



April 11, 2024

Office of Regulations and Administrative Law (CG-LRA),
U.S. Coast Guard Stop 7213,
2703 Martin Luther King Jr. Avenue SE.,
Washington, DC 20593-7213

Dear Office of Regulations and Administrative Law,

Please find attached Petition for Rulemaking to Improve Maritime Safety: Require installation of Automated Weather Stations on all vessels required to install Automatic Identification Systems. Also attached is correspondence with the Commandant's which encouraged us to make this request.

I appreciate the accomplishments that the agency and other maritime agencies have already achieved on the important goal to improve the detection and communication of sudden hazardous weather and hope that this rulemaking will be the next step for those accomplishments.

Thank you for your attention to this critically important issue.

Very truly yours,

Roberta Weisbrod Ph.D.
Executive Director
Worldwide Ferry Safety Association
ferrysafety@gmail.com 917 476 0887

Cc (electronically):
LTCDR Chad Yeamans, USCG
Heike Deggim, IMO
Brian Tetreault, USACE
Gregory Johnson, SERCO
Kevin Kohlmann, Marad
Todd Ripley, Marad
Joseph Sienkiewicz, NOAA
Douglas Scheffler, USCG retired

Petition for Rulemaking to Improve Maritime Safety:
Require installation of Automated Weather Stations
on all vessels required to install Automatic Identification Systems

Preamble

What is the rule being requested?

All vessels that are required by CFR33 section 164.46 to carry Automatic Identification Systems (AIS) must also install Automated Weather Stations (AWS) connected to their AIS so they text out weather information in addition to locational information. As such this action, while requiring minimal cost and effort on the part of the vessel owner and operator, will accrue benefits to their maritime safety as well as improve understanding of the meteorology of the ocean.

Background

This petition for rulemaking builds on the pilot project that the USCG and other maritime agencies have undertaken. In response to maritime disasters like the sinking of the El Faro, since 2019 the US maritime agencies, NOAA, Marad, USCG and the Army Corps of Engineers, began to test a system that would provide mariners with real time information about the weather in their immediate area, that is within Very High Frequency (VHF) Radio wave range. The US Army Corps of Engineers, with Brian Tetreault in the lead, tested Automated Weather Stations (AWS) connected to AIS, referring to it as Wx-AIS) on fifteen US vessels. The vessels ranged in size and type from Containerships to ferries (See Appendix 1: List of Vessels with Wx-AIS installed). The system was effective in that the devices texted out weather information to nearby VHF receivers on vessels and land. The weather data was also received by satellite for incorporation into national weather models. The researchers, Brian Tetreault and Gregory Johnson published a series of peer-reviewed papers about use of Wx-AIS. The pilot project continues to accrue and archive data.

More recently a commercial company based in Canada, OceanSync <https://oceansync.com/> has installed Wx-AIS for its clients. As of March, 2024 they have installed Wx-AIS on 25 vessels. (Sebastian Ambtman, personal communication).

1.0 Why is this rulemaking necessary?

- ***Sudden hazardous weather at sea still causes major casualties, and the Wx-AIS system would ameliorate that.*** In 2021, the US Coast Guard issued [Safety Alert 7/21](#) warning about the dangers of unexpected heavy weather, citing “notable and deadly marine casualties over the past several years.” Furthermore although “modern day forecasting has improved... weather related maritime disasters continue to occur. This introduction of modern day technology into weather forecasting also increases the complexity in determining if the forecast applies to the geographical area where the vessel is actually operating.” The alert discusses the availability of National Weather Service Marine Zone reports -- and their limitations (not available for near shore waters, lakes, inland waters)

and the issue of zone boundaries. The alert cites seven significant marine casualties to which rapidly intensifying thunderstorms and tropical cyclones have contributed.

- The number of vessel losses due to hazardous weather, sudden as well as anticipated weather, has been analyzed and reported by LCDR Chad Yeamans, Detachment Chief USCG Investigations National Center of Expertise.¹ In 2022, he published an article that reported since 2015 the USCG investigated the loss of 89 commercial vessels due to heavy weather, (US vessels in domestic and international waters, as well as international vessels in US waters). About half of the losses were due to anticipated weather events and half to unanticipated weather events. Anticipated weather events are the large weather systems like hurricanes and cyclones that are known to the weather services with the warnings widely disseminated. Unanticipated weather events, on the other hand, come suddenly like the squalls, wake lows, microbursts, and derechos. On average over six vessels were lost per year due to unanticipated weather.

In many of these unanticipated weather events that caused the loss of ships, lives were lost. In the case of the Seacor Power, the wake low came upon the vessel suddenly ultimately caused its capsizing and the loss of 13 lives.

- ***Wx-AIS would reduce the number of vessels lost due to heavy weather.*** Vessels experiencing heavy weather would automatically text out the conditions to vessels in VHF range, allowing immediate warning. (In the case of the Seacor Power, vessels in the vicinity had experienced this weather system but had no way to communicate it – something which would have happened automatically with Wx-AIS).

So, in the 7 years between 2015 and 2022, of the 89 vessels that were lost, 44 were due to anticipated weather (or about 6 vessels/year) Projecting forward to ten years if the weather doesn't worsen, 60 vessels could be lost – a number that could be reduced by the installation of the Wx-AIS system.

2.0 What would be the economic cost of installing Wx-AIS?

There are 6000 United States vessels which are mandated to carry AIS A, according to USCG Vessel Requirements for Notices of Arrival and Departure and Automatic Identification System *Final Regulatory Analysis and Final Regulatory Flexibility Analysis for the Final Rule* (2014). Adding the same type of weather station that the Army Corps used, costing \$1250 each, as a one-time cost for each vessel, with peripherals and a microprocessor (which might not be needed in the future) could bring the cost to the maritime industry, very conservatively, to \$2000. For all 6000 vessels the aggregate conservative cost would be \$12 million. The weather stations have a three-year warranty (although they last longer). Conservative accounting would

¹ “As the weather gets worse, we’ve begun to do better” Marine Log Dec 14, 2022
https://issuu.com/marinelog/docs/marine_log_december_2022 Page 46

include a three-year replacement cost, or per year expense, about \$4 million. Note that 15,000 Foreign Vessels come into ports annually.

The cost to the US Coast Guard for imposing this regulation on US vessels would additionally include the costs of USCG analysts' time to specify parameters for AWS, and the additional cost of enforcement.

3.0 What would be economic benefit of installing Wx-AIS?

3.1 Some number of the 60 vessels in the coming 10 years that would have been lost due to sudden hazardous weather, would have received warning, and be saved.

3.2 And lives would have been saved². According to US Department of Transportation guidance, the value of each statistical life (VSL) is currently \$12.5 million. By way of an example at the time of the loss of the Seacor Power, in 2021 the VSL was \$11.8 million.³ The thirteen lives lost on the Seacor Power alone represent valuation of \$153.4 million.

So, if a \$12 million investment saves the crew members of just one vessel, the benefit-cost ratio is highly positive, more than 10:1

3.3 Preventing loss of vessels prevents pollution associated with vessel loss. Vessel loss often involves loss of fuel and can incur loss of cargo including petroleum products which are highly polluting.

4.0 What are global benefits, including those addressing climate change?

4.1 Wx-AIS addresses the global problem of insufficient maritime weather information. As Heike Deggim, the then Director of the IMO Maritime Safety Division (and currently director of IMO Marine Environment Division) has written⁴: *"IMO is aware that the scarcity of data from vast areas of the ocean (so-called data-sparse areas) to support basic weather forecasting, the provision of marine meteorological and oceanographic services and climate analysis and research is a problem for both meteorology and oceanography."*

4.2 Wx-AIS would exponentially augment vessel weather reporting. Ms. Deggim calls for more vessels to participate in the Voluntary Observing Ships Scheme. Four thousand vessels had registered for the scheme and in 2020, only 2740 of them were reporting the weather. As it turns out most of these vessels, about 90%, report the weather manually a few times a day opposed to automatically and continuously using AWS). According to Ms. Deggim about 200,000 ships are equipped with AIS, of which only 2% have registered for the VOS.

² According to the Talmud, Whoever saves a single life is considered to have saved the world.

³ <https://www.transportation.gov/office-policy/transportation-policy/revised-departmental-guidance-on-valuation-of-a-statistical-life-in-economic-analysis>

⁴ <https://www.helenicshippingnews.com/the-imo-and-wmo-providing-weather-information-to-support-safe-navigation/>

4.3 Satellite weather analysis requires In situ maritime weather for verification and resolution. The European Union’s Copernicus satellite weather system requires in situ weather stations for resolution and correction,⁵ the website stating: “Copernicus services rely on data from in situ monitoring networks (e.g. ground based weather stations, ocean buoys and air quality monitoring networks) to provide robust integrated information and to calibrate and validate the data from satellites.”

4.4 And globally there are insufficient in situ weather stations. The World Maritime Organization (WMO) Global Observation System for maritime observation consists of “observations made by around 4 000 ships recruited under the WMO Voluntary Observing Ship Program (VOS)” and “observations made by about 1 200 drifting buoys”. According to the National Data Buoy Center there are about 1300 moored weather buoys.⁶ Add the 2740 vessel-based weather stations that are actually in use as part of the VOS. This amounts to less than 10,000 in situ maritime weather stations on the ocean or the equivalent of about one weather station for an area the State of Michigan.

5.0 What is the legal authority for the proposed rulemaking?

Under 33CFR 164.46 the US Coast Guard has the rulemaking and regulatory authority for AIS and its modifications.

5.1 Suggested modification of 33 CFR 164.46 <https://www.navcen.uscg.gov/ais-requirements>

The modification of 33 CFR 164.46 could take place in Section (d) Operations, either in paragraph (3) AIS safety-related text messaging, or in paragraph (4) AIS application specific text messaging, or through addition of a new paragraph (5) or through a new Section, (h) Weather Information.

Discussion of possible modifications of paragraph (3)” [AIS safety-related text messaging](#) must be conducted in English and solely to exchange or communicate pertinent navigation safety information (analogous to a SECURITE broadcast).” With the installation of Automated Weather Stations connected to AIS, AIS safety related text messaging would communicate pertinent navigation safety.

Discussion of possible modification of paragraph (4) “[AIS application-specific messaging](#) (ASMs) is permissible, but is limited to applications adopted by the International Maritime Organization (such as [IMO SN.1/Circ.289](#)) or those denoted in the International Association of Marine Aids to Navigation and Lighthouse Authorities’ ([IALA](#)) [ASM Collection](#) for use in the United States or Canada, and to no more than one ASM per minute.”

⁵ <https://www.copernicus.eu/en/about-copernicus/infrastructure-overview/situ-component#:~:text=Copernicus%20services%20rely%20on%20data,validate%20the%20data%20from%20satellites.>

⁶ <https://www.ndbc.noaa.gov/obs.shtml?lat=20.000000&lon=-120.000000&zoom=2&type=oceans&status=r&pgm=&op=&ls=n>

A new section could be added, section h:

(h) In the interests of maritime safety to enhance alerts of impending hazardous weather and to enhance vitally needed global maritime in situ weather acquisition all vessels required to carry AIS must install automated weather stations and connect them to the AIS.

6.0 Relevant International Agency regulatory engagement

6.1 The IMO already seems to have adopted the protocol for sending hydro-meteorological messages (See IMO SN.1/Circ. 289 pages 5 -8: ANNEX AIS Application Specific Messages (ASM) Intended for International Use. Meteorological and Hydrographic data).

(https://www.navcen.uscg.gov/sites/default/files/pdf/IMO_SN1_Circ289_Guidance_on_use_of_AIS_ASM.pdf)

6.2 IALA is aware of the value of the use of AIS to transmit weather information (AIS + Weather Information <https://www.iala-aism.org/ais/>). On November 9, 2023, IALA gave the China Maritime Safety Administration approval to test ASM for meteorological data, the subject of this petition for the United States. See <https://www.e-navigation.nl/asm/vdes-asm> line 1 Meteorological information.

So, modification of paragraph (4) is feasible in terms of international rulemaking.

7.0 How will this proposed rulemaking mesh with upcoming technological innovation?

7.1 Automated weather stations could be reprogrammed for direct integration with AIS. This has been done already (Brian Vlad, AirMar, personal communication). If and when done on a commercial basis it would obviate the need for a microprocessor (which in recent years have ranged in price from \$100 to \$800), making installation yet faster and more feasible.

7.2 The new generation of AIS will ease message visibility and handle expansion of the number of users. AIS 2.0, VDES (Very High Frequency Data Exchange System) will add Application Specific Message and VHF Data Exchange capabilities to the Mobile Marine VHF band. It will allow higher rates of data transfer. Currently implementation is expected for 2026.

7.3 Artificial Intelligence and Machine Learning can tailor how the weather text messages are received. Receivers could be set for specific wind directions, wind speeds, wave spectra, currents, based on vessel conditions including heading, and load characteristics.

8.0 What are legal implications of Wx-AIS?

8.1 Could a transmitting vessel be held liable for the quality of their transmitted weather information? By analogy to the crowd-sourced ocean mapping project, a statement would assure that 'All data contributions are made in a "good faith effort" and contributed "as is" without guarantee or warranted accuracy. This means that although these data are of high quality and useful for planning and modeling purposes, they are not official charts, and they are not held to official chart survey standards.' (See <https://www.farsounder.com/blog/sharing-across-the-fleet> ; FarSounder is an official partner of Seabed 2030 toward mapping the world's oceans, an analogous project to understand maritime weather).

FAQ

9.0 Why is this needed? Aren't there phone Apps that give weather predictions, and more to the point commercial weather routing services?

9.1 Most commercial services are based on satellite information (which requires ground-truthing), or are derived from AIS tracks. There are relatively few in situ maritime weather stations. Please see attached Matrix listing classes of weather stations and types of maritime weather services – and the information and methodology they employ.

Appendix I: Vessels with Automated Weather Stations connected to AIS (Wx-AIS)

Vessel	Company	Route
Manoa	Matson	LA/LB to China
President Wilson	APL Maritime	LA/LB to Honolulu
Perla Del Caribe	Tote	Jacksonville to San Juan
El Coqui	Crowley	Jacksonville to San Juan
Mesabi Miner	Interlake	Great Lakes
James R. Barker	Interlake	Great Lakes
Paul R. Tregurtha	Interlake	Great Lakes
Stewart J. Cort	Interlake	Great Lakes
Ronald Brown	NOAA	Various
Maersk Atlanta	Maersk	Houston to Middle East
Yorktown Express	Hapaq-Lloyd	Houston to UK
Mirador Express	Lomar	Indonesia
Cape Henlopen	Delaware River Bay Ferry	Cape May to Lewes
Block Island	Interstate Nav Co	Pt. Judith to Block Island
Manhattan II	Classic Harbor Line	New York Harbor

U.S. Department of
Homeland Security

United States
Coast Guard



Commandant
United States Coast Guard

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Washington, DC 25093-7000
Stop 7501
Staff Symbol: CG-5P
Phone: (202) 372-1010

16670
21 November 2023

Worldwide Ferry Safety Association
Dr. Roberta Weisbrod, Executive Director
54 Remsen St.
Brooklyn, NY 11201

Dear Dr. Weisbrod:

On behalf of Admiral Fagan, this letter is in response to your correspondence dated September 07, 2023, regarding the recommended use of Automated Weather Stations (AWS) in conjunction with Automatic Identification Systems (AIS). The Coast Guard recognizes the importance of at sea meteorological observations like those submitted through the Voluntary Observing Ships (VOS) scheme to improve the quality of issued forecasts and warnings. We also agree with your assessment that AWS can potentially increase the frequency and accuracy of those reports and minimize the burden on observers.

In April 2014, the United States, in coordination with other Member States, informed the International Maritime Organization (IMO) of the scarcity of observation for vast areas of the oceans to support basic weather forecasting. This led to IMO's publication of MSC.1 Circular 1293(Rev.1):2018 "reintroducing the recruitment of ships to provide ship-based marine meteorological and oceanographic observations," particularly from "ships that pass through or operate in the data-sparse areas such as the polar region." Further, in April 2019, the United States submitted an information paper (IMO NCSR9/INF.8) highlighting the work of Mr. Brian Tetreault and Dr. Gregory Johnson, mentioned in your letter, on the use and testing of weather observations over AIS. Information papers are often the first step in garnering the necessary support and sponsorship for future IMO actions, such as proposing a new work item to amend IMO Guidance on VOS to include automated weather reporting, or to include automated weather reporting in the ongoing effort to define VHF Data Exchange Systems (VDES) performance standards and requirements. We thank you for your input on this issue and will consider your recommendation in future engagements with IMO.

I also note your recommendation that we establish regulations to make AWS a requirement for all US vessels mandated to carry AIS. If you wish for the U. S. Coast Guard to treat this recommendation as a petition for rulemaking, I encourage you to submit your recommendations following the procedures established in 33 CFR 1.05-20 and indicate that it is a petition for rulemaking.

We appreciate the efforts of the Worldwide Ferry Safety Association to enhance maritime safety and for bringing this important matter to our attention.

Sincerely,

A handwritten signature in blue ink that reads "W. R. Arguir".

W. R. Arguir
Rear Admiral, U. S. Coast Guard
Assistant Commandant for Prevention Policy



September 7, 2023

Admiral Linda Fagan, Commandant US Coast Guard
Vice Admiral P.W. Gautier, Deputy Commandant for Operations
US Coast Guard (USCG) Headquarters
1790 Ash St. SE
Washington, DC

Dear Admiral Fagan,

Re: USCG Marine Board of Investigation report and recommendations regarding the capsizing of the Seacor Power

On behalf of the Worldwide Ferry Safety Association I would like to commend the USCG on a fair and thorough Marine Board of Investigation report about the Seacor Power capsizing. On behalf of the international Maritime Safety and Weather Technology research team, I am offering recommendations in response to Recommendation number 6.

The Worldwide Ferry Safety Association is a not-for-profit organization dedicated like the Coast Guard to saving lives. Our mission is to prevent ferry fatalities and to expand the use of safe ferries. We work by analyzing data about the causation of ferry fatalities, take actions to reduce the impact of the causations; we convene an annual Ferry Safety and Technology Conference; and sponsor an annual design competition for a safe affordable ferry.

In the past year the Worldwide Ferry Safety Association has received several honors: The Maritime Safety Award by the Royal Institution of Naval Architects in November 2022; the Lloyd's Register Foundation additional grant in April 2023; and the US Coast Guard Sector Commander Merchant's personal coin with the motto: "Forward with People, Forward with the Mission, Forward with Partnerships!" which was presented to us by Commander Weist on April 26 2023.

In the context of analyzing causation of ferry accidents, we have become increasingly aware of the increasing suddenness of weather systems – their severity and unpredictability, and have expanded our remit to encompass *Maritime Safety and Weather Technology* – recently helping to convene an international conference on the topic in Surabaya, Indonesia. The conference

was funded by the Lloyd's Register Foundation and the funding has enabled us to initiate two research projects using AWS + AIS data, one in the US and one in Indonesia.

About the relationship of sudden hazardous weather and the incident

As the Report states, “ Although there were other factors that contributed to this marine casualty, the major factor was the **unexpected severity of the weather front** that the SEACOR POWER experienced. Although the NWS did issue a Special Marine Warning the crew did not receive the warning, and the **weather front moved much faster and was far worse than predicted.**” (Emphasis added).

Recommendation #6 states that Commandant should issue one or more findings of concern to the NWS (National Weather Service) regarding the following items; bullet 1 calls for:

- **Identify immediate options for increasing automated weather observation equipment in the highly trafficked areas of Port Fourchon and coastal Louisiana.”**

While concurring with all the recommendations I would like to focus on this recommendation, based on experience and research by our organization and many others – and discuss how it could be achieved in a very short time and cost-effectively– and furthermore why in the face of a world experiencing increasingly severe and unpredictable weather events the recommendation should be expanded on a global scale.

How could automated weather stations on vessels be achieved for maximum benefit? Over the past four years, the US Maritime agencies – NOAA, the Maritime Administration, the US Coast Guard, and the Army Corps of Engineers, led by the latter, have engaged in a study of the efficacy of installing automated weather stations (AWS) on vessels and connecting them to the vessel's locational devices, their AIS. The US maritime agencies have undertaken this effort since 2019 on over 15 vessels varying from ocean going containerships to coastal ferries. The impetus of the study was in response to an analysis of the El Faro incident with the intent of finding a way to improve the accuracy and timeliness of maritime weather information at the same time as improving the national and global weather models. Subsequently researchers noted that the AIS texted out the weather information in addition to the standard locational information – allowing vessels in the VHF-receiving region to be informed and thus alerted to impending weather.

Had this system been in place, the crew of the SEACOR POWER would have had the opportunity to be alerted to the impending weather, given the proximity of other vessels and their documented experiences, and indeed Mayday calls.

The Army Corps' lead researcher for the AWS + AIS, at the time Brian Tetreault (now in the MTS subcabinet), and the Corps' contractor Dr. Gregory Johnson of SERCO, and their colleagues have published many peer-reviewed papers about this long-term extensive study. The results of safety and value warrant imposition of the requirement to expand the functionality of existing AIS and install and connect AWS (which cost less than an iPhone). I note that the next

generation of AWS, to be available Fall 2023 will not require a separate microprocessor for the installation, making the low cost and feasibility even more compelling.

Where should the expansion of AIS to encompass AWS be mandated? Not only in the Gulf near Port Fourchon, but globally. Given the additional cost of AWS this is a modest suggestion, and given the almost incredible severity, frequency and unpredictability of the changing global climate, this is urgent. As Heike Deggim, Director of the Maritime Safety Division of IMO stated in a joint article with WMO the need for in situ maritime information is paramount – for mariners.

Given the lack of in situ weather information on the global ocean (there are only 2500 vessels in the Voluntary Observing System, with most of the weather stations non-automated, not to mention an insufficient and limited distribution of weather buoys) we recommend that the USCG recommend that the existing national and international requirement for vessels to install and use AIS be expanded to include AWS. In terms of feasibility although the cost for each is minimal, about 1200 USD, there may be global funds available for acquisition and or help with installation. Our research under the Lloyd's Register Foundation grant working with colleagues in Indonesia, who are with the KNKT (Indonesia's NTSB); BMKG (Indonesia's NWS); and ITS Surabaya (Indonesia's premier technical institution), has demonstrated the relative ease of installation.

What would be required – and we believe – would be globally welcome – is for the US to begin the process of (1). making AWS a requirement on all US vessels that are mandated to install AIS, and (2). Taking leadership to expand the SOLAS V requirement for AIS to include AWS.

Thank you for consideration,

Roberta Weisbrod, Ph.D.

List of published papers with information that would support of recommended action

Brian Tetreault Marine Transportation System Program Manager, US Army Corps of Engineers, and **Dr. Gregory Johnson**, Technical Program Manager, SERCO

Tetreault B., Johnson G.W.: Sharing Ships' Weather Data via AIS TransNav, *International Journal on Marine Navigation and Safety of Sea Transportation*, Vol. 14, No. 1, doi:10.12716/1001.14.01.17, pp. 143- 150, 2020. (This is one of many publications)

Dr. Heike Deggim, Director Maritime Safety Division, International Maritime Organization. "The IMO and WMO – Providing weather information to support safe navigation"

<https://public.wmo.int/en/resources/bulletin/Partnerships/IMO> N.D. on the global need for in situ weather information. Can now be found at:

<https://www.hellenicshippingnews.com/the-imo-and-wmo-providing-weather-information-to-support-safe-navigation/>

LCDR Chad Yeamans, USCG.

“As the weather gets worse we must be better” Marine Log Dec. 21, 2021

https://issuu.com/marinelog/docs/marine_log_december_2021 page 46

“As the weather gets worse, we’ve begun to do better” Marine Log Dec 14, 2022

https://issuu.com/marinelog/docs/marine_log_december_2022 Page 46

Dr. Roberta Weisbrod, Executive Director, Worldwide Ferry Safety Association, “Saving Lives at Sea in a Changing World: The Case for AWS” Ship and Boat International of the Royal Institution of Naval Architects Nov-Dec 2022 reprinted https://ferrysafety.org/documents/SBI_Nov-Dec_22-RW%20article.pdf