
|---|---|---|
| *II.B.6.Comments* | 229 | NDS should cover the entire envelope of potential users/responders. |
| *II.B.6.Comments* | 213 | Good communication is the key to gaining the objective. |
| *II.B.6.m.* | 235 | NDS must be able to initiate and receive communications directly with local law enforcement patrol vessels. |
| *II.B.6.m.* | 216 | Other communications capability needed are for local police aircraft and boats |
| *II.B.6.m.* | 231 | NDS should initiate and receive communications directly with Fire Co. Vehicles. |