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1. INTRODUCTION

The National Oceanic and Atmospheric Administration's (NOAA) National Weather Service (NWS) issues marine weather warnings and advisories to provide the Nation with advance notice of dangerous marine weather events for the protection of life and property. Marine warnings and advisories are currently issued using headlines in three routine marine forecast products. Currently there is no dedicated long duration marine Watch/Warning/Advisory bulletin to provide specificity and vital marine hazard information to the nation. This paper will discuss the development of a new Marine Weather Warning (MWW) bulletin and the NWS implementation process.

2. CURRENT NWS MARINE WEATHER WARNING PROGRAM

The NWS provides weather, hydrologic, and climate forecasts and warnings for the United States, its territories, adjacent waters and ocean areas, for the protection of life and property and the enhancement of the national economy. The NWS (2005) issues a suite of products to provide the public advance notice of dangerous or life threatening weather conditions. The suite of products follows a multitiered concept to increase awareness and promote a proper response to an approaching life threatening weather event. The suite of products are:

- **Outlook** - used when the potential exists for a hazardous weather event to develop in the next three to seven days
- **Watch** - used when conditions are favorable for an hazardous weather event to develop in the next 12 to 48 hours
- **Warning** - used when a hazardous weather event is occurring, imminent, or has a high probability of occurrence in the next 36 hours and poses a threat to life and property
- **Advisory** - used when a hazardous weather event is occurring, imminent, or has a high probability of occurrence in the next 36 hours and causes significant inconvenience and, if caution is not exercised, could become life threatening

The NWS marine warning and advisory program differs significantly from other NWS long duration warning programs like winter weather, non-precipitation weather, hydrological and coastal hazards. For the marine weather program, there is no marine Watch/Warning/Advisory (W/W/A) product. Also, Watches are not issued for marine hazards.

Marine warnings and advisories are currently disseminated through headlines in the Coastal Waters Forecasts (CWF) (NWS 2006), the Nearshore Marine Forecasts (NSH) (NWS 2007) and the Great Lakes Open Lake Forecast (GLF). Other than headlined in these three routine marine forecast products, there is no dedicated long duration marine Watch/Warning/ Advisory product to provide specificity and vital marine hazard information.

In addition to the inconsistent methodology, there is also an inconsistent level of information provided to the public concerning the meteorological basis for marine warnings and advisories, and potential impacts. This is a limitation in that marine hazards are not conveyed to the public in the same way hazards for other warning programs are. Consequently, users familiar with the warning procedures for other programs may be confused and ultimately make poor decisions when in the marine environment.

As a result, there is a need to provide the marine community a new and improved marine weather warning product to more effectively warn for marine weather hazards. A new Marine Weather Warning (MWW) product patterned after the Winter Storm Warning (WSW) and Non-Precipitation Warning (NPW) products would fill this need.

3. NEW NWS MWW BULLETIN

3.1 Development

The MWW concept was first proposed by the Weather Forecast Office (WFO) in Eureka, CA and submitted to Western Region Headquarters (WRH). In June 2006, representatives from WFO Eureka and WRH formally presented the MWW proposal at the NWS National Marine

Program Leaders Meeting in Silver Spring, MD. The MWW proposal was formally accepted and approval was granted for the development of a chartered MWW improvement team. In November 2006, the MWW Improvement team was formed and consisted of representatives from each of the six NWS regions. The team vision was to provide the nation with an operational suite of marine hazard products with clear, concise, logical, comprehensive and meaningful marine weather hazard information.

After four meetings, the MWW improvement team agreed upon the format and content of the marine weather warning bulletin, and developed formal requirements, a concept of operations and a project plan. The MWW project gained approval through the NWS Operations and Service Improvement Process. During the summer and fall of 2007, the MWW formatter was developed and successfully tested by six WFOs. A detailed example of the new MWW bulletin is shown in Figure 1.

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WHUS76 KMFR 091500
MWWWFR

EXPERIMENTAL...URGENT - MARINE WEATHER MESSAGE
NATIONAL WEATHER SERVICE MEDFORD OR
700 AM PST FRI MAR 9 2007

...GALE WARNING IN EFFECT UNTIL 9 PM PST THIS EVENING...

.WINDS WILL INCREASE LATE THIS MORNING AHEAD OF AN APPROACHING
STRONG COLD FRONT THAT WILL REACH THE COAST BY LATE AFTERNOON.
SOUTH WINDS WILL INCREASE TO GALES LATE THIS MORNING. AFTER THE
FRONT PASSES THROUGH THE WATERS WINDS WILL BECOME NORTHWEST
AND DIMINISH BELOW GALES TO SMALL CRAFT ADVISORY WINDS.

PZZ350-356-370-376-092300-
/E.NEW.KMFR.GL.W.0001.070309T1600Z-070310T0500Z/
COASTAL WATERS FROM FLORENCE TO CAPE BLANCO OR OUT 20 NM
COASTAL WATERS FROM CAPE BLANCO OR TO PT. ST. GEORGE CA OUT 20 NM
WATERS FROM FLORENCE TO CAPE BLANCO OR FROM 20 TO 60 NM
WATERS FROM CAPE BLANCO OR TO PT. ST. GEORGE CA FROM 20 TO 60 NM-
705 AM PST FRI MAR 9 2007

...GALE WARNING IN EFFECT UNTIL 9 PM PST THIS EVENING...

THE NATIONAL WEATHER SERVICE IN MEDFORD HAS ISSUED A GALE
WARNING...WHICH IS IN EFFECT UNTIL 9 PM THIS EVENING. SOUTH WINDS WILL
INCREASE LATE THIS MORNING AHEAD OF A COLD FRONT...WITH EXPECTED
WINDS OF 35 TO 40 KT WITH GUSTS TO 45 KT. WINDS WILL BECOME NORTHWEST
AND DIMINISH BELOW GALES BEHIND THE FRONT LATE THIS EVENING.

<INSTRUCTION>

A GALE WARNING MEANS WINDS OF 34 TO 47 KNOTS ARE IMMINENT OR
OCCURRING. OPERATING A VESSEL IN GALE CONDITIONS REQUIRES EXPERIENCE
AND PROPERLY EQUIPPED VESSELS. IT IS HIGHLY RECOMMENDED THAT MARINERS
WITHOUT THE PROPER EXPERIENCE SEEK SAFE HARBOR PRIOR TO THE ONSET OF
GALE CONDITIONS.

</END INSTRUCTION>

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Figure 1. Example of the new MWW Bulletin.

3.2 Improvements

Specifically, the new MWW bulletin will:

- Provide needed marine warning product.
- Produce consistency with other NWS warning programs.
- Improve understanding and use of NWS Warning

products.

- Standardize procedures for forecasters.
- Fill W/W/A void in the Open Waters of the Great Lakes on NWS Home Page.
- Provide value to Users and Partners.
- Allow for more detailed warning information not available in the CWF or NSH.
- Improve dissemination of marine warning information through automated means.

4. NEW MWW BULLETIN IMPLEMENTATION PROCESS

4.1 AWIPS Integration

The MWW implementation required the introduction of a new text formatter and the addition of several marine watch hazards. The GFE text formatter is very similar to Winter Weather (WSW) and Non-Precipitation (NPW) formatters. The notable differences being the allowable hazards for the marine environment and the introduction of the Common Alerting Protocol (CAP) markup language tags for the Call to Action statements (denoted by <INSTRUCTION> and </END INSTRUCTION>). The MWW is the first text product disseminated by the NWS containing CAP markup tags.

The MWW is a prototype for transferring software development from the field into the AWIPS baseline. The software development was led by field personnel and demonstrates how this development path allows for an expedited implementation.

The software changes will be transmitted to each site, along with an installation script. The installation schedule is determined by the Office of Operational Services (OOS), and the installation was monitored by the Network Control Facility (NCF). The installation is scheduled to be completed before the implementation date of October 1, 2008 at all coastal and Great Lakes sites with the exception of Alaska Region WFOs. The installation of the MWW formatter is part of AWIPS Operations Build 8.3 and future Releases.

4.2 Operations Integration

Forecasters will use the Gridded Forecaster Editor (GFE) software in AWIPS to create the required grids at designated intervals or sooner, as dictated by weather conditions. Hazard grids are currently used to create marine weather warning and advisory headlines in CWF, NSH and GLF products. The process for generating headlines is the same. The hazard grids generated will be used to create the MWW product as well.

The following is a list of current marine hazard types being included in the CWF, NSH and/or GLF and are included in the new MWW product:

Gale Warning
Storm Warning
Hurricane Force Wind Warning
Hazardous Seas Warning
Heavy Freezing Spray Warning

Small Craft Advisory
Small Craft Advisory for Hazardous Seas
Small Craft Advisory for Winds
Small Craft Advisory for Rough Bar
Brisk Wind Advisory
Dense Fog Advisory
Dense Smoke Advisory
Freezing Spray Advisory
Ashfall Advisory
Low Water Advisory

The following is a list of new marine hazard types to be issued by the new MWW product:

Gale Watch
Storm Watch
Hurricane Force Wind Watch
Hazardous Seas Watch
Heavy Freezing Spray Watch

After the hazard grids have been created, forecasters will run a formatter to create a MWW product which will have the same format as long duration W/W/A products currently in the public program. This product will have all the required VTEC coding, which will obviate the requirement for a VTEC string in the CWF and NSH. The MWW is an event-drive product that, once issued, will be updated every 12 hours or sooner, as dictated by weather conditions. The formatter is designed to minimize additional workload for the forecaster.

Note: Tropical Hazards will be issued in the Hurricane Local Statement (HLS) in 2008 Hurricane Season.

A new national MWW policy/instruction document (NWS, 2008) was developed to provide forecasters and marine users and partners with operational procedures and format information. In addition, new marine definition Call to Action statements were created for each marine watch/warning and advisory hazard.

4.3 Public Education

The NWS developed an extensive education effort to inform our customers, partners, and WFO personnel about the new MWW bulletin. Education activities targeting our users and partners included: national and local outreach conferences targeting the media, coastal emergency managers, commercial shipping and fisheries, cruise lines, state ferry systems, recreational boaters, national and local Public Information Statement (PNS) describing the new MWW bulletin and published MWW information on

NWS Web Pages. Forecasters were educated through a series of teleconference calls and the issuance of experimental MWW bulletins by all coastal and Great Lakes WFOs (exception Alaska Region WFOs).

The MWW web page can be found at:
<http://www.nws.noaa.gov/os/mww/>

5. SUMMARY

The MWW bulletin is planned for implementation on October 1, 2008. The MWW will provide the marine community with a dedicated marine weather warning bulletin that is consistent with other NWS warning products. The MWW will be the first NWS text product to contain CAP instruction tags.

REFERENCES

NWS, 2008: Marine Weather Warning Product Specification, **National Weather Service Instruction 10-315** (*under review*).

NWS, 2007: Great Lakes Marine Services, **National Weather Service Instruction 10-312**.
<http://www.nws.noaa.gov/directives>.

NWS, 2006: Coastal Marine Forecast Services, **National Weather Service Instruction 10-310**.
<http://www.nws.noaa.gov/directives>.

NWS, 2005: WFO Non-Precipitation Weather Products Specification, **National Weather Service Instruction 10-515**. <http://www.nws.noaa.gov/directives>.

NWS, 2005: WFO Winter Weather Products Specification, **National Weather Service Instruction 10-513**.
<http://www.nws.noaa.gov/directives>.