



# OPERATIONAL REQUIREMENTS DOCUMENT (ORD) FOR NATIONWIDE AUTOMATIC IDENTIFICATION SYSTEM (NAIS)

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*Maritime*  
**Security**



*Maritime*  
**Mobility**

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**Safety**





*Protection of*  
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**Resources**


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Operational Requirements Document (ORD) v2.0  
Nationwide Automatic Identification System (Nationwide AIS) Project

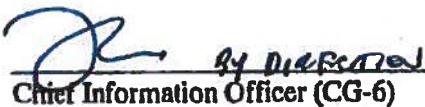
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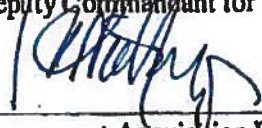
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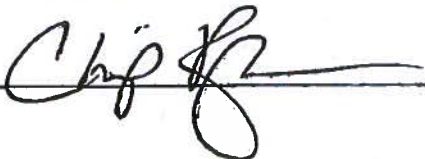
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## Executive Summary

This Operational Requirements Document (ORD) describes operational requirements for the U.S. Coast Guard's Nationwide Automatic Identification System (Nationwide AIS). AIS is an international standard for ship-to-ship, ship-to-shore and shore-to-ship communication of navigation information. AIS also provides the ability to transmit other messages that extend its basic capabilities. The navigational safety purpose for which AIS was developed is of primary importance; however there are other mission areas where AIS capability will enhance mission performance and aid in meeting mission requirements, particularly in the area of Maritime Domain Awareness (MDA).

MDA is the effective understanding of anything associated with the global maritime environment that could affect the security, safety, economy, or environment of the United States. MDA will provide maritime situational awareness for decision makers at all levels using a host of systems, sensors and processes. Nationwide AIS will be a substantial component of these elements providing MDA

The general Nationwide AIS concept of operations is to provide AIS functionality in support of all Coast Guard missions and strategic goals. In order to do this, Nationwide AIS will provide the capability to receive AIS data transmitted from AIS-equipped vessels for the purpose of tracking their movements within U.S. navigable waters and out to 2000 nautical miles offshore while also monitoring the proper operation of the AIS system. Nationwide AIS will employ transmission capability to support these missions as well, including interrogation of shipboard AIS equipment to enhance security screening, channel management to mitigate intentional or accidental frequency interference, transmission of navigational safety and security information to AIS-equipped vessels and management and transmission of binary application identifiers that can expand AIS's standard functionality. Through the provision of these capabilities, Nationwide AIS will support the Department of Homeland Security strategic goals of Awareness, Prevention, Protection, and Response.

Some AIS capability currently exists; however this capability does not meet operational requirements. To meet requirements, this existing capability will either be replaced or enhanced, and new or enhanced capability will be acquired using an incremental acquisition approach, gaining capability in useable segments. Due to the urgent operational need for the capability Nationwide AIS will provide, an aggressive timeline is required. Initial Operating Capability (IOC) for the first increment was achieved 1st Quarter of Fiscal Year 2007 with first increment Full Operating Capability (FOC) achieved by the 4<sup>th</sup> Quarter of Fiscal Year 2007. Subsequent usable segments of capability will be deployed and FOC for the entire system will be achieved in Fiscal Year 2015.

Nationwide AIS capability will provide the following operational functions:

- Receipt and transmission of AIS information in order to detect, identify, monitor and track AIS-equipped vessels and to communicate data to and from shoreside and shipboard AIS equipment.
- Network services to enable conveyance of data between shoreside AIS equipment, processing equipment and command and control (C2) systems and interoperability with such systems.
- Data management capabilities, including data processing, recording, retrieval, warehousing and analysis.
- Interoperability and interface with a variety of command and control systems, including user interfaces for situation display, analysis and control of the system.

Varying levels of coverage will be required throughout the U.S. navigable waters and out to 2000 nautical miles, based on the identified risks, threats, mission need and other operational criteria. Due to the new capabilities AIS will provide, determining mission requirements has been difficult. It is anticipated that these requirements will continue to be refined during the acquisition. Through an incremental acquisition process, proceeding in parallel with increased use and understanding of AIS capabilities, it is anticipated that the risks associated with changing the requirements will be manageable. All such modifications will be managed through a requirements change approval process, closely coordinated between the Sponsor and the Project Manager.

Nationwide AIS is intended to primarily be a provider of information and capability that will be accessed, used and controlled via other systems. To this end, interoperability is an important requirement of Nationwide AIS. In particular, it is intended that display of AIS data, data correlation and fusion, and control of AIS functionality will be performed by non-Nationwide AIS systems. Therefore, interoperability and support of enhancements to these systems will be critical. Some of these systems are classified; however, Nationwide AIS will operate solely within the Sensitive but Unclassified (SBU) domain, but with the capability to provide data to higher security systems.

Nationwide AIS may consist of AIS receivers, transmitters, transceivers, repeaters and other equipment located on shoreside installations and remote platforms potentially including buoys, offshore platforms, aircraft and other platforms as needed to meet operational requirements. Nationwide AIS capability will be used by Coast Guard and other government agencies' command and control, surveillance and data processing systems in support of their missions. The primary means of distributing AIS data will be via the unclassified Common Operational Picture (COP). A means of processing and distribution of AIS data in a standard format outside of the COP will also be required. Below are some of the specific operational concepts that will be supported by Nationwide AIS:

- Sector Command Center Operations
- Maritime Safety and Mobility
- Vessel Movement Anomaly Detection
- Correlation and Fusion of AIS Data with Other Information
- Search and Rescue (SAR) Operations
- Transmission of Standard AIS messages
- Maritime Incident Investigation
- Vessel Inspection/Targeting
- Use of Text Messages, Binary Applications and Application Identifiers
- Maritime Security
- Support to other agencies

Technical requirements have been developed to provide information in developing the technical capabilities needed to perform the missions that will be supported by Nationwide AIS. Some of the key critical technical parameters that have been identified and are detailed further in this ORD are coverage, including receive and transmit coverage; system architectural compliance; technical requirements specific to AIS technology such as VHF Data Link (VDL) management and AIS message transmission; and various information, data management, communications technology and system administration requirements.

Non-technical requirements have been developed to identify capabilities needed to support Nationwide AIS systems and components. Non-technical characteristics that have been identified include:

- Design
- Integrated Logistics Support

- Impact Upon USCG Systems And Infrastructure
- Reliability
- Availability
- Maintainability
- Survivability
- Personnel, Safety, Human Factors, and Environmental Considerations
- Training and other Human Performance Requirements

From these requirements key performance parameters have been identified, and trade offs to be used throughout the acquisition process have been listed and prioritized.

Nationwide AIS will provide a substantial capability in support of all Coast Guard missions, the strategic goals of the Department of Homeland Security and Maritime Domain Awareness for all national maritime interests.



<b>RECORD OF CHANGES</b>			
<b>CHANGE NUMBER</b>	<b>EFFECTIVE DATE OF CHANGE</b>	<b>APPROVED BY</b>	<b>SUMMARY OF CHANGE</b>
01	07 Aug 2008	CG-761	CG-939 Memo 4240 of 30 Jul 08; NAIS OPERATIONAL REQUIREMENTS DOCUMENT (ORD) DECISION MEMO: THRESHOLD REQUIREMENTS ALIGNMENT – INCREMENT 2, PHASE I SOLICITATION <ul style="list-style-type: none"> <li>• Changed the word from “installation” to “Sector”</li> </ul>
02	28 Oct 2010	CG-7	CG-7 Memo 16121 of 28 Oct 10; NATIONWIDE AUTOMATIC IDENTIFICATION SYSTEM (NAIS) ADE 3 SPONSOR DOCUMENTS <ul style="list-style-type: none"> <li>• Updated Section: 6 Tradeoffs</li> </ul>
03	13 Dec 2012	USM	CG-7 Memo 5000 of 13 Dec 12; CLARIFICATION OF NAIS PERMANENT TRANSCIVEIVE SYSTEM REQUIREMENTS <ul style="list-style-type: none"> <li>• Approved by CGARB dtd 17 Dec 2012 &amp; USM via ADM memo dtd 19 Feb 2013</li> <li>• KPP table updated as per change number 04</li> </ul>
04	31 Mar 2014	CG-7	CG-7 Memo 5000 of 31Mar 14; NATIONWIDE AUTOMATIC IDENTIFICATION SYSTEM (NAIS) OPERATIONAL REQUIREMENTS DOCUMENT CHANGE NUMBER TWO <ul style="list-style-type: none"> <li>• Appendices C &amp; D updated</li> <li>• Section 5, KPP table, updated to direct reader to Appendix D</li> </ul>
05	19 Sep 2014	Administrative Updates	<ul style="list-style-type: none"> <li>• Updated Executive Summary to reflect accurate timeline for I-1 and I-2 completion and/or delivery. Also, revised the following paragraphs: 1.3.1.1, 1.3.1.2, 1.3.2.1, 1.3.2.2, 1.3.3.1, 1.3.3.2 &amp; 1.3.4: struck out forecasted dates for the delivery of NAIS IOC, FOC for increments 2 and 3 and forecasted CG Support Date.</li> <li>• Removed CONOPS sections 2.2 &amp; 2.3. NAIS CONOPS v1.1 dtd APR 2013 was approved separately.</li> <li>• Removed original signature page and added updated signature page.</li> <li>• Revised footer from G-XM to CG-761</li> </ul>

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## SECTION 1: INTRODUCTION

### 1.1 PURPOSE

This Operational Requirements Document (ORD) describes operational requirements for the U.S. Coast Guard's Nationwide Automatic Identification System (Nationwide AIS). Nationwide AIS will provide capability to support the Mission Need Statement (MNS) approved by the Department of Homeland Security (DHS) on 29 Sep 2004<sup>1</sup>. Nationwide AIS will receive, distribute, and use the information transmitted by vessels that operate Automatic Identification System (AIS) equipment. It will also take advantage of the functionality<sup>2</sup> provided by AIS technology in support of the Coast Guard's eleven missions and its strategic goals of Maritime Security, Maritime Safety, Mobility, National Defense, and Protection of Natural Resources. Through the provision of these capabilities, Nationwide AIS will support DHS strategic goals of Awareness, Prevention, Protection and Response. The information provided by Nationwide AIS will support the nation's maritime interests, improve navigation safety, reduce maritime security risk, and facilitate vessel tracking within U.S. navigable waters and out to 2000 nautical miles offshore. This ORD will provide the information necessary to evaluate alternatives for achieving Nationwide AIS capabilities.

### 1.2 BACKGROUND

#### 1.2.1 AIS Technology, MDA and Carriage Requirements

AIS is an international standard for ship-to-ship, ship-to-shore and shore-to-ship communication of navigation information. This information includes vessel identification, position, speed, course, destination and other data as detailed in International Telecommunications Union Recommendation M 1371-1 and other references. AIS also provides the ability to transmit short text messages and binary applications that extend the amount and scope of information that can be communicated to and from mariners. AIS was developed to enhance navigational safety through collision avoidance, waterways management, and surveillance. AIS also has the potential to meet many other mission needs through its contribution to Maritime Domain Awareness (MDA).

MDA is the effective understanding of anything associated with the global maritime environment that could affect the security, safety, economy, or environment of the United States. MDA supports the core national defense, security priorities, and maritime challenges over the next decade. MDA serves to clarify operations in the complex maritime environment by meeting the following strategic goals:

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<sup>1</sup> Verbal approval by the DHS Investment Review Board (IRB) was provided this date. Written approval was granted in the Acquisition Decision Memorandum signed by DHS Deputy Secretary on 12 Jan 2005.

<sup>2</sup> Use of term "functionality" of AIS refers to the capabilities of AIS beyond receiving AIS messages from vessels. These include transmission of AIS data and text messages, processing and use of binary applications, channel management and other functions designed into the AIS standard.

- Enhance transparency in the maritime domain to detect, deter and defeat threats as early and distant from U.S. interests as possible.
- Enable accurate, dynamic, and confident decisions and responses to the full spectrum of maritime threats.
- Sustain the full application of the law to ensure freedom of navigation and the efficient flow of commerce.

MDA will provide maritime situational awareness for decision makers at all levels using a host of systems, sensors and processes. Nationwide AIS is one of the most significant of these systems. AIS is a cooperative vessel reporting tool; that is, vessel operators “cooperatively” provide the information that AIS transmits. This is in contrast to “non-cooperative” sensors, which do not rely on any action by the vessel being tracked (e.g., radar or acoustic sensors). There are a large number of vessels that are not required to carry AIS equipment and therefore will need to be tracked by other means but used on the same systems as AIS information. Therefore, it is important that Nationwide AIS be interoperable with other systems in order to contribute to complete MDA.

The Maritime Transportation Security Act (MTSA) of 2002 (46 USC §70113) directed the Secretary of the Department in which the Coast Guard is operating to “implement a system to collect, integrate, and analyze information concerning vessels operating on or bound for waters subject to the jurisdiction of the United States.” The MTSA also included AIS equipment carriage requirements for domestic commercial vessels (46 U.S.C §70114), portions of which were implemented in regulations issued by the Coast Guard in late 2003 (68 Federal Register 60559). The 2004 Department of Homeland Security (DHS) Appropriations Bill appropriated funds for “the acquisition and installation ... of the shore-based universal AIS coverage system in ports nationwide (P.L. 108-90).” The Nationwide AIS acquisition will provide capability per the direction of Congress and in line with the National Maritime Domain Awareness Plan.

### **1.2.2 Current Capability**

Currently, the Coast Guard has interim AIS capability in several areas provided by separate systems with varying levels of service. This capability includes full transmit and receive capability in Vessel Traffic Service (VTS) areas and several Sector Command Centers (SCC). There are several receive-only projects including Coast Guard Research and Development Center sites and additional commercially contracted projects. Projects to evaluate the potential of AIS capability on other platforms, such as offshore weather buoys and a low earth orbit satellite are also underway.

### **1.2.3 Acquisition Description**

Experience gained through evaluation and use of current AIS capability indicates that several state-of-the-market and developmental systems have the ability to provide required AIS capabilities. The successful use of AIS by Vessel Traffic Services and in other applications has validated its usefulness in support of MDA and other national maritime missions. To meet requirements, this existing capability will either be replaced or enhanced and new or enhanced capability will be acquired using an appropriate

acquisition strategy, including acquiring capability in increments. The final acquisition methodology will be described in the Acquisition Plan.

### **1.3 TIMEFRAME**

The following sections outline the approach and timeframe in which Nationwide AIS will provide capabilities to fulfill the Mission Needs Statement (MNS). The new system will be implemented with an approach including the following three incremental capabilities:

1. Receive Only in Critical Ports and Coastal/Near-Coastal Areas
2. Coastal Transmit and Receive Nationwide
3. Long Range Receive Nationwide

The above incremental capabilities are linked such that ultimately, through the implementation of all three, complete nationwide and long range coverage of AIS capability as described in this ORD will be achieved. The primary benefit of an incremental implementation approach is that maritime security stakeholders will receive useful capability more quickly (beginning to fill in operational gaps that currently exist as identified in the MNS) than would be otherwise possible. Implementing Nationwide AIS in the three increments listed above will also help to address technical, logistical and budgetary risks that would be more difficult to manage without an incremental approach. Deployment of usable capability segments will allow for better development of operational procedures for use of this new capability and allow lessons learned to be applied to subsequent increments. The incremental capabilities have been structured in consideration of DHS mission priorities, maturity of AIS technology, and engineering and support feasibility. Based on lessons learned from ongoing AIS efforts, it is known that implementation and support of transmit and receive AIS capabilities will be more complex than receive-only AIS capabilities. As such, the capability to transmit and receive AIS nationwide will be partially based on engineering, supportability, maintainability, and reliability information derived from the first increment.

#### **1.3.1 Increment 1 – Receive Only in Critical Ports and Coastal/Near-Coastal Areas**

Increment 1 will provide the capability to receive AIS messages within identified critical ports and coastal areas as defined in Appendix D. This increment is intended to meet immediate operational needs and align with the anticipated expansion of AIS carriage requirements. Localized coverage gaps will be minimized, but will be accepted on a case-by-case basis based on sponsor guidance and cost benefit trade-off analyses. These potential gaps will be filled with the capability provided by later increments. Support for this increment will be provided to the extent necessary to meet required availability.

##### **1.3.1.1 Increment 1 Initial Operational Capability (IOC)**

IOC for Increment 1 will be reached when AIS receive only capability has been established for one designated critical port, coastal or near-coastal area as identified in Appendix D. This capability includes the ability to receive AIS messages at the site as well as the ability to transfer, store and display the data received from that AIS site.

##### **1.3.1.2 Increment 1 Full Operational Capability (FOC)**

FOC for Increment 1 will be reached when the capability to receive AIS messages has been established at all Increment 1 critical ports and coastal/near-coastal areas identified

in Appendix D, given that localized coverage gaps may exist as previously described. Level of Service I and II Coverage requirements, as identified in Section 3.1.2, will apply to areas included in this increment. In addition, this capability will provide basic networking and data processing services between those specified sites and AIS users. As part of achieving FOC, Increment 1 will also include disseminating data to the COP, MAGNET and other systems for basic data correlation and fusion with USCG databases.

### **1.3.2 Increment 2 - Coastal Transmit and Receive Nationwide**

Increment 2 will expand both the capability and coverage of AIS deployed in the first increment. This increment includes the ability of the system to receive AIS messages within 50 nautical miles (nm) of the baseline and to transmit AIS messages to vessels out to 24 nm of the baseline, nationwide.

#### **1.3.2.1 Increment 2 IOC**

Increment 2 IOC will exist when receive coverage is established within 50 nm and transmit coverage is established within 24nm of the baseline and navigable inland waterways in at least two adjacent Coast Guard Sector Command Centers (SCCs) in one Coast Guard Area and one additional SCC in another Coast Guard Area. IOC will also provide additionally required network services, a subset of all data processing requirements (including, at a minimum, verification of AIS data and consolidation of AIS position reports received from multiple AIS stations in a sector) and integration with end users' systems. The system will be capable of allowing each SCC to effectively transmit all standard AIS messages (including binary messages supporting the SBU Tactical Information Exchange and Display System (STEDS)), and will provide data to separate systems and organizations, which will include at a minimum the sensitive but unclassified (SBU) Common Operational Picture (COP) and the Intelligence Community via the Common Intelligence Picture and supporting systems (e.g., MAGNET).

#### **1.3.2.2 Increment 2 FOC**

FOC for Increment 2 will be reached when receive coverage is established within 50 nm per Section 3.1.2 and transmit coverage is established per Section 3.1.3. Increment 2 will fully support the data requirements of all identified users of the system, including secure data handling, correlation and fusion, and distribution to multiple systems and entities. Access to all AIS functionality will be provided where required and the system will be capable of accommodating advances in AIS technology and changes to AIS standards. Channel Management capability will be established. AIS data and functionality will be seamlessly incorporated into other command and control (C2) systems and AIS portions of these systems will be fully operational. The system will meet all requirements and perform or support all operational functions as described in this and subsequent requirements and specifications documents.

### **1.3.3 Increment 3 - Long Range Receive Nationwide**

This increment will extend the receive coverage beyond increment two, providing the ability to receive AIS messages from 50 nm to 2000 nm of the baseline. This increment will also include the enhanced capability for AIS users to view long range track data.



### **1.3.3.1 Increment 3 IOC**

IOC for Increment 3 will be reached when the capability to receive 1 AIS message per AIS-equipped vessel per day has been established from 50 nm to 2000 nm of the baseline.

### **1.3.3.2 Increment 3 FOC**

FOC for Increment 3 will be reached when all long range coverage requirements have been fully achieved, per the requirements of Section 3.1.1 and meeting Level of Service III, IV, and V performance thresholds defined in Table 3.1.

### **1.3.4 Coast Guard Support Date**

The Coast Guard Support Date (CGSD) is the point at which permanent logistics support and assets will be in place to maintain and sustain Nationwide AIS to the availability described herein. CGSD will occur no later than 12 months after implementation and final testing of the last increment FOC date. Interim logistics support will be in place prior to CGSD, as needed to support incremental implementation and deployment of Nationwide AIS such that Availability requirements, defined in Section 4.5, are achieved.

## SECTION 2: MISSION REQUIREMENTS

### 2.1 OPERATING REQUIREMENTS

#### 2.1.1 Operating Environment

AIS equipment will be installed on various platforms (e.g., coastal towers, buoys, offshore platforms) and will function in the expected operating environments (e.g., surf, temporary submersion, extreme weather).

#### 2.1.2 Geographic Area

Nationwide AIS is a contributor to MDA and therefore supports all national maritime mission requirements in the navigable waters of the United States and out to 2000 nautical miles from the baseline<sup>3</sup>. More specific geographic area requirements are contained in Section 3.1 and Appendix C. The capabilities provided by Nationwide AIS will complement and be complemented by other vessel tracking technologies to meet MDA requirements; therefore, while Nationwide AIS may track some vessels up to 2000 nm offshore, it is not expected that Nationwide AIS alone will meet all vessel tracking requirements.

#### 2.1.3 Climatological Envelope

The system is to operate in the regional environmental conditions expected during a 50-year time period.

#### 2.1.4 Operational Functions

Nationwide AIS will receive and process information transmitted by AIS-equipped vessels and will distribute this information to and among a variety of users. The system will have the ability to transmit standard AIS messages from specified shore stations to AIS-equipped vessels. Nationwide AIS will perform or support the following operational functions:

1. Receive and transmit AIS information:
  - a. Detect, identify, monitor and track appropriately equipped vessels throughout the service area
  - b. Communicate data to and from shoreside and shipboard AIS equipment
2. Network services
  - a. Send and receive data between shoreside AIS equipment, processing equipment and command and control systems
3. Data Management

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<sup>3</sup> From National Oceanic and Atmospheric Administration (NOAA), National Ocean Service, Office of Coast Survey ([http://www.csc.noaa.gov/mbwg/hm/cad\\_mar.htm#TSB](http://www.csc.noaa.gov/mbwg/hm/cad_mar.htm#TSB)): The baseline is “the line from which maritime zones are measured. The normal baseline for measuring the territorial seas (TS), contiguous zone (CZ), exclusive economic zone (EEZ) and continental shelf is the low-water line along the coast.”

- a. Data processing, including verification of AIS data, support of correlation and fusion of vessel tracks with a broad range of government and non-government, classified and unclassified data, primarily via external systems
  - b. Data recording and storage
  - c. Data retrieval and analysis
4. Interoperability
- a. Interface with unclassified, classified and sensitive but unclassified (SBU) systems through appropriate safeguards and systems
  - b. Situation display and decision support primarily via or in conjunction with other command and control systems
  - c. User interfaces for display, analysis and control of the system, primarily via or in conjunction with other command and control systems

### **2.1.5 Interoperability Requirements**

The data collected by Nationwide AIS will be used by a wide range of organizations and integrated into their systems. Therefore, the system will leverage USCG Enterprise Architecture components in order to provide interoperability with other USCG and external networks, databases and systems. The system will comply with DHS Enterprise Architecture requirements and will also be based upon and consistent with interoperability standards defined by the DoD Common Operating Environment (COE), C4ISR, USCG Enterprise Architecture policies and practices, USCG System Design Life Cycle, and DHS Technical Reference Model.

Nationwide AIS will be interoperable as necessary with the following systems to meet the operational requirements defined herein:

- CG-C2 – Coast Guard Command and Control
- CGVTS/PAWSS – Coast Guard Vessel Traffic System and Ports and Waterways Safety System
- Command 2010 – Sector Command Center (SCC) Systems
- COP – Common Operational Picture
- GCCS – Global Command and Control System
- Hawkeye – SCC Command and Control system
- JC2 – Joint Command and Control Systems
- MAGNET – Maritime Awareness Global Network
- Rescue 21 – Rescue 21
- SANS – Ship Arrival and Notification System
- STEDS – SBU Tactical Information Exchange and Display System

## **2.2 CRITICAL OPERATIONAL ISSUES**

Critical Operational Issues (COI) are the measures of operational effectiveness and suitability for Nationwide AIS that will be evaluated during Operational Test and Evaluation (OT&E). COIs are posed as questions that must be satisfactorily answered during acceptance testing to assure the Program Manager that the delivered service operates properly when employed in its intended environment by typical users.

### **2.2.1 Effectiveness Issues:**

1. Does the system receive standard AIS messages in the required coverage area and meet the reception criteria required to achieve MDA and supported mission requirements?
2. Does the system transmit AIS messages in the required coverage area and meet the criteria required to support mission requirements?
3. Does the system automatically distribute data in a standard format to all required organizations and systems meeting the user's criteria?
4. Does the system automatically record and archive all received AIS data?
5. Does the system allow personnel to easily access and query the Nationwide AIS data archives?
6. Does the system provide AIS data in the quantity and format required for other systems to correlate and fuse it with other information prior to providing them to the COP?
7. Is adequate channel management capability provided to accommodate vessels that enter U.S. AIS coverage areas using other than assigned AIS frequencies?
8. Are the system response/transmission times adequate to ensure that no information is lost beyond the expected rates for the AIS and other accepted standards?
9. Are the required network connections, data tools and display systems in place to ensure effective continuous operation?

### **2.2.2 Suitability Issues:**

1. Are information assurance (IA) capabilities in place to protect system integrity and sensitive data?
2. Does the system provide sufficient access controls to prevent unauthorized electronic intrusion into the system and its connections to the distribution network?
3. Does the system design allow end users, both operators and maintainers, to effectively operate and maintain the system through training provided on-the-job or integrated with other established Coast Guard training programs?
4. Does the system have the reliability, availability, and maintainability characteristics sufficient to support continuous conduct of missions during all expected weather conditions and other environmental conditions?
5. Will the system components be safe to operate in all expected operating environments?
6. Is the system based on an open system architecture that allows for adaptation in response to regulatory and technological changes?
7. Can the system be maintained without having to rely on a single external party or a proprietary maintenance source?
8. Does the system provide open systems architecture hardware interfaces for connection to the appropriate networks for data transfer?

9. Is the system design/architecture adaptable to Coast Guard infrastructure and organizational changes (e.g., unit openings/closures and changes in responsibility)?
10. Does the system provide the capability to prevent unnecessary or unwanted transmissions (e.g., stuck key) from any Nationwide AIS site?
11. Does the system operate on support services available on or at current and planned Nationwide AIS sites?
12. Does the system provide monitoring of critical and major system components, including interfaces to the data distribution network, and the appropriate recording and reporting of major component status and system availability?

## SECTION 3: CRITICAL TECHNICAL PARAMETERS

### 3.1 BASIC REQUIREMENTS

#### 3.1.1 Coverage Requirements

Coverage requirements have been developed taking into account AIS standard reporting rates, mission needs and assessments of threat and vulnerability. The rates used in Table 3.1 reflect the required level of reliability of a position report provided by a ship, based on the time since it was transmitted. Shipboard AIS equipment transmits position reports at a defined rate based on vessel speed and maneuvering. The level of confidence that a vessel will be at a certain location varies due to the maneuvering of the ship between position reports. The required level of certainty varies based on several criteria, foremost of which is the time required to respond to a threat posed by or to the vessel (be it terrorism, navigation safety, law enforcement, etc.). Also considered in determining the required level of position certainty is the distance the vessel is from land, other vessels or critical infrastructure. Other measures could have been used to specify the requirements in these tables, such as percentage of AIS messages received, or vessel positional uncertainty. Report rate is used as it is easily conceived without needing to know the variations of the AIS standard report rates and because it aligns with general MDA vessel tracking requirements (Appendix E). It will be noted that the rates in Table 3.1 do not exactly match the rates in Appendix E. Appendix E represents general MDA vessel tracking requirements and will be met by various means, including the use of AIS. It is anticipated that AIS will be able to exceed many of the threshold and objective values listed in Tables 3.1 and 3.2. No AIS data shall be discarded once received, even if received at a higher rate than that required. Thresholds and objectives are used to provide a broader target of acceptable capability. This will assist in the evaluation of potential solutions to meet all requirements. For example, among several similar solutions that all meet the threshold, one may meet the objective and would be rated higher.

The general geographic areas used in Tables 3.1 and 3.2 are defined as follows:

- Ports and Other Specified Areas: The critical port areas as defined by Commandant (CG-5P) and other areas determined by operational commanders to require this level of coverage.<sup>4</sup>
- Inland Navigable and Coastal Waters out to 24 nm: Coastal waters measured from the baseline (as defined in Section 2.1.2) out to 24 nm.
- 24 to 50 nm – The waters in the area 24 to 50 nm from the baseline.
- 50 to 300 nm - The waters in the area 50 to 300 nm from the baseline.
- 300 to 2000 nm - The waters in the area 300 to 2000 nm from the baseline

Appendix C provides the geographic definition of Inland Navigable Waters, coastal waters for U.S. Territories and lists exceptions to the general coverage requirements contained in section 3.1.2 and 3.1.3.

In order to differentiate between larger vessels that are required to carry higher powered AIS equipment (e.g., Class A) and vessels that may be smaller or carry lower powered

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<sup>4</sup> For example, these areas may include lightering zones or vessel operating areas such as the Louisiana Offshore Oil Platform (LOOP) that are offshore but require a higher level of AIS coverage.



AIS equipment (e.g., Class B, either mandated or voluntarily carried) the following definitions are provided:

- Type 1 AIS mobile station has a minimum antenna height of 10 meters and a nominal transmit power of 12.5 watts.
- Type 2 AIS mobile station has a minimum antenna height of 1 meter and a nominal transmit power of 2.0 watts.

### 3.1.2 Receive Coverage

Table 3.1 describes the general AIS receive requirements, with a given level of service required in defined geographic areas as measured from the baseline. The Level of Service is expressed as the required rate of receiving AIS position reports from AIS-equipped vessels, and are identified as levels I-V as these report rates are specified for use in different geographic areas throughout this ORD.

Table 3.1

	Receive Coverage Area									
	Ports and Other Specified Areas		Inland Navigable and Coastal Waters out to 24 nm		24- 50 nm		50- 300 nm		300- 2000 nm	
Level of Service	I		II		III		IV		V	
AIS Type	Threshold	Objective	Threshold	Objective	Threshold	Objective	Threshold	Objective	Threshold	Objective
Type 1	1 minute	15 seconds	5 minutes	1 minute	2 hours	5 minutes	2 hours	1 hour	4 hours	1 hour
Type 2	1 minute	30 seconds	5 minutes	1 minute	--	5 minutes	--	1 hour	--	1 hour

Messages other than position reports or position reports for vessels that are anchored or moored are required to be received at a rate proportional to that required for position reports.

### 3.1.3 Transmit Coverage

Table 3.2 describes the general AIS transmit requirements, with a given level of service required in defined geographic areas as measured from the baseline. The Level of Service is expressed as the probability that a message transmitted from a Nationwide AIS transmitter will be successfully received by an AIS mobile station within the specified area, and are identified as levels I-V as these probabilities are specified for use in different geographic areas throughout this ORD. These probabilities may be met through repeat message transmission from a given base station sufficient number of times to ensure the threshold probability of reception is achieved, as long as such repeat transmissions do not negatively affect normal AIS operations.

Table 3.2

	Transmit Coverage Area									
	Ports and Other Specified Areas		Inland Navigable and Coastal Waters out to 24 nm		24- 50 nm		50-300 nm		300-2000 nm	
Level of Service	I		II		III		IV		V	
AIS Type	Threshold	Objective	Threshold	Objective	Threshold	Objective	Threshold	Objective	Threshold	Objective
Type 1	98%	99%	90%	95%	0%	66%	0	33%	0	25%
Type 2	90%	95%	66%	90%	0%	24%	0	24%	0	0

### 3.1.4 Architectural Compliance

Nationwide AIS will provide data to a wide area network for distribution to authorized users in compliance with applicable regulations, standards and guidelines. Nationwide AIS is not a stand alone capability, but rather is part of a larger IT network and an ever evolving system. The distribution method of AIS data will be compatible with the appropriate elements of the Coast Guard’s Common Operating Environment (COE), enterprise architecture and components (e.g., CGDN+) and provide open systems architecture hardware interfaces for connection to the required organizations and systems.

### 3.1.5 VHF Data Link (VDL) Management

Monitoring and management of the VHF data link is required in order to optimize it in providing the capability to meet operational requirements. The International Maritime Organization has identified a compelling need to ensure the integrity of the AIS VDL, and has asked nations to take steps necessary to ensure its protection (IMO Maritime Safety Committee Resolution MSC.140(76)). VDL management is required to ensure reliable continuation of AIS communications from all Nationwide AIS sites, including detection from satellites and aeronautical platforms, and the safe navigation of ships. Nationwide AIS will have the ability to manage what it broadcasts on the VDL and to monitor the broadcasts of other VDL users. Nationwide AIS will also provide the capability to mitigate problems with the VDL. VDL management includes awareness of all AIS coast station Fixed Access Time Division Multiple Access (FATDMA) assignments, binary and text message use, VDL loading and interference. Knowing the number and type of AIS users (e.g., number of Class A, Class B, and other units) on the VDL through monitoring of channel loading will allow action to correct or mitigate degradation of high-altitude detection of AIS, ship-ship navigation, or other AIS-supported operations. Therefore, monitoring of the slot map (the AIS message transmission schedule) and loading of the VDL is essential. Nationwide AIS should be designed to detect and limit the impact of harmful radio frequency interference whether through malicious intent, environmental causes or inadvertent manmade causes. Nationwide AIS will have the capability to detect and limit the impact of radio frequency interference on the AIS frequencies throughout the area of required coverage as described in Section 3.1.2 and 3.1.3. Nationwide AIS will detect and report radio signal jamming or data spoofing. Spoofing may include equipment malfunctions or unauthorized

activities. If Nationwide AIS services are degraded (e.g., through inability to meet the coverage requirements of Section 3.1.2 and 3.1.3, degraded ship navigation, or loss of Class B functionality), action will be taken to mitigate or correct those problems.

### **3.1.5.1 Channel Management**

Where channel management capability is required for Nationwide AIS operations, it will be accomplished by use of applicable AIS messages or by coordinating with the VHF Channel 70 DSC capabilities of Rescue 21, provided such capability exists in the required coverage area and its operation does not interfere with the operation of the Rescue 21 system. Nationwide AIS will provide dynamic channel-switching capability to accommodate operations on other than the international AIS frequencies as conditions warrant. Channel Management capabilities shall be provided wherever Level of Service I or II transmit capabilities are required per Section 3.1.1 and Appendix C.

### **3.1.6 Information Assurance (IA)**

Nationwide AIS will collect data at a Sensitive But Unclassified (SBU) collection site or sites, and will share data with other SBU systems and classified systems. Nationwide AIS will comply with applicable Coast Guard and DHS IA regulations (e.g., FISMA 2002<sup>5</sup>, National Security Telecommunications Information Systems Security Policy and other requirements and regulations as determined by Commandant (CG-6)). Nationwide AIS will conduct Certification and Accreditation (C&A) in accordance with Coast Guard C&A Practices Handbook and ensure that C&A will be done through use of the mandatory DHS automated on-line C&A tool. Nationwide AIS will incorporate NIST SP 800-53<sup>6</sup> controls to enforce access limitations on an individual basis. These controls will be able to protect sensitive information and keep other users from accidentally reading or destroying data. AIS data will be available to end users through the local activity's log-in procedures, and will be subject to security-relevant events and procedures. System support documentation will be developed and will include the appropriate system access and supervisory privileges for maintaining the system. System administration responsibilities will include continuous review of security precautions and measures required to protect data. It will provide a means to identify and protect proprietary, sensitive, safety, or security critical information distributed via Nationwide AIS.

### **3.1.7 Data Validation**

Nationwide AIS shall have the capability to automatically verify and validate AIS data by comparing information received from two or more AIS sensors. The system shall forward all messages received by AIS receivers, even messages that are corrupt or that include unrecognizable information. This data may be used for anomaly detection or correlation with other sensors that may be able to add information that may help make the bad data useful. Repeated receipt of the same or similar bad messages may indicate improper use of the VDL, an attempt at spoofing or unauthorized "encrypted" AIS operations.

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<sup>5</sup> Public Law 107-347 (Title III)

<sup>6</sup> Recommended Security Controls for Federal Information Systems, February 2005 (Including errata updates through 05-04-2005)

### **3.1.8 Speed of Calculation, Memory Utilization & Network Throughput Capability**

Nationwide AIS equipment will have sufficient data processing capability to handle operational requirements, in particular coverage requirements even with the maximum number of users of the VHF data link (VDL). The system will have the flexibility to manage data processing requirements both over the VDL and via the supporting network as additional installations are added to the Nationwide AIS network, carriage requirements increase and use of binary applications and other AIS functionality increases AIS messaging. Nationwide AIS will collect and distribute every Nationwide AIS message received by the AIS stations along with required metadata. End users may require a subset of the complete AIS data, data only for a particular area, or other variable criteria. Nationwide AIS data processing capabilities will be able to serve a range of end user data delivery requirements. AIS messages received from AIS equipped vessels at shoreside installations will be delivered to local command and control systems with latency from time of receipt not to exceed one second. Messages delivered from shoreside installations to validation, storage, correlation, fusion and distribution services will have latency from time of receipt not to exceed 5 seconds.

### **3.1.9 Safety and Environmental Requirements**

Nationwide AIS will comply with Occupational Safety and Health Administration (OSHA), Federal Communications Commission (FCC) OET Bulletin 65 (Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields), National Electric Code (NEC), National Environmental Policy Act (NEPA) and all other applicable safety and environmental regulations and requirements to ensure personnel and environmental safety.

### **3.1.10 Human Factors**

Nationwide AIS will be designed by incorporating user/human factors so that it will provide data via user interfaces that will allow users to set preferences, sort, and manipulate the information to support the mission requirements described in Section 2.

### **3.1.11 Design Life**

The system will be designed for a 15 year life-cycle.

## **3.2 COMMUNICATIONS/INFORMATION TECHNOLOGY**

### **3.2.1 Data Distribution**

Nationwide AIS will automatically and autonomously make available AIS messages as they are received. The system will be scalable to allow for adaptation to variable reporting rates and planned and unplanned outages of individual sites. Nationwide AIS will be able to deliver or make available information in a standard format to any non-Coast Guard entity with which the Coast Guard has a requirement to share such data.

### **3.2.2 Data Storage and Accessibility**

Nationwide AIS will record, time stamp, and archive all sent and received AIS data. A standard time reference will be used to facilitate correlation with other data sources. This data will be easily accessed, manipulated, and displayed to facilitate maritime investigations, maritime traffic analyses and other missions. Thirty days of data will be available for end users' access through their C2 system or appropriate interface to meet operational requirements. Data older than thirty days will be archived for a minimum period of three years. Nationwide AIS will use industry best practices for data storage, and include redundant data storage capabilities.

### **3.2.3 Data Fusion**

Nationwide AIS will provide AIS data for fusion with information from various sources. Nationwide AIS data, along with the fused data, will be provided to the SBU COP to help define targets of interest and support the CONOPS described in Section 2, particularly Section 2.2.4. Nationwide AIS will ensure appropriate interoperability and integration with the COP and the intelligence community to support the fusion of Nationwide AIS data with SBU or classified intelligence data and other information from non-Nationwide AIS data sources. This fused information will be distributed through the SBU or classified COP as appropriate.

### **3.2.4 Transmission of AIS messages**

Nationwide AIS will provide the ability through appropriate command and control systems to transmit standard AIS messages (including safety and security related text messages, interrogation and assignment messages and binary applications) in specific areas per the AIS standard. The user will have the ability to control who the messages are transmitted to; i.e., specific AIS-equipped vessels or to all AIS-equipped vessels in a specific geographic area. The user will have the ability to choose when messages are sent (e.g., one-time messages, manually repeated messages, automatically repeating messages at an interval defined by the user). The system will undergo a National Telecommunications and Information Administration (NTIA) Systems Review for frequency availability, electromagnetic compatibility, and telecommunications service priority for radio communications, in accordance with Chapter 10 of the NTIA Manual of Regulations & Procedures for Federal Radio Frequency Management.

### **3.2.5 Network Administration**

Network administration will include centralized control, troubleshooting, monitoring, and fault detection tools and will include the capability to monitor and analyze all system operation status and performance, report component diagnostics and perform centralized and remote control, component troubleshooting, and software updates.

### **3.2.6 Self-Monitoring and Fault Detection**

Each installation will have the capability to monitor, record, and report the status of critical and major system components (e.g., AIS stations, data network, facilities, and

servers). The system will have the capability to monitor its own performance and condition.

### **3.3 SENSORS**

#### **3.3.1 AIS Equipment**

Nationwide AIS will employ AIS equipment to receive and transmit AIS messages from vessels operating within the required coverage area. Equipment will be installed so as to meet coverage requirements. In addition, a priority consideration will be to use existing infrastructure rather than build new towers or other structures.



## SECTION 4: NON-TECHNICAL REQUIREMENTS

### 4.1 DESIGN

The design of the Nationwide AIS system will optimize safety, operational effectiveness, supportability and total ownership cost throughout the life cycle of the system. The design is constrained by the following:

#### 4.1.1 Meeting Operational Effectiveness at Minimum Total Operational Cost

This will be accomplished through system engineering during the design process and demonstrated through the use of trade-off analyses.

#### 4.1.2 Data Accessibility and Interface

The Nationwide AIS system will provide data to other systems and end users in a standard format and will define how to access this information. The data will be useable with DHS, Coast Guard and other entities' display, command and control and analysis systems, including secure systems. Data provided will be in compatible format to make it usable to end users. This interface will be in conformance with industry standards for data exchange, database management and other appropriate guidelines.

#### 4.1.3 Control of AIS Functionality

Appropriate modules, applications and other necessary tools will be provided for incorporation into existing Coast Guard command and control systems to make use of full AIS functionality, including transmission of standard AIS messages, use of binary applications, channel management and other required functionality. To the maximum extent possible, the system will leverage existing Coast Guard or DHS infrastructure – the intention is not to create a separate operational display or command and control system.

#### 4.1.4 Existing Technology Standards

The system will be compatible with current international AIS standards and recommendations, particularly those listed in Appendix B, and all applicable standards for system components.

#### 4.1.5 State-of-the-Market, Proven Technology and Materials

State-of-the-market technology will be sought to facilitate ease of manufacturing processes, automation of operations, performance monitoring and maintenance. Such technology will be proven, non-developmental, use open architecture and be commercially available. The system will take maximum advantage of Commercial Off-The-Shelf (COTS) or Government Off-The-Shelf (GOTS) equipment and software.

#### **4.1.6 Equipment Standardization and Compatibility**

The design will avoid equipment, standards, data formats, etc. unique to this system where industry or open source standards are available. System design will be consistent, though not necessarily identical, across operating units of the same type. The system will be operable from existing and planned platforms and facilities. A primary design requirement will be compatibility with existing and planned equipment employed by end users who have a requirement for AIS capability and information.

#### **4.1.7 Technology Refreshment**

The system will be designed to facilitate technology refreshment at various points during the life cycle, incorporating open systems architecture to accommodate component obsolescence as part of a Diminishing Manufacturing Sources and Material Shortages (DMSMS) management program. It is noted that there is a substantial set of AIS equipment under development for which standards have yet to be finalized (e.g., Class B mobile stations, base stations, AIS repeater). Nationwide AIS will take these developments into account and have the ability to accommodate them.

#### **4.1.8 Modularity**

The design should allow for flexibility of equipment replacement or upgrade with minimum interface modifications. The architecture should make use of open systems standards to the extent possible and use a modular design to extend capabilities and accommodate the incorporation of advanced technology or expanded capability.

### **4.2 INTEGRATED LOGISTICS SUPPORT**

Support considerations will be incorporated in the system design, cost, and acquisition process through a formal Integrated Logistics Support (ILS) program and documented in an Integrated Logistics Support Plan (ILSP). The ILSP will detail the ILS program and its relationship with overall program management. It will include all ten elements of ILS, e.g., Configuration Management and DMSMS. Logistics support will be coordinated as a combination of government logistics support and contractor logistics support based on overall cost effectiveness. Modifications to the existing overall Coast Guard support organization should be minimized.

### **4.3 IMPACT UPON USCG SYSTEMS AND INFRASTRUCTURE**

Implementation of Nationwide AIS will provide a significant increase in the number of vessel tracks and amount of information available to watchstanders and decision makers. Nationwide AIS will make modifications to existing USCG command and control systems such that they accept AIS information; support expansion of the USCG network where required to gather or distribute live AIS information; and invest in tools needed to operate, manage, and maintain the Nationwide AIS infrastructure. This will include but not be limited to:

- Improving USCG network infrastructure where required

- Ensuring adequate data fusion capability exists to make AIS tracks usable in the SBU COP
- Integrating AIS controls and information into legacy and developing systems
- Ensuring appropriate displays and standard format are available
- Providing antenna towers, real estate and systems support facilities
- Providing tools for handling, viewing and interpreting data

#### 4.4 RELIABILITY

For the purposes of this section and sections 4.5, 4.6 and 4.7 the following definitions of system levels apply:

- “system” refers to the entire national suite of AIS hardware and software and the critical functions (from Section 2.1.4) that reside there.
- “installation” is a specified subset of equipment and critical functions tailored to the needs of a specific location (e.g., sector, coastal area, or waterway).
- “site” is a discreet location within an installations’ area of responsibility where Nationwide AIS equipment is installed, but not the entire suite of Nationwide AIS equipment supporting the sector. This definition primarily refers to remote sites, such as receivers, towers, antennas and their related equipment.

All levels of Nationwide AIS will be designed for reliability while also considering total life cycle costs. Analyses will be conducted to determine the optimal blend of reliability and maintainability to achieve the required availability. System redundancies, systems interfaces and interferences, and maintenance may all be considered in analysis and design efforts. Since all levels of Nationwide AIS will be dependent on externally provided support services (e.g., GPS, communication links, power, etc.) alternatives that minimize the impact of the loss of any support service shall also be considered during analysis.

#### 4.5 AVAILABILITY

The critical capabilities that are necessary to provide the required level of availability are the continuous operation of the electronics installed at the AIS facilities, the communications network connecting the AIS facilities and the data management services provided or supported (e.g., data validation, fusion, correlation and distribution). The system will be available for operational use 24 hours a day, 7 days a week in all environmental conditions to support continuous maritime domain awareness of the coverage area and to provide a communications path for transmission of safety and security information to and from mariners within specific regions. The system will provide an operational availability ( $A_o$ ) of 96% measured on a monthly basis for each critical function in section 2.1.4 by Sector.  $A_o$  is calculated through the below formula:

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

*where:*

$T_o$  = operating time  
 $T_m$  = maintenance time  
 $T_l$  = logistical delays  
 $T_a$  = administrative delays

The design will consider the use of equipment or coverage redundancies and alternate communication paths to achieve the required availability.

## **4.6 MAINTAINABILITY**

Maintenance may be provided through contracted services, which will be performed under a maintenance plan. Responsibilities for specific levels of maintenance will be documented in the ILSP. The goal of the maintenance plan for this system will be to reduce the time the system is not available to meet operational requirements. This includes outages associated with preventative and casualty maintenance in addition to logistic and administrative delays. Redundancy of system functions 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 system design should provide self and remote access diagnostics, to include automated system monitoring, diagnostic self-tests, and recording and reporting of major component status and system availability. The system, installation and site design shall be field-repairable and/or replaceable by maintenance personnel. Nationwide AIS will be supported throughout its life cycle using the current or planned Coast Guard support structure. Additional support requirements are contained in Sections 4.2, 4.8 and 4.9.

## **4.7 SURVIVABILITY**

The system design will consider the likelihood of all potential failures, inherent or causative, natural or man-made, including sabotage and vandalism. AIS installations and sites will be designed to operate in severe weather conditions and withstand extreme weather and environmental conditions in their geographic area of operation, including coastal, riparian, Great Lakes, and marine environments. Following an extraordinary loss in capability (due to events including earthquake, severe weather, tsunami, etc.), Receive and Transmit capability at individual sites will be restored within two weeks; Network Service and Data Management capabilities at the installation and system levels will be restored within one day.

## **4.8 PERSONNEL, SAFETY, HUMAN FACTORS, AND ENVIRONMENTAL CONSIDERATIONS**

A systems approach to the design is required to provide necessary operational efficiency considerations. The system design will consider improvements in operational effectiveness and efficiency; this includes the automation of tasks when possible. A wide range of personnel is expected to use the data provided by Nationwide AIS. These users will primarily consist of watch standers at Sector Command Centers and other Coast Guard, DHS and outside agency command and control nodes. AIS data will usually be combined with other data and presented on a common display. Operational personnel requirements should fall within planned rate structure and expertise levels of currently existing systems and programs, as well as those associated with programs under development, such as Command 2010. A goal of this acquisition is to leverage existing communications watch standers and Coast Guard systems to make operational use of the system. The following features will be considered in the system design and in any modules or portions of other systems required by this system: logical operator control of

equipment, standard visual indication of system component status and operation, system interfaces adaptable to user preferences; ability to make use of AIS functionality required by a particular end user and the ability to retrieve archived data as required by a particular end user. To the maximum extent possible, Nationwide AIS displays, operational controls and features will be incorporated into existing or planned command and control equipment.

It is intended that a combination of contract and Coast Guard technicians will support and maintain the system. Similar to operational personnel requirements, it is anticipated that any possible increases to maintenance personnel will fall within the authority and control of other associated projects and will be addressed accordingly. There will be specific personnel required for the provision of Nationwide AIS network services. Personnel requirements should fall within 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 and to automate network services to the extent possible. The system will be safe to maintain using accepted/approved maintenance practices.

Safety analyses will be conducted prior to any deployment of equipment or installation of hardware. All safety concerns shall either be eliminated or appropriately identified in supporting technical documentation. Human Factors will also be addressed throughout the lifecycle of the AIS system. Using the systems approach, human factors issues will be identified and resolved quickly.

An environmental impact assessment will be completed to analyze the potential impacts of the various alternatives per the National Environmental Policy Act (NEPA), as required. The system will be compliant with NEPA and any other environmental laws or regulations that apply.

#### **4.9 TRAINING AND OTHER HUMAN PERFORMANCE REQUIREMENTS**

In conjunction with the acquisition process, a Performance Analysis and Cost Benefit Analysis will be conducted to determine any required training and other human performance interventions (e.g., job aids, built-in simulator, etc) and optimal format. Based on the analysis, field level operating personnel may require training and other interventions in the use and interpretation of AIS data and in the operation of the AIS functionalities of their command and control and navigation systems. Maintenance personnel and system administrators may also require training or other interventions on maintenance of applicable software and hardware. Generally, AIS training for end-users should be provided as part of their training on the overall command and control system and their operational duties. When required, new training elements will be integrated into existing courses, (e.g., VTS and Search and Rescue Mission Coordinator (SMC) courses) to maximize effectiveness and minimize resource impacts on training centers and facilities.

Training for this system will be developed in accordance with COMDTINST 1550.9 (series), Management of the Coast Guard's Training System. Initial and follow-on training will not disrupt Coast Guard mission performance. Necessary initial operation

and maintenance training will be delivered as the system is implemented. So that any resident and non-resident training and other required human performance interventions are ready for field personnel, they will be funded by CG-9332 and delivered before full production begins. However, funding for follow-on training or other intervention will be provided by RP, CG-9332 or CG-7.

## SECTION 5: KEY PERFORMANCE PARAMETERS

Key Performance Parameters (KPP) are those system capabilities or characteristics considered essential for successful mission accomplishment.

**Table 5.1: Nationwide AIS Key Performance Parameters**

Capability	Threshold	Objective
Receive	Receive AIS position reports and other messages per ORD Section 3.1.1	Receive AIS position reports and other messages per ORD Section 3.1.1
Transmit	Transmit standard AIS messages limited to VDL management and clear text messaging at the SOC only with the threshold probability for reception in the areas defined in ORD Appendix D.	Transmit all standard AIS messages in the areas defined in Section 3.1.3 with the probability for reception
Network Services	Provide all received AIS messages to the appropriate local command and control entity and to the SBU COP.	Provide all received AIS messages to the SBU COP, intelligence community, local command and control system(s), and external entities
Data Management	Perform data validation on AIS information received. Provide AIS data to an appropriate archive for retrieval.	Perform data validation on AIS information received. Correlate AIS data with other sources and provide this correlated/fused information to the appropriate command and control system. Have as part of the Nationwide AIS system a means for archiving and retrieval of AIS and correlated data.
Interoperability	Provide NAIS data in a standard format to Coast Guard systems and external systems	Provide NAIS data in a customized format to all required Coast Guard and external systems. Integrate NAIS capability with Sector Command Center core Command & Control (C2) systems to provide for control of AIS functionality (e.g., transmission of text messages, etc.)



## SECTION 6: TRADE-OFFS

Funding and technological constraints require prioritization of system characteristics and capabilities. The prioritization categories reflect considerations for providing a baseline level of service, budget realities, commercially available operational capabilities, and projected system support costs. The system characteristics and capabilities have the following relative priorities within existing life cycle cost constraints. Items listed last will be considered as a tradeoff first:

1. Receive capability within 24nm from the baseline.
2. Transmit capability out to 24nm from the baseline for 58 critical ports and 11 coastal areas (pursuant to coverage capability modifications in items 10 through 12).
3. Full interoperability/data exchange (Internet based) with other governmental and commercial MDA systems.
4. Reliability, maintainability, availability.
5. Data correlation and fusion capability.
6. Information Assurance.
7. Network Services.
8. Data archive and retrieval.
9. Receive capability out to 50nm from the baseline.
10. Coverage capability in areas designated as Level of Service III in the Coverage Exceptions table of Appendix C:
  - a. Receive coverage for Western Rivers (covered by IRVMC) and Gulf of Alaska (between 137 degrees and 144 degrees west longitude)
  - b. Transmit capability for Gulf of Alaska (between 137 degrees and 144 degrees west longitude), Unimak Pass, Dutch Harbor, Adak and Attu.
11. Coverage capability in areas designated as Level of Service IV in the Coverage Exceptions table of Appendix C:
  - a. Receive coverage for Alaska Cook Inlet, north and east of Anchorage (Turnagain and Knik Arms), the Western Alaska Bering Sea coastline north to Kotzebue, and Aleutian Islands west of 155 degrees west longitude, except for Unimak Pass, Dutch Harbor, Adak and Attu.
  - b. Transmit coverage for Alaska Cook Inlet, north and east of Anchorage (Turnagain and Knik Arms), the Western Alaska Bering Sea coastline north to Kotzebue, and Aleutian Islands west of 155 degrees west longitude, except for Unimak Pass, Dutch Harbor, Adak and Attu.
12. Coverage capability in areas designated as Level of Service V in the Coverage Exceptions table of Appendix C:
  - a. Receive coverage for Northern Alaska Chukchi and Beaufort Sea coasts (north of Kotzebue and east to Canadian border)
  - b. Transmit capability for Western Rivers (covered by IRVMC) and Northern Alaska Chukchi and Beaufort Sea coasts (north of Kotzebue and east to Canadian border).
13. Long range receive capability out to 2000nm from the baseline.
14. Life Cycle Costs
15. Schedule

## APPENDIX A: LIST OF ACRONYMS

AIS	Automatic Identification System
AOR	Area of Responsibility
Ao	Operational Availability
AtoN	Aids to Navigation
C2	Command and Control
CGDN+	Coast Guard Data Network +
COI	Critical Operational Issues
COMDT	Commandant
CONOPS	Concept of Operations
COP	Common Operational Picture
COTS	Commercial-off-the-shelf
DMSMS	Diminishing Manufacturing Sources and Material Shortages
FATDMA	Fixed Access Time Division Multiple Access
FISMA	Federal Information Security Management Act of 2002
FOC	Full Operational Capability
FY	Fiscal Year
GOTS	Government-off-the-shelf
GPS	Global Positioning System
IAI	International Application Identifier
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
IEC	International Electrotechnical Commission
ILS	Integrated Logistics Support
ILSP	Integrated Logistics Support Plan
IMO	International Maritime Organization
IOC	Initial Operational Capability
ITU-R	International Telecommunications Union Sector for Radio communications
KPP	Key Performance Parameters
LTP	Local Tactical Picture
MAGNET	Maritime Awareness Global Network
MDA	Maritime Domain Awareness
MNS	Mission Need Statement
MTSA	Maritime Transportation Security Act
Nationwide AIS	Nationwide Automatic Identification System
NEC	National Electric Code
NEPA	National Environmental Policy Act
NIST SP 800-53	National Intelligence Support Systems
nm	Nautical Miles
NTIA	National Telecommunications and Information Administration
ORD	Operational Requirements Document
OT&E	Operational Test and Evaluation
PORD	Preliminary Operational Requirements Document
SAR	Search and Rescue
SBU	Sensitive But Unclassified
SOLAS	Safety of Life at Sea
SOTDMA	Self-Organized Time Division Multiple Access
STEDS	SBU Tactical Information Exchange and Display Systems
VDL	VHF Data Link
VHF	Very High Frequency
VTS	Vessel Traffic Service

## APPENDIX B: REFERENCES

1. Mission Need Statement for the Nationwide Automatic Identification System ,29 Sep 04
2. Appendix 1 to Annex A of the MDA Concept of Operations – Automatic Identification System
3. Nationwide Automatic Identification System Preliminary Operational Requirements Document, 28 Feb 05
4. 1974 SOLAS Convention, Chapter V (as amended)
5. IMO Recommendation on Performance Standards for a ship-borne Automatic Identification System (AIS), (MSC 74(69) Annex 3)
6. ITU Recommendation on the Technical Characteristics for a Ship-borne Automatic Identification System (AIS) Using Time Division Multiple Access in the Maritime Mobile Band (ITU-R M.1371-1), including IALA Technical Clarifications
7. IEC Standard 61993-2: Class A Ship-borne equipment of the Universal Automatic Identification System (AIS) - Operational and Performance requirements, methods of testing and required test results.
8. IEC 6112-1 Ed.2: Maritime navigation and radiocommunication equipment and systems-Digital interfaces – Part 1: Single talker and multiple listeners.
9. IEC/PAS 61162-100 Ed.1: Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 100: Single talker and multiple listeners – Extra requirements to IEC 61162-1 for the UAIS.
10. IEC Standard 62287 – Maritime Navigational and radio communication equipment and systems-Class B shipborne installation of the Universal Automatic Identification System (AIS) using VHF TDMA techniques.
11. NMEA 0183 V3.01: National Marine Electronics Association Standard for Interfacing Marine Electronic Devices, January 2002.
12. IALA Guidelines on the Universal Automatic Identification System (Volumes 1 and 2).
13. IALA Recommendation A-124 on AIS Shore Stations and Networking Aspects Related to the AIS Service
14. IALA Recommendation A-126 on AIS Aids To Navigation
15. NTIA Manual of Regulations & Procedures for Federal Radio Frequency Management (<http://www.ntia.doc.gov/osmhome/redbook/redbook.html>)
16. National Maritime Domain Awareness Plan
17. National Strategy for Maritime Security
18. Commandant (G-OCC) ltr 2000 of 19 Jul 05, Operational Requirements for SBU Tactical Information Exchange and Display System (STEDS)

## APPENDIX C: NAVIGABLE WATERS, U.S. TERRITORIES AND EXCEPTIONS FOR AIS COVERAGE

### Inland Navigable Waters:

For purposes of this document, especially Section 3.1, “inland navigable waters” refers to the following locations:

- Columbia River from Astoria, OR to Kennewick, WA
- Sacramento River to Sacramento, CA
- San Joaquin River to Stockton, CA
- Mississippi River to Baton Rouge
- Western Rivers covered by the Inland Rivers Vessel Movement Center (IRVMC)
- Intracoastal Waterway
- Hudson River to Albany, NY
- U. S. waters of the Great Lakes (including connecting rivers: Detroit, St. Clair, St. Mary’s)
- U. S. waters of the St. Lawrence River

### U.S. Territories:

U.S. Territories that shall be included in coastal waters are:

- The island of Guam
- Puerto Rico
- U.S. Virgin Islands

### Coverage exceptions to Tables 3.1 and 3.2:

Area description	Level of Service	
	Receive	Transmit
Alaska Bering Sea coast north of Kotzebue to Canadian border	V	V
Cook Inlet North and East of Anchorage (Turnagin and Knik Arms)	IV	IV
Aleutian Islands west of Dutch Harbor, except for Adak and Attu	IV	IV
Alaska Peninsula west of 155° west longitude, except Unimak Pass	IV	IV
Adak, Attu, Dutch Harbor and Unimak Pass	II	III
Portions of Sector Juneau Identified in Appendix D	II	III
Gulf of Alaska between 137° and 144° west longitude	III	III
Inland Navigable Waters Identified in Appendix C	II	III
U.S. waters exempt from AIS carriage requirements	None	None

## APPENDIX D: INCREMENT 1 & 2 AIS DEPLOYMENT

The areas below have been grouped in order of priority for deployment. Increment 1 will be designed and deployed within the constraints of available infrastructure, cost and performance requirements in order to meet the desired schedule per section 1.3. Therefore, actual deployment in all areas listed below may not occur due to those constraints. Areas that are not listed below but have existing AIS capability accessible by the Coast Guard shall be incorporated into Increment I but evaluation of their ability to meet requirements is not required.

58 Critical port areas:

<u>Group 1</u>	<u>Group 2</u>	<u>Group 3</u>
Baltimore, MD	Baton Rouge, LA	Albany, NY
Charleston, SC	Beaumont, TX	Anchorage, AK
Honolulu, HI	Boston, MA	Camden, NJ
Houston, TX	Chicago, IL	Cincinnati, OH
Jacksonville, FL	Corpus Christi, TX	Cleveland, OH
Long Beach, CA	Detroit, MI	Duluth-Superior, MN/WI
Los Angeles, CA	Lake Charles, LA	Freeport, TX
New Orleans, LA	Memphis, TN	Galveston, TX
New York/New Jersey	Mobile, AL	Huntington, WV
Norfolk Harbor, VA	Newport News, VA	Marcus Hook, NJ
Oakland, CA	Port Arthur, TX	Miami, FL
Philadelphia, PA	Port Everglades, FL	Paulsboro, NJ
Savannah, GA	Portland, ME	Pittsburgh, PA
Seattle, WA	Portland, OR	Port Canaveral, FL
New Haven, CT	San Diego, CA	Portsmouth, NH
Key West, FL	South Louisiana, LA	Richmond, CA
	St. Louis, MO	San Francisco, CA
	Tacoma, WA	San Juan, PR
	Texas City, TX	Tampa, FL
	Wilmington, NC	Valdez, AK
		Wilmington, DE
		Island of Guam

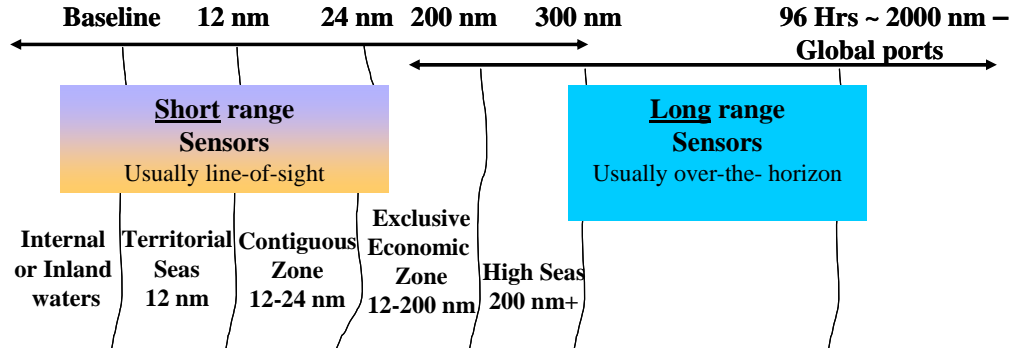
#### Group 4: Critical Coastal and non-port areas

It is intended that these areas will be provided AIS capability primarily covering locations with moderate AIS-equipped vessel density (e.g., points where AIS-equipped vessels transit within 24nm of the shoreline), mid-sized harbors and areas where there is access to infrastructure (e.g., Coast Guard owned or leased towers, property, structures) and network connectivity. Gaps in coverage within the larger areas will be acceptable. The specific harbors and locations provided below are not identified as specific locations for installation of AIS equipment; however they should be included in the coverage area.

- US Waters of the Great Lakes:
  - Lake Superior: West End (Two Harbors, MN), Keweenaw Peninsula, MI, Marquette, MI
  - Lake Michigan: Straits of Mackinac (St Ignace, Charlevoix, Mackinaw City, MI), Door Peninsula (Green Bay, Sturgeon Bay, WI); Milwaukee, WI; South End (Gary, Indiana Harbor, Michigan City, IN), Holland/Grand Haven/Muskegon, MI
  - Lake Huron: Alpena, MI, Bay City, MI, Port Huron, MI
  - Lake Erie: Toledo, OH, Lorain, OH, Erie, PA, Buffalo, NY
  - Lake Ontario: Rochester/Sodus/Oswego, NY
- California/Oregon Coast from Mexican Border to Cape Blanco:
  - Oceanside, CA; Santa Barbara Channel (Point Conception, Santa Barbara, Channel Islands, CA); Point Sur, CA; Point Arena, CA; Cape Mendocino, CA ; Lost Coast (Eureka, Crescent City, CA); Cape Blanco, OR
- Delaware Bay Approaches (Cape May, Cape Henlopen)
- Unimak Pass, AK
- Portions of Sector Juneau
  - Juneau, AK
  - Ketchikan, AK
  - Sitka, AK
  - Yakutat, AK
- Cape Hatteras, NC
- Cape Cod and Island

**APPENDIX E: MARITIME DETECTION AND IDENTIFICATION ZONE**

**Maritime Detection & Identification Zone (National)**



Vessel Size	MDA Surveillance and Action			
All	Surveillance			
≥ 65'	Track (<30 sec)	Track (<1 hr freq)	Detect, Classify/ID, Target (<4 hr freq)	Vessels >300 GT outside 2000 nm Detect, Classify/ID, Target (<6 hr freq)
65' > 25'	Track (<30 sec)	Detect, Classify/ID, Target (<1 hr freq)	*	
≤ 25'	Detect, Classify/ID, Target (<30 sec)			

\*D/C/I/T for vessels >25' may extend beyond 300 nm in some areas to support HLS, HLD, LE or other missions