



U. S. DEPARTMENT OF HOMELAND SECURITY
UNITED STATES COAST GUARD



**U.S. COAST GUARD AND
NATIONAL OCEANIC AND
ATMOSPHERIC
ADMINISTRATION
REPORT TO CONGRESS:**

**FISHERIES MANAGEMENT
SYSTEMS AND
DATA SHARING**

1. Introduction

Section 111 of the Magnuson-Stevens Fisheries Conservation and Management Reauthorization Act 2006 (P.L. 109-479) requires that “within 15 months after the date of enactment of this Act, the National Marine Fisheries Service and the United States Coast Guard shall transmit a joint report to the Senate Committee on Commerce, Science, and Transportation and the House of Representatives Committee on Resources containing—

- A cost-to-benefit analysis of the feasibility, value, and cost of using vessel monitoring systems, satellite-based maritime distress and safety systems, or similar systems for fishery management, conservation, enforcement, and safety purposes with the Federal government bearing the capital costs of any such system.
- An examination of the cumulative impact of existing requirements for commercial vessels.
- An examination of whether satellite-based maritime distress and safety systems or similar requirements would overlap existing requirements or render them redundant.
- An examination of how data integration from such systems could be addressed.
- An examination of how to maximize the data-sharing opportunities between relevant State and Federal agencies and provide specific information on how to develop these opportunities, including the provision of direct access to satellite-based maritime distress and safety system or similar system data to State enforcement officers, while considering the need to maintain or provide an appropriate level of individual vessel confidentiality where practicable.
- An assessment of how the satellite-based maritime distress and safety system or similar systems could be developed, purchased, and distributed to regulated vessels.

This report assesses the use and integration of Vessel Monitoring Systems (VMS), satellite-based maritime distress and safety systems, and similar systems for fishery management, conservation, enforcement and maritime safety. This report further examines the costs and benefits of the various equipment carriage requirements imposed upon commercial vessels by Federal regulations and international treaties.

The following systems are addressed in this report:

- Vessel Monitoring Systems (VMS)
- Automatic Identification System (AIS)
- Long Range Identification and Tracking (LRIT)
- COSPAS-SARSAT System¹
- Global Maritime Distress and Safety System (GMDSS)

¹ COSPAS-SARSAT: COSPAS: Cosmicheskaya Sistyema Poiska Avariynich Sudov (“Space System for the Reach of Vessels in Distress”)
SARSAT: Search and Rescue Satellite-Aided Tracking.

The monitoring and safety systems aforementioned each serve a unique purpose in the maritime environment with limited overlap. Similar to today's automobiles which carry radios, GPS navigation systems, and video display systems, these "black boxes" were designed for different reasons and utilize varying technologies. The National Oceanographic and Atmospheric Administration (NOAA) VMS occupy a unique place as primary fisheries enforcement and resource management tools for both the United States Government and the international community which cannot be replaced by any of the other technologies examined. The focus of this report is therefore on NOAA's VMS.

2. Background - Vessel Monitoring and Other Safety Systems

2.a. Vessel Monitoring Systems (VMS)

In U.S. waters, fishing quotas, harvesting limits, "Closed Areas", moratoria, special management of fishing zones, and license-limitations have become prevalent management tools to protect depleting ocean resources. In 1988, NOAA's Office of Law Enforcement (OLE) implemented satellite-based VMS. VMS have evolved as primary fisheries enforcement and resource management tools for the National Marine Fisheries Service (NMFS) to fulfill the mandates of the Magnuson-Stevens Fishery and Conservation Management Act in various regions of the U.S. Exclusive Economic Zone (EEZ). VMS also aid the monitoring and enforcement of the 14 Marine Sanctuaries, Papahānaumokuākea Marine National Monument, and several international agreements.

The use of VMS to enhance fisheries management and enforcement programs is further guided by the provisions of the Magnuson-Stevens Fishery and Conservation Management Act which states that conservation and management measures shall, where practicable, minimize costs, avoid unnecessary duplication, and promote the safety of human life at sea.

VMS provide four broad benefits to the vessels owners, operators, and other stakeholders: management of fishery resources, conservation and environmental protection, enforcement of fishery regulations, and the safety of mariners. In addition to these four primary benefits, VMS also support national security and economic viability objectives.

VMS have been instrumental in saving lives related to the Nation's most dangerous occupation - fishing. In the 10-year period from 1994-2004, over 1,400 fishing vessels sank and 641 fishermen lost their lives. VMS also aid in the protection of fisheries internationally through the United Nations Food and Agricultural Organization (FAO).

Of the approximately 80,000 U.S. fishing vessels, most are state-registered vessels and approximately 24,000 are U.S. documented. As of the end of calendar year 2007, more than 5,000 vessels have been fitted with VMS units.

VMS provide NOAA with accurate locations of fishing vessels participating in the VMS program. They confidentially transmit information on a vessel's current location and where it was at periodic time intervals. The position information is provided to NOAA in near real time (less than 30 minutes) no matter where the vessel is located in the world.

VMS do not replace or eliminate conventional monitoring, control, and surveillance measures such as aerial surveillance, boarding at sea via patrol boats, landing inspections, and documentary investigation. Many of these measures may need to be activated as a specific response to information received via VMS.

VMS obtain various sets of data and merge them to provide greater detail. The primary data sets include:

- Vessel-based data derived from the VMS equipment on board the fishing vessel.
- Shore-based data obtained from the service provider and vessel license.
- External data sets including weather, historical records, radar, and optical data.
- Resultant information that is derived from processing the various sets of data.
- Identity data.
- Static vessel data.
- Navigational/dynamic data.
- Special data sets.

Beyond these data sets, some VMS allow the transfer of short text-based messages. For example, VMS installed in the NOAA regions require the inclusion of a data terminal that allows the reception and entry of text as part of a basic text-based messaging system. Starting in the spring of 2008, all approvals in the United States will require a type-approved enhanced message terminal unit with this capability.

In general, VMS transmit data every 30 minutes. This can be increased when required and the VMS unit can also be polled to get an earlier update than the scheduled 30-minute transmission. VMS also allow the transmission of data to NOAA by the vessel operator. This data could include notification of the vessel's intentions, such as entering a port or fishing zone, information about the activity of other vessels, or transmission of information from a variety of automatic sensors (e.g., engineering systems).

VMS data accuracy and security

The data from any VMS needs to be as accurate as possible to benefit all stakeholders. The two primary sets of data are identity and position, which the fishing community wants to keep confidential to preserve the location of fishing grounds. There is concern that publication of information or information summaries might be viewed as revealing the operational practices or other sensitive information about individuals or companies.² VMS data is covered by the confidentiality provisions of the Magnuson-Stevens Act and the protection of positional and Personally Identifiable Information (PII) should be protected when required by other regulatory authorities which utilize VMS.

Confidential data shall only be disclosed to the public if required by the Freedom of Information Act (FOIA), 5 U.S.C. 552, the Privacy Act, 5 U.S.C. 552a, or by court order or other

² <http://www.pifsc.noaa.gov/wpacfin/confident.php>

statutory/regulatory authorizations. Authorized users should be cognizant of Magnuson-Stevens Information Collection and confidentiality requirements under 16 U.S.C. 1881a.

The data collected and available in the VMS environmental database are commercially and legally sensitive, and access to these systems is therefore protected. Intentional tampering with VMS equipment exists in several forms on board vessels. Many types of tampering result in a tamper code transmission to NOAA which then triggers an inquiry into the incident. Management agencies must continually evaluate the hardware, firmware, and software of equipment used in their VMS programs to ensure the insertion of false data is prevented.

NOAA type-approved VMS units are robust and tamper-resistant, and have been used to provide evidence of illegal fishing activity in the United States. The prospect of spoofing positions has been raised in papers that discuss VMS systems.³ The methods range from simple interference of the data signals between the Electronic Position Fixing System (EPFS) to those wanting to provide incorrect positional data, and having access to highly sophisticated equipment that could interfere with the positioning systems used by the EPFS on board the vessel. To date, there are no verified incidents of spoofing in the NOAA program, which is in large part based on NOAA's extensive type-approval process and underlying security requirements.

Models for collecting and sharing data

NOAA explored the sharing of data between VMS environments from different manufacturers using different database applications and data sets, including a distributed and duplicated database, a centralized database, and a database index. NOAA has implemented a centralized database.

Data reporting issues

The security of VMS data is important both to fishing vessel operators and to fishery management authorities for commercial and legal reasons. The use of VMS data for scientific reporting should be such that review of the published data does not betray commercially sensitive data.

VMS development, purchase and distribution

The development of the VMS environment must meet three primary criteria:

- The required data with sufficient detail is obtained from fishing vessels within the area of interest.
- The communication system covers the area of interest with sufficient reliability to ensure that the messages are sent and received reliably.
- The cost of the system is evaluated to be proportionate to the benefits obtained.

NOAA has addressed all three criteria. The data required by NOAA includes identity, position, and any other data required by the Fishery Management Plan, such as declarations, landings, and gear types. The extension of this data set is application-dependent and can include declarations, catch reporting, and trip management. This could also expand in the future to include electronic logbook, weather, and habitat analysis information.

³ U.S. National implementation task force GMDSS information bulletin – August 7, 2003

VMS terminals must meet the following requirements:

- Security (sealed and cannot easily be spoofed).
- Features (enhanced security measures in Mobile Transmission Unit (MTU)/ Enhanced Mobile Transmission Unit (EMTU)).
- Reliability (system life is >5 years).
- Reporting (maximum system latency of 5 minutes).

The NOAA communication standard requires 97% of all data transmissions to be received within 15 minutes of the data time stamp and must include a store and forward capability when communication is lost. The fishing industry operates on a low profit margin while contending with constraints related to weather, seasonal variation, and licensing. As a result, NOAA aims to keep the cost of VMS to fishermen low.

NOAA operates a reimbursement program for new VMS EMTUs fitted to fishing vessels as published in the Feral Register for that VMS. Reimbursement is limited to the cost of the lowest type-approved unit for the fishery. Communication costs associated with the reporting requirements are paid by the fisherman. There is support for the NOAA reimbursement program and there seems little need to change this from the fisherman's perspective. Terminal distribution using commercial suppliers also appears to be satisfactory to all participants.

NOAA has implemented:

- Centralized operations with a single high performance system that is scalable to cater to all current and future VMS requirements, including the integration of AIS data when this becomes available in the future.
- Centralized, redundant VMS systems.
- Data storage increased to take account of the increased data set that will become available from the USCG Nationwide AIS (NAIS) environment in the future.

Type approval of VMS units

NOAA's VMS standards and type-approval process is published in the Federal Register, maintained on the OLE web site, and provided directly to vendors and manufacturers. Vendors and manufacturers requesting participation in the NOAA VMS program are required to submit the specifications and capabilities of their respective EMTU and communications provider (collectively characterized as their VMS units). If their units meet the NOAA's VMS standards, OLE requests an EMTU for 90-day trials aboard vessels. A list of approved vendors/units which meet the requirements and pass the trials are ultimately provided to vessel operators/owners and posted on the OLE web page. Once type approved, any modifications to the EMTU or the communications provided require resubmission and formal approval.

High Level Future State Conceptual Design

The VMS data set will be centralized and run on hardware that has sufficient capacity to deal with the current and projected increases in data as well as storing of the data for later analysis and use.

The data collection network will include an expanding sensor set such as AIS and LRIT sources of data. There are ongoing projects that are introducing a secure and electronic logbook for the fishing environment improving the efficiency of managing the vessel fishing activities to enable a more detailed management of the fish stock.

With the increased focus on the exchange of data in the maritime environment, a number of standardized XML interfaces are being published. This allows various environments to easily exchange data and enhance existing and new applications with the increased data set. When multiple sets of data are available from different sources, it becomes easier to examine the data for any anomalies in the data. This has a significant impact on data accuracy, safety, and security.

2.b. Automatic Identification System (AIS)

Automatic Identification System (AIS) is a maritime navigation safety communications system standardized by the International Telecommunication Union (ITU) and adopted by the International Maritime Organization (IMO). AIS accomplishes the following:

- Provides vessel information (e.g., the vessel's identity, type, position, course, speed, navigational status and other safety-related information) automatically to appropriately equipped shore stations, other ships, and aircraft;
- Receives such information automatically from similarly fitted ships;
- Monitors and tracks ships; and
- Exchanges data with ships and shore-based facilities.

Since collision avoidance and safety at sea are the primary goal of AIS, the system broadcasts its information "in the clear" (i.e., not encrypted) to all vessels and stations within its vicinity.

The International Convention for the Safety of Life at Sea (SOLAS) Chapter V/19.2.4 requires carriage of AIS on all ships of 300 gross tonnage and upwards and passenger ships, irrespective of size, engaged on an international voyage. No later than July 1, 2008, all cargo ships of 500 gross tonnage and upwards not engaged on an international voyage will also be required to carry AIS.

Domestically, the Maritime Transportation Security Act of 2002 (MTSA), Public Law 107-295, mandates AIS within Vessel Traffic Service areas of the United States by all commercial vessels of at least 65 feet in length; passenger vessels as determined by the Coast Guard; towing vessels over 26 feet and 600 horsepower; and on any other vessel deemed necessary for safe navigation. SOLAS class vessels are also required to be in compliance with SOLAS Chapter V.

In response to MTSA (46 U.S.C. 70113 (a)), emerging homeland security requirements and the need to improve navigational safety, the Coast Guard created the National Automatic Identification System (NAIS) project--a major Federal acquisition project to collect, integrate, and analyze information concerning AIS-equipped vessels operating on or bound for waters subject to the jurisdiction of the United States Government. NAIS will consist of an integrated system of AIS shore stations, data storage, processing, and networking infrastructure. NAIS will

also be integrated with other systems for the purpose of sharing infrastructure and improving system performance. NAIS will provide the ability to transmit AIS messages to vessels within 24 nautical miles of the United States coastline and receive AIS messages from vessels within 2,000 nautical miles.

Range of AIS

AIS is primarily a VHF-FM system, thus its range is line-of-sight, typically between 20-40 nautical miles depending on the ship's antenna height. This range can be extended considerably by non-shipboard infrastructure such as terrestrial-based antennas and/or phased arrays systems (80-200 nm range), offshore platforms (e.g., data buoys, oil platforms (20-40 nm), and low earth orbit (LEO) satellites)). Feasibility of satellite-based AIS tracking was proven on December 16, 2006 by a launch of the U.S. Department of Defense TACSAT-2 satellite, which was equipped with an AIS receiver. Other commercial companies are also developing the means to provide satellite-based AIS capabilities.

AIS Data Security

As with any open, non-proprietary system, AIS, in conjunction with its multiple interfacing capabilities, can be tampered with and used maliciously. This should be taken into consideration if AIS is used for VMS purposes. Mitigation strategies similar to those used to prevent VMS spoofing could be implemented in AIS VMS.

2.c. Long Range Identification and Tracking (LRIT)

The International Maritime Organization (IMO) Maritime Safety Committee (MSC) passed a resolution in May of 2006 which amended the International Convention for SOLAS of 1974 to require Long Range Identification and Tracking (LRIT). The LRIT system is an automated, satellite-based vessel tracking system designed to collect and disseminate vessel position information received from vessels subject to the regulation. LRIT also establishes a global multilateral agreement in order to meet the maritime safety, security, and Search and Rescue (SAR) concerns of all SOLAS contracting governments. The international system will function through a network of national, regional, and cooperative data centers, an international data exchange, and a data distribution plan.

Vessels on international voyages which are subject to the rule include cargo ships of 300 gross tons and greater, passenger vessels carrying more than 12 passengers, and self-propelled mobile offshore drilling units. The resolution will entitle the United States Government to track 40,000 foreign-flagged SOLAS class vessels as they approach U.S. ports or pass within 1,000 nautical miles of the U.S. coast, and provide the Coast Guard with position information on all U.S.-flagged SOLAS class vessels worldwide. The LRIT information ships will be required to transmit include the ship's identity, location, and date and time of the transmitted position.

This new LRIT regulation, which entered into force on January 1, 2008, requires all ships subject to SOLAS Chapter V/19-1 to transmit LRIT information on a phased-in schedule beginning December 31, 2008. There is no planned interface between LRIT and AIS. The Coast Guard envisions very few, if any, U.S. flag vessels engaged in domestic fisheries will be required to carry LRIT systems.

2.d. COSPAS-SARSAT System

COSPAS-SARSAT is an international satellite-based search and rescue system established by Canada, France, the United States, and Russia. Vessels carry a 406 MHz satellite emergency position-indicating radiobeacon (EPIRB) which can alert the COSPAS-SARSAT system in the event of emergency. These automatic-activating EPIRBs, now required on ships party to the International Convention for the SOLAS, commercial fishing vessels, and other ships, are designed to transmit to a rescue coordination center a vessel identification and an accurate location of the vessel from anywhere in the world. Over the last 25 years, COSPAS-SARSAT has been responsible for saving over 25,000 lives worldwide.

2.e. Global Maritime Distress and Safety System (GMDSS)

GMDSS is a ship-to-shore safety system that uses satellite and automated terrestrial communications systems. GMDSS requires ships to carry various types of communications equipment depending upon the voyages of the ship. GMDSS also requires ships to comply with certain functional requirements. GMDSS rules are found Title 47 Code of Federal Regulations (CFR) Part 80.

Pursuant to GMDSS, cargo ships are required to carry communications equipment based upon which of the four Sea Areas in which the vessels operate⁴. Traditionally, the Federal Communications Commission (FCC) has treated fishing vessels as cargo vessels because the Communications Act defines "cargo ship" as "any ship not a passenger ship."⁵

3. Response to Congressional Questions

3.a. Cost-Benefit Analysis - A cost-benefit analysis of the feasibility, value, and cost of using VMS, satellite-based maritime distress and safety systems, or similar systems for fishery management, conservation, enforcement, and safety purposes with the Federal government bearing the capital costs of any such system.

This report addresses disparate systems with diverse goals; therefore, a meaningful cost-benefit analysis of all vessel monitoring and safety systems is not possible. In conducting our analysis, we eliminated COSPAS-SARSAT and GMDSS since they are not monitoring systems, as well as LRIT since it is not envisioned to be required for fishing vessels (except in rare instances).

After a detailed technical and operational analysis, we conclude that the NOAA VMS is a self-standing system. AIS and VMS have some overlap in features and data sets, but the overlap is not significant. Since some fishing vessels will be required to carry AIS, there is some potential that NAIS could be used to augment the VMS tracking environment for selected fishing vessels. Likewise, VMS could be used to augment other vessel tracking and monitoring systems for homeland security or other missions. The below table provides a general cost comparison of the VMS and NAIS systems.

⁴ <http://www.navcen.uscg.gov/marcomms/gmdss/area.htm>

⁵ <http://www.navcen.uscg.gov/marcomms/Gmdss/default.htm>

System	Number of units on US fishing vessels	Airtime cost	Airtime cost per year	Unit cost	Shoreside Infrastructure cost. 15 year replacement	Operating cost (1)	Cost per unit per annum (2)
VMS	12,000 (3)	\$45.79	\$6.6M	\$3K	\$6.4M	\$0.64M	-
VMS (yr)	-	-	\$6.6M	-	\$0.42M	\$0.64M	\$638 (5)
NAIS	5,520 (4)	\$0	\$0	\$3K	\$276.8M (6)	\$27.70M	-
NAIS (yr)	-	-	\$0	-	\$18.46M	\$27.70M	\$2,723(5)

Note 1: An assumption has been made that 10% of total asset value is required to cover operating costs

Note 2: This value is for comparative purposes only

Note 3: This is the total number of vessels estimated to be fitted with VMS over the next 5 to 8 years (50% of the 24,000 documented fleet)

Note 4: Number of fishing vessels required to carry AIS based on pending regulation change (see USCG Docket 2005-21-869 and 70 FR 64171.)

Note 5: This is calculated by ((Airtime cost +Infra replacement cost + Operating cost) / number of vessels = cost per unit per annum)

Note 6: This represents the total acquisition cost of the NAIS project which includes shore, water and space-based equipment that tracks all AIS equipped vessels.

3.b. Cumulative Impacts - An examination of the cumulative impact of existing requirements for commercial vessels.

The carriage requirements for the systems discussed in this report can result in cumulative impacts on some U.S. fishing vessels. Due to the varying system objectives—vessel tracking, communications, safety—and transmission technologies involved—broadcast versus confidential, and line of sight versus satellite relays—carriage of multiple systems cannot be avoided at this time. These systems are not duplicative, and it is not currently feasible to combine systems and still accomplish necessary program goals. It is also important to recognize that current statutes require NOAA and the Coast Guard to maintain certain distinct authorities. Our organizations will continue to remain attentive to advances in technology which may minimize carriage requirements.

3.c. Tracking Systems Overlap - An examination of whether satellite-based maritime distress and safety systems, or similar requirements would overlap existing requirements or render them redundant.

AIS is the only system with any significant overlap with existing NOAA VMS requirements. VMS is satellite-based and has global, bi-directional communication capability. AIS is designed as a short range VHF-based technology. NAIS will implement the capability to transmit AIS messages out to 24 nautical miles and the capability to receive AIS messages from NAIS equipped vessels out to 2,000 nautical miles from the U.S. shoreline.

VMS data is not broadcast and remains protected from transmission to reception by NOAA. AIS is broadcast and any suitably equipped vessel within range can detect and decode the broadcast messages. The table below outlines the primary functions of each system addressed in this report.

TECHNOLOGY	FUNCTION				
	Vessel Maritime Mobility	Search And Rescue ⁶ [SAR]	Safety ⁷	Security	Fisheries management
Vessel Monitoring System [VMS]	No application	Secondary focus. Requires service provider involvement in some cases.	Secondary focus	Enabled with data sharing	Primary focus
National Automatic Identification System [NAIS]	Significant sensor	AIS equipment fitted on USCG vessels and aircraft, and all SOLAS/MTSA vessels.	Primary focus	Secondary focus with some unique capabilities	Supportive of VMS. Some fishing vessels will have both AIS and VMS onboard.
Global Maritime Distress and Safety Systems [GMDSS]	No application	Primary focus	Primary focus	Part of Long Range Identification and Tracking [LRIT]	Can be modified to support fishery management and other VMS applications
Long Range Identification and Tracking [LRIT]	No application	Secondary focus	No application	Primary focus	No application
COSPAS-SARSAT	No application	Primary Focus	No application	If ship is equipped with a Cospas-Sarsat Ship Security Alerting System (SSAS) beacon ⁸	No application

3.d. Data Integration - An examination of how data integration from such systems could be addressed.

The integration of data between the various systems can occur using the defined and published XML based protocol. NOAA uses XML-based protocols and shares NOAA VMS data with the Coast Guard. The Coast Guard uses XML-based protocols and shares AIS data with NOAA.

The Coast Guard intends to move into a Service Oriented Architecture (SOA) which will allow users to discover, define, consume, subscribe to, and display only the information they require to complete their mission. The Coast Guard will make data available as a service, either as a geo-spatial layer or an XML-formatted feed, through the Coast Guard developed Common Operational Picture (COP) Web Services System (CWSS). This system will provide core enterprise services to allow us to publish data and provide discovery and subscription services which will allow other government agencies to find,

⁶ Search And Rescue [SAR] use improves the response to a SAR incident

⁷ Safety use improves the safety on the maritime environment so that the chances of an incident are minimized

⁸ A Ship Security Alerting System is required for all SOLAS vessels above 500 gross tons. Cospas-Sarsat is one type of SSAS available to mariners.

consume, and display our information in their systems, as well as allow us to discover and subscribe to other agencies' data.

3.e. Data Sharing - An examination of how to maximize the data-sharing opportunities between relevant State and Federal agencies and provide specific information on how to develop these opportunities, including the provision of direct access to satellite-based maritime distress and safety system or similar system data to State enforcement officers, while considering the need to maintain or provide an appropriate level of individual vessel confidentiality where practicable.

Data between the various systems can be shared using the defined and published XML based protocol. NOAA already has XML protocols as part of its VMS environment. This is being used for the NOAA data warehouse and data-sharing activities. The Coast Guard also has XML protocols as part of ongoing projects.

The Coast Guard's intention is to make track data available through a Coast Guard data-sharing portal known as "Homeport." This portal will allow state and Federal government agency partners, as well as local partners, access to information that is vital to completing their mission (in accordance with Magnuson-Stevens Act limitations). This solution will not require additional software or systems to be installed by users. Users with appropriate privileges will access the COP through the standard web browser. The information available in the view will be filtered by permission sets and roles of the user. However, per a Coast Guard/NOAA Memorandum of Agreement, VMS data will be reduced to only position, course/speed, and identification. Other agency requests for the additional fields of VMS data will be addressed by NOAA.

For government agencies that use a Geospatial Information System (GIS) and would like to integrate Coast Guard tracking data, we plan to make data available as a service. We will leverage the Service Orientated Architecture (SOA) methodology and use CWSS to publish our data and provide subscription services which will allow other government agencies to consume and display our information on their systems. No fishery specific information will be available through the Coast Guard; requests for that granularity of information will need to be addressed through NOAA.

3.f. System Equipment - An assessment of how the satellite-based maritime distress and safety system or similar systems could be developed, purchased, and distributed to regulated vessels.

VMS equipment is procured and fitted by the owner of the vessel and at their cost. NOAA, however, operates a reimbursement program for the installation of new VMS EMTUs which is currently fixed at \$3,100.00. Reimbursement is limited to the cost of the lowest type-approved unit for the fishery. Communication costs associated with the reporting requirements under the regulation are paid by the vessel owner.

4.0 Conclusion

The analysis of systems addressed in this report finds that NOAA's VMS occupies a unique place within the maritime environment and cannot be replaced by any of the other technologies examined. AIS and VMS have some overlap in features and data sets, but the overlap is not significant or usefully remedied.

NOAA's Vessel Monitoring Systems (VMS) has evolved as a primary fisheries enforcement and resource management tool for both the U.S. Government and the international community. It is a satellite-based system which allows only fisheries management personnel (not competitors) to monitor vessels and fishing grounds.

Automatic Identification System (AIS) is primarily a means to prevent collisions at sea. Its line-of-sight broadcast system allows other vessels in the vicinity to be aware of the vessel and its intentions, and as such the system does not allow any confidentiality. The Coast Guard's Nationwide AIS System (NAIS) could integrate AIS data with other data such as that received from VMS, but does not provide enough coverage, detail, or confidentiality to replace VMS as a fishery management tool.

Long Range Identification and Tracking (LRIT) is an internationally mandated system for commercial vessels on international voyages. A small number of U.S. fishing vessels will be required to utilize this system, and its frequency of reporting is insufficient for fisheries management. The international COSPAS-SARSAT system requires emergency transponders on board a vessel which transmits only in the case of emergency. This system could not be used for vessel tracking or fisheries management. The Global Maritime Distress and Safety System (GMDSS) is a maritime communications and alerting system which prescribes various communications equipment depending on where a vessel operates. The system was not designed or feasible for use with vessel monitoring or tracking.

All of these systems, with the exception of LRIT (which is not yet operational), are proven technologies which prevent accidents, conserve valuable resources, and save the lives of countless mariners. While combining systems to provide savings to U.S. fishermen is not currently feasible, it may become so in the future. NOAA and the Coast Guard will remain sensitive to this issue and encourage innovation while ensuring continued regulatory compliance.