

# NAVAL CENTER FOR SPACE TECHNOLOGY

Encrypted Tracking System (ETS) Integration for  
Maryland Natural Resources Police (NRP) and the  
Maritime Tactical Operations Group (MTOG)



NRL/PU/8140--13-586  
October 2013

**NAVAL RESEARCH LABORATORY**

4555 Overlook Avenue, S.W.  
Washington, DC 20375

[www.nrl.navy.mil](http://www.nrl.navy.mil)

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**REVIEWED AND APPROVED**

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## 1. INTRODUCTION

Maryland has significant critical infrastructure and key assets specific to the maritime environment that must be protected. The Port of Baltimore is located along the shores and branches of the Patapsco River. It is one of the largest ports in the United States and one of the busiest ports on the East Coast. The Chesapeake Bay is the largest estuary in the United States. It is approximately 200 miles long from the Susquehanna River in the north to the Atlantic Ocean in the south. The Chesapeake Bay's drainage basin covers 64,299 square miles in the District of Columbia and parts of six states: New York, Pennsylvania, Delaware, Maryland, Virginia, and West Virginia. More than 150 rivers and streams drain into the bay. It is an extremely important economic and cultural asset for the approximately 15 million people who live in the Chesapeake Bay basin. It is also vital to the economic stability of the United States: terrorist attacks on any of these assets would destabilize the security and economy of the country.

Protecting the Chesapeake Bay watershed and its critical infrastructure and key assets requires a coordinated unified response from law enforcement agencies working together to deter, detect, and respond to maritime security events. The Maritime Tactical Operations Group (MTOG) was created in 2005 in an effort to coordinate Maryland's maritime tactical assets to prevent, respond to, mitigate and recover from any potential maritime terrorist event. The MTOG is comprised of federal, state and local agencies working together in a task force style operation, focusing on standardization of training, equipment, and operational procedures to achieve tactical interoperability within the marine environment. For example, training each operator within the task force to know and understand the equipment that other members are using will ensure a seamless transfer of gear, if needed. Within the MTOG, a subcommittee was formed to specifically identify where equipment should be identical. Formation of this subcommittee will allow funding and grant opportunities to be leveraged for the same equipment among different agencies, which supports the MTOG's regional collaborative efforts.



The Encrypted Tracking System (ETS) is a collaborative partnership between the Maryland Natural Resources Police (NRP) and the Naval Research Laboratory (NRL) to enable tracking of law enforcement vessels owned by NRP and other members of the MTOG. The NRL has many man-years of expertise in tactical technologies development and integration, vessel tracking, and radar systems that is essential to the success of this effort.

The ETS will enable maritime law enforcement officers from the federal, state, and local levels to become familiar with Automatic Identification System (AIS) traffic that is specific to their marine operating environment. It will also provide a common or "official" Vessel Tracking System (VTS) that the MTOG can use to coordinate maritime security operations using standardized equipment to ensure interoperability. The ETS utilizes existing infrastructure on tower sites around the Port of Baltimore to collect the encrypted AIS signals from the law enforcement patrol craft and securely relays information about the position of the patrol boats utilizing the Maritime Law Enforcement Information Network (MLEIN) to other communication centers. The MLEIN provides visualization of the position of patrol craft and AIS signals collected by patrol craft of other vessels within their detection range. Equipment standardization enables the encrypted signal of the patrol craft to be decrypted and displayed by the other patrol craft. This is accomplished by integrating the AIS signals to existing Global Positioning System (GPS) plotters, allowing patrol craft operator to visualize which "Blue" forces are in the immediate area in the event that back-up forces are required in the response to a security incident. The ETS provides near-real-time awareness of the location of critical assets during maritime security operations and incidents at Maritime Command and Control Centers. The ETS was made possible by the Port Security Grant Program (PSGP), which is one of six grant programs that constitute the Department of Homeland Security Infrastructure Protection Program (IPP).



## **2. APPLICABLE DOCUMENTS**

2.1 National Strategy for Maritime Security, dated September 2005

2.2 Maryland Maritime Strategic Security Plan, dated July 2010

2.3 22 U.S. Code 2778, Arms Export Control Act

2.4 50 U.S. Code 2401, War and National Defense Export Regulation

2.5 Parts 120-130 of title 22, Code of Federal Regulations (also known as the "International Traffic in Arms Regulations")

2.6 Parts 730-774 of title 15, Code of Federal Regulations (also known as the "Export Administration Regulations")

2.7 Parts 120-130 of title 22, Code of Federal Regulations (also known as the "International Traffic in Arms Regulations")



### 3. APPROACH

The ETS will focus on the Captain of the Port (COTP) Zone for the Port of Baltimore, MD. The geographic area will consist of the Area of Responsibility (AOR) for Sector Baltimore. Coverage includes all Maryland areas of the Upper and Lower Chesapeake Bay and its tributaries as described in the US Coast Guard (USCG) - Sector Baltimore's Area of Operation.

MTOG members are a collaboration of maritime law enforcement agencies that span the Federal, State and Local agencies that are layered around Sector Baltimore. The MTOG has three co-chairs: the NRP, USCG – Sector Baltimore, and the Calvert County Sheriff's Office. The chairs help to lead and conduct meetings, activities and foster greater collaboration on preparedness, response, and training activities.

As co-chair, the NRP coordinated with other MTOG agencies. This collaborative effort resulted in two FY2011 PSGP Awards (EMW-2011-PU-SO1/97.056, MTOG AIS Project and EMW-2011-PU-APP-00366, NRP AIS Project in the National Capital Region (NCR)) to integrate standardized encrypted AIS equipment on law enforcement patrol craft. As ETS system integrator, the NRL assembled, tested, and installed all vessel-based hardware, software, and equipment to establish an ETS capability.

#### 3.1 Material

The NRL specified and procured the vessel-based communications equipment<sup>1</sup>: Protec-M hardware and manuals were transferred via DD Form 1149 from NRL to NRP with the statement: "This technical data is controlled under the U.S. International Traffic in Arms Regulation (ITAR) and may not be exported to a Foreign Person, either in the U.S. or abroad, without the proper authorization by the U.S. Department of State."

The NRP specified and procured the shore-based hardware and software required to receive, decrypt, and inject position reports from the vessel-based tracking system into the MLEIN.

The MTOG members provided data interface cables specific to existing chart plotters.

#### 3.2 System Integration and Test

Prior to commencement of the ETS integration effort, the NRP installed and configured a shore-based subsystem capable of receiving, decrypting and injecting position reports from their vessel-based tracking system into the MLEIN.

The NRP provided the NRL with an indoor environment at the NRP Matapeake facility in Stevensville, MD for the integration effort and coordinated logistics to obtain 30 MTOG member owned-and-operated law enforcement vessels to host the vessel-based subsystem.

The NRL assembled the procured vessel-based equipment along with mounting fixtures into a working subsystem for integration onto the selected law enforcement vessels. Integration and test consisted of the following:

- a. Interconnection of the ETS subsystem components with configuration/test for proper operation
- b. Incorporation of the ETS subsystem with the existing vessel-based chart plotter such that AIS position reports received by the vessel-based transponder are sent to the chart plotter for display<sup>2</sup>
- c. Protec-M AIS system familiarization/instructional video for vessel operators (approximately one hour in length) produced on board the NRP 109 vessel to provide step-by-step instructions on the operation of the ETS subsystem, including navigation (NAV) screens, and Sensitive But Classified (SBU) Tactical Information Exchange and Display System (STEDS) functions (available at [http://www.youtube.com/watch?v=0q1nIA\\_mmNU](http://www.youtube.com/watch?v=0q1nIA_mmNU))
- d. Delivery of laminated guides and installation manuals for each transponder (Protec-M Controlling Mode of Operation)

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<sup>1</sup>The NRP retains title to the equipment purchased for this effort. The NRL will retain title to NRL hardware, software, and equipment installed at the NRP sites.

<sup>2</sup> Due to funding constraints, the integration was limited to chart plotters that employ a standard RS-422 interface and the National Marine Electronics Association (NMEA) 0183 protocol.



#### 4. INTEGRATIONS

Using the NRP's prioritization schedule, the NRL performed ETS integration on the 30 specified vessels over a five month period, from October 2012 to March 2013. On average, completing the integration for one vessel required one person working two full days. The following paragraphs detail the integrations and include the Protec-M Installation Checklist. Note 1 on the Checklist refers to the "Mobile Maritime Service Identifier" (MMSI) number (cf. [www.boatus.com/MMSI](http://www.boatus.com/MMSI)). Abbreviations are provided in Appendix A. An equipment list with serial numbers is provided in Appendix B.



*Sunrise over the Chesapeake Bay at Chesapeake Beach, Maryland*

#### 4.1 NRP 104, *Calvert*

The ETS integration on the *Calvert* was successfully accomplished on November 12, 2012. Vessel assessment, equipment installation, configuration, test and verification, and the installation checklist are provided:

##### 4.1.1 Vessel Assessment

This Boston Whaler was deemed too large for the garage, requiring work to be performed while dry docked outdoors (see Figure 4.1.1 NRP 104, *Calvert*). The vessel's mast was unsuitable for the antenna installation because its oval shape would not accommodate the cable clamps, and it did not have sufficient area to accommodate the two antenna mounts.



Figure 4.1.1 NRP 104, *Calvert*

##### 4.1.2 Equipment Installation

The GPS and Very High Frequency (VHF) antennas were installed on the roof of the vessel (see Figure 4.1.2 GPS and VHF Antennas). The vessel's internal cable ways were used for antenna cable routing (see Figure 4.1.3 Cable Access). The transponder was mounted on the console (see Figure 4.1.4 Transponder), and it was connected to the existing Garmin chart plotter.



Figure 4.1.2 GPS and VHF Antennas

##### 4.1.3 Configuration

The transponder was configured in accordance with the installation checklist.

##### 4.1.4 Test and Verification

The transponder was tested with the Garmin chart plotter. System operation was verified using an internet-based ship locator program.



Figure 4.1.3 Cable Access



Figure 4.1.4 Transponder



## 4.2 NRP 106, *St. Mary's*

The ETS integration on the *St. Mary's* was successfully accomplished on November 13, 2012. Vessel assessment, equipment installation, configuration, test and verification, and the installation checklist are provided:

### 4.2.1 Vessel Assessment

This Boston Whaler was deemed to be too large for the garage, requiring work to be performed while dry docked outdoors (see Figure 4.2.1 NRP 106, *St. Mary's*).



Figure 4.2.1 NRP 106, *St. Mary's*

### 4.2.2 Equipment Installation

Antenna installation was similar to NRP 104 and no difficulties were encountered (see Figure 4.2.2 Antenna and Figure 4.2.3 Transponder). The GPS and VHF antennas were installed on the roof of the vessel. The vessel's internal cable ways were used for antenna cable routing. The transponder was mounted on the console (see Figure 4.2.4 Console), and it was connected to the existing Garmin chart plotter.



Figure 4.2.2 Antenna



Figure 4.2.3 Transponder

### 4.2.3 Configuration

The transponder was configured in accordance with the installation checklist.

### 4.2.4 Test and Verification

The transponder was tested with the Garmin chart plotter (see Figure 4.2.4 Console). System operation was verified using another vessel with AIS capability.

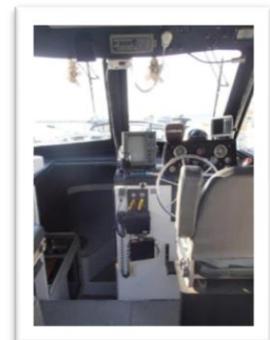


Figure 4.2.4 Console

#### 4.2.5 Installation Checklist

PROTEC-M INSTALLATION CHECKLIST		
<b>Part 1: Pre-Installation Information</b> (provided by the vessel owner/operator).		
Vessel Name (12 Characters Max)	St. Mary's	
MMSI Number <small>(Note 1)</small>	338137771	
Radio Call Sign (FCC ONLY)	NRP 106	
Vessel Maximum Draft (meters)	2	
GPS Antenna Desired Location	mast	
VHF Antenna Desired Location	mast	
Transponder Desired Location	console	
Power Switch Desired Location	console	
Chart Plotter (Model/Manufacturer)	GARMIN	
Chart Plotter (is data cable available?)	yes	
<b>Part 2: Installation Completed 11/13/2012</b>		
Transponder Serial Number	830332	
Transponder Installed	Yes	
Chart Plotter Connected	Yes	
Transponder Power Connected	Yes	
VHF Antenna Installed	Yes	
VHF Cable Connected	Yes	
GPS Antenna Installed	Yes	
GPS Cable Connected	Yes	
<b>Part 3: Power Up and Configuration</b> (To be completed by the Installer)		
Transponder Power Up	Yes	
MMSI Number Entered	Yes	
Navigation Status Entered	Yes	
IMO Number (if applicable)	N/A	
Maximum Draft Entered	Yes	
Radio Call Sign (FCC only)	N/A	
Vessel Type Entered	set to 55	Yes
Vessel Name Entered	Yes	
GPS Internal Position Entered	Yes	
GPS External Position Entered	N/A	
AIS Link to Chart Plotter	Yes	
No Alarms Verified	Yes	
Alarm Control Set Up Complete	Yes	
Vessel Length Entered (meters) *	N/A	
Vessel Beam Entered (meters) *	N/A	
Set Nav fixing device to ext GPS antenna *	N/A	
NV Persist Configured	set to NO	(default -NO)
Key Bit Size	select one	
Key Entered and Verified	Yes/No	
Contact Information: Robert Lewis (Contractor Code 8140) Wilmark & Associates, Inc. Phone (410) 257-4061/4014 Naval Research Laboratory Chesapeake Bay Detachment Bldg. One; Code 8140 5813 Bayside Road Chesapeake Beach, MD 20732	POC: Donna Eveland	
		MNRP - NRP106

### 4.3 NRP 109, Worcester

The ETS integration on the *Worcester* was successfully accomplished on December 12, 2012. Vessel assessment, equipment installation, configuration, test and verification, and the installation checklist are provided:

#### 4.3.1 Vessel Assessment

This 36 foot Sea Ark required the installation of new cable clams to accommodate the VHF and GPS cables and to ensure water tight integrity (see Figure 4.3.1 NRP 109, *Worcester*).



Figure 4.3.1 NRP 109, *Worcester*

#### 4.3.2 Equipment Installation

The antenna mounts for the GPS and VHF antennas were mounted to existing antenna mounting locations (see Figure 4.3.2 Antenna). The transponder was located on the starboard dash and the cables were routed down the window channel with the radar control cable (see Figure 4.3.3 Transponder). Power and ground lines were run to the electrical panel. Power for the unit is provided by the Radar power switch.

The chart plotter is an older Garmin 172s and incapable of processing AIS messages. The Electronic Indicator Control (EIC) cable was installed to allow for future upgrade to a chart plotter capable of integration with the AIS unit (see Figure 4.3.4 Console).



Figure 4.3.2 Antenna



Figure 4.3.3 Transponder

#### 4.3.3 Configuration

The transponder was configured in accordance with the installation checklist.

#### 4.3.4 Test and Verification

The transponder was tested and all indications showed that the unit functioned normally.

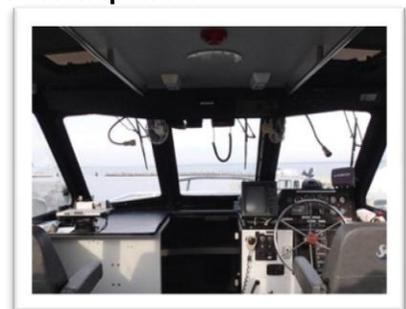


Figure 4.3.4 Console



#### 4.4 NRP 110, *National Harbor*

The ETS integration on the *National Harbor* was successfully accomplished on October 24, 2012. Vessel assessment, equipment installation, configuration, test and verification, and the installation checklist are provided:



Figure 4.4.1 NRP 110, *National Harbor*

#### 4.4.1 Vessel Assessment

This 25 foot Sea Ark had sufficient space for the antenna mounts and antennas to be mounted while still leaving clearance for the infrared camera (see Figure 4.4.1 NRP 110, *National Harbor*). A power source/switch for the transponder was identified on the power panel. This vessel did not have a shelf under the port console.



Figure 4.4.2 Antenna

#### 4.4.2 Equipment Installation

GPS and VHF Antennas were located on the mast and cable clams were installed in the mast to accommodate the cables (see Figure 4.4.2 Antenna). Cable routing was straight forward with no issues. The transponder was wired to the power panel. The transponder was mounted under the lower edge of the console and positioned to allow for sufficient space between the port passenger seat and the unit (see Figure 4.4.3 Console and Figure 4.4.4 Transponder). This location is preferred for ease of operation of the AIS unit.



Figure 4.4.3 Console

#### 4.4.3 Configuration

The transponder was configured in accordance with the installation checklist. The integration of the chart plotter (see Figure 4.4.5 Garmin) was completed after troubleshooting indicated that Garmin uses a non-standard labeling for their communications wiring schematic, which caused delays in the integration of the system. Once the correct wiring scheme was identified, the integration was easily completed.



Figure 4.4.4 Transponder

#### 4.4.4 Test and Verification

Operation of the unit was verified using an AIS system installed on another vessel.



Figure 4.4.5 Garmin

#### 4.4.5 Installation Checklist

PROTEC-M INSTALLATION CHECKLIST		
<b>Part 1: Pre-Installation Information (provided by the vessel owner/operator).</b>		
Vessel Name (12 Characters Max)	Natnl Harbor	
MMSI Number <small>(Note 1)</small>	338137755	
Radio Call Sign (FCC ONLY)	NRP 110	
Vessel Maximum Draft (meters)	2.5	
GPS Antenna Desired Location	mast	
VHF Antenna Desired Location	mast	
Transponder Desired Location	port side under console	
Power Switch Desired Location	GPS switch	
Chart Plotter (Model/Manufacturer)	GARMIN 540 series	
Chart Plotter (is data cable available?)	yes	
<b>Part 2: Installation Completed 10/24/2012</b>		
Transponder Serial Number	830330	
Transponder Installed	yes	
Chart Plotter Connected	yes	
Transponder Power Connected	yes	
VHF Antenna Installed	yes	
VHF Cable Connected	yes	
GPS Antenna Installed	yes	
GPS Cable Connected	yes	
<b>Part 3: Power Up and Configuration (To be completed by the Installer)</b>		
Transponder Power Up	yes	
MMSI Number Entered	yes (Verified)	
Navigation Status Entered	Yes (Underway)	
IMO Number (if applicable)	N/A	
Maximum Draft Entered	yes	
Radio Call Sign (FCC only)	N/A	
Vessel Type Entered	set to 55	Yes
Vessel Name Entered	Yes	
GPS Internal Position Entered	Yes	
GPS External Position Entered	N/A	
AIS Link to Chart Plotter	Yes	
No Alarms Verified	Yes	
Alarm Control Set Up Complete	Yes	
Vessel Length Entered (meters) *	N/A	
Vessel Beam Entered (meters) *	N/A	
Set Nav fixing device to ext GPS antenna *	N/A	
NV Persist Configured	set to NO	Default (NO)
Key Bit Size	select one	to be completed by the installer
Key Entered and Verified	Yes/No	to be completed by the installer
Contact Information: Robert Lewis (Contractor Code 8140) Wilmark & Associates, Inc. <u>Phone (410) 257-4061/4014</u> Naval Research Laboratory Chesapeake Bay Detachment Bldg. One; Code 8140 5813 Bayside Road Chesapeake Beach, MD 20732	POC Donna Eveland	
		MNRP - NRP110

#### 4.5 NRP 111, *Mattawoman*

The ETS integration on the *Mattawoman* was successfully accomplished on October 25, 2012. Vessel assessment, equipment installation, configuration, test and verification, and the installation checklist are provided:

##### 4.5.1 Vessel Assessment

This 45 foot Sea Ark (see Figure 4.5.1 NRP 111, *Mattawoman*) did not have sufficient space on the mast to install the GPS and VHF antennas. A roof mount would require cable routing to go through the lower galley and head in order to reach the console. There was no room on the NAV power switch to accommodate the AIS unit.



Figure 4.5.1 NRP 111, *Mattawoman*

##### 4.5.2 Equipment Installation

Two antenna mounts forward of the mast were used for antenna installation (see Figure 4.5.2 Antennas). The transponder was located on the pilot side of the console toward the centerline, allowing for clearance of other equipment and ease of integration with the Garmin 7215 navigation system (see Figure 4.5.3 Transponder).



Figure 4.5.2 Antennas

To install the cables between the antennas with the transponder, all the ceiling panels in the cabin, lower galley area, and head were removed. Upper cabin power lines to the station lighting and ventilation fans were hard-wired and had to be cut out to remove the panels. The upper cabin lights and fans were reconnected using connectors that allow panel removal without cutting the power cables. After cable routing was accomplished, ceiling panels were reinstalled (see Figure 4.5.4 Ceiling Cables).



Figure 4.5.3 Transponder

Power for the transponder was taken from the main power panel switch. A terminal block was installed in the console to integrate the AIS unit with the Garmin Navigation system.



Figure 4.5.4 Ceiling Cables

##### 4.5.3 Configuration

The transponder was configured in accordance with the installation checklist.

##### 4.5.4 Test and Verification

The system's operation was fully tested.



#### 4.6 NRP 138, *Piney Point*

The ETS integration on the *Piney Point* was successfully accomplished on December 6, 2012. Vessel assessment, equipment installation, configuration, test and verification, and the installation checklist are provided:

##### 4.6.1 Vessel Assessment

This 25 foot Sea Ark had sufficient space for the antenna mounts and antennas to be mounted while still leaving clearance for the infrared camera (see Figure 4.6.1 NRP 138, *Piney Point*). A power source/switch for the transponder was identified on the power panel.



Figure 4.6.1 NRP 138, *Piney Point*

##### 4.6.2 Equipment Installation

GPS and VHF Antennas were located on the mast and cable clams were installed in the mast to accommodate the cables (see Figure 4.6.2 Mast). The transponder was wired to the power panel. The transponder was mounted to the lower edge of the console and positioned to allow for sufficient space between the port passenger seat and the unit (see Figure 4.6.3 Transponder). The integration of the transponder and Garmin chart plotter was completed and verified.



Figure 4.6.2 Mast

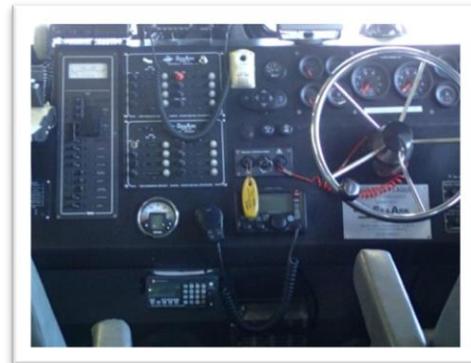


Figure 4.6.3 Transponder

##### 4.6.3 Configuration

The transponder was configured in accordance with the installation checklist.

##### 4.6.4 Test and Verification

Operation of the unit was verified using an AIS system installed on another vessel.



#### 4.7 NRP 139, *Talbot*

The ETS integration on the *Talbot* was successfully accomplished on March 11, 2013. Vessel assessment, equipment installation, configuration, test and verification, and the installation checklist are provided:



Figure 4.7.1 NRP 139, *Talbot*

##### 4.7.1 Vessel Assessment

This is a 25 foot Sea Ark (see Figure 4.7.1 NRP 139, *Talbot*). The radar display and radio prohibited access to the cable chase. There was sufficient space in the console to flush-mount the transponder.

##### 4.7.2 Equipment Installation

Antennas were installed on the mast (see Figure 4.7.2 Mast & Antenna and Figure 4.7.3 Mast) and antenna cables were routed through the overhead and down the cable chase in the center of the window (see Figure 4.7.4 Overhead). The Forward Looking Infrared (FLIR) camera laptop mount was attached on the deck amidships between the pilot and passenger (see Figure 4.7.5 Console). Power for the transponder was connected to the SPARE switch on the Direct Current (DC) power panel.

This vessel uses a Hummingbird 1100 series chart plotter. Integration of the plotter and the AIS transponder was completed and verified.

##### 4.7.3 Configuration

The transponder was configured in accordance with the installation checklist.

##### 4.7.4 Test and Verification

The vessel was moved outside for operational tests and to verify the GPS connection was functioning correctly. The radar, chart plotter, and AIS transponder were all tested and functioned properly.



Figure 4.7.2 Mast & Antenna



Figure 4.7.3 Mast



Figure 4.7.4 Overhead



Figure 4.7.5 Console

#### 4.7.5 Installation Checklist

<b>PROTEC-M INSTALLATION CHECKLIST</b>		
<b>Part 1: Pre-Installation Information (provided by the vessel owner/operator).</b>		
Vessel Name (12 Characters Max)	Talbot	
MMSI Number <small>(Note 1)</small>	338137758	
Radio Call Sign (FCC ONLY)	NRP 139	
Vessel Maximum Draft (meters)	2.5	
GPS Antenna Desired Location	mast	
VHF Antenna Desired Location	mast	
Transponder Desired Location	portside under dash	
Power Switch Desired Location	use GPS switch	
Chart Plotter (Model/Manufacturer)	Hummingbird 998c	
Chart Plotter (is data cable available?)		
<b>Part 2: Installation Completed 3/11/2013</b>		
Transponder Serial Number	837997	
Transponder Installed	Yes	
Chart Plotter Connected	Yes	
Transponder Power Connected	Yes	
VHF Antenna Installed	Yes	
VHF Cable Connected	Yes	
GPS Antenna Installed	Yes	
GPS Cable Connected	Yes	
<b>Part 3: Power Up and Configuration (To be completed by the Installer)</b>		
Transponder Power Up	Yes	
MMSI Number Entered	Yes	
Navigation Status Entered	Yes	
IMO Number (if applicable)	N/A	
Maximum Draft Entered	Yes	
Radio Call Sign (FCC only)	N/A	
Vessel Type Entered	set to 55	Yes
Vessel Name Entered	Yes	
GPS Internal Position Entered	Yes	
GPS External Position Entered	Yes	
AIS Link to Chart Plotter	Yes	
No Alarms Verified	Yes	
Alarm Control Set Up Complete	Yes	
Vessel Length Entered (meters) *	Derived from the GPS antenna position	
Vessel Beam Entered (meters) *	Derived from the GPS antenna position	
Set Nav fixing device to ext GPS antenna *	Default to "Internal"	
NV Persist Configured	set to NO	Default "NO"
Key Bit Size	select one	
Key Entered and Verified	Yes/No	
Contact Information:	POC Donna Eveland	
Robert Lewis (Contractor Code 8140) Wilmark & Associates, Inc. Phone (410) 257-4061/4014 Naval Research Laboratory Chesapeake Bay Detachment Bldg. One; Code 8140 5813 Bayside Road Chesapeake Beach, MD 20732		
	MNRP - NRP139	

#### 4.8 NRP 140, *Baltimore*

The ETS integration on the *Baltimore* was successfully accomplished on November 14, 2012. Vessel assessment, equipment installation, configuration, test and verification, and the installation checklist are provided:

##### 4.8.1 Vessel Assessment

This 25 foot Sea Ark had sufficient space for the antenna mounts and antennas to be mounted while still leaving clearance for the infrared camera (see Figure 4.8.1 NRP 140, *Baltimore*). A power source/switch for the transponder was identified on the power panel.

##### 4.8.2 Equipment Installation

GPS and VHF Antennas were located on the mast and cable clams were installed in the mast to accommodate the cables (see Figure 4.8.2 Mast). The transponder was wired to the power panel. The transponder was mounted on the lower edge of the console and positioned to allow for sufficient space between the port passenger seat and the unit (see Figure 4.8.3 Console). The integration of the transponder and Garmin chart plotter was completed and verified (see Figure 4.8.4 Garmin)

##### 4.8.3 Configuration

The transponder was configured in accordance with the installation checklist..

##### 4.8.4 Test and Verification

Operation of the unit was verified using an AIS system installed on another vessel.



Figure 4.8.1 NRP 140, *Baltimore*



Figure 4.8.2 Mast



Figure 4.8.3 Console



Figure 4.8.4 Garmin

#### 4.8.5 Installation Checklist

<b>PROTEC-M INSTALLATION CHECKLIST</b>		
<b>Part 1: Pre-Installation Information (provided by the vessel owner/operator).</b>		
Vessel Name (12 Characters Max)	Baltimore	
MMSI Number <small>(Note 1)</small>	338137753	
Radio Call Sign (FCC ONLY)	NRP 140	
Vessel Maximum Draft (meters)	2.5	
GPS Antenna Desired Location	mast	
VHF Antenna Desired Location	mast	
Transponder Desired Location	port side under console	
Power Switch Desired Location	use GPS switch	
Chart Plotter (Model/Manufacturer)	GARMIN 540 series	
Chart Plotter (is data cable available?)	yes	
<b>Part 2: Installation Completed 11/14/2012</b>		
Transponder Serial Number	830327	
Transponder Installed	Yes	
Chart Plotter Connected	Yes	
Transponder Power Connected	Yes	
VHF Antenna Installed	Yes	
VHF Cable Connected	Yes	
GPS Antenna Installed	Yes	
GPS Cable Connected	Yes	
<b>Part 3: Power Up and Configuration (To be completed by the Installer)</b>		
Transponder Power Up	Yes	
MMSI Number Entered	Yes	
Navigation Status Entered	Yes	
IMO Number (if applicable)	N/A	
Maximum Draft Entered	Yes	
Radio Call Sign (FCC only)	N/A	
Vessel Type Entered	set to 55	Yes
Vessel Name Entered	Yes	
GPS Internal Position Entered	Yes	
GPS External Position Entered	N/A	
AIS Link to Chart Plotter	Yes	
No Alarms Verified	Yes	
Alarm Control Set Up Complete	Yes	
Vessel Length Entered (meters) *	N/A	
Vessel Beam Entered (meters) *	N/A	
Set Nav fixing device to ext GPS antenna *	N/A	
NV Persist Configured	set to NO	Admin (Default to NO)
Key Bit Size	select one	
Key Entered and Verified	Yes/No	
Contact Information: Robert Lewis (Contractor Code 8140) Wilmark & Associates, Inc. Phone (410) 257-4061/4014 Naval Research Laboratory Chesapeake Bay Detachment Bldg. One; Code 8140 5813 Bayside Road Chesapeake Beach, MD 20732	POC: Donna Eveland	
		MNRP - NRP140

#### 4.9 NRP 141, *City Dock*

The ETS integration on the *City Dock* was successfully accomplished on November 7, 2012. Vessel assessment, equipment installation, configuration, test and verification, and the installation checklist are provided:

##### 4.9.1 Vessel Assessment

This 25 foot Sea Ark had sufficient space for the antenna mounts and antennas to be mounted while still leaving clearance for the infrared camera (see Figure 4.9.1 NRP 141, *City Dock*). A power source/switch (Spare) for the transponder was identified on the power panel.



Figure 4.9.1 NRP 141, *City Dock*

##### 4.9.2 Equipment Installation

GPS and VHF Antennas were located on the mast and cable clams were installed in the mast to accommodate the cables (see Figure 4.9.2 Starboard Antenna and Figure 4.9.3 Port Antenna). The transponder was wired to the power panel. The transponder was mounted on the lower edge of the console and positioned to allow for sufficient space between the port passenger seat and the unit (see Figure 4.9.4 Transponder). This location is preferred for ease of operation of the AIS unit. The integration of the transponder and Garmin chart plotter was completed and verified.



Figure 4.9.2 Starboard Antenna



Figure 4.9.3 Port Antenna

##### 4.9.3 Configuration

The transponder was configured in accordance with the installation checklist.

##### 4.9.4 Test and Verification

Operation of the unit was verified using an AIS system installed on another vessel.



Figure 4.9.4 Transponder



#### 4.10 NRP 143, Deal Island

The ETS integration on the *Deal Island* was successfully accomplished on December 11, 2012. Vessel assessment, equipment installation, configuration, test and verification, and the installation checklist are provided:

##### 4.10.1 Vessel Assessment

This 25 foot Sea Ark had sufficient space for the antenna mounts and antennas to be mounted while still leaving clearance for the infrared camera (see Figure 4.10.1 NRP 143, *Deal Island*). A power source/switch (Spare) for the transponder was identified on the power panel.



Figure 4.10.1 NRP 143, *Deal Island*

##### 4.10.2 Equipment Installation

GPS and VHF Antennas were located on the mast and cable clams were installed in the mast to accommodate the cables (see Figure 4.10.2 Mast & Antenna). The transponder was wired to the power panel. The transponder was mounted on the shelf below the port side console (see Figure 4.10.3 Console and Figure 4.10.4 Transponder). The integration of the transponder and Garmin chart plotter was completed and verified.



Figure 4.10.2 Mast & Antenna



Figure 4.10.3 Console

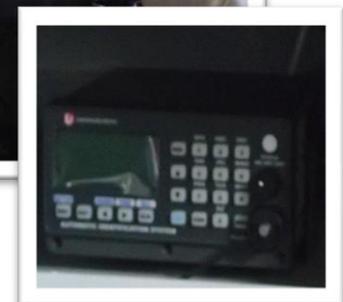


Figure 4.10.4 Transponder

##### 4.10.3 Configuration

The transponder was configured in accordance with the installation checklist.

##### 4.10.4 Test and Verification

Operation of the unit was verified using an AIS system installed on another vessel.



#### 4.11 NRP 144, *South River*

The ETS integration on the *South River* was successfully accomplished on November 8, 2012. Vessel assessment, equipment installation, configuration, test and verification, and the installation checklist are provided:

##### 4.11.1 Vessel Assessment

This 25 foot Sea Ark had sufficient space for the antenna mounts and antennas to be mounted while still leaving clearance for the infrared camera (see Figure 4.11.1 NRP 144, *South River*). A power source/switch (Spare) for the transponder was identified on the power panel.

##### 4.11.2 Equipment Installation

GPS and VHF Antennas were located on the mast and cable clams were installed in the mast to accommodate the cables (see Figure 4.11.2 Side View Antennas and Figure 4.11.3 Rear View Antennas). The transponder was wired to the power panel. The transponder was mounted on the lower edge of the console and positioned to allow for sufficient space between the port passenger seat and the unit (see Figure 4.11.4 Console). The integration of the transponder and Garmin chart plotter was completed and verified.

##### 4.11.3 Configuration

The transponder was configured in accordance with the installation checklist.

##### 4.11.4 Test and Verification

Operation of the unit was verified using an AIS system installed on another vessel.



Figure 4.11.1 NRP 144, *South River*



Figure 4.11.2 Side View Antennas



Figure 4.11.3 Rear View Antennas



Figure 4.11.4 Console



#### 4.12 NRP 146, *Solomon's Island*

The ETS integration on the *Solomon's Island* was successfully accomplished on December 4, 2012. Vessel assessment, equipment installation, configuration, test and verification, and the installation checklist are provided:

##### 4.12.1 Vessel Assessment

This 25 foot Sea Ark had sufficient space for the antenna mounts and antennas to be mounted while still leaving clearance for the infrared camera (see Figure 4.12.1 NRP 146, *Solomon's Island*). A power source/switch (Spare) for the transponder was identified on the power panel.



Figure 4.12.1 NRP 146, *Solomon's Island*

##### 4.12.2 Equipment Installation

GPS and VHF Antennas were located on the mast and cable clams were installed in the mast to accommodate the cables (see Figure 4.12.2 Mast and Figure 4.12.3 Antenna). The transponder was wired to the power panel. The transponder was mounted on the shelf below the console on the port side (see Figure 4.12.4 Transponder). The integration of the transponder and Garmin chart plotter was completed and verified (see Figure 4.12.5 Garmin).



Figure 4.12.2 Mast



Figure 4.12.3 Antenna



Figure 4.12.4 Transponder

##### 4.12.3 Configuration

The transponder was configured in accordance with the installation checklist.

##### 4.12.4 Test and Verification

Operation of the unit was verified using an AIS system installed on another vessel.



Figure 4.12.5 Garmin

#### 4.12.5 Installation Checklist

<b>PROTEC-M INSTALLATION CHECKLIST</b>		
<b>Part 1: Pre-Installation Information (provided by the vessel owner/operator).</b>		
Vessel Name (12 Characters Max)	Solomon's Is	
MMSI Number <small>(Note 1)</small>	338137764	
Radio Call Sign (FCC ONLY)	NRP 146	
Vessel Maximum Draft (meters)	2	
GPS Antenna Desired Location	mast	
VHF Antenna Desired Location	mast	
Transponder Desired Location	portside under console	
Power Switch Desired Location	console	
Chart Plotter (Model/Manufacturer)	GARMIN 540 series	
Chart Plotter (is data cable available?)	yes	
<b>Part 2: Installation Completed 12/4/2012</b>		
Transponder Serial Number	838007	
Transponder Installed	Yes	
Chart Plotter Connected	Yes	
Transponder Power Connected	Yes	
VHF Antenna Installed	Yes	
VHF Cable Connected	Yes	
GPS Antenna Installed	Yes	
GPS Cable Connected	Yes	
<b>Part 3: Power Up and Configuration (To be completed by the Installer)</b>		
Transponder Power Up	Yes	
MMSI Number Entered	Yes	
Navigation Status Entered	Yes	
IMO Number (if applicable)	N/A	
Maximum Draft Entered	Yes	
Radio Call Sign (FCC only)	N/A	
Vessel Type Entered	set to 55	Yes
Vessel Name Entered	Yes	
GPS Internal Position Entered	A-4, B-3, C-2, D-1	
GPS External Position Entered	N/A	
AIS Link to Chart Plotter	Yes	
No Alarms Verified	Yes	
Alarm Control Set Up Complete	Yes	
Vessel Length Entered (meters) *	N/A	
Vessel Beam Entered (meters) *	N/A	
Set Nav fixing device to ext GPS antenna *	N/A	
NV Persist Configured	set to NO	Administrator
Key Bit Size	select one	
Key Entered and Verified	Yes/No	
Contact Information: Robert Lewis (Contractor Code 8140) Wilmark & Associates, Inc. Phone (410) 257-4061/4014 Naval Research Laboratory Chesapeake Bay Detachment Bldg. One; Code 8140 5813 Bayside Road Chesapeake Beach, MD 20732	POC Donna Eveland	
		MNRP - NRP146

#### 4.13 NRP 147, *Severn*

The ETS integration on the *Severn* was successfully accomplished on February 12, 2013. Vessel assessment, equipment installation, configuration, test and verification, and the installation checklist are provided:

##### 4.13.1 Vessel Assessment

This 38 foot Metal Shark had an unused mounting cleat on the roof of the vessel (see Figure 4.13.1 NRP 147, *Severn*). A power source/switch (Spare) for the transponder was identified on the power panel.



Figure 4.13.1 NRP 147, *Severn*

##### 4.13.2 Equipment Installation

GPS and VHF Antennas were located on the mast and cable clams were installed in the roof to accommodate the cables (see Figure 4.13.2 Antenna and Figure 4.13.3 Wiring). The transponder was wired to the power panel. The transponder was installed onto the console and flush-mounted on the port side of the console (see Figure 4.13.5 Console and Figure 4.13.4 Transponder). The integration of the transponder and Garmin 7000 series chart plotter was completed and verified.



Figure 4.13.2 Antenna



Figure 4.13.3 Wiring



Figure 4.13.5 Console



Figure 4.13.4 Transponder

##### 4.13.3 Configuration

The transponder was configured in accordance with the installation checklist.

##### 4.13.4 Test and Verification

Operation of the unit was verified using an AIS system installed on another vessel.

#### 4.13.5 Installation Checklist

<b>PROTEC-M INSTALLATION CHECKLIST</b>		
<b>Part 1: Pre-Installation Information (provided by the vessel owner/operator).</b>		
Vessel Name (12 Characters Max)	Severn	
MMSI Number <small>(Note 1)</small>	338139652	
Radio Call Sign (FCC ONLY)		
Vessel Maximum Draft (meters)	1.5	
GPS Antenna Desired Location	Mast	
VHF Antenna Desired Location	mounting plate	
Transponder Desired Location	Console	
Power Switch Desired Location	Spare	
Chart Plotter (Model/Manufacturer)	Garmin7212	
Chart Plotter (is data cable available?)	Yes	
<b>Part 2: Installation Completed 2/12/2013</b>		
Transponder Serial Number	837994	
Transponder Installed	Yes	
Chart Plotter Connected	Yes	
Transponder Power Connected	Yes	
VHF Antenna Installed	Yes	
VHF Cable Connected	Yes	
GPS Antenna Installed	Yes	
GPS Cable Connected	Yes	
<b>Part 3: Power Up and Configuration (To be completed by the Installer)</b>		
Transponder Power Up	Yes	
MMSI Number Entered	Yes	
Navigation Status Entered	Yes	
IMO Number (if applicable)	N/A	
Maximum Draft Entered	Yes	
Radio Call Sign (FCC only)	N/A	
Vessel Type Entered	set to 55	Yes
Vessel Name Entered	Yes	
GPS Internal Position Entered	Yes	
GPS External Position Entered	Yes	
AIS Link to Chart Plotter	Yes	
No Alarms Verified	Yes	
Alarm Control Set Up Complete	Yes	
Vessel Length Entered (meters) *	Derived from GPS antenna location	
Vessel Beam Entered (meters) *	Derived from GPS antenna location	
Set Nav fixing device to ext GPS antenna *	Set to Internal (Default)	
NV Persist Configured	set to NO	Default (NO)
Key Bit Size	select one	
Key Entered and Verified	Yes/No	
Contact Information: Robert Lewis (Contractor Code 8140) Wilmark & Associates, Inc. Phone (410) 257-4061/4014 Naval Research Laboratory Chesapeake Bay Detachment Bldg. One; Code 8140 5813 Bayside Road Chesapeake Beach, MD 20732		MNRP - NRP147

#### 4.14 NRP 148, *Tangier Sound*

The ETS integration on the *Tangier Sound* was successfully accomplished on March 20, 2013. Vessel assessment, equipment installation, configuration, test and verification, and the installation checklist are provided:

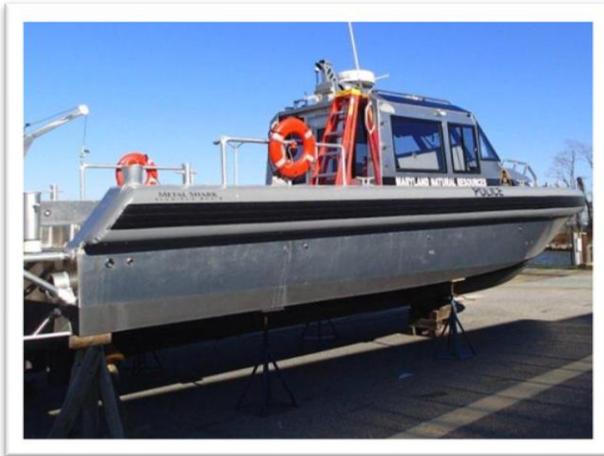


Figure 4.14.1 NRP 148, *Tangier Sound*

##### 4.14.1 Vessel Assessment

This 38 foot Metal Shark was equipped with an available single mounting point suitable for the VHF antenna mount. The mast area was deemed suitable for GPS antenna mounting. The ceiling panels required removal to gain access to the overhead and the cable chases. The console was surveyed, and a location for mounting the transponder was identified (see Figure 4.14.1 NRP 148, *Tangier Sound*).



Figure 4.14.2 Antenna

##### 4.14.2 Equipment Installation

The VHF antenna mount was installed to an available bracket next to the mast. The GPS antenna and mount were installed onto the side of the mast below the camera mounting area (see Figure 4.14.2 Antenna). Penetrations for the cables were made and the cable glands installed (see Figure 4.14.3 Overhead). A hole was cut into the port side console to flush-mount the transponder (see Figure 4.14.4 Transponder). Power and ground cables were routed from the transponder to the Starboard Side DC power panel. The circuit breaker and switch were then tested and the cables terminated. The cables for the GPS and VHF antennas were routed through the ceiling and down the windshield cable chase, terminated and connected to the transponder. All cables were secured into place and the ceiling panels were reinstalled.



Figure 4.14.3 Overhead

The Data cable was routed to a suitable area in the Port electrical bay. A terminal block was installed to make the connections, and the chart plotter (see Figure 4.14.5 Plotter) was connected on NMEA channel 2.

##### 4.14.3 Configuration

The transponder was configured in accordance with the installation checklist.

##### 4.14.4 Test and Verification

A full operational check was completed.



Figure 4.14.4 Transponder



Figure 4.14.5 Plotter

#### 4.14.5 Installation Checklist

<b>PROTEC-M INSTALLATION CHECKLIST</b>		
<b>Part 1: Pre-Installation Information (provided by the vessel owner/operator).</b>		
Vessel Name (12 Characters Max)	Tagier Sound	
MMSI Number <small>(Note 1)</small>	338139653	
Radio Call Sign (FCC ONLY)		
Vessel Maximum Draft (meters)	1.5	
GPS Antenna Desired Location	Mast	
VHF Antenna Desired Location	Roof Antenna mouning plate	
Transponder Desired Location	Port Console	
Power Switch Desired Location	AIS Power Switch	
Chart Plotter (Model/Manufacturer)	Garmin 7212	
Chart Plotter (is data cable available?)	Yes	
<b>Part 2: Installation Completed 3/20/2013</b>		
Transponder Serial Number	838011	
Transponder Installed	Yes	
Chart Plotter Connected	Yes	
Transponder Power Connected	Yes	
VHF Antenna Installed	Yes	
VHF Cable Connected	Yes	
GPS Antenna Installed	Yes	
GPS Cable Connected	Yes	
<b>Part 3: Power Up and Configuration (To be completed by the Installer)</b>		
Transponder Power Up	Yes	
MMSI Number Entered	Yes	
Navigation Status Entered	Yes	
IMO Number (if applicable)	N/A	
Maximum Draft Entered	Yes	
Radio Call Sign (FCC only)	N/A	
Vessel Type Entered	set to 55	Yes
Vessel Name Entered	Yes	
GPS Internal Position Entered	Yes	
GPS External Position Entered	Yes	
AIS Link to Chart Plotter	Yes	
No Alarms Verified	Yes	
Alarm Contol Set Up Complete	Yes	
Vessel Length Entered (meters) *	Yes	
Vessel Beam Entered (meters) *	Yes	
Set Nav fixing device to ext GPS antenna *	Default to Internal	
NV Persist Configured	set to NO	Default NO
Key Bit Size	select one	
Key Entered and Verified	Yes/No	
Contact Information: Robert Lewis (Contractor Code 8140) Wilmark & Associates, Inc. Phone (410) 257-4061/4014 Naval Research Laboratory Chesapeake Bay Detachment Bldg. One; Code 8140 5813 Bayside Road Chesapeake Beach, MD 20732		MNRP - NRP148

#### 4.15 Maryland Transportation Authority Police, *Marine One*

The ETS integration on the *Marine One* was successfully accomplished on November 15, 2012. Vessel assessment, equipment installation, configuration, test and verification, and the installation checklist are provided:

##### 4.15.1 Vessel Assessment

This 25 foot Sea Ark had sufficient space for the antenna mounts and antennas to be mounted while still leaving clearance for the infrared camera (see Figure 4.15.1 MD Transportation Authority Police, *Marine One*). A power source/switch (Spare) for the transponder was identified on the power panel.



Figure 4.15.1 MD Transportation Authority Police, *Marine One*

##### 4.15.2 Equipment Installation

GPS and VHF Antennas were located on the mast and cable clams were installed in the mast to accommodate the cables (see Figure 4.15.2 Mast & Antenna). The transponder was wired to the power panel. The transponder location was discussed with the vessel operator and located to the port side below the console on a built-in tray (see Figure 4.15.3 Transponder). The integration of the transponder and Garmin chart plotter was completed and verified.



Figure 4.15.2 Mast & Antenna



Figure 4.15.3 Transponder

##### 4.15.3 Configuration

The transponder was configured in accordance with the installation checklist.

##### 4.15.4 Test and Verification

Operation of the unit was verified using an AIS system installed on another vessel.

#### 4.15.5 Installation Checklist

<b>PROTEC-M INSTALLATION CHECKLIST</b>		
<b>Part 1: Pre-Installation Information (provided by the vessel owner/operator).</b>		
Vessel Name (12 Characters Max)	Marine One	
MMSI Number <small>(Note 1)</small>	338138346	
Radio Call Sign (FCC ONLY)		
Vessel Maximum Draft (meters)	0.61	
GPS Antenna Desired Location	existing	
VHF Antenna Desired Location	existing	
Transponder Desired Location	below dash	
Power Switch Desired Location	on control panel	
Chart Plotter (Model/Manufacturer)	Garmin GPSmap 541S	
Chart Plotter (is data cable available?)	NOT AVAIL	
<b>Part 2: Installation Completed 11/15/2012</b>		
Transponder Serial Number	838012	
Transponder Installed	Yes	
Chart Plotter Connected	Yes	
Transponder Power Connected	Yes (GPS)	
VHF Antenna Installed	Yes	
VHF Cable Connected	Yes	
GPS Antenna Installed	Yes	
GPS Cable Connected	Yes	
<b>Part 3: Power Up and Configuration (To be completed by the Installer)</b>		
Transponder Power Up	Yes	
MMSI Number Entered	338138346	
Navigation Status Entered	Underway	
IMO Number (if applicable)	N/A	
Maximum Draft Entered	0.6	
Radio Call Sign (FCC only)	N/A	
Vessel Type Entered	set to 55	55 (Police Vessel)
Vessel Name Entered	Marine One	
GPS Internal Position Entered	Yes	
GPS External Position Entered	N/A	
AIS Link to Chart Plotter	Yes	
No Alarms Verified	Yes	
Alarm Control Set Up Complete	Yes	
Vessel Length Entered (meters) *	N/A	
Vessel Beam Entered (meters) *	N/A	
Set Nav fixing device to ext GPS antenna *	N/A	
NV Persist Configured	set to NO	Administrator
Key Bit Size	select one	
Key Entered and Verified	Yes/No	
Contact Information:	Sgt. Ronald G. McElwee	
Robert Lewis	Special Operations Division	
(Contractor Code 8140)	Md. Transportation Authority Police	
Wilmark & Associates, Inc.	2400 Broening Highway, Suite 118	
Phone (410) 257-4061/4014	Baltimore, Maryland 21224	
Naval Research Laboratory	410-537-6771 Office	
Chesapeake Bay Detachment	rmcelwee@mdta.state.md.us	
Bldg. One; Code 8140		
5813 Bayside Road		
Chesapeake Beach, MD 20732	MTAP - Marine1	

#### 4.16 Maryland Transportation Authority Police, *Marine Two*

The ETS integration on the *Marine Two* was successfully accomplished on March 13, 2013. Vessel assessment, equipment installation, configuration, test and verification, and the installation checklist are provided:

##### 4.16.1 Vessel Assessment

This older, 36 foot Sea Ark was located under the Key Bridge in Dundalk, Maryland, and required a gasoline generator to provide 110 voltage alternating current (VAC) power for the installation (see Figure 4.16.1 MD Transportation Authority Police, *Marine Two*). Antenna mount installation areas and a spare power switch were identified. The vessel was equipped with a RDP139 chart plotter, which does not support AIS.

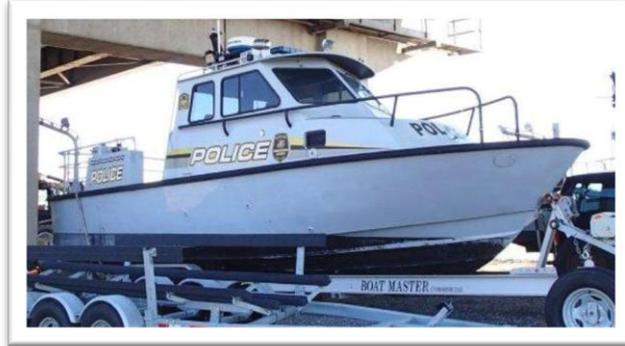


Figure 4.16.1 MD Transportation Authority Police, *Marine Two*

##### 4.16.2 Equipment Installation

The mast was lowered, and antenna mounts were installed. Access holes were cut into the mast to accommodate cables. Cable glands were installed and cable ends were terminated. Antennas were installed and the cables were routed into the cabin (see Figure 4.16.2 Antenna). The center ceiling panels and an access plate were removed to allow for cable routing. Cables were routed down the window cable chase, and an access hole was made to route the cables to the transponder and the power panel. The transponder was mounted and the GPS and VHF cables terminated (see Figure 4.16.3 Transponder). The power and ground cables were routed through the cable chase to the power panel in the console.



Figure 4.16.2 Antenna

The power panel was temporarily removed for cable installation. A 6-pin Furuno data cable was installed to facilitate future upgrade of the chart plotter to a model that supports AIS (e.g. Furuno RDP149). The data cable was connected to the transponder and Data 2 of the RDP139 chart plotter. This data cable is interchangeable between the two units.



Figure 4.16.3 Transponder

##### 4.16.3 Configuration

The transponder was configured in accordance with the installation checklist. Note: at the request of the vessel operator, NV Persist was set to YES and the mode of operation was set to TX- Class A.

##### 4.16.4 Test and Verification

A fully charged 12 volt battery was used to supply power for system configuration and testing. The battery was connected to the DC bus using jumper cables provided by the vessel operator. System checks were completed, and proper operation was verified.

#### 4.16.5 Installation Checklist

<b>PROTEC-M INSTALLATION CHECKLIST</b>	
<b>Part 1: Pre-Installation Information (provided by the vessel owner/operator).</b>	
Vessel Name (12 Characters Max)	Marine Two
MMSI Number <small>(Note 1)</small>	338138428
Radio Call Sign (FCC ONLY)	
Vessel Maximum Draft (meters)	0.914
GPS Antenna Desired Location	existing
VHF Antenna Desired Location	existing
Transponder Desired Location	below dash
Power Switch Desired Location	on control panel
Chart Plotter (Model/Manufacturer)	FURUNO 1833C
Chart Plotter (is data cable available?)	NOT AVAIL
<b>Part 2: Installation Completed 3/13/2013</b>	
Transponder Serial Number	837990
Transponder Installed	Yes
Chart Plotter Connected	Yes
Transponder Power Connected	Yes
VHF Antenna Installed	Yes
VHF Cable Connected	Yes
GPS Antenna Installed	Yes
GPS Cable Connected	Yes
<b>Part 3: Power Up and Configuration (To be completed by the Installer)</b>	
Transponder Power Up	Yes
MMSI Number Entered	Yes
Navigation Status Entered	Yes
IMO Number (if applicable)	N/A
Maximum Draft Entered	Yes
Radio Call Sign (FCC only)	N/A
Vessel Type Entered	set to 55
Vessel Name Entered	Yes
GPS Internal Position Entered	Yes
GPS External Position Entered	Yes
AIS Link to Chart Plotter	Chart Plotter not AIS capable.
No Alarms Verified	Yes
Alarm Control Set Up Complete	Yes
Vessel Length Entered (meters) *	Derived from the GPS antenna position
Vessel Beam Entered (meters) *	Derived from the GPS antenna position
Set Nav fixing device to ext GPS antenna *	Default to Internal
NV Persist Configured	set to NO
Key Bit Size	select one
Key Entered and Verified	Yes/No
Contact Information: Robert Lewis (Contractor Code 8140) Wilmark & Associates, Inc. <u>Phone (410) 257-4061/4014</u> Naval Research Laboratory Chesapeake Bay Detachment Bldg. One; Code 8140 5813 Bayside Road Chesapeake Beach, MD 20732	Sgt. Ronald G. McElwee Special Operations Division Md. Transportation Authority Police 2400 Broening Highway, Suite 118 Baltimore, Maryland 21224 410-537-6771 Office rmcelwee@mdta.state.md.us  MTAP - Marine2

#### **4.17 Maryland Transportation Authority Police, *Marine Three***

The ETS integration on the *Marine Three* was successfully accomplished on November 16, 2012. Vessel assessment, equipment installation, configuration, test and verification, and the installation checklist are provided:

##### **4.17.1 Vessel Assessment**

The installation of this 38 foot Sea Ark had to be conducted outside with the vessel on blocks. There was limited access to the cable trays and electronics power control panel. A spare power switch was identified on the electronics control panel.

##### **4.17.2 Equipment Installation**

The antenna mounts were located on the mast of the vessel and cables were run through the mast to the cable access in the ceiling. The transponder was located near the chart plotter on the upper console port side. Power was provided to the unit.

The data cable for a Furuno 1900 chart plotter was terminated and installed on Data 2. The data port was configured for NMEA 0183 ver. 2.0. The data cable was verified and tested. There were no errors in the cable; however, the Furuno chart plotter does not display AIS targets. This may be due to the age of the unit, or a need for a firmware update. Maryland Transportation Authority personnel should conduct further research to determine a configuration that will allow these units to communicate.

##### **4.17.3 Configuration**

The transponder was configured in accordance with the installation checklist.

##### **4.17.4 Test and Verification**

The transponder was tested and all indications showed that the unit functioned normally.

(No images available)

#### 4.17.5 Installation Checklist

<b>PROTEC-M INSTALLATION CHECKLIST</b>	
<b>Part 1: Pre-Installation Information (provided by the vessel owner/operator).</b>	
Vessel Name (12 Characters Max)	Marine Three
MMSI Number <small>(Note 1)</small>	338138429
Radio Call Sign (FCC ONLY)	
Vessel Maximum Draft (meters)	0.914
GPS Antenna Desired Location	existing
VHF Antenna Desired Location	existing
Transponder Desired Location	below dash
Power Switch Desired Location	on control panel
Chart Plotter (Model/Manufacturer)	FURUNO 1833C
Chart Plotter (is data cable available?)	NOT AVAIL
<b>Part 2: Installation Completed 11/16/2012</b>	
Transponder Serial Number	838005
Transponder Installed	Yes
Chart Plotter Connected	Yes (Not Compatible-Old Furuno 1900C)
Transponder Power Connected	Yes (Spare)
VHF Antenna Installed	Yes
VHF Cable Connected	Yes
GPS Antenna Installed	Yes
GPS Cable Connected	Yes
<b>Part 3: Power Up and Configuration (To be completed by the Installer)</b>	
Transponder Power Up	Yes
MMSI Number Entered	Yes
Navigation Status Entered	Underway
IMO Number (if applicable)	N/A
Maximum Draft Entered	Yes
Radio Call Sign (FCC only)	N/A
Vessel Type Entered	set to 55
Vessel Name Entered	Yes
GPS Internal Position Entered	Yes
GPS External Position Entered	N/A
AIS Link to Chart Plotter	Yes (Old Furuno Not AIS Capable)
No Alarms Verified	Yes
Alarm Control Set Up Complete	Yes
Vessel Length Entered (meters) *	Derived from GPS antenna position
Vessel Beam Entered (meters) *	Derived from GPS antenna position
Set Nav fixing device to ext GPS antenna *	Internal
NV Persist Configured	set to NO
Key Bit Size	select one
Key Entered and Verified	Yes/No
Contact Information: Robert Lewis (Contractor Code 8140) Wilmark & Associates, Inc. <u>Phone (410) 257-4061/4014</u> Naval Research Laboratory Chesapeake Bay Detachment Bldg. One; Code 8140 5813 Bayside Road Chesapeake Beach, MD 20732	Sgt. Ronald G. McElwee Special Operations Division Md. Transportation Authority Police 2400 Broening Highway, Suite 118 Baltimore, Maryland 21224 410-537-6771 Office rmcelwee@mdta.state.md.us  MTAP - Marine3

#### 4.18 Maryland Transportation Authority Police, *Marine Four*

The ETS integration on the *Marine Four* was successfully accomplished on December 6, 2012. Vessel assessment, equipment installation, configuration, test and verification, and the installation checklist are provided:

##### 4.18.1 Vessel Assessment

This was the oldest Sea Ark vessel in this group of ETS integrations. The vessel contained a V-berth forward, making cable installation problematic (see Figure 4.18.1 MD Transportation Authority Police, *Marine Four*). Radios were installed onto a tray covering the ceiling panel in the main cabin, inhibiting panel removal (see Figure 4.18.2 Cabin).



Figure 4.18.1 MD Transportation Authority Police, *Marine Four*

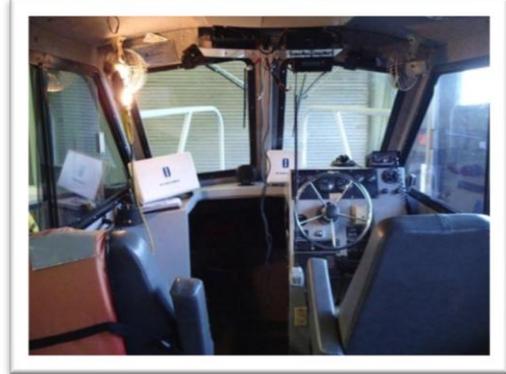


Figure 4.18.2 Cabin

##### 4.18.2 Equipment Installation

Several ceiling panels in the berth were removed to allow access. Cables were routed above the ceiling panel (see Figure 4.18.3 Cables) and down the wind screen beside the cable channel and fastened with cable clams. The transponder was located on the top port console between the Furuno 1833C radar display and the GD 1700C chart plotter (see Figure 4.18.4 Transponder). The transponder power was collocated with the chart plotter power switch.

The data cable was installed; however, the Furuno units are incompatible with AIS. The firmware for these units must to be updated for the integration of the Protec-M to function.



Figure 4.18.3 Cables

##### 4.18.3 Configuration

The transponder was configured in accordance with the installation checklist.

##### 4.18.4 Test and Verification

The transponder was tested and all indications showed that the unit functioned normally.



Figure 4.18.4 Transponder

#### 4.18.5 Installation Checklist

PROTEC-M INSTALLATION CHECKLIST		
<b>Part 1: Pre-Installation Information (provided by the vessel owner/operator).</b>		
Vessel Name (12 Characters Max)	Marine Four	
MMSI Number <small>(Note 1)</small>	338138432	
Radio Call Sign (FCC ONLY)		
Vessel Maximum Draft (meters)	0.61	
GPS Antenna Desired Location	existing	
VHF Antenna Desired Location	existing	
Transponder Desired Location	below dash	
Power Switch Desired Location	on control panel	
Chart Plotter (Model/Manufacturer)	FURUNO GD-1700C	
Chart Plotter (is data cable available?)	NOT AVAIL	
<b>Part 2: Installation Completed 12/6/2012</b>		
Transponder Serial Number	838010	
Transponder Installed	yes	
Chart Plotter Connected	Yes	
Transponder Power Connected	Yes (GPS Switch)	
VHF Antenna Installed	Yes	
VHF Cable Connected	Yes	
GPS Antenna Installed	Yes	
GPS Cable Connected	Yes	
<b>Part 3: Power Up and Configuration (To be completed by the Installer)</b>		
Transponder Power Up	Yes	
MMSI Number Entered	Yes	
Navigation Status Entered	Yes (Underway)	
IMO Number (if applicable)	N/A	
Maximum Draft Entered	Yes	
Radio Call Sign (FCC only)	N/A	
Vessel Type Entered	set to 55	Yes
Vessel Name Entered	Yes (Marine Four)	
GPS Internal Position Entered	Yes (A-5, B-3, C-1, D-2)	
GPS External Position Entered	N/A	
AIS Link to Chart Plotter	Yes - Not compatible with AIS	
No Alarms Verified	Yes	
Alarm Control Set Up Complete	N/A	
Vessel Length Entered (meters) *	N/A	
Vessel Beam Entered (meters) *	N/A	
Set Nav fixing device to ext GPS antenna *	(Internal Antenna)	
NV Persist Configured	set to NO	To be completed by Admin
Key Bit Size	select one	
Key Entered and Verified	Yes/No	
Contact Information:	Sgt. Ronald G. McElwee	
Robert Lewis	Special Operations Division	
(Contractor Code 8140)	Md. Transportation Authority Police	
Wilmark & Associates, Inc.	2400 Broening Highway, Suite 118	
Phone (410) 257-4061/4014	Baltimore, Maryland 21224	
Naval Research Laboratory	410-537-6771 Office	
Chesapeake Bay Detachment	rmcelwee@mdta.state.md.us	
Bldg. One; Code 8140		
5813 Bayside Road		
Chesapeake Beach, MD 20732	MTAP - Marine4	

#### 4.19 Annapolis City Police, *Annapolis*

The ETS integration on the *Annapolis* was successfully accomplished on March 13, 2013. Vessel assessment, equipment installation, configuration, test and verification, and the installation checklist are provided:

##### 4.19.1 Vessel Assessment

The ETS integration was the first installation of this type on the 25 foot Metal Shark vessel and all ceiling panels required removal to determine the approach (see Figure 4.19.1 Annapolis City Police, *Annapolis*). Existing cables were traced one at a time (due to small size of the cable chase) to determine the access point to the cable chase (see Figure 4.19.2 Cable Access).



Figure 4.19.1 Annapolis City Police, *Annapolis*

##### 4.19.2 Equipment Installation

The GPS and VHF cables were pulled through the cable chase from the antennas (see Figure 4.19.3 Antenna) with some difficulty due to 90 degree bends. Two access cuts were made in the chase to allow for a fish tape. With consultation of the vessel operator, the transponder was flush-mounted in the console (see Figure 4.19.4 Transponder). The template was installed and all cables and air conditioning vents were removed from the inside of the console. Pilot holes were drilled and an opening was cut in the console for the transponder. The VHF and GPS antenna cables were terminated and the power and communication cables were routed to the power panel access point (see Figure 4.19.5 Power Panel). The power cable was terminated in the first available spare circuit breaker. The grounds were terminated to the grounding bus. All cables were secured in place. The communications cable for the Garmin 5212 chart plotter was integrated with the transponder.



Figure 4.19.2 Cable Access



Figure 4.19.3 Antenna



Figure 4.19.4 Transponder

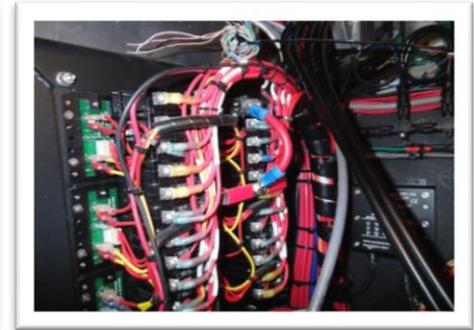


Figure 4.19.5 Power Panel

##### 4.19.3 Configuration

The transponder was configured in accordance with the installation checklist.

##### 4.19.4 Test and Verification

The Radar, chart plotter, and AIS transponder functioned when powered. No communications errors were received; however, full system operation could not be verified because the vessel was inside the garage and could not receive GPS signals. The AIS transponder will not pass targets without first having its own position.

#### 4.19.5 Installation Checklist

<b>PROTEC-M INSTALLATION CHECKLIST</b>		
<b>Part 1: Pre-Installation Information (provided by the vessel owner/operator).</b>		
Vessel Name (12 Characters Max)	Annapolis	
MMSI Number <small>(Note 1)</small>	338139213	
Radio Call Sign (FCC ONLY)		
Vessel Maximum Draft (meters)	1	
GPS Antenna Desired Location	installer discretion	
VHF Antenna Desired Location	installer discretion	
Transponder Desired Location	installer discretion	
Power Switch Desired Location	installer discretion	
Chart Plotter (Model/Manufacturer)	Garmin 5212	
Chart Plotter (is data cable available?)	not available	
<b>Part 2: Installation Completed 3/13/2013</b>		
Transponder Serial Number	838001	
Transponder Installed	Yes	
Chart Plotter Connected	Yes	
Transponder Power Connected	Yes	
VHF Antenna Installed	Yes	
VHF Cable Connected	Yes	
GPS Antenna Installed	Yes	
GPS Cable Connected	Yes	
<b>Part 3: Power Up and Configuration (To be completed by the Installer)</b>		
Transponder Power Up	Yes	
MMSI Number Entered	Yes	
Navigation Status Entered	Yes	
IMO Number (if applicable)	N/A	
Maximum Draft Entered	Yes	
Radio Call Sign (FCC only)	N/A	
Vessel Type Entered	set to 55	Yes
Vessel Name Entered	Yes	
GPS Internal Position Entered	Yes	
GPS External Position Entered	Yes	
AIS Link to Chart Plotter	Yes	
No Alarms Verified	Yes	
Alarm Control Set Up Complete	Yes	
Vessel Length Entered (meters) *	Derived from GPA Antenna location	
Vessel Beam Entered (meters) *	Derived from GPA Antenna location	
Set Nav fixing device to ext GPS antenna *	Default to INTERNAL	
NV Persist Configured	set to NO	Default NO
Key Bit Size	select one	
Key Entered and Verified	Yes/No	
Contact Information:	Lt. John Freeman Annapolis Police Special Operations Division 199 Taylor Ave. Annapolis MD 21401 JVFreeman@Annapolis.gov O #410-268-9000 Ext. 7247 C #443-336-8366	
Robert Lewis (Contractor Code 8140) Wilmark & Associates, Inc. Phone (410) 257-4061/4014 Naval Research Laboratory Chesapeake Bay Detachment Bldg. One; Code 8140 5813 Bayside Road Chesapeake Beach, MD 20732	ACP - Annapolis	

#### 4.20 Anne Arundel County Police, *Patriot*

The ETS integration on the *Patriot* was successfully accomplished on February 18, 2013. Vessel assessment, equipment installation, configuration, test and verification, and the installation checklist are provided:

##### 4.20.1 Vessel Assessment

Integration on this 35 foot Moose boat required an in-depth survey to determine equipment locations (see Figure 4.20.1 Anne Arundel County Police, *Patriot*). The mast is twice the size of the Sea Ark vessels; three people and a come-along are needed to raise and lower it for the integration. The VHF and GPS antenna mounts were located on the forward portion of the mast beside the light bar. There was no obvious access to the cable tray that runs the length of the vessel. There was no area on or under the console to accommodate the transponder. No access to the cable tray was found above the main ceiling panel or above a smaller ceiling panel in the head.

##### 4.20.2 Equipment Installation

Mast penetrations were made to accommodate the cables, and the cables were fished through the mast and out a rear access panel (see Figure 4.20.2 Mast & Antenna). The cables were routed through the main ceiling panel into the forward cable access. After consultation with the fire department personnel, the transponder was located on the ceiling console, requiring one of the VHF radios to be moved several inches (see Figure 4.20.3 Console and Figure 4.20.4 Transponder). The transponder mounting bracket was attached between the radios, allowing for cable connections on the transponder as well as radio operation. Power, ground, and communications cables were routed through the window cable chase and into the lower console behind the power panel. Power was provided to the transponder using a 15 ampere spare circuit breaker and switch. The GPS and VHF antenna cables were routed to the transponder and terminated. The data cable was attached to the back wall of the power bay, and a terminal connector was installed to facilitate connection to existing and future equipment.

A system in the lab was used to determine the best option for integrating the transponder and the chart plotter. The vessel's compass input was moved from the chart plotter's Data 2 port to its Data 3 port. The AIS transponder was connected to the chart plotter's Data 2 port. A 6-Pin Furuno cable was routed through the electrical panel to the back of the Furuno RDP149 display. The input for AIS on this display was in use by the Digital Selective Calling (DSC) radio and a permanent connection to the display could not be made. AIS data was verified using the Data 2 port. Once verified, the DSC radio connection was replaced.

##### 4.20.3 Configuration

The transponder was configured in accordance with the installation checklist.

##### 4.20.4 Test and Verification

A systems operational check was performed and the radar operation verified.



Figure 4.20.1 Anne Arundel County Police, *Patriot*



Figure 4.20.2 Mast & Antenna



Figure 4.20.3 Console



Figure 4.20.4 Transponder

#### 4.20.5 Installation Checklist

<b>PROTEC-M INSTALLATION CHECKLIST</b>		
<b>Part 1: Pre-Installation Information (provided by the vessel owner/operator).</b>		
Vessel Name (12 Characters Max)	Patriot	
MMSI Number <small>(Note 1)</small>	338112395	
Radio Call Sign (FCC ONLY)		
Vessel Maximum Draft (meters)	1	
GPS Antenna Desired Location	mast	
VHF Antenna Desired Location	mast	
Transponder Desired Location	concealed under dash	
Power Switch Desired Location	Spare on AC control panel	
Chart Plotter (Model/Manufacturer)	Furuno GP 7000/F1824C RDP149	
Chart Plotter (is data cable available?)	Yes	
<b>Part 2: Installation Completed 2/18/2013</b>		
Transponder Serial Number	837999	
Transponder Installed	Yes	
Chart Plotter Connected	Data cable connected Data input not avail.	
Transponder Power Connected	Yes	
VHF Antenna Installed	Yes	
VHF Cable Connected	Yes	
GPS Antenna Installed	Yes	
GPS Cable Connected	Yes	
<b>Part 3: Power Up and Configuration (To be completed by the Installer)</b>		
Transponder Power Up	Yes	
MMSI Number Entered	Yes	
Navigation Status Entered	Yes	
IMO Number (if applicable)	N/A	
Maximum Draft Entered	Yes	
Radio Call Sign (FCC only)	N/A	
Vessel Type Entered	set to 55	Yes
Vessel Name Entered	Yes	
GPS Internal Position Entered	Yes	
GPS External Position Entered	Yes	
AIS Link to Chart Plotter	Data cable connected Data input not avail.	
No Alarms Verified	Yes	
Alarm Control Set Up Complete	Yes	
Vessel Length Entered (meters) *	Derived from GPS antenna position	
Vessel Beam Entered (meters) *	Derived from GPS antenna position	
Set Nav fixing device to ext GPS antenna *	Default - Internal	
NV Persist Configured	set to NO	Default- NO
Key Bit Size	select one	
Key Entered and Verified	Yes/No	
Contact Information:	POC: Sgt. Jeff Fratantuono #1001 Anne Arundel County Police Special Operations Section Marine Unit (443) 336-7526 Jeff Fratantuono <jfratantuono@aacounty.org>	
Robert Lewis (Contractor Code 8140) Wilmark & Associates, Inc. Phone (410) 257-4061/4014 Naval Research Laboratory Chesapeake Bay Detachment Bldg. One; Code 8140 5813 Bayside Road Chesapeake Beach, MD 20732	AACP Patriot	

#### 4.21 Baltimore County Police, *MARINE 1*

The ETS integration on the *MARINE 1* was successfully accomplished on December 14, 2012. Vessel assessment, equipment installation, configuration, test and verification, and the installation checklist are provided:

##### 4.21.1 Vessel Assessment

This 25 foot Sea Ark did not have sufficient space to install the antenna mounts and antennas, and allow enough clearance for the camera system (see Figure 4.21.1 Baltimore County Police, *MARINE 1*). A power source/switch for the transponder was identified on the power panel.



Figure 4.21.1 Baltimore County Police, *MARINE 1*

##### 4.21.2 Equipment Installation

The antenna mounts and antennas were located on the sides of the light bar bracket (see Figure 4.21.2 Antennas). Cable clams were installed in the roof to accommodate the cables. The transponder was wired to the power panel. The transponder was installed on the side of the shelf below the console on the port side (see Figure 4.21.3 Transponder). The integration of the transponder and Garmin 4212 chart plotter was completed and verified.



Figure 4.21.2 Antennas

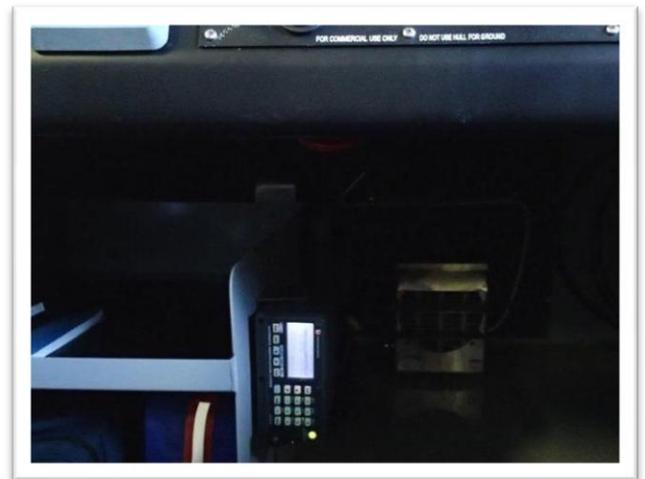


Figure 4.21.3 Transponder

##### 4.21.3 Configuration

The transponder was configured in accordance with the installation checklist.

##### 4.21.4 Test and Verification

Operation of the unit was verified using an AIS system installed on another vessel.

#### 4.21.5 Installation Checklist

<b>PROTEC-M INSTALLATION CHECKLIST</b>		
<b>Part 1: Pre-Installation Information (provided by the vessel owner/operator).</b>		
Vessel Name (12 Characters Max)	BCOPDMARINE1	
MMSI Number <small>(Note 1)</small>	338137904	
Radio Call Sign (FCC ONLY)		
Vessel Maximum Draft (meters)	1	
GPS Antenna Desired Location	mounted on forward light bracket	
VHF Antenna Desired Location	mounted on forward light bracket	
Transponder Desired Location	Under Console-Port side	
Power Switch Desired Location	Spare	
Chart Plotter (Model/Manufacturer)	Garmin 4212	
Chart Plotter (is data cable available?)	Yes	
<b>Part 2: Installation Completed 12/14/2012</b>		
Transponder Serial Number	838002	
Transponder Installed	Yes	
Chart Plotter Connected	Yes	
Transponder Power Connected	Yes	
VHF Antenna Installed	Yes	
VHF Cable Connected	Yes	
GPS Antenna Installed	Yes	
GPS Cable Connected	Yes	
<b>Part 3: Power Up and Configuration (To be completed by the Installer)</b>		
Transponder Power Up	Yes	
MMSI Number Entered	Yes	
Navigation Status Entered	Underway	
IMO Number (if applicable)	N/A	
Maximum Draft Entered	Yes	
Radio Call Sign (FCC only)	N/A	
Vessel Type Entered	set to 55	Yes
Vessel Name Entered	Yes	
GPS Internal Position Entered	Yes	
GPS External Position Entered	Yes	
AIS Link to Chart Plotter	Yes	
No Alarms Verified	Yes	
Alarm Control Set Up Complete	Yes	
Vessel Length Entered (meters) *	N/A	
Vessel Beam Entered (meters) *	N/A	
Set Nav fixing device to ext GPS antenna *	set to internal primary GPS antenna	
NV Persist Configured	set to NO	Default to NO
Key Bit Size	select one	
Key Entered and Verified	Yes/No	
Contact Information:	PFC T.R. Oakes #3646 Baltimore County Police Marine Team Support Operations Division 3033 Strawberry Point Rd. Baltimore, Maryland 21220 Ph. (410) 887-0279 Fax (410) 574-5196	
Robert Lewis (Contractor Code 8140) Wilmark & Associates, Inc. Phone (410) 257-4061/4014 Naval Research Laboratory Chesapeake Bay Detachment Bldg. One; Code 8140 5813 Bayside Road Chesapeake Beach, MD 20732	BCP - Marine1	

#### 4.22 Baltimore Police Department, *Dauntless*

The ETS integration on the *Dauntless* was successfully accomplished on December 13, 2012. Vessel assessment, equipment installation, configuration, test and verification, and the installation checklist are provided:



Figure 4.22.1 Baltimore Police Department, *Dauntless*

##### 4.22.1 Vessel Assessment

This older, 36 foot Sea Ark did not have an area on the mast suitable for antenna installation (see Figure 4.22.1 Baltimore Police Department, *Dauntless*).

##### 4.22.2 Equipment Installation

A bracket that covers the forward light bar and serves as a mount for one of the camera systems was used as a mounting location for the antenna mounts (see Figure 4.22.2 Side View of Antennas and Figure 4.22.3 Antennas). Access holes were drilled, and cable clams were installed. The cables were routed through the roof panel and down through the electrical cabinet. The transponder was mounted to the starboard side console and positioned to give the boat operator a clear view of the unit (see Figure 4.22.4 Transponder). The chart plotter and radar system on this vessel are not compatible with AIS. The data cable was provided to the operator for future integration to an upgraded radar/plotter.



Figure 4.22.2 Side View of Antennas



Figure 4.22.3 Antennas



Figure 4.22.4 Transponder

##### 4.22.3 Configuration

The transponder was configured in accordance with the installation checklist.

##### 4.22.4 Test and Verification

Operation of the unit was verified.

#### 4.22.5 Installation Checklist

<b>PROTEC-M INSTALLATION CHECKLIST</b>		
<b>Part 1: Pre-Installation Information (provided by the vessel owner/operator).</b>		
Vessel Name (12 Characters Max)	Dauntless	
MMSI Number <small>(Note 1)</small>	338138433	
Radio Call Sign (FCC ONLY)		
Vessel Maximum Draft (meters)	5.5	
GPS Antenna Desired Location	Mounted on light bracket	
VHF Antenna Desired Location	Mounted on light bracket	
Transponder Desired Location	Discussed with operator - on console	
Power Switch Desired Location	Spare	
Chart Plotter (Model/Manufacturer)	Furuno 1850 WDF Not AIS compatible	
Chart Plotter (is data cable available?)	This plotter will not display AIS data	
<b>Part 2: Installation Completed 12/13/2012</b>		
Transponder Serial Number	838003	
Transponder Installed	Yes	
Chart Plotter Connected	No (not compatible)	
Transponder Power Connected	Yes	
VHF Antenna Installed	Yes	
VHF Cable Connected	Yes	
GPS Antenna Installed	Yes	
GPS Cable Connected	Yes	
<b>Part 3: Power Up and Configuration (To be completed by the Installer)</b>		
Transponder Power Up	Yes	
MMSI Number Entered	Yes	
Navigation Status Entered	Underway	
IMO Number (if applicable)	N/A	
Maximum Draft Entered	Yes	
Radio Call Sign (FCC only)	N/A	
Vessel Type Entered	set to 55	Yes
Vessel Name Entered	Yes	
GPS Internal Position Entered	Yes	
GPS External Position Entered	N/A	
AIS Link to Chart Plotter	N/A	
No Alarms Verified	Yes	
Alarm Control Set Up Complete	Yes	
Vessel Length Entered (meters) *	N/A	
Vessel Beam Entered (meters) *	N/A	
Set Nav fixing device to ext GPS antenna *	Set to internal	
NV Persist Configured	set to NO	Default (NO)
Key Bit Size	select one	
Key Entered and Verified	Yes/No	
Contact Information:	Sergeant Kurt Roepcke Baltimore Police Department Marine Unit / Underwater Recovery Team Coordinator/Special Operations 242 W. 29th street WorkCell- 443-938-3122 / 410-365-4366 kurt.roepcke@baltimorepolice.org	
Robert Lewis (Contractor Code 8140) Wilmark & Associates, Inc. Phone (410) 257-4061/4014 Naval Research Laboratory Chesapeake Bay Detachment Bldg. One; Code 8140 5813 Bayside Road Chesapeake Beach, MD 20732	BPD - Dauntless	

#### 4.23 Baltimore Police Department, *Ram 9828*

The ETS integration on the *Ram 9828* was successfully accomplished on February 11, 2013. Vessel assessment, equipment installation, configuration, test and verification, and the installation checklist are provided:

##### 4.23.1 Vessel Assessment

This 25 foot Sea Ark had GPS and VHF antennas on the mast (see Figure 4.23.1 Baltimore Police Department, *Ram 9828*). A power source/switch for the transponder was identified on the power panel.



Figure 4.23.1 Baltimore Police Department, *Ram 9828*



Figure 4.23.2 Mast

##### 4.23.2 Equipment Installation

Cable clams were installed in the mast to accommodate the cables (see antenna and mast at Figure 4.23.2 Mast and Figure 4.23.3 Antenna). The transponder was wired to the power panel. The transponder was mounted on the lower edge of the console and positioned to allow for sufficient space between the port passenger seat and the unit (see Figure 4.23.4 Console and Figure 4.23.5 Transponder). Chart plotter integration was not accomplished because the Furuno 1850WDF chart plotter is not AIS capable.



Figure 4.23.3 Antenna

##### 4.23.3 Configuration

The transponder was configured in accordance with the installation checklist.

##### 4.23.4 Test and Verification

Operation of the unit was verified using an AIS system installed on another vessel



Figure 4.23.4 Console



Figure 4.23.5 Transponder

#### 4.23.5 Installation Checklist

<b>PROTEC-M INSTALLATION CHECKLIST</b>		
<b>Part 1: Pre-Installation Information (provided by the vessel owner/operator).</b>		
Vessel Name (12 Characters Max)	Ram 9828	
MMSI Number <small>(Note 1)</small>	338138435	
Radio Call Sign (FCC ONLY)		
Vessel Maximum Draft (meters)	2	
GPS Antenna Desired Location		
VHF Antenna Desired Location		
Transponder Desired Location		
Power Switch Desired Location		
Chart Plotter (Model/Manufacturer)	Furuno GP 1850 WDF	
Chart Plotter (is data cable available?)	yes	
<b>Part 2: Installation Completed 2/11/2013</b>		
Transponder Serial Number	837998	
Transponder Installed	Yes	
Chart Plotter Connected	No - Not AIS Compatible	
Transponder Power Connected	Yes	
VHF Antenna Installed	Yes	
VHF Cable Connected	Yes	
GPS Antenna Installed	Yes	
GPS Cable Connected	Yes	
<b>Part 3: Power Up and Configuration (To be completed by the Installer)</b>		
Transponder Power Up	Yes	
MMSI Number Entered	Yes	
Navigation Status Entered	Yes	
IMO Number (if applicable)	N/A	
Maximum Draft Entered	Yes	
Radio Call Sign (FCC only)	N/A	
Vessel Type Entered	set to 55	Yes
Vessel Name Entered	Yes	
GPS Internal Position Entered	Yes	
GPS External Position Entered	NO	
AIS Link to Chart Plotter	NO Not compatible	
No Alarms Verified	Yes	
Alarm Control Set Up Complete	Yes	
Vessel Length Entered (meters) *	Derived from GPS	
Vessel Beam Entered (meters) *	Derived from GPS	
Set Nav fixing device to ext GPS antenna *	Default Internal	
NV Persist Configured	set to NO	Default No
Key Bit Size	select one	
Key Entered and Verified	Yes/No	
<b>Contact Information:</b> Robert Lewis (Contractor Code 8140) Wilmark & Associates, Inc. Phone (410) 257-4061/4014 Naval Research Laboratory Chesapeake Bay Detachment Bldg. One; Code 8140 5813 Bayside Road Chesapeake Beach, MD 20732		Sergeant Kurt Roepcke Baltimore Police Department Marine Unit / Underwater Recovery Team Coordinator/Special Operations 242 W. 29th street WorkCell- 443-938-3122 / 410-365-4366 kurt.roepcke@baltimorepolice.org  BPD - Ram9828

#### 4.24 Baltimore Police Department, *Hurricane 1*

The ETS integration on the *Hurricane 1* was successfully accomplished on February 15, 2013. Vessel assessment, equipment installation, configuration, test and verification, and the installation checklist are provided:

##### 4.24.1 Vessel Assessment

This 18 foot Zodiac had an open cockpit with an aluminum cover over the cockpit and part of the passenger area (see Figure 4.24.1 Baltimore Police Department, *Hurricane 1*). The electronics enclosure located above the console did not have sufficient space to mount the transponder. There was sufficient space available on the console for mounting the transponder.



Figure 4.24.1 Baltimore Police Department, *Hurricane 1*

##### 4.24.2 Equipment Installation

The antenna mounts were installed directly onto the roof (see Figure 4.24.2 Antenna). Cable clams were located forward to allow for routing the cables to the electrical/battery compartment. The antenna cables were routed down to the electronics compartment and power was supplied to the unit using the spare 15 ampere circuit breaker. The transponder was flush-mounted (see Figure 4.24.3 Console with Transponder). The Radar/Chart Plotter on this vessel is a Raymarine C80 with only one NMEA connection. This connection is used by the ICom VHF-DSC radio. This installation was problematic because of the limited space available to access the electronics compartment. On 21 February 2013, upon request of the vessel operator, the input from the DSC radio on *Hurricane 1* was removed and the data cable was terminated for connection between the AIS transponder and the C80 multi-function display. The C80 was configured for AIS operation and the vessel name and MMSI was verified; the radar was functioning properly.

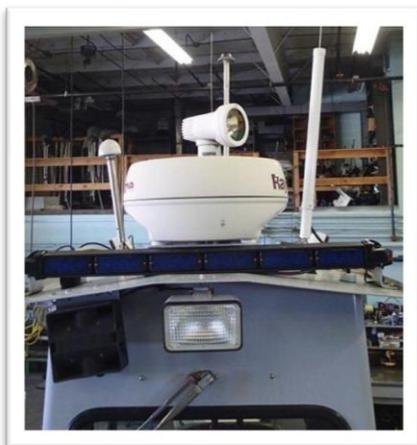


Figure 4.24.2 Antenna



Figure 4.24.3 Console with Transponder

##### 4.24.3 Configuration

The transponder was configured in accordance with the installation checklist.

##### 4.24.4 Test and Verification

The system was tested and is fully operational.

#### 4.24.5 Installation Checklist

<b>PROTEC-M INSTALLATION CHECKLIST</b>		
<b>Part 1: Pre-Installation Information (provided by the vessel owner/operator).</b>		
Vessel Name (12 Characters Max)	Hurricane 1	
MMSI Number <small>(Note 1)</small>	338138437	
Radio Call Sign (FCC ONLY)		
Vessel Maximum Draft (meters)		
GPS Antenna Desired Location		
VHF Antenna Desired Location		
Transponder Desired Location		
Power Switch Desired Location		
Chart Plotter (Model/Manufacturer)	RayMarine C80	
Chart Plotter (is data cable available?)	Yes	
<b>Part 2: Installation Completed 2/15/2013</b>		
Transponder Serial Number	837996	
Transponder Installed	Yes	
Chart Plotter Connected	No - NMEA connection in use with Radio	
Transponder Power Connected	Yes	
VHF Antenna Installed	Yes	
VHF Cable Connected	Yes	
GPS Antenna Installed	Yes	
GPS Cable Connected	Yes	
<b>Part 3: Power Up and Configuration (To be completed by the Installer)</b>		
Transponder Power Up	Yes	
MMSI Number Entered	Yes	
Navigation Status Entered	Yes (Underway)	
IMO Number (if applicable)	N/A	
Maximum Draft Entered	Yes (0.5m)	
Radio Call Sign (FCC only)	N/A	
Vessel Type Entered	set to 55	Yes
Vessel Name Entered	Yes	
GPS Internal Position Entered	Yes	
GPS External Position Entered	N/A	
AIS Link to Chart Plotter	No - NMEA cable in use with Radio	
No Alarms Verified	Yes	
Alarm Control Set Up Complete	Yes	
Vessel Length Entered (meters) *	N/A Derived from GPS antenna position	
Vessel Beam Entered (meters) *	N/A Derived from GPS antenna position	
Set Nav fixing device to ext GPS antenna *	No External GPS - Set to Internal	
NV Persist Configured	set to NO	Default NO
Key Bit Size	select one	
Key Entered and Verified	Yes/No	
Contact Information:	Sergeant Kurt Roepcke Baltimore Police Department Marine Unit / Underwater Recovery Team Coordinator/Special Operations 242 W. 29th street WorkCell- 443-938-3122 / 410-365-4366 kurt.roepcke@baltimorepolice.org	
Robert Lewis (Contractor Code 8140) Wilmark & Associates, Inc. Phone (410) 257-4061/4014 Naval Research Laboratory Chesapeake Bay Detachment Bldg. One; Code 8140 5813 Bayside Road Chesapeake Beach, MD 20732	BPD - Hurricane1	

#### 4.25 Baltimore Police Department, *Hurricane 2*

The ETS integration on the *Hurricane 2* was successfully accomplished on February 13, 2013. Vessel assessment, equipment installation, configuration, test and verification, and the installation checklist are provided:

##### 4.25.1 Vessel Assessment

This 18 foot Zodiac had an open cockpit with an aluminum cover over the cockpit and part of the passenger area (see Figure 4.25.1 Baltimore Police Department, *Hurricane 2*). The electronics enclosure located above the console did not have sufficient space to mount the transponder, nor was there sufficient space available on the console for mounting the transponder.

##### 4.25.2 Equipment Installation

The antenna mounts were installed directly onto the roof (see Figure 4.25.2 Antenna).



Figure 4.25.1 Baltimore Police Department, *Hurricane 2*

Cable clams were located forward to allow for routing the cables to the electrical/battery compartment. The transponder was mounted in the electronics compartment by attaching the mount to the bulkhead (see Figure 4.25.3 Console and Transponder). The antenna cables were routed down to the electronics compartment and power was supplied to the unit through the spare 5 ampere circuit breaker.

The Radar/Chart Plotter on this vessel is a Raymarine C80 with only one NMEA connection. This connection is used by the ICom VHF-DSC radio. After consulting with the vessel operator, the NMEA cable was installed on the plotter with the other end being used by the ICom VHF radio, and the DSC input was disconnected to allow for the connection of the AIS transponder.



Figure 4.25.2 Antenna

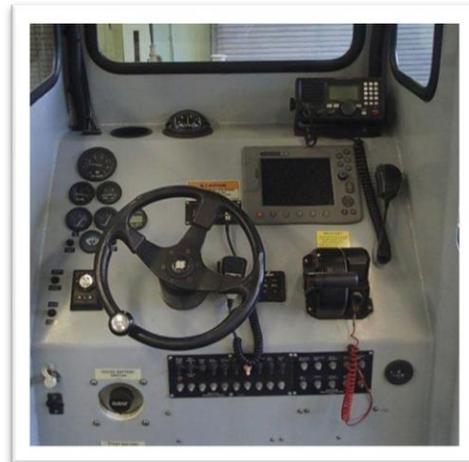


Figure 4.25.3 Console and Transponder

##### 4.25.3 Configuration

The transponder was configured in accordance with the installation checklist.

##### 4.25.4 Test and Verification

The system was checked for proper operation.

#### 4.25.5 Installation Checklist

<b>PROTEC-M INSTALLATION CHECKLIST</b>		
<b>Part 1: Pre-Installation Information (provided by the vessel owner/operator).</b>		
Vessel Name (12 Characters Max)	Hurricane 2	
MMSI Number <small>(Note 1)</small>	338138439	
Radio Call Sign (FCC ONLY)		
Vessel Maximum Draft (meters)		
GPS Antenna Desired Location		
VHF Antenna Desired Location		
Transponder Desired Location		
Power Switch Desired Location		
Chart Plotter (Model/Manufacturer)	RayMarine C80	
Chart Plotter (is data cable available?)	Yes	
<b>Part 2: Installation Completed 2/13/2013</b>		
Transponder Serial Number	838000	
Transponder Installed	Yes	
Chart Plotter Connected	NMEA cable in use by DSC Radio	
Transponder Power Connected	Yes	
VHF Antenna Installed	Yes	
VHF Cable Connected	Yes	
GPS Antenna Installed	Yes	
GPS Cable Connected	Yes	
<b>Part 3: Power Up and Configuration (To be completed by the Installer)</b>		
Transponder Power Up	Yes	
MMSI Number Entered	Yes	
Navigation Status Entered	Yes	
IMO Number (if applicable)	N/A	
Maximum Draft Entered	Yes	
Radio Call Sign (FCC only)	N/A	
Vessel Type Entered	set to 55	Yes
Vessel Name Entered	Yes	
GPS Internal Position Entered	Yes	
GPS External Position Entered	Yes	
AIS Link to Chart Plotter	NMEA Cable in use by DSC Radio	
No Alarms Verified	Yes	
Alarm Control Set Up Complete	Yes	
Vessel Length Entered (meters) *	Derived from the GPS position	
Vessel Beam Entered (meters) *	Derived from the GPS position	
Set Nav fixing device to ext GPS antenna *	Set to Internal	
NV Persist Configured	set to NO	Default (NO)
Key Bit Size	select one	
Key Entered and Verified	Yes/No	
Contact Information:	Sergeant Kurt Roepcke	
Robert Lewis	Baltimore Police Department	
(Contractor Code 8140)	Marine Unit / Underwater Recovery	
Wilmark & Associates, Inc.	Team Coordinator/Special Operations	
Phone (410) 257-4061/4014	242 W. 29th street	
Naval Research Laboratory	WorkCell- 443-938-3122 / 410-365-4366	
Chesapeake Bay Detachment	kurt.roepcke@baltimorepolice.org	
Bldg. One; Code 8140		
5813 Bayside Road		
Chesapeake Beach, MD 20732	BPD - Hurricane2	

#### 4.26 Calvert County Sheriff, *SPECOPS 2*

The ETS integration on the *SPECOPS 2* was successfully accomplished on February 14, 2013. Vessel assessment, equipment installation, configuration, test and verification, and the installation checklist are provided:

##### 4.26.1 Vessel Assessment

This 36 foot Sea Ark did not have a power source/switch available for use (see Figure 4.26.1 Calvert County Sheriff, *SPECOPS 2*).



Figure 4.26.1 Calvert County Sheriff, *SPECOPS 2*



Figure 4.26.2 Antennas

##### 4.26.2 Equipment Installation

GPS and VHF antennas were located on the mast, and cable clams were installed in the mast to accommodate the cables (see Figure 4.26.2 Antennas). The power for the unit was provided directly from the DC main switch and can be switched at the pilot's power console. The transponder was installed on the console shelf behind the radar display unit (see Figure 4.26.3 Console and Figure 4.26.4 Transponder).



Figure 4.26.3 Console

The integration of the transponder with the Furuno RDP-149 Multifunction display was not successful. The RDP149 requires that AIS data is input on Data port 2, which was in use by another piece of equipment, most likely the DSC radio. A cable was fabricated to attempt to input the AIS data on Data port 4. Data port 4 read the AIS data but does not display the data on the chart plotter. The Furuno interconnection chart shows that AIS data is only parsed on Data port 2. The vessel operator plans to discuss the issue with superiors to see if the system using Data port 2 can be input on Data port 4 without causing system issues. The data ports have dissimilar pin outs and the cables would need to be re-terminated for each piece of equipment.

##### 4.26.3 Configuration

The transponder was configured in accordance with the installation checklist.

##### 4.26.4 Test and Verification

Operation of the unit was verified using an AIS Test Set.

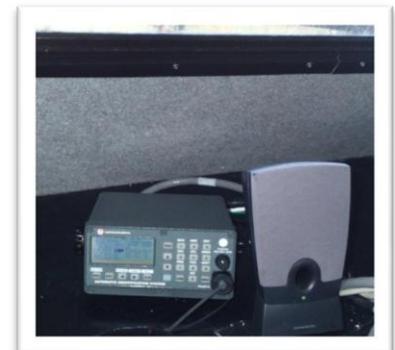


Figure 4.26.4 Transponder



#### 4.27 Calvert County Sheriff, *SPECOPS 3*

The ETS integration on the *SPECOPS 3* was successfully accomplished on December 12, 2012. Vessel assessment, equipment installation, configuration, test and verification, and the installation checklist are provided:

##### 4.27.1 Vessel Assessment

This 25 foot Sea Ark did not have sufficient space to install the antenna mounts and antennas while allowing enough clearance for the camera system (see Figure 4.27.1 Calvert County Sheriff, *SPECOPS 3*). A power source/switch for the transponder was identified on the power panel.



Figure 4.27.1 Calvert County Sheriff, *SPECOPS 3*

##### 4.27.2 Equipment Installation

The antenna mounts and antennas were located on the sides of the light bar bracket. GPS and VHF antennas were installed, and cable clams were placed in the roof to accommodate the cables. The transponder was installed on the shelf below the console on the port side (see Figure 4.27.2 Console and Figure 4.27.3 Transponder). The integration of the transponder and Garmin chart plotter was completed and verified.



Figure 4.27.2 Console



Figure 4.27.3 Transponder

##### 4.27.3 Configuration

The transponder was configured in accordance with the installation checklist.

##### 4.27.4 Test and Verification

Operation of the unit was verified using an AIS system installed on another vessel.

#### 4.27.5 Installation Checklist

<b>PROTEC-M INSTALLATION CHECKLIST</b>		
<b>Part 1: Pre-Installation Information (provided by the vessel owner/operator).</b>		
Vessel Name (12 Characters Max)	SPECOPS 3	
MMSI Number <small>(Note 1)</small>	338138893	
Radio Call Sign (FCC ONLY)		
Vessel Maximum Draft (meters)	1	
GPS Antenna Desired Location	Forward Light bracket	
VHF Antenna Desired Location	Forward Light bracket	
Transponder Desired Location	Below port console on side of shelf	
Power Switch Desired Location	GPS Switch	
Chart Plotter (Model/Manufacturer)	F1724C and Garmin 541S	
Chart Plotter (is data cable available?)	Yes	
<b>Part 2: Installation Completed 12/12/2012</b>		
Transponder Serial Number	838009	
Transponder Installed	Yes	
Chart Plotter Connected	Yes	
Transponder Power Connected	Yes	
VHF Antenna Installed	Yes	
VHF Cable Connected	Yes	
GPS Antenna Installed	Yes	
GPS Cable Connected	Yes	
<b>Part 3: Power Up and Configuration (To be completed by the Installer)</b>		
Transponder Power Up	Yes	
MMSI Number Entered	Yes	
Navigation Status Entered	Underway	
IMO Number (if applicable)	N/A	
Maximum Draft Entered	Yes	
Radio Call Sign (FCC only)	N/A	
Vessel Type Entered	set to 55	Yes
Vessel Name Entered	Yes	
GPS Internal Position Entered	Yes	
GPS External Position Entered	N/A	
AIS Link to Chart Plotter	Yes	
No Alarms Verified	Yes	
Alarm Control Set Up Complete	Yes	
Vessel Length Entered (meters) *	(derived from GPS position)	
Vessel Beam Entered (meters) *	(derived from GPS position)	
Set Nav fixing device to ext GPS antenna *	Default to internal	
NV Persist Configured	set to NO	Default to NO
Key Bit Size	select one	
Key Entered and Verified	Yes/No	
Contact Information:	Christopher M. Sloane Calvert County Sheriff's Office Special Operations Team 443-624-3296	
Robert Lewis (Contractor Code 8140) Wilmark & Associates, Inc. Phone (410) 257-4061/4014 Naval Research Laboratory Chesapeake Bay Detachment Bldg. One; Code 8140 5813 Bayside Road Chesapeake Beach, MD 20732	Calvert CS - SPECOPS3	

#### 4.28 Charles County Sheriff, Boat 1

The ETS integration on the *Boat 1* was successfully accomplished on December 19, 2012. Vessel assessment, equipment installation, configuration, test and verification, and the installation checklist are provided:

##### 4.28.1 Vessel Assessment

This 25 foot Sea Ark did not have sufficient space to install the antenna mounts and antennas, and still have enough clearance for the camera system (see Figure 4.28.1 Charles County Sheriff, *Boat 1*). A power source/switch (GPS) for the transponder was identified on the power panel.



Figure 4.28.1 Charles County Sheriff, *Boat 1*

##### 4.28.2 Equipment Installation

The GPS and VHF antenna mounts and antennas were located on the sides of the light bar bracket (see Figure 4.28.2 Antennas). Cable clams were installed in the roof to accommodate the cables. A power source/switch (GPS) for the transponder was integrated. The transponder was installed on the side of the shelf below the console on the port side (see Figure 4.28.3 Console and Figure 4.28.4 Transponder). The integration of the transponder and Garmin chart plotter was completed and verified.



Figure 4.28.2 Antennas



Figure 4.28.3 Console



Figure 4.28.4 Transponder

##### 4.28.3 Configuration

The transponder was configured in accordance with the installation checklist.

##### 4.28.4 Test and Verification

Operation of the unit was verified using an AIS Test Set. This installation is complete.

#### 4.28.5 Installation Checklist

<b>PROTEC-M INSTALLATION CHECKLIST</b>		
<b>Part 1: Pre-Installation Information (provided by the vessel owner/operator).</b>		
Vessel Name (12 Characters Max)	CCSO Boat 1	
MMSI Number <small>(Note 1)</small>	338139316	
Radio Call Sign (FCC ONLY)		
Vessel Maximum Draft (meters)	0.7	
GPS Antenna Desired Location	Mast wing, star side 15' to transponder	
VHF Antenna Desired Location	currently on top cabin	
Transponder Desired Location	current sounder is on star transom	
Power Switch Desired Location	current gps switch is on port side wheel	
Chart Plotter (Model/Manufacturer)	Garmin GPSmap 541s	
Chart Plotter (is data cable available?)	no	
<b>Part 2: Installation Completed 12/19/2012</b>		
Transponder Serial Number	837993	
Transponder Installed	Yes	
Chart Plotter Connected	Yes	
Transponder Power Connected	Yes	
VHF Antenna Installed	Yes	
VHF Cable Connected	Yes	
GPS Antenna Installed	Yes	
GPS Cable Connected	Yes	
<b>Part 3: Power Up and Configuration (To be completed by the Installer)</b>		
Transponder Power Up	Yes	
MMSI Number Entered	Yes	
Navigation Status Entered	Yes	
IMO Number (if applicable)	N/A	
Maximum Draft Entered	Yes	
Radio Call Sign (FCC only)	N/A	
Vessel Type Entered	set to 55	Yes
Vessel Name Entered	Yes	
GPS Internal Position Entered	Yes	
GPS External Position Entered	Yes	
AIS Link to Chart Plotter	Yes	
No Alarms Verified	Yes	
Alarm Control Set Up Complete	Yes	
Vessel Length Entered (meters) *	Derived from GPS antenna position	
Vessel Beam Entered (meters) *	Derived from GPS antenna position	
Set Nav fixing device to ext GPS antenna *	Default to Internal	
NV Persist Configured	set to NO	Default to NO
Key Bit Size	select one	
Key Entered and Verified	Yes/No	
Contact Information: Robert Lewis (Contractor Code 8140) Wilmark & Associates, Inc. Phone (410) 257-4061/4014 Naval Research Laboratory Chesapeake Bay Detachment Bldg. One; Code 8140 5813 Bayside Road Chesapeake Beach, MD 20732		Charles CS - Boat1

#### 4.29 Charles County Sheriff, Boat 2

The ETS integration on the *Boat 2* was successfully accomplished on December 18, 2012. Vessel assessment, equipment installation, configuration, test and verification, and the installation checklist are provided:

##### 4.29.1 Vessel Assessment

This 24 foot Zodiac had an open cockpit with a canvas cover over the cockpit and part of the passenger area (see Figure 4.29.1 Charles County Sheriff, *Boat 2*). There were no readily available points for the antenna mounts nor was there sufficient space on the console to mount the transponder.



Figure 4.29.1 Charles County Sheriff, *Boat 2*

##### 4.29.2 Equipment Installation

The antenna mounts were installed on an available roof support brace (see Figure 4.29.2 Antennas). Cable clams were co-located with each of the mounts and the signal cables were routed through the roof and down a support pipe to the electronics enclosure. The electronics enclosure located above the console was the only option for installation of the transponder (see Figure 4.29.3 Console & Transponder). A pass-through was cut to accommodate the incoming signal cables and the outgoing power, ground and communications cables. An access was cut into the forward vertical support pipe to allow routing of the power, ground and communications cables to the electrical bay inside the console. The cable way had very limited space to run the cables. A patch cable was fabricated to replace the much larger data communications cable in the cable run. The chart plotter is a Garmin 4212; a NMEA communications cable was provided for communications between the plotter and transponder. All cables required extensions to allow for the length of run.



Figure 4.29.2 Antennas

##### 4.29.3 Configuration

The transponder was configured in accordance with the installation checklist.

##### 4.29.4 Test and Verification

The systems were tested for communications and proper operation.

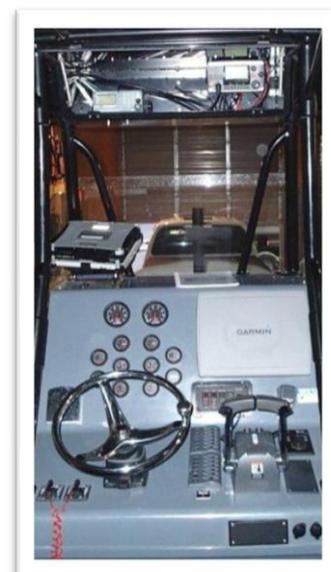


Figure 4.29.3 Console & Transponder

4.29.5 Installation Checklist

<b>PROTEC-M INSTALLATION CHECKLIST</b>	
<b>Part 1: Pre-Installation Information (provided by the vessel owner/operator).</b>	
Vessel Name (12 Characters Max)	CCSO Boat 2
MMSI Number <small>(Note 1)</small>	338139318
Radio Call Sign (FCC ONLY)	
Vessel Maximum Draft (meters)	0.6
GPS Antenna Desired Location	installer's discretion
VHF Antenna Desired Location	installer's discretion
Transponder Desired Location	installer's discretion
Power Switch Desired Location	installer's discretion
Chart Plotter (Model/Manufacturer)	Garmin
Chart Plotter (is data cable available?)	no
<b>Part 2: Installation Completed 12/18/2012</b>	
Transponder Serial Number	830328
Transponder Installed	Yes
Chart Plotter Connected	Yes
Transponder Power Connected	Yes
VHF Antenna Installed	Yes
VHF Cable Connected	Yes
GPS Antenna Installed	Yes
GPS Cable Connected	Yes
<b>Part 3: Power Up and Configuration (To be completed by the Installer)</b>	
Transponder Power Up	Yes
MMSI Number Entered	Yes
Navigation Status Entered	Yes
IMO Number (if applicable)	N/A
Maximum Draft Entered	Yes
Radio Call Sign (FCC only)	N/A
Vessel Type Entered	set to 55
Vessel Name Entered	Yes
GPS Internal Position Entered	Yes
GPS External Position Entered	Yes
AIS Link to Chart Plotter	Yes
No Alarms Verified	Yes
Alarm Control Set Up Complete	Yes
Vessel Length Entered (meters) *	Derived from GPS Antenna position
Vessel Beam Entered (meters) *	Derived from GPS Antenna position
Set Nav fixing device to ext GPS antenna *	Default to Internal
NV Persist Configured	set to NO
Key Bit Size	select one
Key Entered and Verified	Yes/No
Contact Information: Robert Lewis (Contractor Code 8140) Wilmark & Associates, Inc. Phone (410) 257-4061/4014 Naval Research Laboratory Chesapeake Bay Detachment Bldg. One; Code 8140 5813 Bayside Road Chesapeake Beach, MD 20732	Charles CS - Boat2

#### 4.30 Prince Georges County Patrol Vessel, PG1289

The ETS integration on PG1289 was successfully accomplished on October 23, 2012. Vessel assessment, equipment installation, configuration, test and verification, and the installation checklist are provided:

##### 4.30.1 Vessel Assessment

This 25 foot Sea Ark patrol vessel had identified GPS and VHF antenna locations (see Figure 4.30.1 Prince Georges County Patrol Vessel, PG1289). This vessel was equipped with shelving on the port side below the console that was available for placement of the transponder.



Figure 4.30.1 Prince Georges County Patrol Vessel, PG1289

##### 4.30.2 Equipment Installation

The GSP and VHF antennas were installed (see Figure 4.30.2 Antennas), and cable clams were installed onto the mast to accommodate the required cabling. The transponder was installed on the port side shelving (see Figure 4.30.3 Transponder).

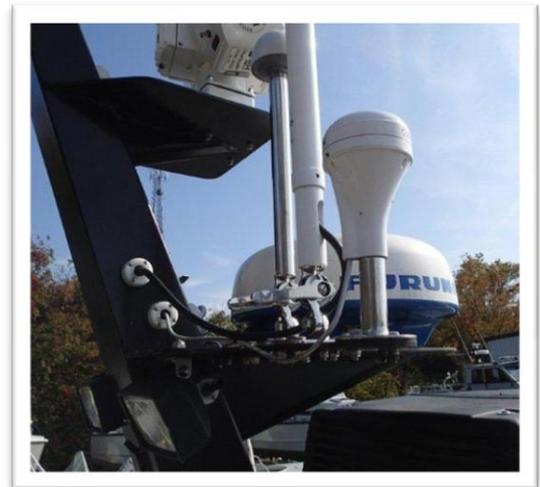


Figure 4.30.2 Antennas

The vessel is equipped with a Garmin 541S chart plotter that has an integrated data and power cable. Several hours were spent attempting to identify a communications error between the AIS and the chart plotter. A second visit on 7 November 2012 was required to continue troubleshooting, and an additional visit was needed to repair a severed cable. During the troubleshooting, it was noted that the vessel had been stored with the mast open during several days of inclement weather. The mast, VHF connector, and VHF antenna were filled with water, which caused an initial Voltage Standing Wave Ratio (VSWR) error during transmission.

Inspection of the GPS cable from the antenna to the transponder revealed that the cable had been severed at the mast opening. An additional site visit was required to repair the cable and complete the integration.

##### 4.30.3 Configuration

The transponder was configured in accordance with the installation checklist.

##### 4.30.4 Test and Verification

The unit was transmitting and verification of the operational status of the unit was conducted using a Furuno FA100 AIS transponder. Verification was made of both transmit and receive signals.



Figure 4.30.3 Transponder

#### 4.30.5 Installation Checklist

<b>PROTEC-M INSTALLATION CHECKLIST</b>		
<b>Part 1: Pre-Installation Information (provided by the vessel owner/operator).</b>		
Vessel Name (12 Characters Max)	#1289	
MMSI Number <small>(Note 1)</small>	338138414	
Radio Call Sign (FCC ONLY)	NA	
Vessel Maximum Draft (meters)	2	
GPS Antenna Desired Location	Installed on mast, port side	
VHF Antenna Desired Location	Installed on mast, port side	
Transponder Desired Location	Installed on shelf below port console	
Power Switch Desired Location	Integrated with the Garmin	
Chart Plotter (Model/Manufacturer)	GPS Maps 541s	
Chart Plotter (is data cable available?)	Yes - Integrated with power cable	
<b>Part 2: Installation Completed 10/23/2012</b>		
Transponder Serial Number	830329	
Transponder Installed	yes	
Chart Plotter Connected	no	
Transponder Power Connected	yes	
VHF Antenna Installed	yes	
VHF Cable Connected	yes	
GPS Antenna Installed	yes	
GPS Cable Connected	yes	
<b>Part 3: Power Up and Configuration (To be completed by the Installer)</b>		
Transponder Power Up	yes	
MMSI Number Entered	yes (Verified)	
Navigation Status Entered	Yes (Set to underway)	
IMO Number (if applicable)	N/A	
Maximum Draft Entered	yes	
Radio Call Sign (FCC only)	N/A	
Vessel Type Entered	set to 55	Yes
Vessel Name Entered	Yes (1289)	
GPS Internal Position Entered	Yes	
GPS External Position Entered	N/A	
AIS Link to Chart Plotter	to be completed by the installer	
No Alarms Verified	no	
Alarm Control Set Up Complete	Yes	
Vessel Length Entered (meters) *	No input for vessel length	
Vessel Beam Entered (meters) *	No input for vessel length	
Set Nav fixing device to ext GPS antenna *	Set to Installed Internal GPS	
NV Persist Configured	set to NO	Default (NO)
Key Bit Size	select one	to be completed by the installer
Key Entered and Verified	Yes/No	to be completed by the installer
Contact Information:	Hamilton, Scott A<SAHamilton@co.pg.md.us>	
Robert Lewis	Cpl. Scott Hamilton #2135	
(Contractor Code 8140)	Prince George's County Police Department	
Wilmark & Associates, Inc.	Special Operations Division, Marine Unit	
Phone (410) 257-4061/4014	6700 Riverdale Road, Riverdale MD. 20737	
Naval Research Laboratory	Office 301 731-4422	
Chesapeake Bay Detachment	Cell 240 481-5874	
Bldg. One; Code 8140		
5813 Bayside Road		
Chesapeake Beach, MD 20732	PGCP - PG1289	



**APPENDIX A – ABBREVIATIONS AND DEFINITIONS**

ABBREVIATIONS	DEFINITIONS
AIS	Automatic Identification System
AOR	Area of Responsibility
COTP	Captain of the Port
DC	Direct Current
DSC	Digital Selective Calling
EIC	Electronic Indicator Control
ETS	Encrypted Tracking System
FLIR	Forward Looking Infrared
GPS	Global Positioning System
IPP	Infrastructure Protection Program
ITAR	International Traffic in Arms Regulation
MD	Maryland
MLEIN	Maritime Law Enforcement Information Network
MMSI	Mobile Maritime Service Identifier
MTOG	Maritime Tactical Operations Group
NAV	Navigation
NCR	National Capital Region
NMEA	National Marine Electronics Association
NRL	Naval Research Laboratory
NRP	Maryland Natural Resources Police
NV	Night Vision
PSGP	Port Security Grant Program
STEDS	Sensitive But Classified (SBU) Tactical Information Exchange and Display System
VAC	Voltage Alternating Current
VHF	Very High Frequency
VSWR	Voltage Standing Wave Ratio
VTS	Vessel Tracking System



**APPENDIX B – PROPERTY INVENTORY**

**FY 2011 PSGP Award: EMW-2011-PU-SO1 / 97.056 – MTOG AIS Project**

<b>Description of Property</b>	<b>Name of Vendor Purchase Order #</b>	<b>Serial #</b>	<b>Location and Use / Disposition</b>
PROTEC-M AIS	L3-Com	000837992	MD Natural Resources Police - NRP104
VHF Ant 159HD	MORAD		MD Natural Resources Police - NRP104
GPS Ant	TRIMBLE		MD Natural Resources Police - NRP104
PROTEC-M AIS	L3-Com	000830332	MD Natural Resources Police - NRP106
VHF Ant 159HD	MORAD		MD Natural Resources Police - NRP106
GPS Ant	TRIMBLE		MD Natural Resources Police - NRP106
PROTEC-M AIS	L3-Com	000837989	MD Natural Resources Police - NRP109
VHF Ant 159HD	MORAD		MD Natural Resources Police - NRP109
GPS Ant	TRIMBLE		MD Natural Resources Police - NRP109
PROTEC-M AIS	L3-Com	000838008	MD Natural Resources Police - NRP111
VHF Ant 159HD	MORAD		MD Natural Resources Police - NRP111
GPS Ant	TRIMBLE		MD Natural Resources Police - NRP111
PROTEC-M AIS	L3-Com	000837997	MD Natural Resources Police - NRP139
VHF Ant 159HD	MORAD		MD Natural Resources Police - NRP139
GPS Ant	TRIMBLE		MD Natural Resources Police - NRP139
PROTEC-M AIS	L3-Com	000830327	MD Natural Resources Police - NRP140
VHF Ant 159HD	MORAD		MD Natural Resources Police - NRP140
GPS Ant	TRIMBLE		MD Natural Resources Police - NRP140
PROTEC-M AIS	L3-Com	000838004	MD Natural Resources Police - NRP141
VHF Ant 159HD	MORAD		MD Natural Resources Police - NRP141
GPS Ant	TRIMBLE		MD Natural Resources Police - NRP141
PROTEC-M AIS	L3-Com	000837995	MD Natural Resources Police - NRP143
VHF Ant 159HD	MORAD		MD Natural Resources Police - NRP143
GPS Ant	TRIMBLE		MD Natural Resources Police - NRP143
PROTEC-M AIS	L3-Com	000830331	MD Natural Resources Police - NRP144
VHF Ant 159HD	MORAD		MD Natural Resources Police - NRP144
GPS Ant	TRIMBLE		MD Natural Resources Police - NRP144
PROTEC-M AIS	L3-Com	000838007	MD Natural Resources Police - NRP146
VHF Ant 159HD	MORAD		MD Natural Resources Police - NRP146
GPS Ant	TRIMBLE		MD Natural Resources Police - NRP146
PROTEC-M AIS	L3-Com	000837994	MD Natural Resources Police - NRP147
VHF Ant 159HD	MORAD		MD Natural Resources Police - NRP147
GPS Ant	TRIMBLE		MD Natural Resources Police - NRP147
PROTEC-M AIS	L3-Com	000838011	MD Natural Resources Police - NRP148
VHF Ant 159HD	MORAD		MD Natural Resources Police - NRP148
GPS Ant	TRIMBLE		MD Natural Resources Police - NRP148
PROTEC-M AIS	L3-Com	000838012	MD Trans Authority Police - Marine1
VHF Ant 159HD	MORAD		MD Trans Authority Police - Marine1
GPS Ant	TRIMBLE		MD Trans Authority Police - Marine1
PROTEC-M AIS	L3-Com	000837990	MD Trans Authority Police - Marine2
VHF Ant 159HD	MORAD		MD Trans Authority Police - Marine2
GPS Ant	TRIMBLE		MD Trans Authority Police - Marine2
PROTEC-M AIS	L3-Com	000838005	MD Trans Authority Police - Marine3
VHF Ant 159HD	MORAD		MD Trans Authority Police - Marine3
GPS Ant	TRIMBLE		MD Trans Authority Police - Marine3
PROTEC-M AIS	L3-Com	000838010	MD Trans Authority Police - Marine4
VHF Ant 159HD	MORAD		MD Trans Authority Police - Marine4

<b>Description of Property</b>	<b>Name of Vendor Purchase Order #</b>	<b>Serial #</b>	<b>Location and Use / Disposition</b>
GPS Ant	TRIMBLE		MD Trans Authority Police - Marine4
PROTEC-M AIS	L3-Com	000838001	Annapolis City Police - Annapolis
VHF Ant 159HD	MORAD		Annapolis City Police - Annapolis
GPS Ant	TRIMBLE		Annapolis City Police - Annapolis
PROTEC-M AIS	L3-Com	000837999	Anne Arundel Co. Police - Patriot
VHF Ant 159HD	MORAD		Anne Arundel Co. Police - Patriot
GPS Ant	TRIMBLE		Anne Arundel Co. Police - Patriot
PROTEC-M AIS	L3-Com	000838002	Baltimore Co. Police - Marine1
VHF Ant 159HD	MORAD		Baltimore Co. Police - Marine1
GPS Ant	TRIMBLE		Baltimore Co. Police - Marine1
PROTEC-M AIS	L3-Com	000838003	Baltimore Police Dept - Dauntless
VHF Ant 159HD	MORAD		Baltimore Police Dept - Dauntless
GPS Ant	TRIMBLE		Baltimore Police Dept - Dauntless
PROTEC-M AIS	L3-Com	000837996	Baltimore Police Dept - Hurricane1
VHF Ant 159HD	MORAD		Baltimore Police Dept - Hurricane1
GPS Ant	TRIMBLE		Baltimore Police Dept - Hurricane1
PROTEC-M AIS	L3-Com	000838000	Baltimore Police Dept - Hurricane2
VHF Ant 159HD	MORAD		Baltimore Police Dept - Hurricane2
GPS Ant	TRIMBLE		Baltimore Police Dept - Hurricane2
PROTEC-M AIS	L3-Com	000837998	Baltimore Police Dept - Ram9828
VHF Ant 159HD	MORAD		Baltimore Police Dept - Ram9828
GPS Ant	TRIMBLE		Baltimore Police Dept - Ram9828
PROTEC-M AIS	L3-Com	000838006	Calvert Co. Sheriff- SPECOPS2
VHF Ant 159HD	MORAD		Calvert Co. Sheriff- SPECOPS2
GPS Ant	TRIMBLE		Calvert Co. Sheriff- SPECOPS2
PROTEC-M AIS	L3-Com	000838009	Calvert Co. Sheriff - SPECOPS3
VHF Ant 159HD	MORAD		Calvert Co. Sheriff - SPECOPS3
GPS Ant	TRIMBLE		Calvert Co. Sheriff - SPECOPS3
PROTEC-M AIS	L3-Com	000837993	Charles Co. Sheriff - Boat1
VHF Ant 159HD	MORAD		Charles Co. Sheriff - Boat1
GPS Ant	TRIMBLE		Charles Co. Sheriff - Boat1
PROTEC-M AIS	L3-Com	000830328	Charles Co. Sheriff - Boat2
VHF Ant 159HD	MORAD		Charles Co. Sheriff - Boat2
GPS Ant	TRIMBLE		Charles Co. Sheriff - Boat2
PROTEC-M AIS	L3-Com	000830329	Price Georges Co. Police - PG1289
VHF Ant 159HD	MORAD		Price Georges Co. Police - PG1289
GPS Ant	TRIMBLE		Price Georges Co. Police - PG1289

**FY 2011 PSGP Award: EMW-2011-PU-APP-00366 – NRP AIS Project in the NCR**

<b>Description of Property</b>	<b>Name of Vendor Purchase Order #</b>	<b>Serial #</b>	<b>Location and Use / Disposition</b>
PROTEC-M AIS	L3-Com	000830330	MD Natural Resources Police - NRP110
VHF Ant 159HD	MORAD		MD Natural Resources Police - NRP110
GPS Ant	TRIMBLE		MD Natural Resources Police - NRP110
PROTEC-M AIS	L3-Com	000837991	MD Natural Resources Police - NRP138
VHF Ant 159HD	MORAD		MD Natural Resources Police - NRP138
GPS Ant	TRIMBLE		MD Natural Resources Police - NRP138