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# THESIS

**USING AUTOMATIC IDENTIFICATION SYSTEM TECHNOLOGY TO IMPROVE MARITIME BORDER SECURITY**

by

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December 2014

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This thesis provides an overview of existing AIS systems and reviews the maritime border security effectiveness and cost benefit impacts of potential AIS equipment carriage requirements. We compared and analyzed policy options and reviewed implementation issues and concerns. Our conclusions are that the Department of Homeland Security should implement a regulation for all vessels, regardless of size, to install and broadcast Class A or Class B AIS when conducting international voyages. The proposed regulation would expand the existing Small Vessel Reporting System to a mandatory program wherein mariners are required to preregister and file float plans prior to conducting an international voyage. This proposed action provides direct support to three of the five basic homeland security missions: prevent terrorism and enhance security, secure and manage our borders, and enforce and administer our immigration laws.

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# USING AUTOMATIC IDENTIFICATION SYSTEM TECHNOLOGY TO IMPROVE MARITIME BORDER SECURITY

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# LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ADIZ | air defense identification zone |
| ADS-B | Automatic Dependent Surveillance-Broadcast |
| AIS | Automatic Identification System |
| AMOC | Air and Marine Operations Center |
| ANOA | advance notice of arrival |
| CBP | U. S. Customs and Border Protection |
| CBSA | Canadian Border Security Agency |
| CSS | Coastal Surveillance System |
| CSTDMA | Carrier Sense Time Division Multiple Access |
| DHS | U. S. Department of Homeland Security |
| DSC | digital selective calling |
| EPIRB | Emergency Position Indicting Radio Beacon |
| EU | European Union |
| FAA | Federal Aviation Administration |
| GAO | U. S. Government Accountability Office |
| GPS | Global Positioning System |
| GS | General Schedule |
| IBIS | Interagency Border Inspection System |
| ICMLEO | Integrated Cross-Border Maritime Law Enforcement Operations |
| MANPADS | Man-Portable Air-Defense System |
| MDA | maritime domain awareness |
| MMSI | Maritime Mobile Service Identity |
| MSIS | Merchant Ship Information System |
| NAIS | National Automatic Identification System |
| NATO | North Atlantic Treaty Organization |
| NEXUS | Alternative CBP Inspection Program |
| NPS | Naval Postgraduate School |
| NSVSS | National Small Vessel Security Summit |
| OAM | Office of Air and Marine |
| OARS | Outlying Area Reporting System |

| | |
|---|---|
| POE | port of entry |
| QHSR | Quadrennial Homeland Security Review |
| RCMP | Royal Canadian Mounted Police |
| RFID | radio frequency identification |
| SARSAT | synthetic aperture radar satellite |
| SOLAS | safety of life at sea |
| SOTDMA | self organizing time division multiple access |
| SVRS | Small Vessel Reporting System |
| SVSS | Small Vessel Security Strategy |
| TSA | Transportation Security Agency |
| US | United States |
| USCG | United States Coast Guard |
| VHF | very high frequency |
| VTS | vessel traffic service |
| WBIED | water born improvised explosive device |
| WMD | weapons of mass destruction |

# EXECUTIVE SUMMARY

Our coastal waters are the United States' most open and vulnerable borders. This vast maritime domain harbors critical threats from terrorism, criminal activities, and natural disasters. The maritime border security mission is complex and challenging; the maritime domain is an expansive pathway to the world without fences that connects to more than 95,000 miles of U.S. shoreline.[1] This presents unique challenges and enforcing the law is difficult, especially when nefarious individuals intend to ignore it. Illegal drugs, money, weapons, and migrants flow both directions across our maritime borders as vessels can quickly complete these transits without detection. A recent Government Accountability Office (GAO) report indicates, "Law enforcement agencies face the challenge of distinguishing between legitimate small vessel operators and the relatively few individuals estimated to be engaged in illicit activities."[2] This thesis looks at the extent Automatic Identification System (AIS) technology could improve border security and reduce the small vessel threat.

An overview of Class A, Class B, and Class E AIS technology provides a baseline of current capabilities and use. The development of less expensive Class B AIS transceivers has increased the use of AIS beyond the Class A carriage requirements established by the International Maritime Organization. Recently deployed commercial satellite systems now provide almost worldwide coverage for tracking vessel AIS signals. Many countries have expanded AIS carriage requirements to improve maritime safety and security and small self-contained AIS identifiers now provide worldwide tracking of vessels of any size.

[1] *Written Testimony of CBP Office of Air and Marine Assistant Commissioner Randolph Alles for a House Committee on Homeland Security, Subcommittee on Border and Maritime Security Hearing Titled What Does a Secure Maritime Border Look Like?* 113th Cong. (2013) (testimony of Randolf Alles, U.S. Customs and Border Patrol Office of Air and Marine Assistant Commissioner), accessed October 7, 2014 http://www.dhs.gov/news/2013/11/19/written-testimony-cbp-house-homeland-security-subcommittee-border-and-maritime

[2] Stephen Caldwell, *Maritime Security DHS Could Benefit from Tracking Progress in Implementing the Small Vessel Security Strategy* (GAO 14-32) (Washington, DC: Government Accountability Office, 2013), 1.

In this thesis, three policy options for AIS equipment carriage requirements are developed and analyzed: status quo, Class A/B requirement policy option, and Class E requirement policy option. Maritime border security effectiveness and cost benefit impacts of each policy option is developed. Policy options are compared and analyzed and implementation issues and concerns are reviewed. As a cellular phone based system, Class E AIS was not considered an effective option for improving maritime security in the border region and excluded from further consideration.

Conclusions are that Department of Homeland Security (DHS) should implement a regulation for all vessels, regardless of size, to install and broadcast Class A or Class B AIS when conducting international voyages. The proposed regulation would expand the existing Small Vessel Reporting System (SVRS) to a mandatory program in which mariners are required to pre-register and file float plans prior to conducting an international voyage. Analysis indicates implementation costs for both the government and public are low and the program has the potential to make maritime border security operations more efficient and effective. If the government attempted to detect, identify, interdict, and board each vessel crossing our maritime border as is done now with aircraft and vessels, it would expend between $5,000 and $10,000 per maritime boarding event. AIS allows law enforcement agencies to monitor the border without having to detect, identify, and interdict on the water. Agencies can decide the need, time, and location of conducting a boarding to ensure compliance with federal law providing a more streamlined border crossing for the mariner. A comparison to private aviation requirements for border crossings supports the implementation of an AIS requirement.

To facilitate the drafting of appropriate AIS rules and regulations as well as an effective implementation strategy, DHS should engage the various stakeholders via a second National Small Vessel Security Summit. This summit should review the changes in technology and threat and advise DHS on a specific AIS policy design that balances competing issues and concerns yet fulfills maritime security needs. As an incentive to participate with the program the federal government should consider offering a financial rebate to those that purchase an AIS and register with the Small Vessel Reporting System. This proposed action provides direct support to three of the five basic homeland

security missions: prevent terrorism and enhance security, secure and manage our borders, and enforce and administer our immigration laws.

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# I. INTRODUCTION

Our country's ports and waterways are physically, economically, and culturally significant to our way of life. We use our maritime venues for recreation and transportation of people and products to our economic benefit and expect this to be a safe and secure environment. Our coastal waters are also the United States' most open and vulnerable borders. This vast maritime domain generates critical threats from terrorism, criminal activities, and natural disasters.[1] The United States (U.S.) maritime borders pose significant security challenges (e.g., nefarious entities have used small boats to conduct illegal activities for years and they continue today). Illegal drugs, money, weapons, and migrants flow both directions across our maritime borders as vessels can quickly complete these transits without detection. To what extent could Automatic Identification System (AIS) technology improve border security against the small vessel threat?

## A. SMALL VESSEL THREAT

The Department of Homeland Security (DHS) published the *Small Vessel Security Strategy* (SVSS) in 2008 to harmonize related strategies into a multi-layered, unified approach to improve security across all levels of government that work within the maritime domain.[2] Three years later, DHS published the *Small Vessel Security Strategy Implementation Plan* to provide a roadmap for realizing the goals and objectives of the DHS *National Small Vessel Security Strategy*.[3] DHS *Small Vessel Security Strategy Implementation Plan* Goal 2 is "to enhance maritime security and safety based on a coherent plan with a layered, state-of-the-art approach."[4] Goal 3 of this strategy is to

[1] U.S. Department of Homeland Security, *Small Vessel Security Implementation Plan Report to the Public* (Washington, DC: U.S. Department of Homeland Security, 2011), 1.

[2] U.S. Department of Homeland Security, *DHS Small Vessel Security Strategy* (Washington, DC: Department of Homeland Security, 2008), 16.

[3] U.S. Department of Homeland Security, *Small Vessel Security Implementation Plan*, 1.

[4] Ibid., 6.

"leverage technology to enhance the ability to detect, determine intent, and, when necessary interdict suspicious small vessels."[5]

### 1. SVSS

DHS crafted the *Small Vessel Security Strategy* (SVSS) to "reduce potential security and safety risks from small vessels through the adoption and implementation of a coherent system of regimes, awareness, and security operations that strike the proper balance between fundamental freedoms, adequate security, and continued economic stability."[6] The four scenarios that cause the greatest concern for the use of small vessels in terrorist-related attacks are identified in the SVSS as:

a) Domestic use of waterborne improvised explosive devices (WBIEDs);

b) Conveyance for smuggling weapons (including WMDs) into the United States;

c) Conveyance for smuggling terrorists into the United States; and

d) Waterborne platform for conducting a stand-off attack (e.g., Man-Portable Air-Defense System (MANPADS) attacks).[7]

Two of these four high consequence scenarios involve vessels smuggling people and/or weapons into the U. S. across the maritime border.

### 2. DHS Small Vessel Security Implementation Plan

To move closer to the goal of small vessel security, the *DHS Small Vessel Security Implementation Plan* was forged in 2011 to improve overall management of maritime risks. The plan "builds upon a strong, successful partnership and dialogue among federal and local authorities, small vessel stakeholders, the private sector, and the general public."[8] The plan identifies potential and existing methods for managing and controlling maritime risks associated with the use of small vessels for terrorism. The *Implementation Plan* has four stated goals:

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[5] Ibid., 8.

[6] U.S. Department of Homeland Security, *DHS Small Vessel Security Strategy*, 1.

[7] Ibid., 11.

[8] U.S. Department of Homeland Security, *Small Vessel Security Implementation Plan*, 1.

1 Develop and leverage a strong partnership with the small vessel community and public and private sectors in order to enhance maritime domain awareness;

2 Strengthen maritime security and safety based on a coherent plan with a layered, innovative approach;

3 Exploit technology to enhance our ability to detect, determine the intent of, and, where necessary, interdict small vessels; and,

4 Enhance coordination, cooperation, and communications between Federal, state, local, tribal, and territorial agencies, the private sector, and non-governmental organizations as well as international partners.[9]

The *Implementation Plan* is not a resourcing document and all government activities are required to follow the standard federal appropriations process and regulatory review procedures for funding support and execution. The plan "lays out ongoing and contemplated activities to meet the objectives of the *Strategy* and promotes active linkages of DHS components, state, tribal, local, and other national authorities."[10] Although the U.S. has a strong vision for small vessel security, there is very weak budget support to implement the various plans and intended actions. Funding requests have been made by DHS, but there have been no funds authorized to specifically support small vessel security issues in recent DHS budgets.[11]

The vastness of the maritime domain provides great opportunities for exploitation by terrorists. The use of smaller commercial and recreational vessels closer to shore and areas of interest to transport WMD is of significant concern. Terrorists have demonstrated that they have the capability to use explosive-laden suicide boats as weapons as demonstrated by the attack on the USS *Cole*. The Mumbai attacks in India were carried out using a hijacked fishing vessel. In a world where small watercraft can be turned into weapons against navy destroyers and pirates can hold ships for ransom, surveillance of the sea is of increasing importance.[12]

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[9] Ibid., 2.

[10] Ibid., 12.

[11] William Painter, and Jennifer Lake, *Homeland Security Department: FY2012 Appropriations*, (R41982), (Washington DC: Congressional Research Service, 2011).

[12] "Maritime Security—Maritime Situational Awareness (MSA)," NATO Science and Technology Organization, accessed July 11, 2014, http://www.cmre.nato.int/research/maritime-situational-awareness

In addition to potential terrorist use of small vessels, our nation must strengthen the means to detect and deter illegal or harmful activity designed to take advantage of inherent vulnerabilities within the maritime domain. To protect, prevent, mitigate, and enhance recovery from all threats, including human and drug smuggling, the United States must achieve a more comprehensive and effective understanding of the maritime domain. Table 1 of the *National Maritime Domain Awareness Plan*, published in December 2013, lists the top challenge to U.S. maritime domain awareness as the collection of non-emitting and uncooperative vessels.[13] These small dark non-emitting and uncooperative vessels intentionally conduct undetected maritime operations while they transport people, weapons, money, and drugs in support of criminal or terrorist activities. Requiring all vessels that conduct international voyages to or from the United States to carry and broadcast AIS would improve the visibility of legitimate small vessel traffic.

## B. LITERATURE REVIEW OF SMALL VESSEL DETECTION

Key to improving small vessel security is increasing the ability to detect small vessels and determine intent of these small dark contacts. In his 2007 Naval Postgraduate School (NPS) thesis, John Crofts proposes to use radio frequency identification (RFID) tags to monitor small vessels. Crofts finds, "an RFID-based monitoring system could work effectively as one layer in a multi-faceted small vessel monitoring program."[14] Although this technology could support small vessel security in accordance with Goal 3 of the *Small Vessel Security Implementation Plan*, mentioned above, there has been no action toward the use of RFID to track and monitor small boats. The limited range of detection and privacy concerns are the most likely drawbacks to employing RFID in the maritime arena. As Crofts concludes that RFIDs would only be one layer of a complete system; an effective small vessel monitoring system must alert to vessels that are not carrying RFID tags.

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[13] *National Maritime Domain Awareness Plan for the National Strategy for Maritime Security*, 2013, White House, accessed July 17, 2014, http://www.whitehouse.gov/sites/default/files/docs /national_maritime_domain_awareness_plan.pdf, C-1.

[14] John A. Crofts, "Radio Frequency Identification Potential to Monitor Small Vessels" (master's thesis, Naval Postgraduate School, 2007), 52.

In his 2010 NPS thesis, Jeffrey Westling proposes a Great Lakes Maritime Operations Center with the installation of radar surveillance equipment coupled with Automatic Identification System (AIS) transceivers to monitor and track vessel movements in the Great Lakes region.[15] This system would improve maritime domain awareness (MDA) and security by automatically notifying Command Center watchstanders when a vessel violates border crossing regulations or security zones.[16] In his thesis, Westling calls for increasing infrastructure and coordination to improve the common operating picture, but he does not expand the AIS carriage requirements. Legislation or the establishment of new rules would be necessary to require all vessels to purchase AIS equipment and transmit identification signals. Thus, far there has been no action to put in place such a requirement. Furthermore, a recent 2011 Congressional research report states, "It appears the Coast Guard has no immediate plans to require smaller vessels be outfitted with transponders."[17]

In 2010, Dr. Stephen Harris at the Savannah River National Laboratory led a team that looked into computer-based simulation modeling to determine "the probability of encountering an adversary based on allocated resources including response boats, patrol boats and helicopters over various environmental conditions including day, night, rough seas and various traffic flow rates."[18] The U. S. Coast Guard (USCG) has used probability and detection theory for years to optimize search and rescue, law enforcement and security operations.[19] Harris's paper produced no new concepts or unique resource allocations to improve the probability of detection of a small vessel. In addition, the Coast Guard does not have sufficient helicopters and small boats to use as primary

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[15] Jeffrey C. Westling, "Securing the Northern Maritime Border through Maritime Domain Awareness" (master's thesis, Naval Postgraduate School, 2010), 72.

[16] Ibid.

[17] William Painter, *Issues in Homeland Security Policy for the 112th Congress* (R42025), (Washington DC: Congressional Research Service, 2011), 31.

[18] Dave Dixon et al., *Security Modeling for Maritime Port Defense Resource Allocation* (Aiken, SC: Savannah River National Laboratory, 2010), 3.

[19] U. S. Coast Guard, *The U.S. Coast Guard Addendum to the United States National Search and Rescue Supplement (NSS) to the International Aeronautical and Maritime Search and Rescue Manual (IAMSART)* (Commandant Instruction M16130.2F), (Washington, DC: U. S. Department of Homeland Security, 2013), accessed October 7, 2014 http://www.uscg.mil/hq/cg5/cg534/manuals/COMDTINST%20M16130.2F.pdf, H-81.

detection assets due to the immense size of the maritime domain and high operating expenses. In concert with Goal 3 of the *Implementation Plan*, agencies should seek technology to enhance the ability to detect, to determine the intention of, and to interdict small vessels.[20]

In his NPS thesis from 2009, Brian Hill proposes a nationwide effort to identify areas where a small boat attack could be staged or originated, and then provide a focused and coordinated presence in these areas. The Coast Guard has adopted Hill's Operation Focused Lens as a best practice since the program's goal is to detect an attack before it begins.[21] The effort has Coast Guard personnel visiting high-risk marinas on a frequent basis and training local mariners on America's Waterway Watch program.[22] During the 2010 Winter Olympics in Vancouver British Columbia, the Coast Guard utilized over 400 local Coast Guard Auxiliary and watch group members in and around the Puget Sound region to increase vigilance and communication using the Focused Lens approach. Focused Lens was identified by DHS in 2013 during a Government Accountability Office (GAO) audit on progress in implementing the SVSS as a key initiative that enhances small vessel security.[23] This effort improves internal security but does not reduce the threat from external small vessels that begin voyages outside of the United States.

To counter the threat posed by small vessels exploiting the porous maritime border with Canada, the Integrated Cross-Border Maritime Law Enforcement Operations agreement (ICMLEO-Shiprider) framework was signed in 2009 by former Public Safety Minister Peter Van Loan and Janet Napolitano, U.S. Secretary of Homeland Security.[24] This program uses law enforcement personnel from the Royal Canadian Mounted Police (RCMP) and USCG to conduct joint patrols on small boats in the border region. This

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[20] U.S. Department of Homeland Security, *Small Vessel Security Implementation Plan*, 8.

[21] Brian P. Hill, "Maritime Terrorism and the Small Boat Attack Threat to the United States: A Proposed Response" (master's thesis, Naval Postgraduate School, 2009), 12.

[22] Ibid., 69.

[23] Stephen Caldwell, *Maritime Security DHS Could Benefit from Tracking Progress in Implementing the Small Vessel Security Strategy* (GAO 14-32), (Washington, DC: Government Accountability Office, 2013), 22.

[24] "Canada-U.S. Shiprider," Royal Canadian Mounted Police, last modified June 17, 2013, http://www.rcmp-grc.gc.ca/ibet-eipf/shiprider-eng.htm

effort effectively removes the international maritime border as a weakness to be exploited by criminals as the patrol vessel crewed with both USCG and RCMP can enforce laws on both sides of the border.[25] This program aligns with the *Implementation Plan* requirement of building innovative partnerships and improving cooperation, but it brings no additional resources to the Coast Guard. Existing crews and small boat hours have been redirected to support this worthwhile effort.

## C. STATUS QUO

Operators of small pleasure craft on international voyages arriving in the United States are required to report their entrance immediately to U. S. Customs and Border Protection (CBP) as per Reports of Arrival of Vessels in the 19 CFR 4.2.[26] In addition, the U.S. Customs and Border Protection establishes specific reporting locations for recreational boaters to moor and be inspected. There are several programs in place to facilitate these requirements and streamline the processing of recreational boaters return to the U.S. In July 2011, "CBP developed the Small Vessel Reporting System (SVRS) to better track small boats arriving from foreign locations and deployed this system to eight field locations."[27] Unfortunately this option, as well as all arrival reporting programs, is based on a self-reporting system where mariners phone in their arrivals to CBP to comply with Report of Arrival of Vessels, Vehicles, and Aircraft, 19 USC 1433.[28] Law abiding citizens are likely to comply with these requirements, but criminals and terrorists would simply forgo checking in with CBP and enter the country illegally. Amitai Etzioni highlights this gap in security and the likelihood that many small vessels arriving into the United States go unchecked by failing to comply with the reporting process.[29] His article highlights the lax enforcement of entry by mariners as compared to the tight security

[25] U.S. Department of Homeland Security, *DHS Northern Border Strategy* (Washington, DC: U.S. Department of Homeland Security, 2012), 5.

[26] Reports of Arrival of Vessels, 19 C.F.R. 4.2, 1993.

[27] Caldwell, *Maritime Security DHS Could Benefit*, 11.

[28] U. S. Customs and Border Protection, "Pleasure Boat Reporting Requirements," U. S. Customs and Border Protection, accessed July 22, 2014, http://www.cbp.gov/xp/cgov/travel/pleasure_boats/boats/pleasure_boat_overview.xml

[29] Amitai Etzioni, "The Joke is on Air Travelers," *Huffington Post*, April 7, 2011.

imposed on air travelers. The current system also allows an unlawful mariner to make landfall, moor, offload contraband or personnel, and then contact CBP for inspection after completing illegal activity. A system to detect, determine intent, and interdict small vessels crossing our maritime borders as proscribed by Goal 3 is needed.

President Reagan's famous Russian saying regarding nuclear arms-control was *doveryai, no proveryai*, "trust, but verify." We could use some of his wisdom along our maritime borders today. We are trusting that all mariners aboard small boats entering the country are law-abiding citizens; however, the nation would benefit from a system to verify the movements of these small vessels.

## D. POTENTIAL SOLUTION

As Westling postulates in his thesis, AIS is a critical element to maritime domain awareness and improving the security of our borders.[30] AIS alone is not the solution and sensors to detect vessels not transmitting AIS are needed. This thesis will analyze to what extent maritime border security could be improved through the use of AIS policy changes coupled with recent improvements in technology.

Government agencies would be significantly more effective and efficient in securing our maritime borders if all vessels crossing the maritime border were broadcasting AIS. In concert with Goal 3, requiring all vessels, regardless of size, that conduct international voyages to install and broadcast AIS would leverage existing technology to monitor, detect, and determine intent of small vessels in the maritime arena. This requirement, the mandatory broadcast of AIS, would increase the security of our nation and the effectiveness of law enforcement efforts by directing limited resources to intercept and board small vessels transiting our maritime borders that are not broadcasting AIS.

Following this introduction, an overview of existing AIS systems is provided in Chapter II, and in Chapter III the maritime border security effectiveness and cost benefit impacts of potential AIS requirements are discussed. In Chapter IV, the policy options

[30] Westling, "Securing the Northern Maritime Border," 71.

are compared and analyzed and implementation issues and concerns are considered. Within Chapter IV, the current and future aviation border security laws and procedures to support potential changes in maritime border security requirements are also reviewed. Finally, in Chapter V conclusions and recommendations are proposed.

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# II. AUTOMATIC IDENTIFICATION SYSTEM

## A. AIS OVERVIEW

Automatic Identification System (AIS) is an automatic tracking system used on ships and by vessel traffic services (VTS) for identifying and tracking vessels by electronically exchanging data with other nearby ships and AIS base stations. A ship borne AIS combines a very high frequency (VHF) transceiver with a positioning system, most often a Global Positioning System (GPS) receiver, with other electronic navigation sensors, such as a gyrocompass or rate of turn indicator. An AIS-equipped system on board a ship displays information on other vessels in the vicinity via a variety of information display systems: standalone AIS transceivers, radar, or integrated charting systems. AIS information supplements marine radar, which continues to be the primary method of collision avoidance in the maritime arena.[31]

There are several versions of AIS equipment: Class A, Class B, Class B receive only, and identifiers that are fully self-contained battery powered AIS units with internal GPS and antenna. AIS was originally configured to transmit data via VHF radio frequencies and therefore limited to line-of-sight distances based on the height of VHF radio antennas on a ship's mast. Information provided by AIS equipment includes vessel identification, position, course, speed as well as other parameters like destination, estimated time of arrival, and rate of turn.[32] Vessels fitted with AIS transceivers and transponders can be tracked by AIS base stations located along the coast. Numerous websites provide real-time data on maritime traffic in the area by collecting and displaying the AIS information received. Commercial AIS systems using VHF-FM radio coverage can provide data well offshore depending on the height of the vessel's mast, locations of shore-based antennas, and transmit power[33] as shown in Figure 1 taken from

[31] U.S. Coast Guard Navigation Center, "Automatic Identification System Overview," accessed July 11, 2014, http://www.navcen.uscg.gov/?pageName=AISmain

[32] Evans Starzinger, "Collision Avoidance 2.0," *Boat US Magazine*, October/November, 2013, accessed August 10, 2014, http://www.boatus.com/magazine/2013/October/collision-avoidance.asp

[33] Ibid.

MarineTraffic.com. AIS signals are displayed in Figure 1 by vessel type (color), size, and direction of travel; squares represent vessels drifting or moored. Hovering the mouse over contacts will bring up the vessel name, course, and speed. Clicking on the contact will bring up complete AIS data including track history, pictures, and destination. As demonstrated by Figure 1, in a VHF-FM "line-of-sight" based system, shore based towers generally receive and display AIS information when the vessels are within 80 nautical miles of the mainland.

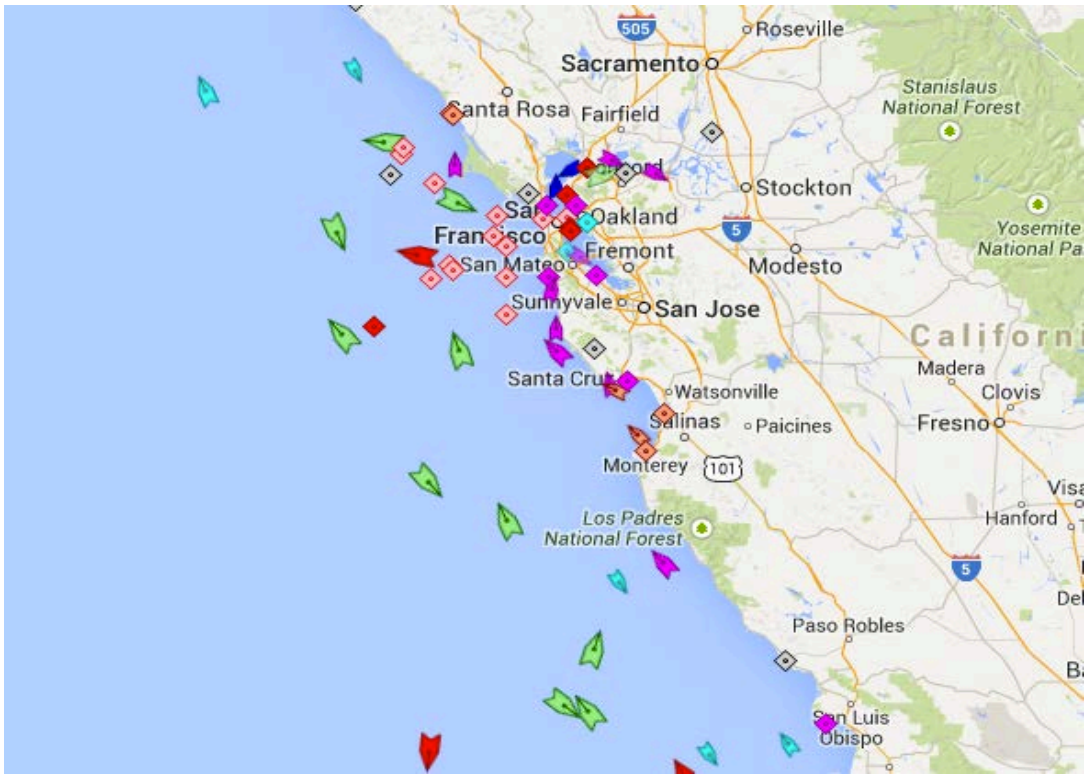


Figure 1. VHF-Based AIS Coverage

Recently, satellites have been fitted with special AIS receivers that are capable of managing a large number of signals.[34] The AIS identifier shown in Figure 2 is the advanced Class B satellite enabled AIS (ABSEA) along with typical satellite AIS coverage. Details on the product and recent technology advances that allow worldwide

[34] London Research and Development Corporation, "Automatic Identification of Ships (AIS)," accessed July 11, 2014, http://www.london-research-and-development.com/AIS.html

AIS coverage can be found at the exactEarth website. Deployment of satellite communications-enabled and linked AIS receivers have enabled vast improvements in maritime coverage providing essentially worldwide vessel tracking capabilities and services as shown in Figure 2.

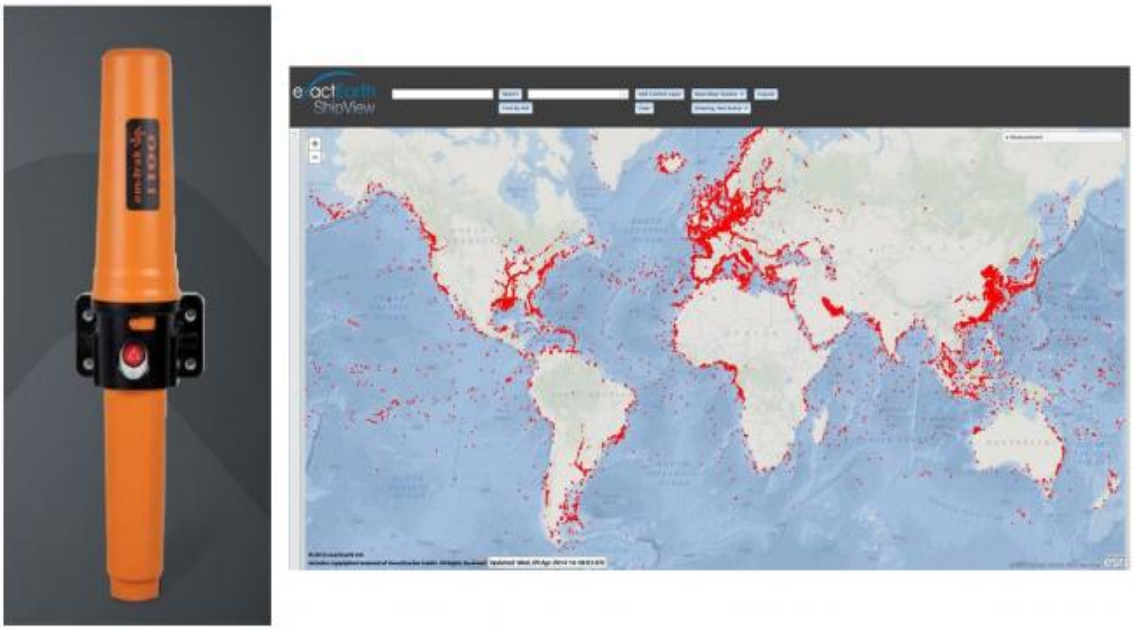

Figure 2. AIS Identifier and Satellite-Based AIS Coverage[35]

## B. CLASS A AIS

Class A AIS equipment standards were established to comply with safety of life at sea (SOLAS) requirements, including integration of bridge equipment and displays; transmit power of 12.5 watts, and use of self-organizing time division multiple access (SOTDMA) VHF-FM transmissions. When a Class A AIS starts up, SOTDMA "pre-determines its data transmission slots by 'listening' to the existing traffic. This establishes which slots are free, helped by stations already 'on-air,' which broadcast their future slot selection as part of their transmitted messages."[36] SOTDMA helps to manage and

[35] exactEarth, "ABSEA," accessed February 17, 2014, http://www.exactearth.com/technology/absea

[36] Andy Norris, "Automatic Identification Systems: The Effects of Class B on the Use of Class A Systems," *The Journal of Navigation* 59, no. 2 (2006): 335–347.

maximize the flow of data over the VHF-FM band by eliminating units from broadcasting simultaneously. In a congested area with limited time slots, the AIS unit will select a timeslot being used by the most distant transmitter. This feature gives preference to the closer targets that are of greater concern and drops out the targets farther away. Class A units refresh their position and movement information every two to 10 seconds while underway, depending on vessel speed and every three minutes while anchored or moored. Static data including vessel name, type, call sign, International Maritime Organization (IMO) number, destination, and estimated time of arrival is reported every six minutes.[37]

## C. CLASS B AIS

The key differences between Class A and B AIS are lower transmitting power, slower refresh rates, and data transmission method. Class B units use 2 or 5 watts as their maximum transmit power and refresh rates between five and 30 seconds depending on vessel speed and transmission method. Some Class B units use SOTDMA, identical to Class A, while others use carrier sense time division multiple access (CSTDMA) transmissions that are designed not to compete with Class A broadcasts. Class B units operating CSTDMA monitor the time slots to sense the presence of a Class A transmission. The unit waits about two microseconds and when it senses an unused time slot it will broadcast its data. The combination of lower power and CSTDMA protocols "ensure that Class B stations do not significantly affect the channel capacity of Class A traffic."[38]

## D. SATELLITE AIS

Since 2008, commercial companies have been launching low-earth orbiting satellites with AIS receivers and offering worldwide vessel tracking services using data received from AIS transponders aboard vessels. These satellites currently use two methods for collecting and retransmitting AIS data. In low-density locations, they use an

[37] U.S. Coast Guard Navigation Center, "Automatic Identification System Types of AIS," accessed July 11, 2014, http://www.navcen.uscg.gov/?pageName=typesAIS

[38] Ibid.

onboard processor and relay AIS data like an Earth-based VHF tower. In areas of higher vessel density, the chance of time slot collisions increase generating a higher probability of data loss. In these areas, satellites use spectrum de-collision processing where all of the AIS signals are collected and then re-transmitted back to Earth where computers are used to process the data and de-collide any messages that were received simultaneously from vessels.[39] Commercial satellite companies have established worldwide networks resulting in satellite-based collection of AIS as the primary means of tracking vessels at sea.[40]

## E. CLASS E AIS

Technology Systems, Inc. has developed a new free smartphone application (app) called Smart Chart AIS. Smart Chart AIS's development has been supported by the DHS Science and Technology Directorate under the Small Business Innovation Research Program, Contract #D12PC00364. The app provides visibility of AIS Class A and B traffic and "introduces a new cellular-based AIS capability, called AIS Class E, which is tailored for smaller, recreational craft."[41] The app includes many additional features that improve mariner safety, including an augmented reality feature allowing boaters to "see" in fog, darkness, and other low-visibility situations, the locations of buoys and channel markers are displayed, and live weather overlays are available. Users can transmit their location immediately in the event of an emergency and use the social networking to chat boat-to-boat with friends, send photos, share waypoints, arrange where to rendezvous, and find friends in a large or crowded harbor.[42] As boaters elect to use this technology to improve their safety and social networking, they "get lots of valuable resources free of charge, in exchange for participating in this new form of AIS."[43] The app is available on phones with either android or apple operating systems. As of October 2014, the android-

[39] Heather Ball, *Satellite AIS for Dummies*, Special edition (Mississauga, Ontario: John Wiley and Sons, 2013), 21.

[40] Edward Lundquist, "Connecting the Dots," *Proceedings*, 140, no. 10 (2014): 22.

[41] "Need Maritime Security? There's an App for That," Maritime Security Outlook, accessed December 28, 2013, http://www.maritimesecurityoutlook.com/ index.php?option=com_content&view=article&id=110:aisapp&catid=2:products&Itemid=5

[42] "Smart Chart AIS," accessed December 27, 2013, http://www.smartchartais.com./ (

[43] "Need Maritime Security? There's an App for That."

based Smart Chart app reported 10,000 to 50,000 users providing more than 300 reviews with an average rating of 3.6 out of 5.[44] A primary difference between Class E and Class A/B is that Class E AIS operates over the cellular phone network and not VHF-FM or satellite. As a smart phone app, the device is mobile and not mounted to a specific vessel but it can be associated with a vessel for identification purposes.

## F. AIS REGULATIONS WITHIN THE UNITED STATES

The International Maritime Organization Safety of Life at Sea (SOLAS) AIS carriage requirements can be found in Regulation 19, Chapter V. As of 2005 the requirements are, "all ships of 300 gross tonnage and upwards engaged on international voyages and cargo ships of 500 gross tonnage and upwards not engaged on international voyages and passenger ships irrespective of size"[45] shall be fitted with AIS.

Current AIS carriage requirements for U.S. vessels are contained in 33 CFR 164.64 and are summarized as applying to:

- Self-propelled vessels of 65 feet or more in length, other than passenger and fishing vessels, in commercial service and on an international voyage;
- Passenger vessels of 150 gross tonnage or more or certificated to carry more than 150 passengers-for-hire;
- Tankers, regardless of tonnage;
- Vessels, other than passenger vessels or tankers, of 300 gross tonnage or more;
- Towing vessels of 26 feet or more in length and more than 600 horsepower in commercial service within a Vessel Traffic System.[46]

The Coast Guard has proposed new AIS regulations to expand the required carriage to additional vessels. The proposed regulations have been published in the Federal Register, are pending implementation, and are summarized as:

- All commercial self-propelled vessels 65 ft in length or greater—no exclusions.

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[44] "Smart Chart AIS Android," accessed December 27, 2013, https://play.google.com/store/apps/details?id=com.tsinc.smartchart&hl=en

[45] "IMO Automatic Identification Systems," accessed February 2, 2014, http://www.imo.org/OurWork/Safety/Navigation/Pages/AIS.aspx

[46] Navigation and Navigable Waters, 33 C.F.R. 164.64.

- Towing vessels of 26 feet or more in length and more than 600 horsepower, in commercial service (expands current requirement to all locations).
- Vessels with 50 or more passengers for hire;
- High-speed passenger vessels with 12 or more passengers for hire;
- Certain dredges and floating plants;
- Vessels moving certain dangerous cargos[47]

These new proposed regulations do not alter the international SOLAS requirements for carriage of Class A AIS, although Class B devices will be authorized to meet the new requirements on some commercial vessels. As Class A devices transmit data more frequently, they are a better option for "commercial vessels that are highly maneuverable, travel at high speed, or routinely transit congested waters or in close-quarter situations with other AIS equipped vessels."[48] The current and proposed U.S. regulations do not require small private vessels to install and transmit AIS although some U.S. mariners could be required to install and transmit AIS when conducting international voyages to other countries. A review of international use of AIS supports the safety and security benefits of this technology.

## G. INTERNATIONAL USE OF AIS

The primary requirement for the use of AIS in the international community is contained in the international convention for SOLAS. AIS carriage requirements from Regulation 19 of SOLAS, Chapter 5, are summarized as: "all ships of 300 gross tonnage and upwards engaged on international voyages and cargo ships of 500 gross tonnage and upwards not engaged on international voyages and passenger ships irrespective of size."[49] This IMO requirement went into effect in December of 2004.

The versatility of new and modern variants of AIS has resulted in additional regulations by various countries to improve maritime domain awareness, safety, and

[47] U. S. Coast Guard, "Notice of Proposed Rulemaking: Vessel Requirements for Notices of Arrival and Departure, and Automatic Identification System," *Federal Register* 73, no. 242 (2008): 76317–76318.

[48] U.S. Coast Guard Navigation Center, "Automatic Identification System Overview."

[49] International Maritime Organization, "IMO SOLAS Regulations for AIS Carriage," accessed July 16, 2014, http://www.imo.org/OurWork/Safety/Navigation/Pages/AIS.aspx

security. As of January 2012, Singapore has extended the requirement that all power driven vessels entering Singapore waters have on board and operating a class A or class B AIS transponder.[50] Previously, the AIS requirement did not apply to private visiting vessels.[51]

The Mexican government has also taken steps to improve identification requirements of vessels in its waters. Mexico has received $4.9M in funding from the U.S. Department of State for the purchase of Class B AIS I-100 identifiers to be installed on all vessels greater than seven meters in length operating in its waters.[52] The I-100 identifiers are transmitting only devices that allow the government of Mexico to "locate and identify (in real time) any small vessels cruising Mexican National waters."[53] As of June 2014, the Mexican government has installed over 7,000 of the planned 19,000 AIS identifiers on commercial, tourist, and fishing vessels.[54] In addition to Mexican flagged vessels, the regulation technically encompasses all vessels greater than seven meters in length visiting Mexico. How soon Mexico begins to enforce this new AIS regulation on visiting U.S. vessels is unknown.

In 2009, after the Mumbai attacks, India announced a new requirement for the installation and use of AIS equipment on all vessels other than fishing vessels that are less than 20 meters in length. This requirement is intended to improve safety and security and during the regulation "roll-out" India explained, "That the uniform registration practice and installation of AIS transponders would go a long way in tracking lost or hijacked vessels like MV Kuber, which was hijacked by the terrorists involved in the

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[50] Victor Han, *Carriage of Transponders—Port Entry Requirement* (Port Marine Circular #10 of 2010), Maritime and Port Authority of Singapore, accessed July 17, 2014, http://www.mpa.gov.sg/sites/circulars_and_notices/pdfs/port_marine_circulars/pc10-10.pdf

[51] Val Ellis, "New—AIS Requirement for Yachts Entering Singapore," Noonsite, accessed January 16, 2014, http://www.noonsite.com/Members/val/R2012-04-02-1

[52] Bruce Striegler, "Vancouver's Xanatos Marine Makes AIS Sale to Mexican Merchant Marine," *Canadian Sailings*, September 16, 2012, accessed July5, 2014, http://www.canadiansailings.ca/?p=4699

[53] Monica Niiranen, *2014 AIS Installation Progress* (Washington, DC: Department of State/International Narcotics and Law Enforcement Bureau, 2014).

[54] Ibid.

Mumbai attacks."[55] An Indian committee is currently studying equipment and requirements that could provide MDA over vessels less than 20 meters but no regulations have been enacted. To support this effort, India contracted Saab, in collaboration with Elcome Marine Services, to install a National Automatic Identification System (NAIS) network. The 74 lighthouses outfitted with the Saab system provides AIS coverage to the entire Indian Coast and is monitored at six regional control and two coastal control centers, besides one national data center. In July 2013, India, Maldives, and Sri Lanka agreed to share AIS information via the Merchant Ship Information System (MSIS) to bring about maritime domain awareness in the region. India has also recently added 200 patrol vessels between five and 12 tons to perform intercepts of suspected dark contacts. A study recommended setting up of an additional 131 coastal police stations along the Indian coastline and upgrading 20 existing police stations in the Andaman and Nicobar islands.[56]

In 2009, the European Union (EU) updated the AIS carriage requirement to include more fishing vessels operating within EU waters. The phased implementation ending 31 May 2014 is now complete with all fishing vessels of 15 meters in length or more required to carry AIS equipment.[57] The United Kingdom completed an analysis of the regulation to include cost impacts and elected to follow the EU requirement.[58]

Other countries have also taken steps toward mandatory identification systems. For example, Turkey is mandating 25,000 commercial vessels to carry Class B AIS and many other nations are enacting sweeping AIS coverage and requirements. In addition, China has built a complete coastal listening network similar to India with the plan of monitoring some 220,000 fishing vessels and integrated VTS-AIS, which includes small

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[55] Vishwa Mohan, "AIS Transponders Now Made Must for all Fishing Vessels," *The Times of India*, sec. India, July 12, 2009.

[56] "India's Coastal Security Profile: The Official View." Security-Risks, accessed January 17, 2014, http://www.security-risks.com/security-trends-south-asia/india-defence/india%E2%80%99s-coastal-security-profile:-the-official-view-510.html

[57] "The EU System for Fisheries Controls," European Commission, last modified October 28, 2014, accessed August 15, 2014 http://ec.europa.eu/fisheries/cfp/control/technologies/index_en.htm

[58] "Automatic Identification System (AIS) for Fishing Vessels," August 12, 2014, accessed August 15, 2014 https://www.gov.uk/government/publications/automatic-identification-system-ais-for-fishing-vessels

commercial vessels is already in place in South Korea.[59] Countries around the world are finding that AIS technology provides a cost effective approach to improving maritime domain awareness, safety, and security.

## H. SUMMARY

To summarize this chapter, the various AIS systems together provide extensive worldwide coverage; however, small private boats are outside U.S. carriage requirements for AIS equipment. The international community is embracing AIS technology for the improved safety and security it offers at a reasonable price and implementing regulations for use by the small vessel community. In the proposed rulemaking process for expanding AIS, the Federal Register describes AIS as a major contributor of information needed for maritime domain awareness. In 2008, the Coast Guard stated, "ultimately we believe all vessels should avail themselves of AIS,"[60] and this is the direction being taken by many countries. The reason the requirement has not been expanded to all vessels is the Coast Guard only mandates AIS on vessels as directed by Congress via the Maritime Transportation Safety Act,[61] and this law is the basis for the expanded AIS regulations that are pending implementation. Currently, there are no requirements for small vessels to carry and broadcast AIS in the U.S. and that is the issue. A policy analysis of requirements for all vessels, regardless of size, to install Automatic Identification System (AIS) equipment and transmit vessel specific information via AIS when on international voyages that cross U.S. maritime borders will be conducted in Chapter III.

[59] Ben Ellison, "AIS on Fire Worldwide, & Hello AIS MOB Tech," Panbo, May 3, 2010, accessed March 24, 2014, http://www.panbo.com/archives/2010/05/ais_on_fire_worldwide_hello_ais_mob_tech.html

[60] U. S. Coast Guard, "Notice of Proposed Rulemaking," 76301.

[61] Ibid.

# III. POLICY OPTIONS ANALYSIS

This chapter lays out policy options for improving maritime border security using AIS. The three options investigated are: status quo, Class A or B AIS, and Class E AIS. After an overview of the policy is presented, the maritime security benefits and estimated costs of these policy options are developed to assist in cost benefit analysis.

## A. STATUS QUO

To establish a baseline for the existing process and conditions for conducting international voyages to and from the U.S. the current laws, rules, and regulations are reviewed in this status quo section. The maritime security effectiveness of our current regulations are reviewed and both financial and security impacts are estimated.

### 1. Overview

Operators of all small pleasure craft, regardless of size, on international voyages arriving in the United States are required to report their entrance immediately to U. S. Customs and Border Protection (CBP) as per Reports of Arrival of Vessels (19 CFR 4.2).[62] A voyage is considered international when arriving in the United States from a foreign port or place, including any vessel that has visited a hovering vessel or received merchandise outside the territorial sea. A hovering vessel is defined as a vessel loitering offshore often with the intent to introduce merchandise into the United States illegally. Departing the United States and transiting international or foreign waters without a call at a foreign port is not considered an international voyage. Therefore, "fishing vessels, cruises to nowhere, or any vessel that leaves from a United States port and returns without calling a foreign port or place, has not departed the United States."[63] Pursuant to the Scope of Examination (8 CFR 235.1), an application to lawfully enter the United States must be made in person to a CBP officer at a U.S. port-of-entry.[64] The vessel

[62] Reports of Arrival of Vessels, 19 C.F.R. 4.2, 1993.

[63] U. S. Customs and Border Protection, "Pleasure Boat Reporting Requirements."

[64] Ibid.

master must contact CBP telephonically and be "directed to the nearest Port of Entry to satisfy the face-to-face requirement, or report to the nearest designated reporting location along with the boat's passengers for inspection."[65] Customs and Border Protection establishes specific reporting locations for recreational boaters to report their arrival and be inspected.

CBP continues to work to reduce barriers to fast, efficient, and secure travel to and from the U.S. and implemented several programs, including Alternate Inspection Systems, to facilitate entry requirements and streamline the processing of recreational boaters return to the U.S. All of these arrival-reporting programs are based on a self-reporting system where mariners phone in their arrivals to CBP to comply with Report of Arrival of Vessels, Vehicles, and Aircraft (19 USC 1433).[66] In each of these programs, CBP retains the right to direct mariners to report for a physical inspection. These programs are summarized below:

### *a. NEXUS*

NEXUS is a joint venture between Canada Border Services Agency (CBSA) and U.S. Customs and Border Protection (CBP) that offers facilitated customs and immigration clearance for low-risk recreational boaters entering either country through registration into the program. NEXUS registration is valid for five years and satisfies the boat operator's legal requirement to report to a port-of-entry for face-to-face inspection, but boaters must still phone in their arrival. Approved applicants are issued a photo-identification and proximity radio frequency identification (RFID) card that allows them to cross the border with a minimum of customs and immigration questioning.[67]

### *b. Canadian Border Boat Landing Permit (I-68)*

Another alternative inspection system is the Canadian Border Boat Landing Permit (I-68) that allows recreational boaters to enter the U. S. from Canada. Applicants

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[65] Ibid.

[66] Ibid.

[67] U. S. Customs and Border Protection, "NEXUS Program Description," accessed July 17, 2014, http://www.cbp.gov/travel/trusted-traveler-programs/nexus/nexus-overview

are inspected and issued an I-68 permit valid for the entire boating season. The I-68 permits boaters to report their arrival telephonically without having to appear at a port-of-entry for an in person inspection. The process to obtain an I-68 permit "involves an interview, checking the individual in the Interagency Border Inspection System (IBIS) and possibly other law enforcement databases, completion of the form I-68, and payment of the fee."[68] Each person aboard the vessel older than 14 years of age must obtain his or her own I-68 permit and "the names and dates of birth of children less than 14 years of age must be listed on one or both of their parents' Form I-68."[69] The Form I-68 is valid for one year and will bear the photograph and fingerprint of the applicant for identification purposes.

#### *c. Outlying Area Reporting System*

Outlying Area Reporting System (OARS) is another northern border method for boaters to report entry to satisfy reporting requirements into the United States from Canada. The OARS program uses videophones, located at public marinas, which boaters use to report their arrival. The system is "comprised of an AutoDial telephone, a video transceiver, a monitor, a facial camera and a document camera"[70] that allows both the traveler and the officer to view one another as the inspection is taking place. Typically, "OARS reporting satisfies the in-person inspection requirement, but a CBP Officer may direct a boater to report to a port-of-entry or designated location for an in-person inspection."[71]

#### *d. Small Vessel Reporting System*

The Small Vessel Reporting System (SVRS) is the latest program that facilitates customs and immigration clearance for low risk recreational boaters; it is an outgrowth of the CBP's Local Boater Option. The SVRS was initially piloted in Florida starting in

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[68] U. S. Customs and Border Protection, "Canadian Border Boat Landing (I-68) Program," accessed October 7, 2014, http://www.cbp.gov/travel/pleasure-boats-private-flyers/cbbl

[69] Ibid.

[70] Blue Seas, "U. S. Customs and Border Protection," Blue Seas, accessed October 7, 2014, http://www.offshoreblue.com/cruising/us-customs.php

[71] U. S. Customs and Border Protection, "Pleasure Boat Reporting Requirements."

2010 and fielded to all offices by the end of 2011. Enrollment in SVRS is voluntary, but boaters benefit by the expedited arrival reporting process. The program satisfies the vessel operator's legal requirement to report for a face-to-face interview at a port-of-entry, but boaters must still phone in their arrival.[72] The SVRS is a web-based automated on-line reporting system created to streamline the small boat international arrival process. Mariners complete an application to participate on line that includes the scheduling of an appointment for a face-to-face interview with a CBP officer to complete the registration process.[73] Program participants are required to provide digital fingerprints and a photograph for identification purposes. Upon returning to the U. S., the master must contact CBP immediately upon arrival; provide her or his specific SVRS number, identifying biographical information, and information as directed by the acceptance letter to the SVRS program:

> The master of a pleasure boat arriving from foreign is required to contact CBP via telephone immediately upon arrival (pursuant to 19 CFR 4.2 and 8 CFR 235.1) and make an oral declaration for themselves and all passengers on the boat concerning any goods purchased or acquired while abroad (19 CFR 148.11 and 148.12). The master is also required to report in-person at the nearest port-of-entry (POE) within 24 hours to submit the necessary documentation to verify identity and lawful immigration status (pursuant to 8 USC 1321 and 1323). For more detailed information about the CBP requirements for pleasure boaters, please visit our website at http://www.cbp.gov/xp/cgov/travel/pleasure_boats/boats/svrs.xml.[74]

The requirement to report within 24 hours may be waived by CBP as the letter also states; "CBP will verify that the master and occupants of the vessel are SVRS participants and determine whether the master's telephonic arrival notification satisfies the inspection requirements or whether further inspection is necessary."[75] CBP retains the authority to board and inspect any vessel and its occupants arriving from any foreign port and conducts random inspections of SVRS participants.

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[72] U. S. Customs and Border Protection, "Small Vessel Reporting System (SVRS)," accessed October 6, 2014, http://www.cbp.gov/travel/pleasure-boats-private-flyers/svrs

[73] Ibid.

[74] U. S. Customs and Border Protection, "Sample CBP SVRS Acceptance Letter," accessed October 6, 2014, https://svrs.cbp.dhs.gov/Documents/SampleAcceptanceForm.pdf

[75] Ibid.

A key element of the SVRS program is the online float plan that captures biographical information for all persons intending to travel, vessel registration information, and voyage itinerary information; once a float plan is entered online at the SVRS website and activated, SVRS will issue a float plan number. Upon return to the United States, the mariner will contact CBP via a dedicated telephone line where the CBP officer or an automated attendant will ask the standard questions on a customs declaration form and provide the mariner with their arrival number, or refer the vessel to a predetermined inspection site for a CBP inspection.[76]

### 2. Maritime Border Security Effectiveness

The maritime border security mission is complex and challenging; the maritime domain is an expansive pathway to the world without fences that connects to more than 95,000 miles of U.S. shoreline.[77] This presents unique challenges and enforcing the law is difficult, especially when nefarious individuals intend to ignore it. A recent GAO report states, "Law enforcement agencies face the challenge of distinguishing between legitimate small vessel operators and the relatively few individuals estimated to be engaged in illicit activities."[78] CBP estimates that only a small percentage of the vessels returning to the U. S. report arrival information as required by the law. According to CBP, "this low level of compliance is due, in part, to a lack of (1) public awareness of the reporting requirements, and (2) inspections to emphasize and ensure compliance."[79]

The NEXUS, I-68, and OARS alternate inspection systems operate only along the U.S./Canadian border and provide some efficiency to both the mariner and CBP but add no increased security. The latest program, SVRS, is open to the entire U.S. maritime community and does provide some security benefits. The SVRS captures biographical

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[76] U. S. Customs and Border Protection, *Small Vessel Reporting System (SVRS)*.

[77] *Written Testimony of CBP Office of Air and Marine Assistant Commissioner Randolph Alles for a House Committee on Homeland Security, Subcommittee on Border and Maritime Security Hearing Titled What Does a Secure Maritime Border Look Like?* 113th Cong. (2013) (testimony of Randolf Alles, U.S. Customs and Border Patrol Office of Air and Marine Assistant Commissioner), accessed October 7, 2014 http://www.dhs.gov/news/2013/11/19/written-testimony-cbp-house-homeland-security-subcommittee-border-and-maritime

[78] Caldwell, *Maritime Security DHS Could Benefit*, 1.

[79] Ibid.

and vessel data when mariners sign up for the program and the float plan increases awareness of small vessels approaching the U. S. This information can be reviewed in advance allowing CBP to determine if a face-to-face inspection is desired.[80] Segregating low risk vessels using the SVRS program "facilitates legitimate recreational boater traffic and increases CBP's ability to identify higher risk vessels and dedicate resources to address illicit maritime activities."[81]

The SVRS increases maritime security through the implementation of advanced data submission and increased reporting compliance. In the 2013 GAO report, the following participation statistics are presented: total participants—30,190, registered vessels—11,189, and float plans—5,862.[82] Almost 80 percent of the participants operate in the waters off of Florida, and CBP estimates this is a result of the program beginning there and replacing the CBP Local Boater Option.

The SVRS was implemented after the existing alternate compliance programs along the northern border were enacted and fully implemented. With low participation in the SVRS, the boaters along the northern border with Canada appear reluctant to change from the existing programs. The distances between the U. S. and Canada are extremely short in some areas, allowing for quick international trips. The I-68 permit is good for a year and once that initial inspection is complete, a vessel could enter the U. S. without inspection on subsequent trips. Mariners along the northern border appear reluctant to change to a program that requires a float plan for every trip.

### 3. Cost Benefit Considerations

Determining cost benefit of government policies and actions is a challenging endeavor. For this thesis, risk reduction and financial costs are examined to determine the fiscal impacts of actions and to what extent those efforts reduce the risk to the public and our country.

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[80] Ibid.

[81] *Written Testimony of CBP Office of Air and Marine Assistant Commissioner Randolph Alles.*

[82] Caldwell, *Maritime Security DHS Could Benefit*, 1.

### *a. Risk Reduction*

Traditional cost-benefit analysis has difficulty dealing with security issues, as the metrics are uncertain or extremely difficult to quantify. Past studies in the transportation arena have looked at safety and not security, yet these are fundamentally different issues, as safety is associated with risk while security is associated with uncertainty. Determining "probabilities to intentional acts is particularly problematic because of the possibility of strategic behavior: terrorists adapt their strategy to changes in the security environment in which they operate."[83] Uncertainty makes economic analysis difficult. The tools developed to determine risk costs, on the basis of historical accidents, cannot be applied to events that are uncertain. Additionally, "terrorists adjust their strategies according to the security measures taken, something that does not happen in relation to accidents."[84] When dealing with the uncertainty of security and terrorism, intelligence agencies exist to help avoid strategic surprise, as the foremost goal of any intelligence community "must be to keep track of threats, forces, events, and developments that are capable of endangering the nation's existence."[85] The following from the December 2008 International Transport Forum Conference frames the challenges of cost-benefit analysis within the security environment.

> An extreme view is that the risk management paradigm and economic analysis in general are not suitable for the support of security policy, as it is not feasible to determine reasonable attack probabilities, the modeling of impacts is too sketchy to be useful, and it is not possible to say how effective measures are in reducing threats. Under these conditions, pursuing a quantitative assessment may lead to the adoption of measures that infringe on civil liberties or are otherwise poorly legitimated, while their benefits are questionable.[86]

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[83] "Security, Risk Perception and Cost-Benefit Analysis Summary and Conclusions," discussion paper 2009-6 (International Transport Forum Roundtable, Pars, France, December 2008), http://www.internationaltransportforum.org/jtrc/discussionpapers/DP200906.pdf, 6.

[84] Ibid. 14.

[85] Mark M. Lowenthal, *Intelligence: From Secrets to Policy*, 5th ed. (Los Angeles: Sage/CQ Press, 2012), 2.

[86] "Security, Risk Perception and Cost-Benefit Analysis Summary and Conclusions," 9.

Cost benefit analysis of government actions is also complicated by limited performance measures. CBP and the USCG have faced challenges in developing meaningful performance measures of maritime border security. The GAO has determined that DHS and its component agencies have experienced the following challenges when measuring the performance of maritime border security:

- Collecting complete, accurate, and reliable data.
- Not always having or using performance information to manage their missions.
- Developing and using performance measures that focus on outcomes.[87]

John Mueller and Mark Stewart propose the benefit of a security measure is a function of three elements: Benefit = (probability of a successful attack) × (losses sustained in the successful attack) × (reduction in risk).[88] The element within this calculation that will be considered in this analysis is the extent to which each option provides a reduction in risk. This aligns with the current DHS strategic priority and approach to expand risk-based security by shrinking the haystack. DHS understands that one size does not fit all when dealing with security and is looking to "expand efforts to identify low-risk travelers and cargo to focus security resources on those we know less about or those identified as higher risk."[89] These types of actions are being done now like TSA's Pre-Check™ program where low risk travelers volunteer for background checks to take advantage of faster processing. The experts at the transportation security round table agreed, "risk-profiling in aviation screening, in order to concentrate resources where they are most needed whilst maintaining random checks on pre-screened passengers, is probably the key measure for achieving better levels of security from the resources spent."[90] Estimating the relative risk reduction of the various policy options provides a reasonable measure of beneficial effectiveness for comparative purposes.

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[87] Stephen Caldwell, *Maritime Security Progress and Challenges in Key DHS Programs to Secure the Maritime Borders* (GAO 14-196-T), (U. S. Government Accountability Office, 2013), 13–15.

[88] John Mueller, and Mark Stewart, *Terror, Security, and Money: Balancing the Risks, Benefits, and Costs of Homeland Security* (New York: Oxford University Press, 2011), 23–25.

[89] U.S. Department of Homeland Security, *The 2014 Quadrennial Homeland Security Review* (Washington, DC: U.S. Department of Homeland Security, 2014), 35.

[90] "Security, Risk Perception and Cost-Benefit Analysis Summary and Conclusions," 14.

### *b. Cost Impacts*

Determining specific costs for individual events and incremental efforts of the federal government can be a challenge. Federal agencies capture funding requests and expenditures in a variety of methods. There are both fixed costs, like equipment, personnel, and infrastructure, and incremental costs such as operating expenses like fuel and maintenance. In the DHS *Budget in Brief for Fiscal Year 2014*, CBP lists broad categories like "Border Security and Control Between the Ports of Entry"[91] with corresponding funding levels; individual programs like the SVRS are not identified. Numerous statistics are available on hours expended by both CBP and the USCG. An Internet search produces the following CBP data for the current year: "Office of Air and Marine (OAM) achieved 81,045 flight hours in aircraft and 125,131 underway hours in marine vessels."[92] The challenge in developing a cost benefit analysis comes from not being able to parse out to what extent the various funding, resource hours, and effort expended by various agencies support specific government programs or actions. When completing the report on the 10-year anniversary of the Maritime Transportation Safety Act, the GAO stated, "activities related to small vessel security activities are not specifically identified in the Coast Guard budget."[93] Funding for small vessel security activities are captured under the broad category of the Coast Guard's ports, waterways, and coastal security mission.

To counter the challenges of conducting a cost benefit analysis where both the costs and benefits are not well defined, this thesis looks at cost differentials when comparing alternatives. Differential costs between proposed alternate actions and the status quo can be calculated using known cost rates of specific resources. The USCG publishes standard hourly rates, both inside government and outside government costs, for personnel, cutters, aircraft, and small boats. A sample of these hourly standard rates is

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[91] U. S. Department of Homeland Security, *DHS Budget in Brief, Fiscal Year 2014* (Washington, DC: U. S. Department of Homeland Security, 2013), 114.

[92] U. S. Customs and Border Protection, "Fact Sheet—Office of Air and Marine," May 1, 2013, http://www.cbp.gov/sites/default/files/documents/air_marine_6.pdf

[93] Caldwell, *Maritime Security Progress and Challenges*, 36.

provided in Table 1 from the Coast Guard *Commandant Instruction 7310.1O* published on 18 November 2013.[94]

Table 1. Hourly Standard Rates for Coast Guard Services[95]

| Resource Type | Inside Government | Outside Government |
|---|---|---|
| **Cutters:** | **Hourly Rate** | **Hourly Rate** |
| 210 ft Cutter | $5,460 | $8,283 |
| 87 ft Patrol Boat | $3,098 | $4,178 |
| **Aircraft:** | | |
| HC-130 Fixed Wing | $15,467 | $20,830 |
| H-65 Helo | $8,448 | $11,937 |
| **Small Boats:** | | |
| 45 ft RBM | $6,514 | $8,859 |
| 25 ft RBS | $1,108 | $1,571 |
| **Personnel:** | | |
| Enlisted E-6 | $56 | $76 |
| Civilian GS-12 | $66 | $71 |

CBP does not perform reimbursable services like the USCG and therefore has not developed reimbursable rates for activities performed. The 2014 *DHS Budget in Brief* documents 23,087 CBP personnel assigned to work border security and control between the ports of entry at a total cost of $3,319,657,000.[96] Using a 40-hour workweek, this equates to an average hourly personnel cost of $78 per hour. CBP uses the General Schedule (GS) wage scale for field personnel; most agents start as a GS-5 and work up to GS-12. CBP's necessity to work overtime, night shifts, and weekends increases salaries and personnel costs: night differential pay is 15 to 20 percent more, holidays are 50 percent above normal pay, and overtime pay is twice the normal hourly wage.[97] The

[94] U. S. Coast Guard, *Coast Guard Reimbursable Standard Rate*s (Commandant Instruction 7310.1O), (Washington, DC: U.S. Department of Homeland Security, 2013), accessed October 5, 2014, http://www.uscg.mil/directives/ci/7000-7999/CI_7310_1N.pdf, Encl 1.

[95] Ibid.

[96] U. S. Department of Homeland Security, *DHS Budget in Brief, Fiscal Year 2014*, 114.

[97] "Customs and Border Protection Officer Careers," BorderPatrolEdu, accessed October 6, 2014, http://www.borderpatroledu.org/us-customs/cbp-officer/

*Coast Guard Commandant Instruction 7310.1O* lists reimbursable rates for GS-5 to GS-13 between $35 and $85 per hour. Considering the additional night differential and overtime costs of CBP personnel the average salary cost of $78 per hour is in alignment with published standard USCG personnel costs. Based on available data, CBP costs for personnel, vessel, and aircraft should be commensurate with those listed in the USCG reimbursable rate instruction.

## B. AIS CLASS A/B REQUIREMENT POLICY OPTION

The status quo option provides the baseline for the current situation and process for small vessels returning to the U. S. This section looks at the potential policy option of requiring Class A or B AIS for improving maritime security of our borders.

### 1. Overview

This AIS Class A/B requirement policy option would require all vessels, regardless of size, that conduct international voyages to install and broadcast either Class A or Class B AIS. The policy would compel mariners to participate in the SVRS with the added requirement to install AIS. Class A or Class B AIS equipment and AIS identifiers would fulfill the obligation but AIS receive-only units, that is, vessels that do not transmit their own location would not meet the carriage requirement. AIS identifiers are fully integrated, battery powered, standalone AIS transceivers designed for reliable low cost vessel tracking. The identifier is fully inter-operable with all AIS systems and transmits complete AIS Class B messages; both GPS and VHF antennas are integrated within a toughened waterproof security shell.[98] The units can be mounted to small vessels and provide worldwide tracking via the AIS capable satellite constellation as being implemented in Mexico. The primary disadvantage of identifiers is they do not display information about other AIS equipped vessels in the vicinity to the mariner. To provide other vessel tracking on board a ship, AIS A or B with an integrated display is necessary.

[98] SRT Marine, "AIS Identifier Class B Transceiver—Product Data Sheet," accessed February 17, 2014, http://www.srt-marine.com/products/oem/identifier-2/

### 2. Maritime Border Security Effectiveness

Government agencies would be significantly more effective and efficient in securing our maritime borders if all vessels crossing the maritime border were broadcasting AIS. Under this proposal, in addition to installing the AIS equipment, the SVRS registration and float plan would include the vessels Maritime Mobile Service Identity (MMSI) number. An MMSI number is a unique identifier assigned to a boat. Only one number is assigned for all applicable electronics on the vessel, such as an AIS transceiver, digital selective calling (DSC) radio, and emergency position indicating radio beacon (EPIRB). MMSIs are "regulated and managed internationally by the International Telecommunications Union in Geneva, Switzerland, just as radio call signs are regulated."[99] In the U.S., a third party is required to program the boat's data and MMSI number into the AIS transceiver; generally, this is the manufacturer. MMSI registration includes contact information to be used in case of an emergency.

This policy option significantly improves maritime security over status quo as it tracks vessels crossing the border. The SVRS registration and float plan coupled with AIS delivers enough information for border security agencies to determine if, when, and where to conduct a boarding of the vessel. The addition of AIS to vessels conducting an international voyage shrinks the haystack by illuminating the compliant vessels and allowing law enforcement to target the dark contacts that are not transmitting AIS signals. To improve the detection of small dark contacts, governments and private industry continue to work on increasing maritime domain awareness using surveillance and high-frequency (HF) radar, active and passive sonar, and satellite-based EO (electro-optical) and SAR (synthetic aperture radar) imagery.[100] The North Atlantic Treaty Organization's (NATO's) Science and Technology Center is conducting a performance evaluation of various sensors to improve detection of maritime traffic anomalies and suspicious activities.[101]

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[99] U. S. Coast Guard, "Navigation Center—Maritime Mobile Service Identity," U. S. Department of Homeland Security, accessed October 6, 2014, http://www.navcen.uscg.gov/?pageName=mtMmsi

[100] "Maritime Security—Maritime Situational Awareness (MSA)."

[101] Ibid.

The other alternate inspection programs along the northern border with Canada would also be significantly strengthened by the AIS requirement. Ideally, a float plan provides advance notice of movement but that may not be as critical when dealing with frequent and known travelers. Visibility of mariner identification and location via AIS provides maritime domain awareness and improves security. This option facilitates legitimate recreational boater traffic and allows law enforcement to more effectively use their limited resources to intercept and board small vessels transiting our maritime borders that are not broadcasting AIS.

### 3. Cost Benefit Considerations

As discussed above, determining the value of increased security actions and measures is never easy. Individuals make personal security decisions and choices daily: locking doors, putting up fences, purchasing home security systems, or turning on lights. Each person is conducting an analysis within a cost benefit framework when he or she makes these decisions about the purchase of a dog or home security monitoring system. As with personal decisions, not everyone will agree on the best or optimal approach regarding government actions to improve security. Requiring AIS on vessels making international voyages does produce risk reduction by reducing the size of the haystack, and therefore a benefit to security as presented by Mueller and Stewart.[102] The cost to the mariner for this policy would be between $500 to $1000 for a Class B AIS transceiver and $1,500 to $3,000 for a Class A AIS transceiver. For this expense, the mariner is likely to receive a more efficient border crossing experience that could be accomplished without a face-to-face interview as is accomplished now via the alternate inspection programs. The U.S. government could automate the float plan database to monitor AIS data feed and alert CBP well in advance of the vessel's arrival when completing an international voyage and eliminate the requirement for a phone call by the mariner.

The risk reduction benefits of this policy option to the government from shrinking the haystack come from having knowledge of the vessel's identification, position, course, and speed as well as persons aboard once the associated float plan is accessed. Less time

[102] Mueller, and Stewart, *Terror, Security, and Money*, 23–25.

and effort would need to be expended detecting and identifying the vessel as it conducts the border crossing. The pre-departure float plan would provide government agencies time to assess any threat from the personnel aboard the small boat as is done now for commercial vessels. The Coast Guard currently "screens ships, crews, and passengers for all vessels required to submit a 96-hour Advance Notice of Arrival (ANOA) prior to entering a U.S. port."[103] The Maritime Intelligence Fusion Centers also screen commercial vessels for suspicious indicators based on "ownership, ownership associations, cargo, and previous activity."[104] The pre-screening of the vessel and personnel filed via the float plan could be done at the USCG Maritime Intelligence Fusion Center or CBP's Air and Marine Operations Center (AMOC). DHS Science and Technology (S&T) Directorate is prototyping a Coastal Surveillance System (CSS) to improve maritime domain awareness and the detection of small dark maritime contacts. The CSS prototype has been established at the CBP AMOC in Riverside, California (CA). Additionally, the CSS is intended to provide an affordable command, control, communication, computer, intelligence, surveillance, and reconnaissance (C4ISR) solution to decision makers to improve coordination, response, and joint tactical operations.[105] The program optimizes the use of limited resources available to interdict targets by improving abilities to detect, classify, track, and interdict small vessels. The primary purpose of CSS is to collect and share inputs from disparate sensors to improve the detection of targets and support a coordinated response.[106] AIS signals from all vessels transiting our maritime borders would be an integral part of this new CSS and

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[103] *Written Testimony of U.S. Coast Guard Deputy for Operations Policy & Capabilities Rear Admiral William Lee for a House Committee on Homeland Security, Subcommittee on Border and Maritime Security Hearing Titled "What Does a Secure Border Look Like?"* 113th Cong. (2013) (testimony of .S. Coast Guard Deputy for Operations Policy & Capabilities Rear Admiral William Lee), accessed August 10, 2014 http://www.dhs.gov/news/2013/02/26/written-testimony-us-coast-guard-house-committee-homeland-security-subcommittee

[104] Ibid.

[105] Edward Lundquist, "Networking Sensors: Coastal Surveillance System Sheds Light on 'Dark Targets' for More Comprehensive Maritime Domain Awareness," *Sea Power* 56, no. 10 (2013): 32.

[106] Thomas Tomaiko, "Overview of the Coastal Surveillance System" (PowerPoint presentation at U.S. Department of Homeland Security, Science and Technology Directorate, Maritime West Security Conference, Long Beach, CA, August 2013).

increase the efficiency and effectiveness of, and reduce costs associated with, enforcing security of our maritime borders.

As marine air and surface assets patrol the border, less time is required to detect, identify, intercept, and board vessels crossing the border. Law enforcement agencies do not have to board the vessel to determine the purpose of the voyage and who's aboard, as this information is now available in the float plan filed by the mariner. The potential government savings of this policy option using the inside government hourly rates are estimated in the Table 2. Costs vary depending on the type of asset used to complete the event. In addition, government savings come from not having to complete the events listed in Table 2.

Table 2. Estimated Government Costs for Specific Actions

| Event | Time | Cost Range Est |
|---|---|---|
| Detection/Identification via Aircraft | 15 min | $2,000 to $4,000 |
| Intercept/Board via Cutter or Small Boat | 60 min | $3,000 to $5,500 |
| Boarding (2 person team) | 30 min | $60 |
| Total: | | $5,060 to $9,560 |

## C. AIS CLASS E REQUIREMENT POLICY OPTION

This policy option would allow Class E AIS to meet the AIS carriage requirement when conducting international voyages. Class E AIS is a recently launched cellphone application supported by DHS Science and Technology Directorate that provides many features that improve mariner safety. Chuck Benton, the owner and chief technical officer of Technology Systems Inc., creator of Smart Chart AIS, recently stated, "Smart Chart AIS could potentially lead to smoother international border crossings and possibly even reduce the risks of a routine Coast Guard stop, if people are willing to share their tracks."[107]

[107] David Schmidt, "Smart Chart AIS: Vessel Tracking for Generation E," *Yatching*, June 19, 2014, accessed November 20, 2014, http://www.yachtingmagazine.com/smart-chart-ais-vessel-tracking-generation-e

### 1. Overview

Class E AIS operates over the cellular phone network and not VHF-FM or satellite and provides visibility of Class A and B AIS data via Internet data and not directly from other vessels in the vicinity.[108] As a smart phone app, the device is mobile and not mounted to a specific vessel but it can be associated with a vessel for identification purposes. The Smart Chart application and service does not use MMSI numbers for identification and tracking.

### 2. Maritime Border Security Effectiveness

The Class E AIS option provides a slight increase in maritime domain awareness and border security over status quo; however, not having the cell phone physically attached or associated with a specific vessel like AIS equipment is a significant drawback. Phones could be moved between vessels and provide misinformation if mariners intend to circumvent the requirements. A formal registration process as done by the assignment of an MMSI number to each AIS device is important to maintain fidelity of the information in the database. Law enforcement agencies would only see vessels that were operating in areas with cell phone coverage. Cellphone towers near the coastline provide limited offshore coverage, but even so, it is not considered reliable for tracking vessels as they transit the border. Although the Coast Guard would respond to phone calls for help from mariners, it is not the preferred equipment as "cell phones may have gaps in coverage, especially in coastal waters, leading to dropped calls and bad reception."[109] Although both cell phones and VHF-FM radios use line-of-sight technology, DSC (VHF-FM) equipped radios are the preferred system for maritime communications since VHF signals are much stronger than the signals of most cell phones and VHF radios transmit the AIS signals and data. With waterproof GPS integrated DSC radios available below $200, they cost less than a smartphone and can be registered with a MMSI number for rapid identification and location of the caller. At the touch of a button, a DSC-equipped VFH radio would send an automated distress call using the mariners' unique MMSI

[108] "Need Maritime Security? There's an App for That."

[109] John D. Miller, "On the Water and in Distress?" Sailing World, January 2013, accessed October 6, 2014, http://www.sailingworld.com/water-and-distress

number. According to Miller, "Given the comparable price but the incomparable advantages of VHF-FM, it seems that on the water, VHF is the smarter technology."[110] This option provides limited security benefits as it shrinks less of the haystack and encourages mariners to shift to cell phones away from VHF-FM based radios and AIS producing undesirable and negative safety impacts.

### 3. Cost Benefit Considerations

The smart phone application (app) is free but requires the purchase of a phone and service contract. Over time, these costs would exceed $1,000, therefore, purchasing a Class B AIS transceiver would make better financial sense. With the limited cell phone coverage of the border region as compared to the coverage of VHF-FM and satellite based AIS equipment, the government would receive limited and inconsistent benefits from a Class E AIS policy option. Vessels using a cell phone based AIS are not displayed on Class A or B AIS equipment and therefore do not appear to be in compliance with the requirement. Law enforcement agencies would have to take the same actions with associated costs to detect, identify, intercept, and board these vessels as if they were not participating and any potential savings are lost. The mariner would also be frustrated that his voyage is interrupted while complying with the government regulation.

For the reasons stated above, Class E AIS is not considered an effective option for improving maritime security in the border region. It provides very limited additional security over status quo, does not communicate directly with AIS equipment so other mariners and law enforcement agencies cannot see the vessel using Class E AIS, has coverage limited to areas with cell phone signals, and encourages unsafe practices by relying on cell phones over VHF-FM radios. This smartphone app is an excellent tool for mariners who remain within U.S. internal waters with adequate cell phone coverage, but it is not effective for international voyages. The AIS Class E policy option is being excluded from further consideration and will not be included in the next chapter on analysis and comparison.

[110] Ibid.

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# IV. ANALYSIS AND COMPARISON

With the elimination of AIS Class E as a viable policy option, this chapter will focus on the benefits and impacts of requiring Class A or Class B AIS on all vessels conducting international voyages as compared to the status quo. Requiring AIS on all vessels, regardless of size, that cross our maritime borders improves security and safety. This action is in alignment with DHS's strategic priorities to shrink the haystack and expand risk based security operations as outlined in the 2014 *Quadrennial Homeland Security Review*.[111]

## A. SECURITY BENEFITS AND COST IMPACTS

The SVRS that requires vessel and personnel registration and a float plan coupled with AIS linked to the vessel via an MMSI number provides a system that improves security and facilitates legitimate traffic across the border. The float plan specifies advance notice of movement/arrival, and AIS provides mariner identification and tracking to yield increased security and maritime domain awareness. Vessels and aircraft patrolling the border routinely receive AIS information over VHF-FM radio signals prior to either radar or visual contact. This allows law enforcement agencies to more effectively use assets patrolling the border to intercept and board small vessels transiting our maritime borders that are not broadcasting AIS. With this option, expensive resource hours are not expended to detect, interdict, and identify vessels broadcasting AIS. An AIS requirement will significantly improve compliance by mariners returning to the U.S., as the system can be configured to automatically report arrival information as required by law. As vessels are intercepted crossing the border without AIS, education and enforcement action will increase public awareness of the requirements and emphasize and ensure compliance.

AIS equipment costs between $500 and $3,000, depending on the options and capabilities of the specific device purchased. It is expected that most mariners would purchase the Class B device that costs between $500 and $1,000. AIS makes government

[111] U.S. Department of Homeland Security, *The 2014 Quadrennial Homeland Security Review.*

enforcement operations significantly more efficient when coupled with the SVRS registration and a float plan as border security agencies do not need to detect, interdict, identify, and board these vessels as they cross the border. The government could expend in excess of $5,000 per event to complete these actions, depending on the resources used. For a relatively small investment by the private mariner, the government receives significant financial return and a more efficient government produces benefits to all taxpayers. The mariners would benefit from a more efficient border crossing experience and increased safety during their voyage.

The concern that AIS intrudes on personal freedom by tracking mariner movements is countered by the increased security received by the nation. This is an issue that must be balanced, as absolute security is unattainable and absolute freedom is simply anarchy. Finding the right balance between what freedoms are worth giving up for increased security is the challenge. In general, when dealing with border security the scale tips away from personal freedom, as we want to regulate who is allowed to enter the country.

## B. AVIATION COMPARISON—A RIGOROUS AND VETTED SYSTEM

Currently, mariners have the most relaxed and unregulated process for crossing the border.[112] A comparison to private aviation requirements for border crossings supports implementing an AIS requirement coupled with a float plan for mariners to mimic the flight plan and transponder requirements of aviation travel. A review of both current and future aviation requirements is provided next.

### 1. Current Requirements

Requiring the use of AIS coupled with a float plan for all vessels conducting an international voyage is commensurate with the current requirements for international civilian aviation travel. Title 14, Part 99 of the Code of Federal Regulations covering security control of aircraft codifies the requirements for flying aircraft into or out of the U.S. or across an air defense identification zone (ADIZ). Section 99.9 prescribes that a

[112] Etzioni, "The Joke is on Air Travelers."

"person who operates a civil aircraft into an ADIZ must have a functioning two-way radio, and the pilot must maintain a continuous listening watch on the appropriate aeronautical facility's frequency."[113] Additionally, Section 99.11 requires that a flight plan be filed, activated, and closed with the appropriate aeronautical facility. Moreover, Section 99.13 directs the use of a transponder with Mode C when flying "into or out of the United States, or into, within, or across an ADIZ."[114] Civilian aircraft must transmit a discrete code assigned by the local air traffic control center on Mode C for their specific flight when crossing the border either northbound or southbound. Furthermore, Section 99.15 requires the pilot to make a position report to the appropriate aeronautical facility 15 minutes prior to entering the ADIZ.[115]

These requirements allow law enforcement agencies to monitor the movements of private aircraft as they conduct border crossings and meet them upon arrival for a customs inspection. It is reasonable to impose and enforce a similar process on private vessels that conduct border crossings. Requiring mariners to file a float plan and transmit AIS would create a system that is essentially in effect now for the aviation community. The costs of an aircraft Mode C transponder is on par with the costs of an AIS Class A transceiver:; $2,000 to $3,000. Private aviators accept this as the process and cost for international air travel and have not raised concerns about the requirement intruding on their freedom.

### 2. Automatic Dependent Surveillance-Broadcast Requirements

The Federal Aviation Administration (FAA) issued requirements in May 2010 mandating that aircraft flying in certain controlled airspace be equipped with Automatic Dependent Surveillance-Broadcast (ADS-B) "Out" avionics beginning January 1, 2020.[116] ADS-B is a major component of the FAA's Next Generation Air Transportation

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[113] "Title 14, chap 1, sub chap. F, Part 99—Security Control of Air Traffic," Electronic Code of Federal Regualtions, last modified November 14, 2014, accessed October 7, 2014 http://www.ecfr.gov/cgi-bin/text-idx?SID=bf63f52dd4457cd76f39466d7c3c1b82&node=pt14.2.99&rgn=div5

[114] Ibid.

[115] Ibid.

[116] Automatic Dependent Surveillance-Broadcast, Out Equipment and Use, 14 C.F.R. 91.225.

System (NextGen) that transitions air traffic control from radar to a GPS satellite-based surveillance system. With each aircraft broadcasting key flight data, ADS-B significantly enhances air traffic surveillance capabilities and will be required in all airspace where Mode C is currently mandated. With ADS-B, controllers can see aircraft with much greater precision, accuracy, and reliability as aircraft equipped with ADS-B send their precise, GPS-derived location to radio stations on the ground where controllers are able to see information such as aircraft speed, altitude, and identity.[117] Aircraft with ADS-B "In" capabilities can also receive these signals and have awareness of other aircraft and properly equipped ground equipment in their vicinity improving overall safety.

There has been some controversy regarding the cost verses benefit of ADS-B for small private aircraft; yet, the Aircraft Owners and Pilots Association (AOPA) supports ADS-B in concept and has embraced this transition from ground-based radar to a GPS satellite system.[118] With a 10-year phase in period, AOPA plans to work closely with the FAA to ensure that pilots can identify the benefits of ADS-B and comply with the new rules with affordable avionics.[119] In October 2014, Garmin announced an ADS-B compliant system, GDL-84, with a suggested retail price of $3,995. The GDL 84

> … provides an all-inclusive, minimally intrusive solution for aircraft owners looking to satisfy the requirements of NextGen, while providing the benefits offered by ADS-B In without the need to significantly modify the panel of the aircraft or the need for a multifunction display.[120]

The GDL-84 has an optional wireless ADS-B In display to receive and display traffic and weather.

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[117] "Fact Sheet—Automatic Dependent Surveillance-Broadcast (ADS-B)," news release, Federal Aviation Administration, August 13, 2014, accessed October 7, 2014, http://www.faa.gov/news/fact_sheets/news_story.cfm?newsid=16874

[118] "Automatic Dependent Surveillance-Broadcast (ADS-B)," Aircraft Owners and Pilots Association, accessed October 8, 2014, http://www.aopa.org/Advocacy/Air-Traffic-Services-,-a-,-Technology/Air-Traffic-Services-Brief-Automatic-Dependent-Surveillance-Broadcast-ADS-B

[119] Ibid.

[120] Jessica Koss, "Garmin® Introduces New Cost-Effective ADS-B Solution for General Aviation," *Business Wire*, October 28, 2014, http://www.businesswire.com/news/home/20141028005398/en/Garmin%C2%AE-Introduces-Cost-Effective-ADS-B-Solution-General-Aviation#.VFBlQvTF_6I

When Malaysia Airlines flight MH 370 disappeared in March 2014, it reinvigorated the discussion of aircraft tracking equipment and requirements. ADS-B broadcasts an aircraft's identity, position, and flight data but is currently only available when in range of an ADS-B ground station. Flight MH 370 was equipped with and initially broadcasting ADS-B, but there were insufficient ground stations in the area to receive the aircrafts signal. The live flight tracking program, FlightAware, "operates a worldwide network of ADS-B receivers that track ADS-B-equipped aircraft flying around the globe" to supplement the various government radar feeds and provide improved flight tracking services.[121] FlightAware's current ground stations for receiving ADS-B signals in the area where MH 370 was flying are shown in Figure 3.[122]

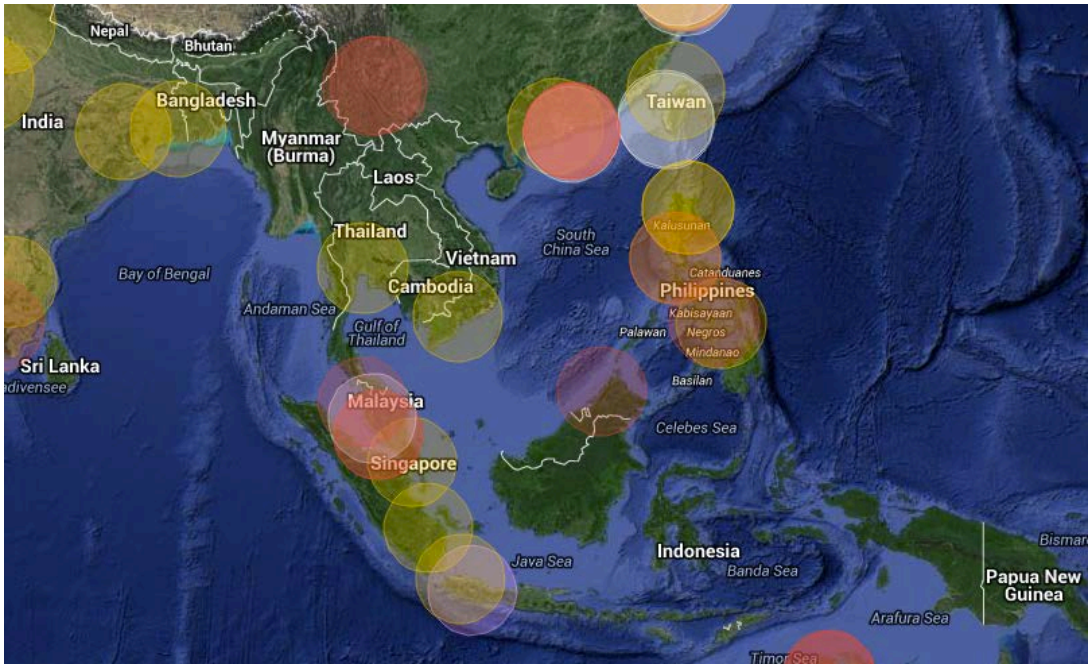


Figure 3. ADS-B Coverage from FlightAware

FlightAware is actively seeking individuals and sites to install ADS-B receivers to improve worldwide coverage as "new sites all around the world are beneficial and data

[121] "FlightAware and ADS-B," Flightware, accessed November 17, 2014, https://flightaware.com/adsb/

[122] Ibid.

will be used from any contributing facility. Even in places where coverage exists already, more redundancy and overlapping coverage results in significantly better low-altitude coverage and coverage reliability."[123] Malaysia is also "implementing ADS-B surveillance to improve coverage of certain air routes that do not have complete radar coverage. This entails installing two ADS-B ground stations at radar sites in Pulau Langkawi and Genting Highland."[124] Commercial flight-tracking services that use ADS-B are the aviation counterpart to Marine Traffic website as shown in Figure 1 in Chapter II. Similar to AIS, there is now a market for worldwide tracking of aircraft, and commercial companies are working on installing ADS-B antenna and receiver systems in satellites for tracking aircraft from space where the "final objective is to deploy a full satellite constellation able to track any aircraft on earth."[125]

ADS-B is the aviation equivalent to AIS and provides improved efficiency, safety, and security with eventual worldwide coverage. The safety and security benefits outweigh public concern over cost or invasion of privacy by tracking individual aircraft, as FAA has implemented the ADS-B regulations with minimal objections. When ADS-B is fully implemented, FAA will secure some secondary surveillance radars but will retain primary radars for homeland defense purposes.[126] Primary radars will allow FAA to see aircraft within the ADIZ that are not broadcasting ADS-B and launch military aircraft to intercept as is done currently when aircraft approach our borders without a flight plan or transmitting an assigned transponder Mode C code. Requiring all vessels to broadcast AIS as they transit our maritime borders fully aligns with what FAA has implemented for aircraft.

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[123] Ibid.

[124] "MH370 Mystery Points to Need for Better Aircraft Tracking," *Aviation Week*, March 14, 2014, accessed October 29, 2014, http://aviationweek.com/commercial-aviation/mh370-mystery-points-need-better-aircraft-tracking

[125] "Satellite ADS-B," Innovative Solutions in Space, accessed November 17, 2014, http://www.isispace.nl/cms/index.php/projects/s-ads-b

[126] "Automatic Dependent Surveillance-Broadcast (ADS-B)."

## C. IMPLEMENTATION ISSUES AND CONCERNS

A stakeholder analysis will help one deal with political forces through a rational approach when implementing a new policy or change. According to Mintzberg, Ahlstrand, and Lampel, "In a sense, it is the planning school's solution to the messiness of politics."[127] This approach begins with the analysis of behavior of the stakeholders, then understanding the logic behind this behavior, and finally searching for possible coalitions among several stakeholders.[128]

### 1. Impact to Mariners

AIS equipment costs between $500 and $3,000 depending on the options and capabilities of the specific device purchased. Many small vessel owners will not want to expend funds to meet this requirement regardless of the benefits derived. Some boat owners and non-boat owners will also protest the government's intrusion into their privacy by tracking their movements using this technology, as the satellite-based systems have worldwide tracking capabilities. To counter privacy concerns, legislation could allow mariners to turn AIS off, or place it in receive only, when conducting voyages that do not cross our international maritime borders. If a voyage takes place entirely within internal U.S. waters, the vessel could broadcast but would not be required to do so. Some mariners could also choose to secure or place AIS in receive only while transiting areas where they would not want to broadcast for security reasons, such as around eastern Africa. Opposition to any AIS requirement is expected from a vocal minority of lobbyists paid by the various boating organizations who describe their activities as: "Boat U.S. uses the collective strength of its over 500,000 members to fight against unfair taxes and regulations, all the while advocating sound public policy that promotes safe, responsible boating."[129]

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[127] Henry Mintzberg, Bruce W. Ahlstrand and Joseph Lampel, *Strategy Safari: A Guided Tour through the Wilds of Strategic Management* (New York: Free Press, 1998), Kindle edition, location 3524.

[128] Ibid.

[129] "Boat US Government Affairs," Boat Owners Association of the United States, 2014, accessed October 7, 2014 http://www.boatus.com/gov/about.asp

### 2. General Public Stakeholders

A percentage of the general public would judge the proposed regulation is important to improve the security of the country. It is likely many in this security conscious group are not members of the boating community but believe this gap in national security should be closed. These proponents of security are expected to work in opposition to the small boat stakeholders by commenting in favor of the proposed regulation and contacting their political representatives directly and via lobbyists as well. Those concerned about closing this gap in our security would support this law yet the majority of the U. S. public will be apathetic towards this proposal as they judge it does not impact them.

### 3. Review of Pending AIS Regulation Changes

Reviewing the process of a similar proposed change to AIS regulations will illuminate how the public and stakeholders might react to this proposed law. The U. S. Coast Guard is currently updating AIS regulations to expand the equipment carriage requirements to additional commercial vessels. The estimate is the new regulation would impact about 17,500 commercial vessels as shown in the Table 3.[130]

Table 3. Vessels Impacted by the Pending AIS Regulations[131]

| Vessel Type | Number |
|---|---|
| Commercial Vsl greater than 65 ft and less than 300 GTons | 2,973 |
| Commercial Fishing Vessel greater than 65 ft | 5,520 |
| Towing Vessel greater than 26 ft and more than 600 HP | 4,560 |
| Passenger Vessels | 3,235 |
| Dredges | 35 |
| Foreign Flag Vessels | 1,119 |
| **Total** | **17,442** |

[130] Jorge Arroyo, "Waterways Management" [PowerPoint], (AIS Rulemaking Briefing to the Navigation Safety Advisory Council at Savannah, GA, May 2009), U. S. Coast Guard, accessed February 17, 2014, http://www.navcen.uscg.gov/pdf/AIS/Arroyo@NAVSAC(20090520).pdf

[131] Ibid.

Only 23 people provided comments at the two public meetings held to collect input on these proposed changes to AIS regulations. During the four-month open comment period, another 70 comments were submitted to the regulations.gov website.[132] Assuming only those impacted commented, less than 100 comments or about one half of one percent (0.005) of the 17,000 plus impacted mariners chose to provide comments. It is highly likely that members of the general public not impacted by this proposed regulation also provided comments, and this reduces the percent of impacted public commenting even further. This supports the position that the majority of the public and even those impacted would be apathetic towards this proposed regulation. Comments provided were typically negative and focused on the regulation not being needed within their specific vessel community. None of the comments provided produced a change in the proposed regulation.[133]

#### 4. National Small Vessel Security Summit Concerns

In 2007, DHS engaged private, commercial, and government stakeholders over small vessel operations, safety, and security at the National Small Vessel Security Summit (NSVSS). At this summit, there was "considerable controversy over the role and status of the Automatic Identification System (AIS). Numerous recreational boating representatives were unequivocally opposed to applying AIS requirements to those vessels."[134] The stakeholders at the summit judged that AIS was too costly and impractical for recreational vessels and had minimal effect on security. In addition, attendees expressed concern that the government could not monitor AIS data with current resources and the system would be "easily compromised by terrorists."[135] Final remarks made by Mr. Richard Schwartz of the Boat Owners Association of the United States at the NSVSS are summarized as:

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[132] Ibid.

[133] Ibid.

[134] Charles Brownstein et al., *Report of the DHS National Small Vessel Security Summit* (Washington, DC: Homeland Security Institute, 2007), accessed February 17, 2014, http://www.dhs.gov/xlibrary/assetts/small_vessel_NSVSS_Report_HQ_508.pdf, 7.

[135] Ibid., 8.

> Lastly, Boat U.S. uniformly and strongly opposed requiring recreational boaters to install any form of the Automatic Identification System (AIS). He stated three rational for his opposition to AIS: 1) potential terrorists would not comply with this identification requirement, 2) adding millions of recreational vessels AIS signatures would overwhelm the USCG's ability to effectively monitor the system, and 3) the cost of such equipment for recreational boaters is prohibitive at a cost of $500 per device.[136]

### 5. Improved Maritime Domain Awareness

To counter the concerns from the 2007 NSVSS that the government lacks the ability to monitor AIS, the Coast Guard now has a network of AIS stations covering all major and most of the smaller ports around the country.[137] Commercial satellite companies currently provide almost worldwide coverage of AIS signals and one company, exactEarth, reports it has over 100 customers on five continents including:[138]

- The federal government of Canada, Department of National Defense
- Australian Maritime Safety Authority
- South African Maritime Safety Authority
- U.S. Coast Guard
- U.S. 6th Fleet
- U.S. Space and Naval Warfare Systems Command
- United Kingdom Hydrographic Office

Efforts are ongoing to leverage technology to improve the ability to monitor the world's maritime traffic and provide the intelligence community's maritime surveillance analysts the tools to identify suspicious activity.[139] In addition, technology is rapidly improving our capability to obtain maritime domain awareness data through the use of synthetic aperture radar satellites (SARSAT) that can detect small targets, including the wakes of fast moving small vessels. A joint-capability technology demonstration is ongoing where SARSAT is being used to provide alerts on suspicious situations "such as

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136 Ibid., 55–56.

137 Lundquist, *Connecting the Dots*, 22.

138 C. Puddy, personal communication, August 13, 2014.

139 "Maritime Security—Maritime Situational Awareness (MSA)."

at sea rendezvous or small, fast boats headed to an unusual location."[140] SARSAT technology is a critical step towards improving maritime domain awareness of non-emitting and uncooperative vessels. Furthermore, it could provide the framework for a satellite-based system that can monitor the maritime border from space, recognize vessels transiting with an active AIS signal, and alert law enforcement when a vessel transits the border without broadcasting AIS.

AIS critics are correct; terrorists will not comply with an equipment carriage requirement; however, if legitimate marine traffic is transmitting AIS, border security forces can be more effective and efficient. With AIS data and signals from registered mariners, SARSAT or other state of the art technology has the potential to provide cues to law enforcement agencies of terrorists and other criminals attempting to illegally cross our maritime borders. This is exactly what DHS is looking for with the shrinking haystack strategy.

### 6. Estimated Public Costs

Although there are about 12 million recreational vessels registered in the U. S., most of these are less than 26 feet in length and not likely to make an international voyage. The *2012 Recreational Boating Statistics* shows approximately 610,000 small boats with a length of 26 feet or more registered in the U.S.[141] The proposed regulation is anticipated to impact only a small percentage of the boating community as most boaters do not conduct international voyages. GAO report 14–32 listed approximately 30,000 vessels registered in the SVRS.[142] For impact analysis, an estimate of 100,000 vessels will be used; this is three times the number currently registered with CBP's SVRS and about one sixth of the total number of small boats 26 feet or greater that are registered in the U.S. This estimate of 100,000 vessels owners who would be required to expend money to purchase required AIS equipment represents less than one percent of the total

[140] Lundquist, *Connecting the Dots*, 22.

[141] U.S. Coast Guard, *2012 Recreational Boating Statistics* (COMDTPUB P16754.26) (Washington, DC: U. S. Coast Guard, 2013), 66.

[142] Caldwell, *Maritime Security DHS Could Benefit*, 26.

boat owners in the U.S. Based on $500 to $1000 per unit and 100,000 vessels impacted, the total cost to the public is estimated between $50 to $100 million.

### 7. Marketing

The use of marketing could sway some individuals if the idea is sound and implemented correctly. The key marketing elements of the requirement to install and broadcast AIS is the security that it provides to the nation, the safety it provides the individuals aboard the small boat, and the increased efficiency of a border crossing. Boater safety is improved by the increased visibility to other vessels in the area and the ability of rescuers to locate the small boat in times of distress. The desire to improve national security will tip the scale to implement this policy over the minor costs to boat owners and limited intrusion to their privacy as observed within the aviation community. The third concern from the NSVSS by Boat U.S. regarding AIS equipment costs could be mitigated with an incentive program.

### 8. Incentive to Participate

To further market a new AIS carriage requirement, a rebate incentive on the purchase of an AIS transceiver would encourage mariners to participate in the SVRS. With the significant savings the government obtains from having mariners purchase and install AIS equipment, a financial incentive program could be used to encourage mariners' compliance. As the public registers for the SVRS and provides MMSI numbers for installed AIS equipment, the government could reimburse a partial amount to the mariner. Amounts between $100 and $250 would provide strong motivation for mariners to participate.

The government has used financial incentives in the past to modify behavior and that practice continues those efforts today. For example, during the transition from analog to digital TV signals in 2009, two $40 coupons were offered to consumers to offset the cost of digital converters.[143] Also in 2009, the federal government offered rebates for the purchase of more efficient vehicles via the Car Allowance Rebate System (CARS) or

[143] "Digital Converter Boxes," PBS, accessed October 22, 2014, http://www.pbs.org/digitaltv/converter_boxes.php

"Cash for Clunkers" program. Depending on the difference in fuel economy between the trade-in vehicle and the new vehicle, participants received a voucher for either $3,500 or $4,500.[144] Nearly 700,000 clunkers were traded in between July 1, 2009 and August 24, 2009 as part of the program for a total cost of $2.85 billion.[145] In addition, federal tax credits of $300 or more continue today for installing energy efficient equipment in homes[146] and many municipalities provide rebates for installing equipment that reduce water usage.

Providing a $100 to $250 rebate incentive for an estimated 100,000 AIS units would cost the federal government between $10 and $25 million. This is a fraction of the costs expended on some of the above incentive programs, and it would produce immediate and tangible savings for the law enforcement agencies enforcing border security. Providing a $50 rebate would cost approximately $5 million and equate to the $4.9 million the U.S. government spent purchasing AIS equipment for Mexico.[147]

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[144] Ted Gayer, and Emily Parker, *Cash for Clunkers: An Evaluation of the Car Allowance Rebate System* (Washington DC: Brookings Institute, 2013), accessed November 11, 2014, http://www.brookings.edu/~/media/research/files/papers/2013/10/cash%20for%20clunkers%20evaluation%20gayer/cash_for_clunkers_evaluation_paper_gayer.pdf, 1.

[145] Ibid.

[146] "Federal Tax Credits for Consumer Energy Efficiency," Energy Star, accessed November 17, 2014, http://www.energystar.gov/index.cfm?c=tax_credits.tx_index

[147] Striegler, "Vancouver's Xanatos Marine Makes AIS Sale."

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# V. CONCLUSION AND RECOMMENDATIONS

## A. CONCLUSION

Automatic Identification System (AIS) technology could significantly improve border security and reduce the small vessel threat to the United States. Requiring AIS for all vessels conducting international voyages to enhance maritime security and safety is aligned with DHS *Small Vessel Security Strategy Implementation Plan* Goals 2 and 3.[148] This action follows a layered, state-of-the-art approach that leverages technology to enhance the nation's ability to detect, determine intent, and, when necessary, interdict suspicious small vessels. The AIS requirement conforms to the *Small Vessel Security Strategy* to reduce potential security and safety risks from small vessels through the implementation of "security operations that strike the proper balance between fundamental freedoms, adequate security, and continued economic stability."[149] The advantages of requiring Class A or Class B AIS outweigh the disadvantages and would strengthen law enforcement agencies ability to detect and interdict small boats in the vicinity of the border that are conducting illegal activities or attempting to smuggle people and/or weapons into the U.S. across the maritime border. This regulation would align with the actions being taken by other countries around the world to require AIS on small private vessels as has been done in Singapore and Mexico.

An AIS requirement aligns private vessels with private aircraft and improves safety for the mariner as well as security for the nation. With legitimate marine traffic broadcasting AIS, law enforcement agencies would be able to focus on small dark contacts that are not transmitting AIS and carrying potential terrorists, illegal drugs, money, weapons, and migrants across our borders. Satellites are the most efficient sensor systems for wide area surveillance and increasing maritime domain awareness. Furthermore, commercial entities are rapidly acquiring worldwide surveillance capabilities. As new SARSAT detection systems come online, AIS will be key to sorting

[148] U.S. Department of Homeland Security, *Small Vessel Security Implementation Plan*, 1.

[149] U.S. Department of Homeland Security, *DHS Small Vessel Security Strategy*, 1.

the information collected by these satellites, provide detailed information to the intelligence community, and direct law enforcement to investigate suspicious vessels illegally transiting the maritime border.

Coupling an AIS requirement with CBP's SVRS aligns with the DHS's *Quadrennial Homeland Security Review* 2014 strategy of expanding risk based security by removing low risk vessels from the haystack and allows existing resources to focus efforts against illicit maritime activities.[150] The SVRS registration and float plan, combined with AIS, delivers enough information for border security agencies to determine if, when, and where to target and conduct a boarding of the vessel. AIS automates the existing SVRS and removes the inconsistencies of a self-reporting system for border crossings and security in the maritime arena. CBP estimates that only a small percentage of the vessels returning to the U. S. report arrival information as required by the law,[151] and an AIS requirement would allow for improved performance measures of compliance. As vessels are detected in violation of the policy, corrective measures can be taken to increase participation and compliance shrinking the haystack even further.

Implementation costs for both the government and public are low and the program has the potential to make maritime border security operations more efficient and effective. If the government attempted to detect, identify, interdict, and board each vessel crossing our maritime border as is done now with aircraft and vessels, it would expend between $5,000 and $10,000 per maritime boarding event. AIS allows law enforcement agencies to monitor the border without having to detect, identify, and interdict on the water. Agencies could decide the need, time, and location of conducting a boarding to ensure compliance with federal law providing a more streamlined border crossing for the mariner.

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[150] U.S. Department of Homeland Security, *The 2014 Quadrennial Homeland Security Review*, 35.

[151] Caldwell, *Maritime Security DHS Could Benefit*, 7.

## B. RECOMMENDATIONS.

The following are recommendations this thesis research, analysis and discussion will support:

(1) Implement AIS Requirement

DHS should implement a requirement for all vessels to install and broadcast Class A or Class B AIS when conducting international voyages. The regulation should expand the existing Small Vessel Reporting System (SVRS) to a mandatory program where mariners are required to pre-register and file float plans prior to conducting an international voyage. When registering for the SVRS, owners must provide the MMSI number for the AIS equipment that is installed on the vessel. Essentially, this would be akin to issuing a passport to a vessel.

(2) Engage Stakeholders

The second recommendation is to engage the various stakeholders early in the process since "trying to solve the problems of implementation after the law, structure, and blueprint of an undertaking are already decided is too late."[152] Implementing government laws and regulations can be a complex process within democracies. The United Nations indicates the key attributes of good governance as transparency, responsibility, accountability, participation, and responsiveness.[153] Successful execution of public policy begins at the idea phase, not during implementation.[154] In this spirit, U.S. government rule making follows a specific process to be both transparent and allow for participation where the public is allowed to comment on potential new laws and regulations. The website for conducting the business of rulemaking can be found at the regulations.gov website. The success or failure of various proposed regulations is clearly impacted by stakeholders via public opinion. The regulations' website states: "Public

[152] William D. Eggers, and John O'Leary, *If We Can Put a Man on the Moon: Getting Big Things Done in Government* (Boston, MA: Harvard Business Press, 2009), Kindle edition, location 415.

[153] "Good Governance and Human Rights," United Nations Office of the High Commissioner for Human Rights, accessed November 11, 2014, http://www.ohchr.org/en/Issues/Development/GoodGovernance/Pages/GoodGovernanceIndex.aspx

[154] Eggers, and O'Leary, *If We Can Put a Man on the Moon*, Location 415.

participation matters. Democratic, legal, and management principles justify why public comments make a difference in regulatory policy. Public participation is an essential function of good governance. Participation enhances the quality of law and its realization through regulations."[155]

(3) 2015 Small Vessel Security Summit

To facilitate the drafting of appropriate AIS rules and regulations as well as an effective implementation strategy, DHS should bring together select members and groups who participated in the 2007 National Small Vessel Security Summit. This panel should review the changes in technology and threat and advise DHS on a specific AIS policy design that balances competing issues and concerns yet fulfills maritime security needs. If time and funding are available, the summit could be expanded to revisit all of the issues examined back in 2007 as well as open the floor for new topics.

(4) Incentive Program

The fourth and final recommendation is to have an incentive program. The federal government should consider offering a financial rebate to those that comply with the regulations as an incentive. After a reasonable grace period, mariners found not in compliance with the law should lose the opportunity to receive a rebate and possibly be fined for their failure to participate in the program.

## C. EPILOGUE

Implementing an AIS requirement for all vessels conducting international voyages to and from the U.S. is a risk-based security action that can be achieved within current budget constraints. This action provides direct support to three of the five basic homeland security missions.[156]

- **Prevent Terrorism and Enhance Security**—Preventing terrorist attacks on the nation is and should remain the cornerstone of homeland security. By shrinking the haystack, AIS increases the probability of border security

[155] Regulations.Gov, "Home," accessed November 17, 2014, http://www.regulations.gov/#!home

[156] U.S. Department of Homeland Security, *The 2014 Quadrennial Homeland Security Review*, 6–7.

forces detecting and interdicting terrorists attempting to enter the country through our maritime borders, which makes the nation more secure.

- **Secure and Manage Our Borders**—AIS uses enhanced technology to improve upon border security, to exclude terrorist threats, drug traffickers, and other threats to national security, economic security, and public safety. AIS is a risk-based strategy that is smart, cost-effective, and conducted in a manner that is acceptable to the American people.
- **Enforce and Administer Our Immigration Laws**—AIS coupled with small vessel float plans will improve our nation's ability to enforce our immigration laws and administer our immigration system.

We know that not all small boats crossing our maritime borders are law-abiding citizens and implementing this AIS regulation allows us to "trust, but verify."

*Doveryai, no Proveryai*

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