



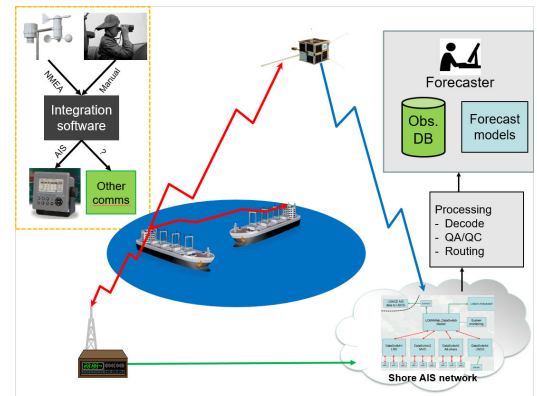
US Army Corps  
of Engineers®

Engineer Research and  
Development Center

# Shipboard weather observations via the Automatic Identification System (AIS)

## Description

This project is investigating the feasibility of automating and increasing the frequency of collection of observations by using existing Automatic Identification System (AIS) equipment installed aboard commercial vessels. A processor aboard a vessel will connect to existing or specially installed weather sensors, process the observations and create an AIS message that can be presented to the ship's AIS transceiver. The transceiver will transmit it (without affecting the normal operation of the AIS) and the transmitted message may be received by other vessels, shore AIS stations, or AIS receivers aboard low earth orbit satellites. Once received, the messages will be parsed, placed in a database, and provided to forecasters or others who find the data valuable.



## Issue

In the aftermath of the sinking of the US-flagged containership EL FARO in October 2015, one of the recommendations of the U.S. National Transportation Safety Board (NTSB) was to explore increasing the collection of weather data from ships in order to improve weather forecast products. Currently the National Weather Service runs the Voluntary Observing Ship (VOS) program, where ships voluntarily submit weather observations to NOAA. However, only a small fraction of the thousands of vessels sailing worldwide participate in this program, and VOS weather observations are submitted infrequently via a mainly manual process. This capability has the potential to augment VOS and increase the number of observations collected, fill in gaps in areas where observations are scarce, and improve ocean weather forecasts.

## Users

US Maritime Administration (MARAD), NOAA NWS, USACE, Other Federal agencies, oceanic researchers, academia, the maritime industry.

## Approach & Products

Bench test: In September 2018 initial testing was conducted in a lab set up by Alion Science (now Serco) to test the concept. This test successfully collected weather observations automatically from a sensor, created AIS messages containing the observations, presented them to an AIS transceiver which transmitted them, and the messages were received by test equipment

Moored vessel test: An installation of a weather sensor and processor was conducted aboard the MARAD ship CAPE WRATH moored in Baltimore. This test successfully proved the ability to generate messages, transmit them via a ship's AIS transceiver, and receive them via a shore AIS network. The ability to parse and store the data from the received messages was also demonstrated.

Underway vessel test: A system was installed on the Massachusetts Maritime Academy training vessel KENNEDY for their January-February 2019 winter cruise from

Massachusetts to the Caribbean. In addition to receiving the AIS transmissions from shore networks, two AIS satellite services (Exact Earth and Spire Global) agreed to share the data they received from the KENNEDY. This test proved the ability of the system to operate for an extended period, and the initial capability to receive messages via satellite.

Installation aboard commercial vessels: The current phase of the project is the installation of systems on commercial vessels sailing various routes. Systems have been installed aboard ships from APL, Pasha, Matson, Crowley, Tote, Maersk, Hapag-Lloyd, Interlake Shipping, and a NOAA research vessel. As of December 2019, there are installations aboard 12 vessels sailing the Great Lakes, transpacific, transatlantic, and Caribbean.

Delivery of observation data to forecasters: The data is collected and processed (currently by Serco) and stored in a database. To make it available to forecasters and others it may be useful to, several capabilities are being explored. First, the data is being parsed and converted to a format that can be emailed to the NWS VOS gateway for incorporation into the existing VOS observation database. Second, a standalone database is being created for the parsed data. From this database we will create an API so external users can access and query the data. Third, we are working with another project that collects crowd-sourced weather observations from cell phones to provide the data we collect into their database and make it available through their existing API. Finally, we are seeking other potential users interested in using the data who may be willing to accept, store, use, and disseminate the observation data.

Onboard equipment: The installed weather station observes barometric pressure, temperature, relative humidity, wind direction and wind speed. This weather information is sent to a small computer processor which formats the message and presents it to the ship's AIS transceiver. The connection to the AIS is made through the pilot port using a Y-connector which allows simultaneous use of the pilot port. Weather data messages are sent from the vessels every 3 minutes. When vessels are near land or congested areas, messages are received through the terrestrial system at a high success rate. When vessels are far from land messages are being received with a high success rate from satellite-based receivers.

**Benefits** Increased availability of weather observations will improve the timeliness and accuracy of ocean weather forecasts, improving mariner and vessel safety. Increased weather observations in areas where they have not previously been available will benefit other oceanic and climate researchers. The ability to automate the collection of weather observations will lessen the burden on seafarers, and improve the accuracy and quality of observations.

**Corps Program** Navigation Systems (NavSys) Research Program, Dr. Patricia DiJoseph, Program Manager

**Sponsors** MARAD; Headquarters, US Army Corps of Engineers

**Point of Contact** Brian Tetreault, [brian.j.tetreault@usace.army.mil](mailto:brian.j.tetreault@usace.army.mil) , CEERD-HN-N, 3909 Halls Ferry Road, Vicksburg, MS 39180-6199

**Partners**

- Maritime Administration (MARAD)
- USACE Engineer Research & Development Center, Coastal and Hydraulics Laboratory
- National Oceanic and Atmospheric Administration (NOAA)
- Shipping lines: Matson, Pasha Hawaii, APL, TOTE Maritime, Crowley, Maersk, Hapag-Lloyd
- Serco North America, Inc.