CHAPTER 13

METEOROLOGICAL AND OCEANOGRAPHIC BRIEFS

In previous chapters of this manual you were given information on various aids available to help you provide the best products to on-scene commanders. This chapter will deal with the briefing of just a few of these aids. In addition, we will highlight specific environmental factors that must be considered when mine warfare and amphibious warfare briefings are being prepared.

Now that you have been given all this information, your biggest challenge may be to sell it to the on-scene commander.

The success of any operation or exercise depends, to a large extent, on the various "players" being prepared for any eventualities. It is of utmost importance that the Aerographer become aware of these "what ifs" and brief the players accordingly.

Unit 5 of *AG2* TRAMAN, Volume 2, NAVEDTRA 10371, covers briefing techniques. It would be to your advantage to review this material prior to conducting any METOC briefings.

TROPICAL CYCLONE DISASTER PLANNING

LEARNING OBJECTIVES: Evaluate unit/activity preparedness for tropical cyclones. Familiarize yourself with sources of information used in the preparation of tropical cyclone briefs.

In order to brief tropical cyclone advisories/warnings effectively, a thorough understanding of tropical cyclone principles, characteristics, and climatology must first be understood. These topics were discussed in detail in chapter 11.

PREPAREDNESS

When dealing with tropical cyclone preparedness you should be aware of the following important items:

- The affects that a tropical cyclone may have on units or activities
  - What activities are prone to wind, sea, and/or surge damage
  - The significance of wind direction and time of onset of severe weather
  - The potential for evacuation or sortie
- That effective lines of communication must exist throughout the threat period

SEVERE WEATHER CONDITIONS OF READINESS

OPNAVINST 3140.24 provides specific guidance and criteria for issuing conditions of readiness (COR). Destructive weather poses a significant threat to personnel, ships, aircraft, installations, and other resources. Adequate and timely weather warnings, coupled with prompt and effective action by commanders concerned, will minimize loss and damage from destructive weather. Table 13-1 lists the conditions of readiness for tropical cyclones, subtropical, or extratropical wind storms. The lower portion of table 13-1 list the conditions of readiness for small area storms, that is, thunderstorms and tornadoes.

Local area forecaster handbooks and climatological data are very valuable as planning tools in preparing and presenting tropical cyclone disaster briefs.

For further information on tropical cyclone disaster planning and associated phenomena, see module 12 of the *Composite Warfare Oceanographic Support Modules (CWOSM).*

Table 13-1.-Conditions of Readiness

CONDITIONS OF READINESS	
TROPICAL CYCLONE, SUBTROPICAL, OR EXTRATROPICAL WIND STORMS (Issue using gale, storm, tropical storm or hurricane/typhoon to indicate force of destructive winds.)	
CONDITION IV	Trend indicates a possible threat of destructive winds of the force indicated **within 72 hours**. Review hazardous and destructive weather implementation plans, as established by local regulations.
CONDITION III	Destructive winds of the force indicated are **possible within 48 hours**. Take preliminary precautions.
CONDITION II	Destructive winds of the force indicated are **anticipated within 24 hours**. Take precautions that will permit establishment of an appropriate state of readiness on short notice.
CONDITION I	Destructive winds of the force indicated are **occurring or anticipated within 12 hours**. Take final precautions as prescribed.

SMALL AREA STORMS	THUNDERSTORM OR TORNADO CONDITIONS
CONDITION II	Destructive winds accompanying the phenomena indicated are expected in the general area **within 6 hours**. Associated lightning/thunder, torrential rain, hail, severe downbursts, and sudden wind shifts are possible. Take precautions that will permit establishment of an appropriate state of readiness on short notice.
CONDITION I	Destructive winds accompanying the phenomena indicated are **imminent or are occurring**. Associated lightning/thunder, torrential rain, hail, severe downbursts, and sudden wind shifts are possible. Take immediate safety precautions and shelter.

BRIEFING CLIMATOLOGICAL SUMMARIES OF TROPICAL CYCLONE STORM TRACKS

LEARNING OBJECTIVES: List the sources for obtaining climatological tropical cyclone storm track information.

There may be occasions when climatological data is required for an area for which your activity does not hold the necessary climatology publications. FNMOD Asheville prepares the publication, *Atmospheric Climatic Publication,* FLENUMMETOCDET ASHEVILLENOTE 3146, which contains a concise list of climatological publications, and the procedures for obtaining them.

Among those available to assist the Aerographer are:

- *Marine Climatic Atlases of the World*
- *Global Tropical/Extrotropical Cyclone Climatic Atlases*

Since 1990 FNMOD Asheville has been shifting away from climatic atlases in hard copy to compact disc-read only memory (CD-ROM).

We will now discuss a few Geophysics Fleet Mission Program Library (GFMPL) products used as aids in the event of evasive and/or sortie measures due to tropical cyclones.

BRIEFING OF TROPICAL CYCLONE EVASIVE/SORTIE RECOMMENDATIONS

LEARNING OBJECTIVES: Identify GFMPL products used as aids in assessing tropical cyclone evasive/sortie recommendations.

Aerographers can't have too many METOC products at their disposal to assist them in their day-to-day duties. They must put all their experiences and learning to use, particularly when a tropical system is bearing down on an activity or unit. The *Geophysics Fleet Mission Program Library (GFMPL) Summary,* GFMPL-SUM-91-01, provides meteorological, oceanographic, electromagnetic, and acoustic software for use as aids in planning various operations.

WARNINGS PLOT

The Warnings Plot program is composed of three primary functions: Tropical Cyclone Plot, High Winds Plot, and High Seas Plot. The Warnings Plot program provides the capability to enter Tropical Cyclone, High Winds, and High Seas warning messages and their subsequent forecasts or both. This product is available on GFMPL HP-9020.

ADDITIONAL GFMPL AIDS

Two additional programs available in GFMPL to assist the Aerographer with tropical cyclone preparation are Tropical Cyclone and Tropical Cyclone Applications Software System (TCASS).

Tropical Cyclone

GFMPL offers the program, TROPICAL CYCLONE, which plots tropical cyclone track and forecast information on a map background.

Tropical Cyclone Applications Software System (TCASS)

Tropical cyclones can pose a serious threat to the safety of ship and battle group operations. TCASS is designed to be used by Aerographer personnel to evaluate the probability that dangerous tropical cyclone winds will threaten the ship or battle group. These tropical cyclone applications programs can also be used to evaluate the threat of tropical cyclone winds at ports and other locations. In the event that the probability of encountering dangerous winds exceeds the critical probability specified by the operator, these tropical cyclone applications programs may also be used to reroute the ship around hazardous areas.

SURGE BRIEFING AIDS

LEARNING OBJECTIVES: Identify Geophysics Fleet Mission Program Library (GFMPL) products used as aids in assessing surge threats.

The greatest danger to coastal areas being threatened by a tropical cyclone is not necessarily the extreme winds, but the wall of water being pushed ahead of the storm by those winds. Tropical storm surges have caused much devastation over the last 50 years to structures along the coastline. Forecasting of maximum surge heights will allow preparations to be made accordingly.

The *GFMPL Summary,* GFMPL-SUM-91-01, contains a program called SURGE that serves as an aid in the planning of the surge threat.

The SURGE program provides an approximation of peak storm surge for tropical cyclones moving onshore or alongshore on the Atlantic or Gulf coasts of the United States (a similar program for the Pacific region is not yet available). This estimate provides a "worst case" storm surge for any given storm and location. This information can be used in choosing precautionary actions for coastal activities. The estimated peak storm surge is a function of storm and coastline characteristics. Radius of maximum winds, central pressure drop, and storm speed and direction are inferred from the tropical cyclone warning. The user may specify a coastal station of interest from the list provided by SURGE, in which case the shoaling factor (the effect of the surge approaching shallower water) and coastline orientation are retrieved from the SURGE data base, or the user may also enter these values directly. Now let's look at METOC effects on various warfare operations.

METOC EFFECTS ON VARIOUS WARFARE OPERATIONS

LEARNING OBJECTIVES: Identify the publication that outlines the contents of antisubmarine (ASW), space and electronic warfare (SEW), strike warfare (STW), antisurface warfare (ASUW), and antiair warfare (AAW) briefs.

It is beyond the scope of this text to discuss all the information considered important for the various METOC briefs listed below. Significant information regarding these briefs, for the most part, is confidential. Refer to the text *Environmental Effects on Weapon Systems and Naval Warfare,* (S)RP1, for a discussion of these topics:

- Environmental factors affecting ASW operations
- Environmental effects on special warfare
- Environmental effects on SEW
- Environmental effects on chemical, biological, and radiological (CBR) operations
- Environmental considerations for STW operations
- Environmental considerations for ASUW operations
- Environmental considerations for AAW operations
- Target environmental conditions

Now let's discuss those elements of importance during the planning and execution of minewarfare (MIW) operations.

BRIEFING OF METOC EFFECTS ON MIW OPERATIONS

LEARNING OBJECTIVES: Brief the effects that water depth, currents, tides, and bottom characteristics have on MIW operations. Understand the impact of the magnetic, acoustic, pressure, and biological environments on MIW operations.

There are environmental considerations unique to the planning of MIW operations and this section will be devoted to this topic. For further discussion of MIW operations, refer to the technical manual, *Composite Warfare Oceanographic Support Modules (CWOSM), Part 1,* TM 04-92.

WATER DEPTH

Water depth is a factor to be considered in the spacing of mines, sensitivity setting, mine type, and mine impact velocity (air-laid mines).

- Bottom mines — In deep water (180 ft or greater), detonation will not cause much of a disturbance in the upper layers of the ocean.
- Moored mines — Depth may exceed the mooring range required for the mine to be effective.
- Sensitivity and actuation width — Important for bottom mines since an increase in depth will result in a decrease of the sensitivity and actuation width of a bottom mine.
- Damage width — Water depth affects the damage width in the same way as in actuation width. Increasing water depth causes a reduction in the damage width of a mine.
- Mine burial upon impact — The depth at which terminal velocity is reached depends on the initial velocity when launched and the depth of the water.

CURRENTS

Subsurface currents may *set* in different direction as mines descend, and current velocity may also vary during descent. These factors must be considered during planning of MIW operations.

- *Burial* — Burial on the sea floor can result from *scour* (water velocity increases around the mine, setting sand and sediments in motion, burying the mine). Once the mine is completely buried, scouring stops.
- *Sand ridge migration* — Currents may cause large sand dunes to migrate along the bottom in the direction of the current. The dunes can be as high as 12 to 20 ft.
- *Mine dip* (vertical movement of mines) — An increase in mine depth from the normal vertical position above the mooring point. Current action creates forces against the mine, increasing the depth, Dip is directly proportional to current speed; therefore, dip will increase with faster currents. During *flood* and *ebb*

tides, mine dip is at a maximum, which is the best time to penetrate a minefield.

• *Mine walking* (horizontal movement of a mine) — Movement of the mine anchor caused by currents. In regions where the bottom slope is greater than 5° and a strong current exists, moored mines can walk downslope into deeper water. Walking is also dependent on bottom sediment, bottom topography, and wave action.

• *Mine rolling* — Rolling or tilting of a mine on the bottom may result in magnetic or acoustic pressure causing the mine to detonate. A delay-arming device is used to eliminate this possibility.

• *Acoustic mines* — Strong currents can produce enough turbulence to increase ambient noise at the acoustic sensor to partially mask a ship's acoustic signature.

• *Pressure mines*— A ship drifting with the current will have a reduced pressure signature as if the ship's speed was reduced.

• *Explosive ordnance demolition (EOD) operations* — Current velocity for surface water may not be the same as that below the surface. The layers of water above and below the thermocline can move independent y of one another, so divers may drift in several directions while descending.

• *Mine neutralization vehicle (MNV) operations* — Using an unmanned, tethered, remote-controlled submersible known as an MNV, it provides mine countermeasure (MCM) ships with mine neutralization capabilities. MNV maneuverability can be drastically reduced by currents because of the dragon the cable.

• *Navigation errors* — Currents can cause the ship's track to vary significantly from the intended trackline. Mine laying (spacing) and mine countermeasures (sweep coverage) depend on an accurate track

• *Mine drift* — By utilizing prevailing currents, drift mines may be launched at safe distances to occupy a minefield that would otherwise be inaccessible. A change in current direction could present an inherent danger to the mining forces or to other friendly forces in the later stages of the campaign.

TIDES

Local topographic features, meteorological conditions, currents, and the influences of the sun and moon must be considered to establish the tidal characteristics for a given area.

• *Selection of mooring depth* —Tides may cause depth variations of a moored mine and can cause the mine to surface during low tide and be too deep during high tide.

• *Mine sensitivity and damage width* — In areas where the tidal range is great, the position of a moored mine relative to the sea surface may vary significantly. As with the impact of water depth, increasing the depth of a mine will cause a reduction in its sensitivity, actuation width, and damage width.

• *Submergence of reference buoys* — Reference buoys are used to mark the position of mines and as aids to navigation. If these buoys are deployed at low tide, they may become submerged during high tide.

BOTTOM CHARACTERISTICS

Bottom sediments vary in porosity, water content, compactibility, and plasticity.

• *Reverberation* — Bottom reverberation depends on frequency and grazing angle. Bottom scattering depends on sediment type and bottom roughness.

• *Acoustic contrast* — Detecting and classifying mines with high-frequency mine hunting sonars creates a problem in acoustically distinguishing mines from the background.

• *Bottom sediments (hardness)* — Initial penetration in silt or clay will be greater than rock, gravel, or a sandy bottom.

• *Impact velocity* — Softer bottom types affect initial penetration more so than hard bottoms.

• *Weight of the mine* — This causes subsequent penetration. This results from *plastic flow* (sediment flow out from under the mine upon impact), and/or scour and deposition.

• *Angle of impact* — The more perpendicular the angle of impact, the greater the expected initial penetration.

• *Mine movement* — A mine will not roll on a bottom composed of various mixtures of fine-grained sand, silt, and clay. Initial penetration into the bottom will prevent subsequent rolling.

• *Mine burial* — Burial of a mine will have little influence upon a magnetic-actuated mechanism, but an acoustic signal may be attenuated by overlying sediment.

- *Bottom clutter* — This phenomena results in non-mine targets being detected by a minehunting sonar system. This makes it difficult for the operator to identify targets from the ambient noise.

- *Sediment resistivity* — This is the ability of sediment to conduct electrical current. Resistivity depends upon salinity, electrical conductivity of the sediment, and the thickness of the sediment.

MAGNETIC ENVIRONMENT

The factors that affect the sensitivity of magnetic sweep equipment are as follows:

- The effectiveness of magnetic sweep equipment is influenced by the water depth and the conductivity of the water (salinity and temperature).

- Magnetic storms cause momentary fluctuations in the earth's magnetic field. These storms sometimes closely resemble the magnetic signature of a ship and may result in magnetic influences firing mines prematurely.

ACOUSTIC ENVIRONMENT

Ambient noise can create problems for mines and MCMs in shallow water.

- High ambient noise levels present a problem for the performance of acoustic influence mines, since the target must be discriminated from ambient noise over relatively long ranges.

- High-frequency components of ambient noise tend to have little effect on minehunting operations because of the high receiver directivity characteristics of minehunting sonar systems.

PRESSURE ENVIRONMENT

Water pressure can play a significant role in MIW operations.

- The effective pressure change caused by wave heights at the surface diminishes with increasing depth.

- Generally, pressure mines require other influences, such as acoustic or magnetic influences to be present simultaneously in order for the mine to explode.

BIOLOGICAL ENVIRONMENT

Biologics may influence sonar detection, the neutralization of mines by EOD divers, and the performance of acoustic influence mines.

- *Marine biofouling* — Both plant and animal forms constitute major fouling agents in shallow waters, animal forms being dominant in deeper waters.

- *Marine life* — Divers can be exposed to dangerous marine life in open waters.

- *Bioluminescence* — Bioluminescent displays may reveal minedrops or outline moored mines and cables.

- *Biological ambient noise* — Minehunting sonars and most acoustic mines are not seriously affected by this type of ambient noise.

PHYSICAL CHARACTERISTICS

Water temperature, and temperature profile versus depth can play a significant role in MIW operations.

Temperature

Strong negative temperature gradients found in shallow water will result in strong bottom reverberation. Detection ranges may be sharply reduced.

Variable Depth Sonar (VDS) Transducers

Depth and tilt angles can be adjusted to be optimally tuned to existing environmental conditions.

Diving Operations

Diver performance is affected by water temperature as well as water clarity.

- In cold water, a diver's ability to concentrate and work efficiently will be greatly reduced.

- The possibility of exhaustion exists when diving operations are conducted in the vicinity of industrial outflow due to higher temperature waste water.

Salinity

There are salinity considerations that must be addressed in the planning and conducting of MIW operations.

• Areas of lower salinity (river runoff, ice edge) will reduce the conductivity of the water and overall effectiveness of MIW operations. Conductivity is directly proportional to salinity and temperature.

• In coastal environments with a large input of fresh water from river runoff, a strong positive sound velocity gradient can form causing upward refraction of the sonar beam.

Meteorology

There are several METOC considerations that must be addressed in the planning and conducting of MIW operations.

• *Surface winds* — If they are too strong, can we have an effective operation?

• *Wave action* — Affects underwater visibility, burial and movement of mines, accuracy of navigation, sound velocity profiles, deployment of MNVs, sweep gear, and divers.

• *Prevailing visibility* — If obstructions to visibility are present, navigation, minehunting and sweep effectiveness is decreased.

• *Hours of daylight* — Airborne minehunting, minesweeping, and EOD diver operations are primarily conducted during daylight hours.

Now let's discuss the environmental support for amphibious warfare (AMW) operations.

BRIEFING OF METOC SUPPORT FOR AMW OPERATIONS

LEARNING OBJECTIVES: Brief the Commander, Amphibious Task Force (CATF), and all interested personnel on expected METOC conditions during the planning, embarkation, rehearsal, movement, and assault phases of AMW operations.

In this discussion of AMW operations we will be discussing environmental support during the Planning phase, followed by the Embarkation phase, Rehearsal phase, Movement phase, and lastly the Assault phase (PERMA).

THE PLANNING PHASE

The Aerographer must first become familiar with the initial operation plans (OPPLANs) and operation orders (OPORDs), and must attend pre-mission briefings and conferences so that environmental factors affecting the various aspects of the mission can be addressed. In addition, the Aerographer must be prepared to provide the following:

• Long-range climatological and historical data. During the planning phase this can prove critical to mission success. Determine conditions that will most likely influence the location and time of landing including:

— Weather. Emphasis should be given to cloud ceiling height, visibility, and winds. This also includes local effects.

— Sea, swell, and surf conditions.

— Sea surface temperatures.

• Astronomical data (sunrise/sunset, moonrise/ moonset, and percent of illumination), tidal data that affects local anchorages, as well as surf conditions to include:

— Character of surf zone.

— Degree of exposure of potential obstacles in the surf zone.

— Beach slope/s.

— Wave oscillation in harbor/s.

• Hydrographic data for inshore navigation of landing craft.

— Treacherous regions of bays, harbors, etc.

— Sandbars.

— Reefs.

THE EMBARKATION PHASE

During this phase, equipment and troops are embarked in assigned ships. Load out is accomplished.

• Amphibious operations are keyed to sequential events.

• Environmental support may include both mid-range and short-range forecasts.

• The OA division aboard the LHA/LHD/LPH becomes the focal point of the operation.

- OA division personnel must make environmental recommendations to the CATF and Commander, Landing Force (CLF).

- Factors in the environment that can be exploited to enhance safety, covertness, or defense readiness must be made known to the appropriate parties.

- METOC conditions play an enormous role in the successful outcome of AMW operations.

THE REHEARSAL PHASE

This phase is the “dry run” and is used to test the adequacy of plans and to evaluate the readiness of forces. It also is used to check the timing sequence of each event and also as an opportunity to test communications. This phase may or may not take place, depending on the situation.

- OA division personnel should take this opportunity to test the adequacy of support and support timing for the actual assault and make changes as necessary.

- Weaknesses uncovered in the development of support products, the Amphibious Warfare Environmental Summary, and in the timeliness of delivery during this phase will prove to be a valuable “lessons learned”.

- OA division personnel should also check familiarity with OPPLANS/OPTASK METOC.

THE MOVEMENT PHASE

During this phase, the Amphibious Task Force (ATF) is vulnerable to enemy interception so the full spectrum of defensive/offensive support products should be disseminated and updated twice daily.

- OA division personnel should provide necessary environmental support according to the OPORD.

- It is important to avoid heavy weather to minimize effects to deckloaded cargo and embarked troops.

- Intelligence may have aerial photographs of the assault site, which can be useful in locating and determining such features as surf zone, rip currents, bottom obstacles, and floating debris.

ASSAULT PHASE

This phase starts with the arrival of the ATF in the Amphibious Objective Area (AOA) and terminates with the accomplishment of the ATF mission.

Operations conducted during this phase are critically dependent upon environmental factors.

Significant Weather

Significant weather includes the following factors:

- *Precipitation* — Heavy precipitation interferes with the movement ashore and the push inland. Strike capability is greatly diminished.

- *Lightning* — Poses a grave danger during boat operations.

- Low *visibility* — Hampers small boat operation.

- *Wind direction/speed* — Can modify breaker type in the surf zone and affect flight operations. May also reduce visibility in the surf zone.

- *Modified surf index* (MSI) — Most critical parameter in a waterborne assault.

Aviation Weather

Aviation weather is dependent on the following factors:

- Cloud cover (bases and tops).
- Prevailing and sector risibilities,
- Surface and upper level winds.
- Density altitude (DA) and pressure altitude (PA).
- Air/sea temperature, icing, freezing level.
- Contrail formation.
- Bingo fields.
- EO weapon/sensor performance.
- Any other significant weather.

Currents

In the discussion of currents we will first discuss, offshore currents, followed by rip currents, and shore currents.

OFFSHORE CURRENTS.— These currents are found outside the surf zone (both tidal and nontidal).

- Tidal currents are predominant near entrances to bays and sounds, channels, between islands, or between islands and the mainland.

- Tidal currents usually reverse direction on a periodic basis (every 6 to 12 hours) and can reach speeds up to several knots.

RIP CURRENTS.— These currents result from waves piling water up against the coast. They flow along the coast until they are deflected seaward by bottom irregularities or until they meet another current.

- Flow can reach speeds as high as 12 kts, but usually attain speeds of 2 to 4 kts. Prevents most landing craft from making any headway ashore.

- The *head* (leading edge) of the current is often discolored by silt in suspension.

- If the beach is irregular, they will flow along the beach for a short distance and then flow out to sea.

- They are easily identified by aircraft, as they create a turbid flume offshore.

SHORE CURRENTS.— The following discussion deals with the formation and characteristics of shore currents.

- Generated by waves breaking at an angle to the beach.

- Littoral or longshore currents flow parallel to the beach inside the breakers.

- Speeds increase with increasing breaker height, with increasing angle of the breaker with the beach, and with steeper slopes.

- Speeds decrease with increasing wave period.

- In areas where longshore/littoral currents are common, sandbars are usually present.

- Longshore/littoral currents must be considered in selecting a beach or landing site. A littoral current can cause a landing craft to broach.

Further discussion of beach topography, beach composition, beach surveys, breakers, and offshore sealswells may be found in the technical manual, *CWOSM, Part 1,* TM 04-92.

For further discussion of AMW operations refer to the technical manual, *CWOSM, Part 1,* TM 04-92 and *Joint Surf Manual,* COMNAVSURFPAC/COMNAVSURFLANT Instruction 3840.1. The last topic of discussion in this chapter will be the briefing of METOC services available from OA divisions.

BRIEFING OF AVAILABLE METOC SERVICES

LEARNING OBJECTIVES: Brief OTCs and interested personnel on METOC conditions, as well as communications.

Previous discussions in this chapter have dealt with various briefs that OA division personnel are required to present on a routine basis. METOC support was standardized recently to better support afloat units Navywide. This plan includes Meteorology/Oceanography (OPTASK METOC) and several tactical support summaries. This standardized format will now be contained in ANNEX H to numbered fleet basic OPORDs.

The standardization to ANNEX H to the numbered fleet OPORDs and information previously presented in this chapter and technical manual, *CWOSM, Part 1,* should ensure all METOC briefs, regardless of respective fleets, will outline all necessary elements of benefit to OTCs.

SUMMARY

In this chapter we discussed various METOC briefs conducted by Aerographer personnel. Among those presented were tropical cyclone disaster planning, tropical cyclone evasion/sortie, storm surge, MIW, AMW, and those used in fleet coordinated exercises/operations. It should be understood that these are just a few of the many METOC briefs that Aerographers may present.