



# Maritime Weather Information: Automatic Reporting, A New Paradigm



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- Responsibilities under SOLAS Met Services
  - Contracting governments
- Observations
  - Limited (temporal and spatial)
- El Faro NTSB recommendations
- NOAA's role
  - AIS as a means of meteorological data transmission
  - Multi-agency plan for proof of concept
  - Automated observations





# Ship Observations

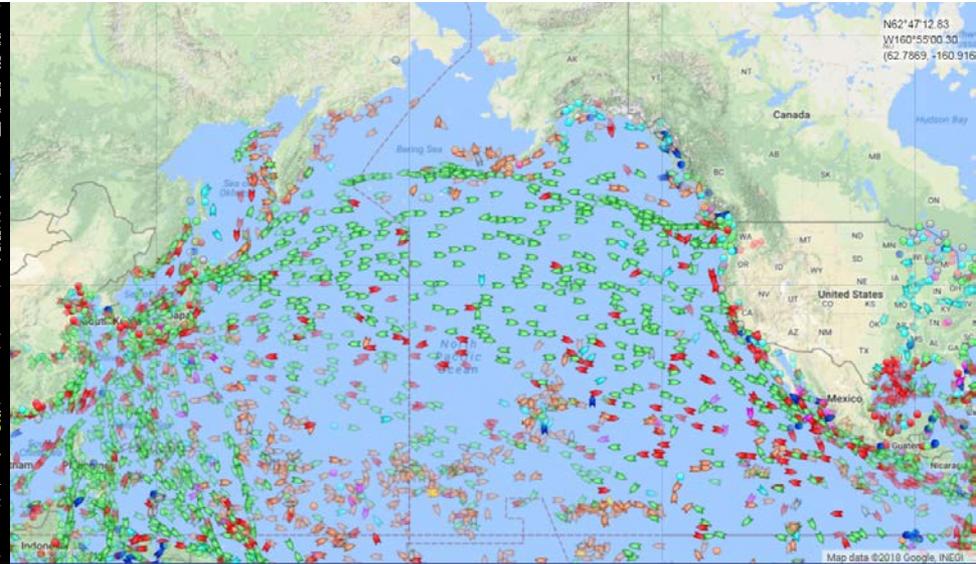
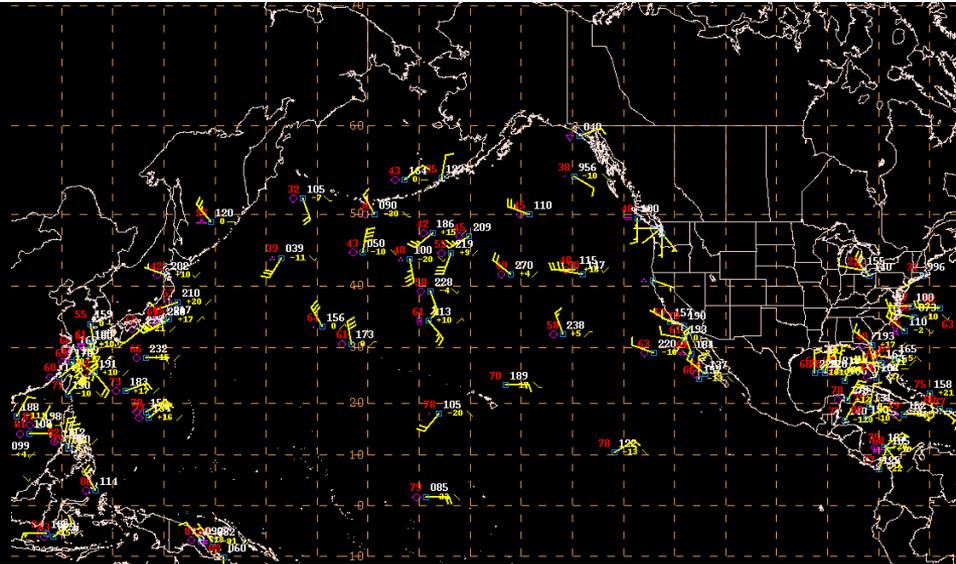


## SOLAS – Ch. V - Safety of Navigation

- Reg. 5 – Meteorological services and warnings
  - Items 1, 4-9 Key word “encourage”
- Reg. 31 – Danger messages
  - “bound” to communicate ice, derelict, danger to navigation, tropical storm, sub-freezing temperature with gale force winds causing severe icing, winds of force 10 or higher for which no storm warning has been received
- Reg. 32 – Information required in danger messages
  - 3 and 4 – tropical cyclone and for winds of force 10 and higher
  - Barometric pressure, barometric tendency, true wind direction, wind force, state of sea, swell (also period and length), true course and speed of ship



# Marine Weather Observations



Comparison of received ship weather observations (left) for 1200 UTC 14 March 2018 and AIS positions of ships via MarineTraffic.com (right).



# The Forecast Process



Input

Output

Verification

Observations

Numerical Models  
Deterministic  
Probabilistic

Guidance Products  
Post-processed



Add value  
Filter

Experience / familiarity/  
Interpretation

Warnings &  
Forecasts

Graphical

Gridded

Text Bulletins

(Days 1-5)



# Marine Weather Observations



- Critical to the warning and forecast loop
  - Forecasters, numerical models, verification, fellow mariners
- Source regions for numerical model errors or uncertainty
  - over the oceans
- Small percentage of ships are reporting weather
- Need for more frequent and accurate weather observations from ships
- Forecasters—biased by what is observed (reported)
- SOLAS – Chapter V - Safety of Navigation



# NTSB El Faro Report



- Pages 236 – 241, discussion on AIS utilization
- NOAA coordinate with the National Weather Service to perform a “proof of concept” project to establish whether AIS (or other suitable method) in a single message,
  - (1) meteorological and oceanographic data obtained directly from automated instrumentation and manual observation on board vessels at sea,
  - (2) vessel position and time of observation, and
  - (3) other important metadata, by satellite and land-based receivers, to global meteorological authorities via the Global Telecommunication System with acceptable time delay. (M-17-52)

A paraphrase – NTSB language contained in backup slides



# NTSB El Faro Report



- If it is established that AIS is a viable means by which to relay (with acceptable time delay) meteorological and oceanographic data and metadata from vessels at sea.
- (The U.S.) Propose to the IMO that vessels required to use AIS also be equipped with meteorological and oceanographic sensors... that will automatically disseminate the data at high-temporal resolution via AIS.  
(M-17-48)

A paraphrase – NTSB language contained in backup slides



# NTSB El Faro Report



## Key language in NTSB Report

- Point to an example of extreme weather experienced by a ship – without VDR information and retrieved – met services would not have known conditions were that severe
  - Other vessels may have benefited from such a report as above and taken action
  - Observations can provide ground truth
- Ships providing **continuous stream of real-time data** would enhance both awareness of current conditions and forecasting or early warning tools,. Benefit not only the marine industry but also other public and private entities across the globe.
- Expanding AIS message **transmission** capabilities to provide mariners with timely access to a variety of navigational, **weather**, and marine safety information...



# Status



- NOAA engaged with Federal and Industry through Ship Operators Cooperative Program
  - Beginning April 2017
- Pilot test plan developed with NOAA working with MARAD and US Army Corps of Engineers (USACE)
- Alpha test (potential) Mar 23 (Cape Wrath)
- Beta test





# SOLAS CH. V.



## • **Regulation 5 - Meteorological services and warnings**

1. **Contracting Governments** undertake to encourage the collection of meteorological data by ships at sea and to arrange for their examination, dissemination and exchange in the manner most suitable for the purpose of aiding navigation. Administrations shall encourage the use of meteorological instruments of a high degree of accuracy, and shall facilitate the checking of such instruments upon request. Arrangements may be made by appropriate national meteorological services for this checking to be undertaken, free of charge to the ship.
  
- .4. to arrange for a selection of ships to be equipped with tested marine meteorological instruments (such as a barometer, a barograph, a psychrometer, and suitable apparatus for measuring sea temperature) for use in this service, and to take, record and transmit meteorological observations at the main standard times for surface synoptic observations (i.e. at least four times daily, whenever circumstances permit) and to encourage other ships to take, record and transmit observations in a modified form, particularly when in areas where shipping is sparse.
  
- .5. to encourage companies to involve as many of their ships as practicable in the making and recording of weather observations; these observations to be transmitted using the ship's terrestrial or space radiocommunications facilities for the benefit of the various national meteorological services.
  
- .6. the transmission of these weather observations is free of charge to the ships concerned.



# NTSB El Faro Report



- Coordinate with the National Weather Service, vessel operators, automatic identification system (AIS) service providers, and required onboard technology vendors to perform a “proof-of-concept” project to establish whether AIS, or another suitable alternative, can practically deliver, in a single message, (1) meteorological and oceanographic data obtained directly from automated instrumentation and manual observation on board vessels at sea, (2) vessel position and time of observation, and (3) other important metadata, by satellite and land-based receivers, to global meteorological authorities via the Global Telecommunication System with acceptable time delay. (M-17-52)



# NTSB El Faro Report



- If the actions recommended to the National Oceanic and Atmospheric Administration in Safety Recommendation M-17-52 establish that the automatic identification system (AIS) is a viable means by which to relay (with acceptable time delay) meteorological and oceanographic data and metadata from vessels at sea for use by global meteorological authorities, propose to the International Maritime Organization that vessels required to use AIS also be equipped with meteorological and oceanographic sensors—including, at a minimum, sensors for barometric pressure and sea-surface temperature—that will automatically disseminate the data at high-temporal resolution via AIS. (M-17-48)

