

VOLUNTARY OBSERVING SHIP PROGRAM

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1 Purpose. The Voluntary Observing Ship (VOS) program is one of the National Weather Service’s (NWS) sources of marine weather data from coastal, offshore, high seas areas, and the Great Lakes.

2 General. The NWS program for acquisition of oceanic surface weather reports is based upon national needs and international agreements, and is an integral part of the World Meteorological Organization’s (WMO) “World Weather Watch.” These surface weather reports include, in addition to others, meteorological and oceanographic parameters such as wind speed, wind direction, ocean temperature, and wave height.

Merchant ships participating in the U.S.-managed portion of the VOS program are recruited by Port Meteorological Officers (PMO). NWS VOS program vessels are asked to take observations at standard synoptic times (0000, 0600, 1200 and 1800 Universal Time Coordinated) while at sea. Additional reports are requested at 3 hourly intervals when within 300 nautical miles of named tropical storms or hurricanes and when within 200 nautical miles of the U.S., Mexican and Canadian coasts.

The collection of marine reports from the Great Lakes, Gulf of Mexico, western North Atlantic Ocean, and north and south Pacific Oceans is a coordinated effort between the Department of

Commerce's NOAA/NWS, the Department of Transportation's U.S. Coast Guard, and commercial shore radio stations. The International Maritime Satellites (INMARSAT) play a critical role in the data collection process.

3 Port Meteorological Officer. Four NWS regions (Eastern, Central, Southern, and Western) have full time PMOs; two NWS regions (Alaska and Pacific) have part time PMOs. PMOs are located in major U.S. seaports. They are responsible for (1) recruiting ships, (2) training ships' officers in weather observing procedures and practices, (3) checking and calibrating shipboard instrumentation, (4) maintaining the quality of ships' observations [Quality Control (QC)], (5) organizing and maintaining liaison with maritime interests, and (6) assisting NOAA's Office of Oceanic and Atmospheric Research in executing their VOS Program.

4 Ship Selection and Recruitment. Vessels enrolled in the VOS program allow for a broad distribution of observations over all oceanic regions. Priority is given to recruiting vessels which operate where the United States has forecast and warning responsibilities. PMOs are encouraged to emphasize the importance of ship observations to surface analyses and forecasts when recruiting vessels for the program. Special emphasis is placed on recruiting ships traversing data-sparse areas, off the main shipping routes. In any recruitment, the following points should be considered:

a. No ship is to be recruited as U.S.-supervised if it is already in another nation's program. Ships of Japan, India, Canada, United Kingdom, and other nations with active observing programs should be paid a courtesy visit and reminded of the U.S. high seas data requirements. Foreign flag vessels may be recruited into the U.S. VOS program if they are not participating in the programs of their own countries.

b. The recruited ship is expected to call at a U.S. port accessible to a PMO at least every six months so that observing equipment may be inspected and loaned equipment can be retrieved if the ship is decommissioned, transferred to another route, or fails to adequately participate in the U.S. VOS program. Adequate participation for the purposes of the U.S. VOS program means the vessel submits a minimum of 400 observations per year or, in the judgment of the PMO, is submitting a sufficient number of observations consistent with the vessel's type of operation and area operating in.

c. Ships will not be recruited when there is little or no opportunity to meet the deck officers and discuss with them the quality and techniques for weather observing. Exceptions may be made for major U.S. shipping lines or when a visit to an interested vessel is not possible. In such cases, forms, observing instructions, and handbooks can be sent through the mail.

4.1 Ship Classification. Ships in the VOS program are classified under WMO International VOS definitions, i.e., SELECTED, SUPPLEMENTARY, or AUXILIARY. A special classification for Great Lakes vessels is made to handle this special regional program. Special classifications are used for other marine observing facilities not defined by the WMO program.

4.1.1 Selected. A selected class ship is equipped with an NWS or shipping company-owned barograph, barometer and psychrometer, all of high quality and accuracy. These ships sail routes where they can be visited by a U.S. PMO at least every six months. This ship class is expected to take and routinely transmit weather messages in the FM-13 synoptic code format while at sea.

4.1.2 Supplementary. A ship with at least a barometer and a thermometer of acceptable accuracy is classified as supplementary when it lacks a full complement of suitable observing equipment or it cannot be reached for routine visits. Supplementary ships transmit weather messages in FM-13 synoptic code format while at sea.

4.1.3 Auxiliary. A ship with at least a barometer and a thermometer of acceptable accuracy which does not desire or cannot routinely report, is classified as an auxiliary class vessel. Auxiliary ships transmit weather messages in FM-13 synoptic code format while at sea.

4.1.3 Great Lakes. This ship observing program consists of approximately 50 vessels. Great Lakes ships transmit weather messages in FM-13 synoptic code format while underway.

5 Ship Visitations. This function requires the greatest amount of the PMO's time. Proper management of this activity is essential to the VOS program. The PMOs plan routine visits to (1) recruit new ships into the VOS program, (2) inspect meteorological equipment and provide observing instructions to ships already in the VOS program, (3) replace or make adjustments to previously installed NWS equipment, (4) instruct observers and provide necessary meteorological equipment to newly recruited ships, and (5) make courtesy calls on foreign supervised VOS ships.

5.1 Timing of Visits. Ship visits should be planned for times when the greatest number of weather observing personnel can be reached to discuss observing procedures and the use of NWS products.

5.2 Purpose of Visits. Ship visitations are made primarily to (1) expand the existing VOS program, (2) maintain the quality of weather observation programs aboard ships, (3) furnish observing and reporting instructions and supplies, (4) inform ships' personnel about the availability and use of NWS forecast and warning broadcasts, and (5) Solicit feedback regarding NWS products and services.

5.3 Visit Routine. The routine during a visit to a ship varies, but generally all visitations should begin with a call to the captain or the captain's designated representative to explain the purpose of the visit (follow-up, new recruit, or courtesy) and to request permission to carry out all the PMO designated functions.

5.3.1 Instructions on Observation Techniques. The PMO should visit with as many shipboard observers as possible. During the first visit on a newly recruited ship, instructions from National Weather Service Observing Handbook No. 1, Marine Surface Weather Observations, should be reviewed with the observers. If observation records are onboard the ship, the PMO should

examine them for coding and logging errors, or omissions and make tactful suggestions for correcting problems.

5.3.2 Instrument Quality Checks. The PMO should check all the weather observing equipment onboard the ship during the visit. NWS VOS program ships have barometers corrected to read sea level pressure. To correct to sea level, the portable inspection barometer should be brought to the bridge and the bridge height determined. The height correction is found by multiplying the bridge height in feet by the correction factor, 0.037 millibars per foot. The ship's barometer is then set to sea level pressure by adding the height correction to the inspection barometer reading. If the ship's barometer cannot be adjusted, a height correction (plus or minus) must be applied by the observer to achieve a sea level pressure reading. The correction should be entered on NWS Form B-13, Barometer Correction Label, and posted on or near the barometer face. Several barometer comparisons should be made to figure the proper height correction. Some large vessels, such as bulk carriers, ride either fully loaded or empty without ballast. Two different corrections should be provided for these ships since large changes in draft can cause considerable pressure difference. To maintain accuracy, the portable inspection barometer should be checked each day by the PMO before and after ship visitations.

Barographs should be checked for normal operation and adjusted to sea level pressure. Thermometers should be cleaned and columns inspected for separations. If necessary, the psychrometer muslin should be replaced. All defective NWS equipment should be replaced.

If the ship is equipped with an anemometer, the PMO should provide the ship with a wind plotting board and explain its use. The PMO should evaluate the wind system exposure and discuss the qualities of the instrument with the deck officers. Ship's officers should be encouraged to have their anemometers checked by a qualified technician at least semiannually and calibrated if necessary and where to locate NWS forecast services and Internet websites.

5.3.3 Explanation of Use of NWS Forecast Services. Discussion of radio facsimile broadcast schedules and products, as well as radio broadcasts of forecasts, synopses, warnings, and analyses, should be brought to the attention of the ship's officers. If necessary, shipboard personnel should be provided instructions on the interpretation and use of these NWS forecast products.

5.3.4 Visitation Services to Foreign Ships. Ships recruited by foreign meteorological services or foreign ships not participating in any observing program should be visited by PMOs when time permits and visits can be arranged. The activities of the PMO on these courtesy ship visits should be the same as if visiting a vessel in the U.S. VOS program.

5.3.5 Visitation Services to U.S. Government and Private Research Ships. Every effort should be made to encourage the cooperation of ships that sail under the following Government-sponsored programs:

- a. U.S. Coast Guard

- b. National Oceanic and Atmospheric Administration (NOAA)
- c. Ships engaged in Government-funded research

Visitation services should be offered to all ships in the various categories listed above. Services to NOAA ships should be coordinated through National Ocean Service Marine Centers, National Marine Centers, and National Marine Fisheries Service Research Centers and Laboratories.

6 NWS Instruments Installed Aboard Ships. The NWS provides as a loan: (1) a barometer, barograph, and thermometer to ships of the selected class; (2) a barometer and thermometer to supplementary class ships; and (3) in special cases, a barometer and thermometer to coastal auxiliary class ships. The NWS also provides sea water thermometers to vessels reporting sea surface temperature. In certain cases, U.S. VOS vessels will use NWS loaned automated weather observation equipment. In many cases, shipboard instrumentation is a mix between shipping company and NWS-loaned equipment.

7 Observational Aids and Marine Publications Provided to Voluntary Observing Ships. Forms, aids, and publications provided to VOS vessels may include:

- a. National Weather Service Observing Handbook No. 1, Marine Surface Weather Observations
- b. WS Form B-81, Ship's Weather Observations
- c. NOAA Form 72-5(series), Marine Coastal Weather Log-Ship Station
- d. Worldwide Marine Radiofacsimile Broadcast Schedule (electronic version)
- e. Mariners Weather Log
- f. Barograph sheets (WS Form 455-12)

8 Observation Procedures and Transmission and Disposition of NWS Forms by Ships. All voluntary ships are requested to take weather observations on a routine basis while at sea. These observations are encoded according to WMO and U.S. requirements and transmitted to selected shore stations for relay to the NWS. Completed weather observation forms, when required, are sent to the servicing PMO, who performs quality control checks of the coded data. In the case where vessels are utilizing software to encode observations and a digital archived record is subsequently transferred to electronic media, this media should be forwarded to the PMO for his/her quality control check of the coded data (requirement for paper copy is eliminated in this case). The PMO then sends them to the National Climatic Data Center where they are archived and used in various investigations and studies.

8.1 Observation Procedures Onboard Voluntary Observing Ships. All voluntary ships are requested to take and record observations at intervals of 6 hours daily while at sea. Observations every 3 hours are requested from vessels operating within 200 nautical miles of the U.S. or Canadian coasts or within 300 nautical miles of named tropical storms or hurricanes. Special observations are made when specifically requested by a Weather Forecast Office, the National Hurricane Center, or the Central Pacific Hurricane Center and when the ship encounters severe weather conditions, especially those not forecast. These conditions can include ice, strong winds, high seas, tropical storms, etc., following the "International Convention on the Safety of Life at Sea (SOLAS)" instructions. In the case where a U.S. VOS program vessel has installed an NWS loaned automated weather system, observations may be automatically sent hourly to the NWS.

8.2 VOS Observations. The VOS Observations made in accordance with National Weather Service Observing Handbook No. 1, Marine Surface Weather Observations, should include, whenever possible, the meteorological measurements of wind speed, wind direction, and barometric pressure as well as the ocean measurements of wave height, wave direction, wave period, and sea surface temperature. Other measurements contained in National Weather Service Observing Handbook No. 1 may be included and encoded in the observations.

8.3 Disposition of Weather Records by Ships. Shipboard observers should be instructed to forward completed observation forms [NOAA Forms B-81 and 72-5(series)], archived electronic media, and/or barograph sheets (WS Form 455-12) to the closest PMO to the port they are routinely operating out of.

A supply of self-addressed envelopes will be furnished to ships by the PMO for mailing the forms and media. Requests for additional forms, supplies, and services should be noted by the PMO receiving the request and handled as expeditiously as possible.

9 PMO Liaison Activities. Next in priority to ship visitations, the PMOs are responsible for maintaining close liaison with shipping company officials, the U.S. Coast Guard, and other marine-oriented organizations. Through these contacts the PMOs can gain support for the VOS program and determine the local marine communities' requirements for weather services. Important unfulfilled requirements discovered by these contacts should be brought to the attention of the Regional Headquarters point of contact and the VOS Program Leader for necessary action.

9.1 Marine Weather Training by PMOs. The PMOs are encouraged to provide training in weather observing techniques for shipboard weather observers. The purpose of the training is to provide the ship's officers with practical assistance in observing techniques and uses of the meteorological services available to the ships. Basic meteorology necessary for weather map analysis and interpretation should be included in the training, if requested.

9.2 Merchant Marine Schools. Since the majority of cadets at merchant marine academies will eventually serve onboard ships participating in the VOS, the NWS should provide them with meteorological assistance when requested and if resources permit.

10 Familiarization Trips. PMOs will maintain skills and expertise in meteorological observations and remain well informed concerning all marine meteorological services available to shipping. This requirement cannot be met by ship visitation and liaison alone. To fully understand the mariners and their challenges with regard to the VOS, all PMOs should sail onboard a cooperating merchant vessel at least once every 2 years. In addition, part time PMOs and marine forecasters with offshore and high seas forecast responsibilities are encouraged to take familiarization trips as time and resources permit. Arrangements for such voyages will be approved by the regional headquarters and with the permission of the cooperating shipping companies affected.

10.1 Duties While on Familiarization Trips. During a familiarization trip, the PMO, part time PMO and marine forecaster should assist the deck officer in taking, encoding, and transmitting synoptic observations; discuss the weather broadcast schedules with the deck officers; and suggest that pertinent marine weather bulletins be copied. Using appropriate bulletins, the PMO, part time PMO, and marine forecaster should demonstrate plotting, drawing, and analysis of surface charts and assist ships' personnel with any questions they may have. The broadcast analysis and forecasts should be checked for accuracy and consistency. A complete report of any problems or discrepancies encountered with these products should be prepared. Dates and times of all observations transmitted and shore radio stations that acknowledge receipt of the messages should be noted. This information should be included in a trip report completed at the end of each voyage and sent to the VOS Program Leader and the appropriate regional point of contact.

11 Awards for Voluntary Observing Ships. To provide suitable recognition of long or especially effective service rendered by participants in the VOS program, awards may be granted. Awards are provided to ships, shipping companies, and to individuals in the maritime community. Arrangements for presentation of awards should be made through the VOS Program Leader and the Regional Headquarters point of contact. When feasible, presentation should be made before a local, civic, or management group. The presentation ceremony should be adequately publicized. Newspaper clippings, pictures, and other pertinent information should be sent to the VOS Program Leader for distribution to NOAA Public Affairs and for inclusion in the Mariners Weather Log as appropriate.