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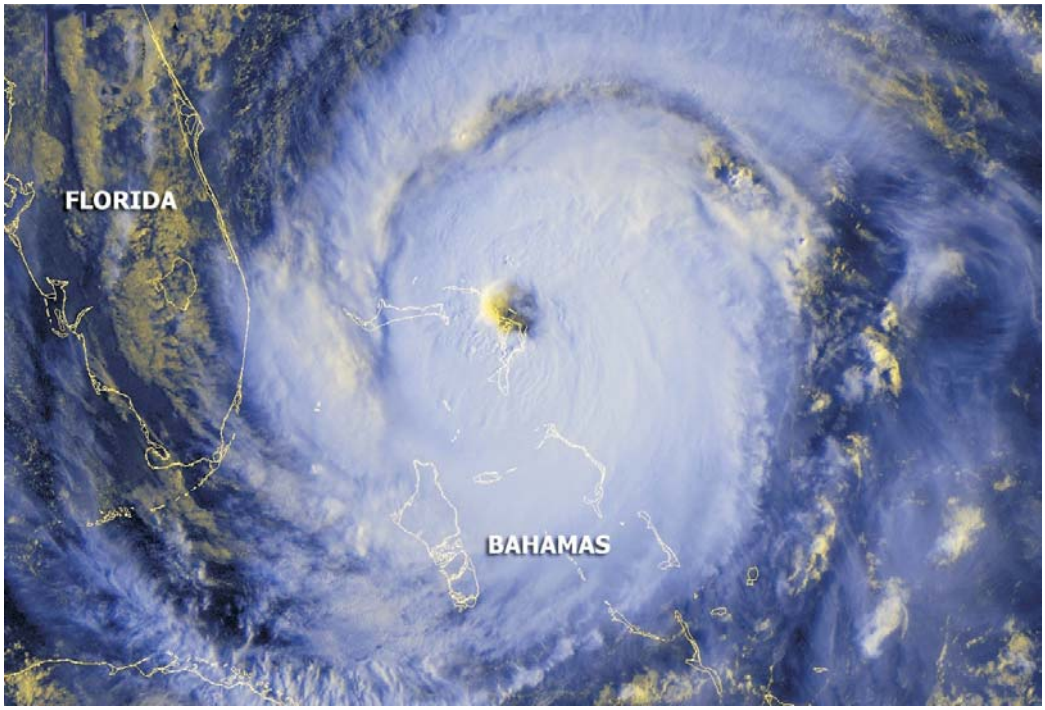
METEOROLOGICAL SERVICES AND SUPPORTING RESEARCH

National Hurricane Operations Plan

FCM-P12-2005



Hurricane Jeanne - 25 September 2004

Washington, DC
May 2005

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NATIONAL HURRICANE OPERATIONS PLAN

FCM-P12-2005

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May 2005

CHANGE AND REVIEW LOG

Use this page to record changes and notices of reviews.

Change Number	Page Numbers	Date Posted	Initial
1			
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Changes are indicated by a vertical line in the margin next to the change or by shading and strikeouts.

Review Date	Comments	Initial

FOREWORD

The Interdepartmental Hurricane Conference (IHC) is sponsored annually by the Office of the Federal Coordinator for Meteorological Services and Supporting Research (OFCM) to provide a forum for the responsible Federal agencies, together with representatives from the user communities like emergency management, to review the Nation's hurricane forecast and warning program and to make recommendations on how to improve the program in the future. The major objective is to plan and prepare for the upcoming hurricane season. The 59th IHC was held in Jacksonville, Florida, March 7-11, 2005, and the new procedures, procedural changes, and agreements reached at the conference were incorporated into this publication—the 43rd edition of the *National Hurricane Operations Plan* (NHOP).

At the 59th IHC, the Working Group for Hurricane and Winter Storms Operations and Research (WG/HWSOR) addressed 13 action items. Of the 13, 6 will be closed through incorporation into the NHOP as approved recommendations and/or changes. Two of the items were informational in nature, and one was withdrawn. The action items will be published on the OFCM web site at www.ofcm.gov.

This edition includes a number of minor revisions and changes to Chapter 3, *General Operations and Procedures of the National Weather Service Hurricane Centers*, and Chapter 5, *Aircraft Reconnaissance*. Chapter 6, *Satellite Reconnaissance*, and Appendix A, *Local National Weather Service (NWS) Office Products*, were substantially updated, and the breakpoints for California were added to Appendix B.

For the state of Florida, the 2004 Atlantic tropical cyclone season was a season to remember. Two major hurricanes (Charley and Jeanne) hit Florida for the first time since 1950, with a third hurricane (Frances) making landfall in Florida and a fourth (Ivan) in Alabama, just west of the northern Panhandle. Hurricane Frances prompted the largest evacuation in Florida history, and Frances and Ivan each produced over 100 tornadoes in the U.S. Of the season's 15 tropical or subtropical storms, 9 became hurricanes, and 6 became major hurricanes. A record eight tropical storms formed during the month of August. Hurricanes Charley, Frances, Gaston, Ivan, and Jeanne made landfall in the U.S.—the most hurricane landfalls since 1985. The death toll for the season was over 3100, primarily due to the effects of Jeanne in Haiti; there were 60 direct deaths in the U.S. The unadjusted property damage in the U.S. is estimated to be near $45 billion—the costliest hurricane season on record for the U.S. The bottom line, however, is that forecast track errors were at record lows, and our multiagency tropical cyclone warning support system superbly responded to a very challenging season—a tribute to the professionalism, dedication, and cooperation of the civilian and military agencies involved.

Samuel P. Williamson
Federal Coordinator for Meteorological
Services and Supporting Research

NATIONAL HURRICANE OPERATIONS PLAN

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CHAPTER 1

INTRODUCTION

1.1. General. The tropical cyclone warning service is an interdepartmental effort to provide the United States and designated international recipients with forecasts, warnings, and assessments concerning tropical and subtropical weather systems. The National Oceanic and Atmospheric Administration (NOAA) of the Department of Commerce (DOC) is responsible for providing forecasts and warnings for the Atlantic and Eastern and Central Pacific Oceans while the Department of Defense (DOD) provides the same services for the Western Pacific and Indian Ocean (see Figure 1-1). NOAA, along with other Federal agencies such as the U.S. Navy and the National Aeronautics and Space Administration (NASA), also conducts supporting research efforts to improve tropical cyclone warning services. The bottom line--this interdepartmental cooperation achieves economy and efficiency in the provision of the tropical cyclone warning services to the Nation. The *National Hurricane Operations Plan* provides the basis for implementing agreements reached at the Interdepartmental Hurricane Conference (IHC), which is sponsored annually by the Office of the Federal Coordinator for Meteorological Services and Supporting Research. The goal of the IHC is to bring together the responsible Federal agencies to achieve agreement on items of mutual concern related to tropical cyclone warning services for the Atlantic and Pacific Oceans.

1.2. Scope. The procedures and agreements contained herein apply to the Atlantic Ocean, Gulf of Mexico, Caribbean Sea, and the Pacific Ocean. The plan defines the role of the individual agencies participating in the tropical cyclone warning service when more than one agency is involved in the delivery of service in any specific area. When a single agency is involved in any specific area, that agency's procedures should be contained in internal documents and, to the extent possible, be consistent with NHOP practices and procedures. Please note that under the National Weather Service Modernization Plan, the former National Hurricane Center (NHC) was incorporated into the Tropical Prediction Center (TPC), one of the seven service-oriented centers and two central support activities that comprise the National Centers for Environmental Prediction (NCEP)--formerly the National Meteorological Center. The tropical cyclone warning mission still resides with the NHC (Hurricane Specialist Unit), which is a major component of the TPC. For completeness, the NHC will be referred to as TPC/NHC throughout the document.

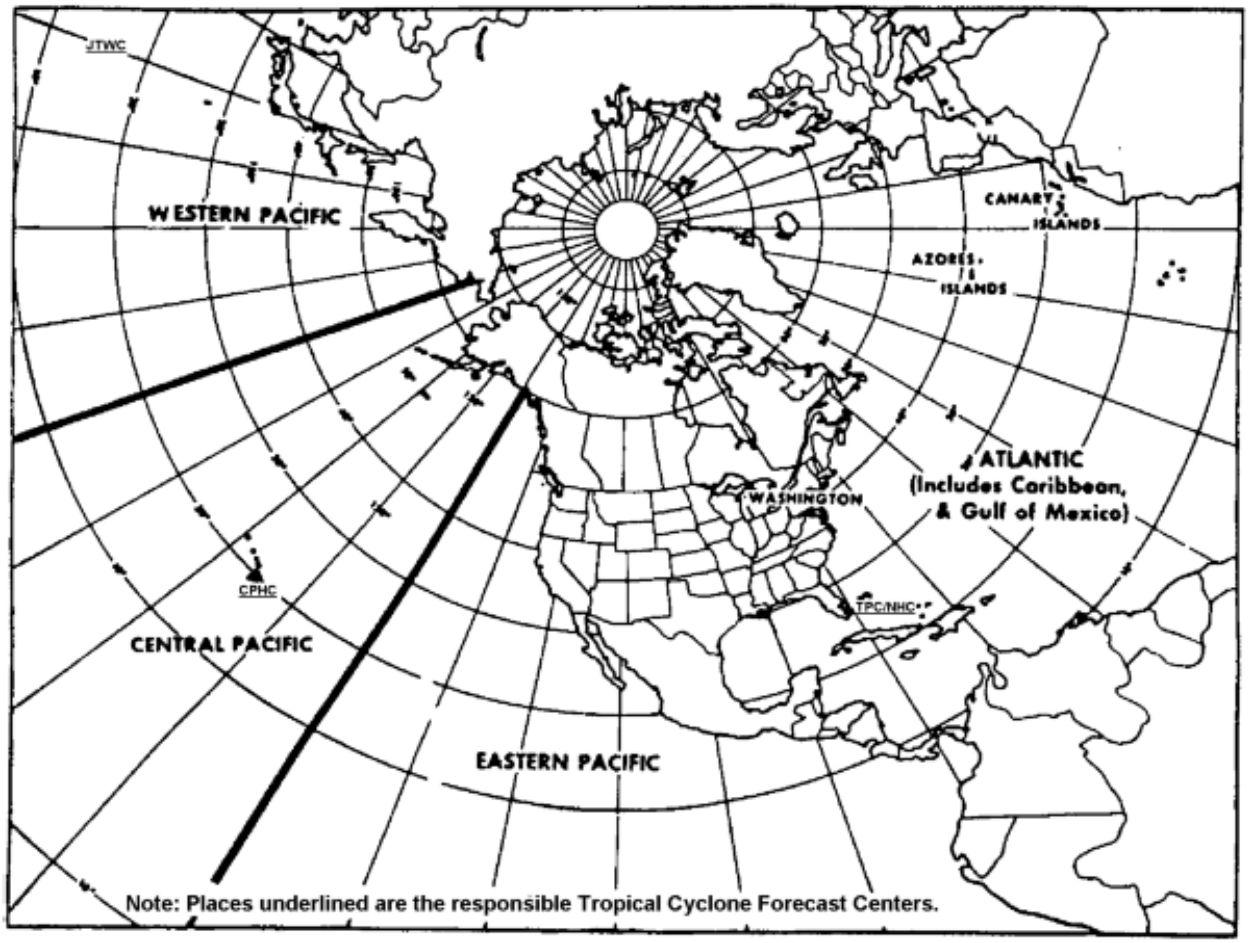

Figure 1-1. Tropical cyclone forecast centers' areas of responsibility

Note: While the Joint Typhoon Warning Center (JTWC) has physically moved to Pearl Harbor, Hawaii, its area of responsibility remains unchanged.

CHAPTER 2

RESPONSIBILITIES OF COOPERATING FEDERAL AGENCIES

2.1. General. The Department of Commerce (DOC), through the National Oceanic and Atmospheric Administration (NOAA), is charged with the overall responsibility to implement a responsive, effective national tropical cyclone warning service. Many local, state, and Federal agencies play a vital role in this system; their cooperative efforts help ensure that necessary preparedness actions are taken to minimize loss of life and destruction of property. The joint participation by the Department of Defense (DOD) and the Department of Transportation (DOT) with the DOC brings to bear those limited and expensive Federal resources considered essential for storm detection and accurate forecasting. This cooperative effort has proven to be a cost-effective, highly responsive endeavor to meet national requirements for tropical cyclone warning information.

2.2. DOC Responsibilities.

2.2.1. Forecast and Warning Services. The DOC will provide timely dissemination of forecasts, warnings, and all significant information regarding tropical and subtropical cyclones to the appropriate agencies, marine and aviation interests, and the general public.

2.2.2. Support to DOD. Through NOAA's National Weather Service (NWS), the DOC will:

- Consult, as necessary, with the DOD regarding their day-to-day requirements for forecast/advisory services and attempt to meet these requirements within the capabilities of the tropical cyclone warning service.

- Provide, through the Tropical Prediction Center/National Hurricane Center (TPC/NHC), the coordinated DOC requirements for weather reconnaissance and other meteorological data to be acquired by the DOD on tropical or subtropical cyclones and disturbances.

- Provide facilities, administrative support, and the means to disseminate meteorological data for the Chief, Aerial Reconnaissance Coordination, All Hurricanes (CARCAH) as agreed to by the DOC and DOD.

- Provide the DOD with basic meteorological information, warnings, forecasts, and associated prognostic reasoning concerning location, intensity, and forecast movement of tropical and subtropical cyclones in the following maritime areas, including the adjacent states and possessions of the United States:

< Atlantic Ocean (north of the equator including the Caribbean Sea and Gulf of Mexico). Advisories are the responsibility of the Director, TPC/NHC, Miami, FL. The TPC/NHC will consult with the Naval Atlantic Meteorology and Oceanography Center (NAVLANTMETOCCEN), Norfolk, VA, prior to issuing initial and final advisories and prior to issuing any advisory that indicates a significant change in forecast of intensity or track from the previous advisory. Exchange of information is encouraged on subsequent warnings when significant changes are made or otherwise required.

< Eastern Pacific Ocean (north of the equator and east of 140EW). Advisories are the responsibility of the Director, TPC/NHC, Miami, FL. The TPC/NHC will consult with the Joint Typhoon Warning Center (JTWC), Pearl Harbor, HI, prior to issuing initial and final advisories and prior to issuing any advisory that indicates a significant change in forecast of intensity or track from the previous advisory. Exchange of information is encouraged on subsequent warnings when significant changes are made or otherwise required.

< Central Pacific Ocean (north of the equator between 140EW and 180E). Advisories are the responsibility of the Director, Central Pacific Hurricane Center (CPHC), Honolulu, HI. The CPHC will consult with JTWC prior to issuing initial and final advisories and prior to issuing any advisory that indicates a significant change in forecast of intensity or track from the previous advisory. Exchange of information is encouraged on subsequent warnings when significant changes are made or otherwise required.

< West Pacific Ocean (Guam and Micronesia). Public advisories are prepared by the NWS Forecast Office, Tiyan, Guam, using the tropical cyclone forecasts/advisories prepared by JTWC.

2.2.3. Post Analysis of Tropical Cyclones. The DOC, through NWS, will conduct an annual post analysis for all tropical cyclones in the Atlantic and the Pacific regions east of 180E and prepare an annual hurricane report for issue to interested agencies.

2.2.4. Environmental Satellite Systems. The National Environmental Satellite, Data, and Information Service (NESDIS) will:

- Operate DOC environmental satellite systems capable of providing coverage of meteorological conditions in the tropics during the tropical cyclone season, and monitor and interpret DOC satellite imagery.

- Obtain, as necessary, National Aeronautics and Space Administration (NASA) research and development satellite data and Defense Meteorological Satellite

Program (DMSP) data for NWS operational use and to comply with TPC/NHC and CPHC satellite data requirements.

- Provide, resources permitting, surveillance support with fixes and/or intensity estimates to the Joint Typhoon Warning Center (JTWC), TPC/NHC, and CPHC through analysis of all available satellite imagery.

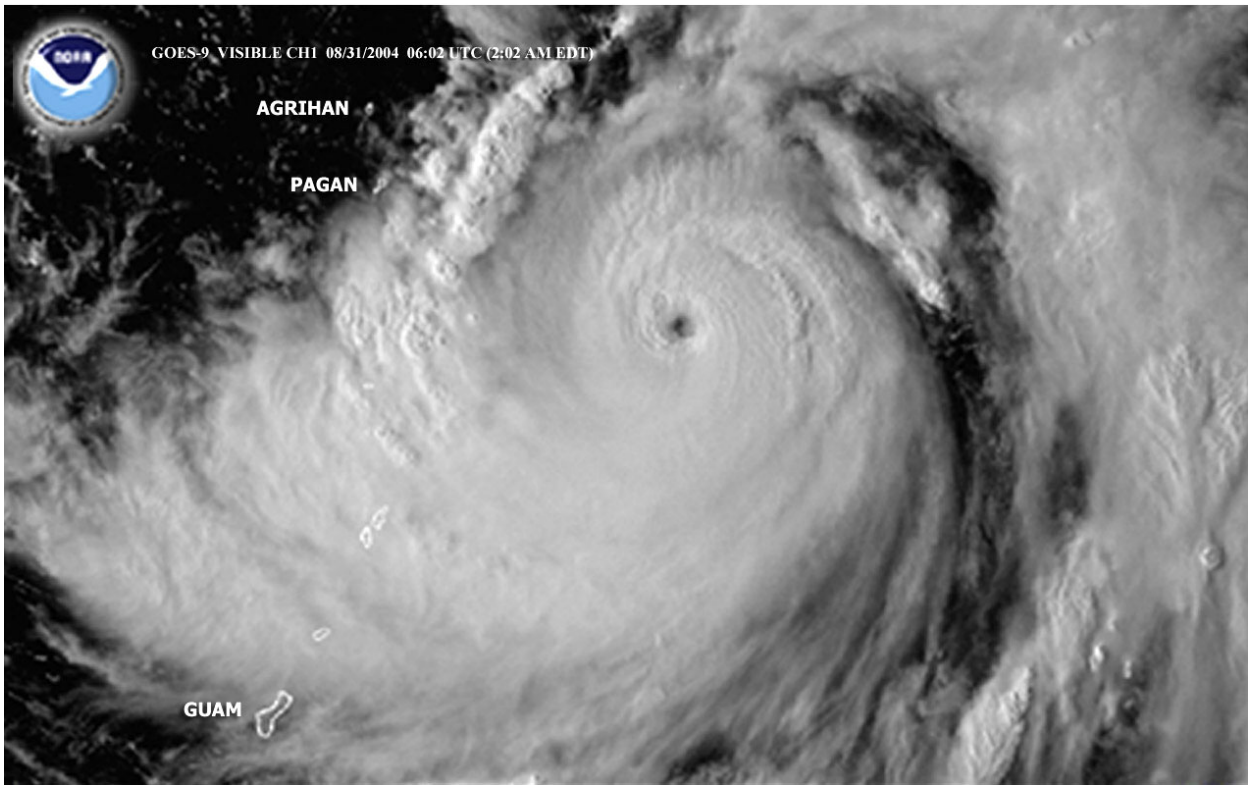

Figure 2-1. Typhoon Songda, August 31, 2004

2.2.5. Data Buoy Systems. Through the National Data Buoy Center (NDBC), the DOC will, subject to available funding, develop, deploy, and operate environmental data buoy systems and automated coastal stations to support the data requirements of TPC/NHC and CPHC.

2.2.6. Weather Reconnaissance. Through the NOAA Office of Marine and Aviation Operations (OMAO), DOC will provide weather reconnaissance flights, including synoptic surveillance, as specified in Chapter 5, unless relieved of these responsibilities by the Administrator of NOAA.

2.3. <u>DOD Responsibilities</u>. The DOD will:

- Disseminate significant meteorological information on tropical and subtropical cyclones to the NWS in a timely manner.

- Provide TPC/NHC and CPHC current DOD requirements for tropical and subtropical cyclone advisories.

- Meet DOC requirements for aircraft reconnaissance and other special observations as agreed to by DOD and DOC (see Appendix F).

- Provide at TPC/NHC a 24-hour aircraft operations interface--Chief, Aerial Reconnaissance Coordination, All Hurricanes (CARCAH).

- Designate CARCAH as the liaison to TPC/NHC. CARCAH will serve as TPC/NHC's point of contact to request special DOD observations in support of this plan; i.e., DMSP fixes, additional upper-air observations, etc.

- Provide weather reconnaissance data monitor services to evaluate and disseminate reconnaissance reports.

- Provide, resources permitting, through the Air Force Weather Agency (AFWA), Offutt AFB, NE, and the 17th Operational Weather Squadron Meteorological Satellite (MetSat) Operations Flight (17 OWS/WXJ), Joint Typhoon Warning Center, Pearl Harbor, HI, surveillance support with fixes and or intensity and gale-wind estimates to all United States tropical cyclone warning agencies through analysis of satellite imagery obtained primarily from the DMSP system. AFWA support will typically be worldwide, while the JTWC MetSat Operations Flight support focuses on the Indian Ocean and the Central, South, and Northwest Pacific Ocean.

- Western Pacific Ocean (north of the equator): Provide NWS with basic meteorological information, forecasts, and associated prognostic reasoning, concerning location, intensity and forecast movement of tropical cyclones for the Northwest Pacific west of 180°. JTWC will consult with the NWS Forecast Office (NWSFO), Tiyan, Guam, regarding all tropical cyclones affecting Micronesia and Guam. Consultation will occur prior to issuing initial and final

advisories and prior to issuing any advisory that indicates a significant change in forecast intensity or track from the previous advisory.

- Initiate, monitor, and update satellite invest areas on the tropical cyclone satellite websites provided by the Fleet Numerical Meteorology and Oceanography Center (FNMOC) and the Naval Research Laboratory (NRL), Monterey, California. TPC/NHC and CPHC will coordinate with JTWC on the initiation of desired invest areas and will provide JTWC numbers for invest areas as required.

- Deploy, through the Naval Oceanographic Office (NAVOCEANO), drifting data buoys in support of Commander-in-Chief, Atlantic Fleet (CINCLANTFLT) requirements.

2.4. <u>DOT/DHS Responsibilities</u>.

2.4.1. Information Dissemination. The DOT will provide NWS with timely dissemination of significant information received regarding tropical and subtropical cyclones.

2.4.2. Flight Assistance. Through the Federal Aviation Administration (FAA), the DOT will provide air traffic control, communications, and flight assistance services.

2.4.3. U. S. Coast Guard. The DOT will provide the following through the U.S. Coast Guard:

- Personnel, vessel, and communications support to the NDBC for development, deployment, and operation of moored environmental data buoy systems.

- Surface observations to NWS from its coastal facilities and vessels.

- Communications circuits for relay of weather observations to NWS in selected areas.

- Coastal broadcast facilities at selected locations for tropical storm or hurricane forecasts and warnings.

2.5. <u>Annual Liaison with Other Nations</u>. The DOD, DOC, and DOT will cooperate in arranging an annual trip to the Caribbean and the Gulf of Mexico area to carry out a continuing and effective liaison with the directors of meteorological services, air traffic control agencies, and disaster preparedness agencies of nations in those areas, regarding the provision of tropical cyclone warning services. The Air Force Reserve Command (AFRC) and TPC/NHC jointly have the responsibility to plan and execute this mission, resources permitting. TPC/NHC will coordinate with the meteorological services in the countries to be visited. AFRC will fly the mission and will issue invitational travel orders (ITO) to the TPC/NHC Director and staff, other U.S. officials, and the media on a noninterference, non-reimbursable basis.

2.6. <u>Air Traffic Control/Flight Operations Coordination</u>. The operations officers of the principal flying units, the Assistant Manager, Operations, Air Traffic Control System Command Center, Herndon, VA, and the assistant managers for traffic management or assistant manager for military operations, as appropriate, at key Air Route Traffic Control Centers (ARTCC) will maintain a close working relationship on a continuing basis to ensure mission success under actual tropical storm conditions. This will involve visits to each other's facilities, familiarization flights, and telephone and teletype communications to improve the understanding of each other's requirements and capabilities.

2.6.1. Gulf of Mexico Weather Reconnaissance. The 53rd Weather Reconnaissance Squadron and the NOAA Aircraft Operations Center operations officers will maintain a close working relationship with the Air Traffic Control System Command Center, the ARTCCs, and the Fleet Aerial Control and Surveillance Facility (FACSFAC) for the coordination of weather reconnaissance flights in the Gulf of Mexico and over the Caribbean Sea in particular, and in the United States in general. The operations officers will:

- Request the assistance of the appropriate ARTCC/FACSFAC in support of the *National Hurricane Operations Plan*.

- Provide the current operations officer's name and telephone number to the appropriate ARTCC and FACSFAC.

- Publish the unit's telephone numbers [Defense Switched Network (DSN)/Commercial] and teletype address code for Service B (Appendix I).

2.6.2. Air Traffic Control Assistance. The Air Traffic Control System Command Center, appropriate ARTCCs, and FACSFAC will maintain a close working relationship with the weather reconnaissance units and provide airspace and air traffic control assistance to the extent possible. Those organizations will:

- Provide the current names and telephone numbers of points of contact to the flying units.

- Publish telephone numbers (DSN/Commercial) and teletype code for Service B (Appendix I).

CHAPTER 3

GENERAL OPERATIONS AND PROCEDURES OF THE NATIONAL WEATHER SERVICE HURRICANE CENTERS

3.1. General. This chapter describes the products, procedures, and communications headers used by the Tropical Prediction Center/National Hurricane Center (TPC/NHC) and the Central Pacific Hurricane Center (CPHC). See Appendix A for a description of local National Weather Service (NWS) office products which support the tropical cyclone forecast and warning program.

3.2. Products.

3.2.1. Tropical Weather Outlook (TWO). Tropical weather outlooks are prepared and issued by the TPC/NHC and CPHC during their respective hurricane seasons. The TPC/NHC writes TWOs for both the Atlantic and Eastern Pacific Basins. They are transmitted at 0530, 1130, 1730, and 2230 Eastern Local Time in the Atlantic and at 0400, 1000, 1600, and 2200 Pacific Local Time. In the Central Pacific, TWOs are transmitted by the CPHC at 0200, 0800, 1400, and 2000 UTC. The outlook briefly describes significant areas of disturbed weather and their potential for tropical cyclone development out to 48 hours. A tropical weather summary of Atlantic, Eastern Pacific, and Central Pacific tropical cyclone activity will be prepared and issued at the end of each month during the hurricane season.

3.2.2. Tropical Cyclone Discussion. The TPC/NHC and the CPHC will, as appropriate, issue tropical cyclone discussions on Atlantic, Eastern Pacific, and Central Pacific tropical cyclones at 0300, 0900, 1500, and 2100 UTC. Discussions will contain preliminary prognostic positions and maximum wind-speed forecasts up to 72 hours; will describe objective techniques, synoptic features, and climatology used; and will provide reasons for track changes.

3.2.3. Tropical Cyclone Public Advisories. Tropical cyclone public advisories are issued by the TPC/NHC for all tropical cyclones in the Atlantic. In the Eastern Pacific, tropical cyclone public advisories are issued by TPC/NHC for tropical cyclones that are expected to affect land within 48 hours. In the Central Pacific, tropical cyclone public advisories are issued by CPHC for all tropical cyclones within the area of responsibility. Tropical cyclone public advisories are issued at the same time scheduled tropical cyclone forecast/advisories are issued; i.e., 0300, 0900, 1500, and 2100 UTC. Watch and warning break points are listed in Appendix B. In the Western Pacific, public advisories are issued by the NWS Forecast Office (WFO), Tiyan, Guam, for all tropical cyclones within the Territory of Guam and Micronesia, using tropical cyclone forecasts/advisories prepared by the Joint Typhoon Warning Center (JTWC) as guidance. *Public advisories will be discontinued when (1) the tropical cyclone ceases to be a tropical cyclone; e.g., becomes extratropical, a remnant low, or dissipates, or (2) the tropical cyclone is centered over land, is below tropical storm strength, and is not forecast to move back over water as a tropical cyclone, and (3) there are no coastal tropical cyclone watches or warnings in effect.*

[NOTE: To further publicize local products, when a tropical cyclone threatens a land area, the following statement shall be included in the advisory..."For storm information specific to your area...please monitor products issued by your local weather office." Tropical cyclone public

advisories use statute miles for distance and miles per hour for speed. Nautical miles and knots may be added at the discretion of the centers. Atlantic advisories should include the metric units in kilometers and kilometers per hour following the equivalent English units except when the United States is the only country threatened.]

3.2.4. Tropical Cyclone Forecast/Advisories. Tropical cyclone forecast/advisories are issued by the TPC/NHC and the CPHC. See Section 4.3 for content and format of the advisories. In both the Atlantic and Pacific, the advisories are scheduled for 0300, 0900, 1500, and 2100 UTC. Pacific advisories should be transmitted 15 minutes before the effective time. In the Western Pacific, tropical cyclone forecasts/advisories are issued by the JTWC; Appendix C provides a listing of the abbreviated communications headings and titles for JTWC products. Information on the broadcast of tropical cyclone information to coastal and high-seas shipping can be found in Chapter 9, Marine Weather Broadcasts.

3.2.5. Probability of Hurricane/Tropical Storm Conditions.

3.2.5.1. When Issued. The probability of hurricane/tropical storm conditions shall be issued in tabular form at regularly scheduled tropical cyclone public advisory and tropical cyclone forecast/advisory times. These probabilities will generally be carried for all named storms in the Atlantic Basin[1] within 72 hours of forecasted landfall. In addition, TPC/NHC may issue probabilities for tropical depressions forecast to become named storms and be a threat to land within 72 hours. When a tropical cyclone is forecast to track parallel to a coastline, maximum values over water points should be included, and the tropical cyclone public advisory should state that the highest probabilities are over water. The 72-hour cumulative probabilities of less than 5 percent are not included in the transmitted probability tables.

3.2.5.2. When Computed. The probabilities, which are based on the official forecast track, should be issued when the 72-hour forecast position approaches the coast and should be carried in advisories until the storm makes landfall. Two conditions in which probability information should not be issued are: (1) the hurricane/tropical storm has made landfall and is not expected to reemerge over water and/or (2) the computed probability values are not significant. At the discretion of the hurricane forecaster, probabilities need not be listed for sites where the tropical storm or hurricane would likely be over land or less than tropical storm strength at the time it would affect the site. TPC/NHC may include a brief explanation of probabilities in the advisory.

These probabilities should be computed shortly after synoptic times for the 0-24, 24-36, 36-48, and 48-72 hours. A total probability for the next 72 hours should be shown in the last column and should represent a total of all forecast periods. The probability of the storm striking a coastal location within 48 hours may be determined by adding the 0-24, 24-36, and 36-48 hour probabilities. If the probability for a location is less than 1 percent, an "X" will be indicated in the table. If probabilities are not to be issued, a statement will be included in both the tropical cyclone public advisory and the tropical cyclone forecast/advisory. Refer to *Probability of Hurricane/Tropical Storm Conditions: A User's Manual* for further information.

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[1] Atlantic Basin includes the Atlantic, Caribbean, and Gulf of Mexico

3.2.5.3. Locations. When appropriate, specific probabilities will be computed for the following locations:

Brownsville, TX	Fort Pierce, FL
Corpus Christi, TX	Cocoa Beach, FL
Port O'Connor, TX	Daytona Beach, FL
Galveston, TX	Jacksonville, FL
Port Arthur, TX	Savannah, GA
New Iberia, LA	Charleston, SC
New Orleans, LA	Myrtle Beach, SC
Buras, LA	Wilmington, NC
Gulfport, MS	Morehead City, NC
Mobile, AL	Cape Hatteras, NC
Pensacola, FL	Norfolk, VA
Panama City, FL	Ocean City, MD
Apalachicola, FL	Atlantic City, NJ
St. Marks, FL	New York City, NY
Cedar Key, FL	Montauk Point, NY
Tampa, FL	Providence, RI
Venice, FL	Nantucket Island, MA
Fort Myers, FL	Hyannis, MA
Marco Island, FL	Boston, MA
Key West, FL	Portland, ME
Marathon, FL	Bar Harbor, ME
Miami, FL	Eastport, ME
West Palm Beach, FL	28°N 93°W
29°N 85°W	28°N 95°W
29°N 87°W	27°N 96°W
28°N 89°W	25°N 96° W
28°N 91°W	

Note: Probabilities are not issued for the west coast of the continental United States, Hawaii, and the Territory of Guam and Micronesia.

3.2.6. Tropical Cyclone Updates. Tropical cyclone updates are brief statements in lieu of or preceding special forecasts to inform of significant changes in a tropical cyclone, or to post or cancel watches and warnings.

3.2.7. Tropical Cyclone Position Estimates. The hurricane centers and WFO Guam may issue a position estimate between 2-hourly intermediate public advisories whenever sufficient, reliable radar center fix information is available. Position estimates disseminated to the public, DOD, and other Federal agencies will provide geographical positions in two ways: by latitude and longitude and by distance and direction from a well-known point.

3.2.8. Special Tropical Disturbance Statement. Special tropical disturbance statements may be issued to furnish information on strong formative, non-depression systems.

3.2.9. HPC Public Advisories (TCP). The National Centers for Environmental Prediction's Hydrological Prediction Center (HPC) will issue public advisories after TPC/NHC discontinues its on subtropical and tropical cyclones that have moved inland in the United States or Mexico, but still pose a threat of heavy rain and flash floods in the conterminous United States or Mexico. The last NHC advisory will normally be issued when winds in an inland tropical cyclone drop below tropical storm strength, and the tropical depression is not forecast to regain tropical storm intensity or reemerge over water. The TCP is an alphanumeric product, and advisories are issued at 0300, 0900, 1500, and 2100 UTC. TCPs will continue to be numbered in sequence with tropical cyclone advisories by TPC/NHC and will reference the former storm's name in the text. Content will refer to the decaying system's position, intensity, general forecast trends, highlight impacts which occurred and are expected to occur (usually in relation to heavy rain/flooding and tornadoes), and indicate when the next summary will be issued. Advisories will terminate when the threat of flash flooding has ended or when the remnants of these storms can no longer be distinguished from other synoptic features capable of producing flash floods.

```
WTNT3i KWNH DDHHMM
TCPATc

PUBLIC ADVISORY NUMBER XX FOR (TROPICAL CYCLONE TYPE) (NAME)
NWS HYDROMETEOROLOGICAL PREDICTION CENTER CAMP SPRINGS MD
time am/pm time_zone day mon DD YYYY

TEXT

$$
```

Figure 3-1. **HPC Public Advisory Product Format**

3.2.10. Tropical Disturbance Rainfall Estimates. As required, the TPC/NHC/CPHC will issue satellite-based rainfall estimates for tropical disturbances and tropical cyclones within 36 hours of forecasted landfall.

3.2.11. Tropical Weather Summary (Monthly). NHC and CPHC will prepare and issue these products each month during the hurricane season. The product will summarize the previous month's tropical cyclone activity. The last product issued at the end of the hurricane season will summarize November's activity plus the activity for the whole season.

3.2.12. Tropical Cyclone Summary - Fixes. CPHC will issue these products when a tropical cyclone is classifiable using the Dvorak technique. Fixes will be issued for the north central Pacific from 140ºW to 180º and for the south central Pacific from 120ºW to 160ºE. After the initial tropical cyclone fix, succeeding fixes will be done at approximately 0000, 0600, 1200, and 1800 UTC as long as the system is classifiable using the Dvorak technique.

3.2.13. Tropical Cyclone Danger Area Graphic. The Tropical Cyclone Danger Area is a graphical marine product depicting a tropical cyclone's track (out to 72 hours) and shades in a danger area determined by adding 100, 200, and 300 nautical miles plus the 34-knot wind radii to the 24-, 48-, and 72- hour forecast position respectively in the Atlantic and east Pacific. For the

central Pacific, the shaded danger area will vary in width dependent upon the hurricane specialist's confidence in the track and the length of the 34-knot wind radii. In addition, areas of possible tropical cyclone genesis (out to 36 hours) are included and depicted as either a circular, rectangle, oval, or polygon shaped area. The product is prepared by the TPC and covers the entire Atlantic north of the equator and the Pacific north of the equator from the Mexican and Central America coast west to 140ºW. CPHC prepares a separate chart for 140ºW to the International Dateline north of the equator. The product is disseminated four times per day during the hurricane season within 1 hour after the advisory package issuance. This would be at 0400, 1000, 1600 and 2200 UTC.

3.2.14. Aviation Tropical Cyclone Advisory (TCA). The TCA is intended to provide short-term tropical cyclone forecast guidance for international aviation safety and routing purposes. The product is prepared by TPC/NHC and CPHC for all ongoing tropical cyclone activity in their respective areas of responsibility. This requirement is stated in the World Meteorological Organization Region IV hurricane plan. TCAs list the current TC position, motion and intensity, and 12- and 24-hour forecast positions and intensities. It is an alphanumeric text product produced by hurricane forecasters and consists of information extracted from the official forecasts. This forecast is produced from subjective evaluation of current meteorological and oceanographic data as well as output from numerical weather prediction models, and is coordinated with affected WFOs, the National Centers, and the Department of Defense. It is prepared four times daily and issued at 0300, 0900, 1500, and 2100 UTC.

```
FKaa2i CCCC DDHHMM
TCAxxx

(TROPICAL CYCLONE TYPE) ICAO ADVISORY NUMBER ##
ISSUING OFFICE CITY STATE
time am/pm time_zone day mon DD YYYY

TEXT

$$
```

Figure 3-2. Aviation Tropical Cyclone Advisory Format

3.3. Designation of Tropical and Subtropical Cyclones.

3.3.1. Numbering of Tropical and Subtropical Depressions. The hurricane centers are responsible for numbering tropical and subtropical depressions in their areas of responsibility. Tropical depressions shall be numbered consecutively beginning each season with the spelled out number "ONE." For ease in differentiation, tropical depression numbers shall include the suffix "E" for Eastern Pacific, "C" for Central Pacific, or "W" for Western Pacific, after the number. In both the Atlantic and Pacific, once the depression has reached tropical storm intensity, it shall be named and the depression number dropped. The depression number will not be used again until the following year. Give tropical cyclones a name in the first advisory after intensifying to 34 knots (39 mph) or greater.

The following rules apply for tropical cyclones passing from one basin to another: Retain the name if a tropical cyclone passes from one basin into another basin as a tropical cyclone; i.e., advisories are continuous. An unnamed tropical depression will also retain its number (e.g. Tropical Depression Six-E remains Tropical Depression Six-E) if it crosses into another area of responsibility. *For unnamed tropical depressions moving from west to east across 180°, CPHC will use the associated Joint Typhoon Warning Center's (JTWC) number and indicate JTWC in parentheses following the number. For named systems, CPHC will use the associated Regional Specialized Meteorological Center (RSMC) Tokyo and provide the associated JTWC number in parentheses.*

Within a basin, if the remnant of a tropical cyclone redevelops into a tropical cyclone, it is assigned its original number or name. If the remnants of a former tropical cyclone regenerate in a new basin, the regenerated tropical cyclone will be given a new designation.

3.3.1.1. Atlantic Basin. Depression numbers, ONE, TWO, THREE, will be assigned by the TPC/NHC after advising the Naval Atlantic Meteorology and Oceanography Center (NAVLANTMETOCCEN) Norfolk.

3.3.1.2. Pacific East of 140ºW. Depression numbers, with the suffix E, e.g., ONE-E, TWO-E, THREE-E, will be assigned by the TPC/NHC after advising JTWC, Pearl Harbor, HI. The assigned identifier shall be retained even if the depression passes into another warning area.

3.3.1.3. Pacific West of 140ºW and East of 180º. Depression numbers, with suffix C; e.g., ONE-C, TWO-C, THREE-C, will be assigned by the CPHC after advising JTWC.

3.3.1.4. Pacific West of 180º and North of 0º. Depression numbers, with suffix W; e.g., ONE-W, TWO-W, THREE-W, are assigned by JTWC.

3.3.1.5. Subtropical Depressions. A single list of numbers and names will be used for all tropical and subtropical cyclones. Therefore, numbering of subtropical depressions will follow the same procedure as tropical depressions. For example, if the first subtropical depression follows the first tropical depression, the subtropical depression will be given the designation SUBTROPICAL DEPRESSION TWO. If a subtropical depression becomes a subtropical storm, it receives the next available name in the tropical cyclone naming sequence.

3.3.2. Numbering and Naming of Tropical and Subtropical Cyclones.

3.3.2.1. Numbering and Naming Tropical Cyclones. Tropical cyclone centers will number tropical depressions in their areas of responsibility. Number tropical depressions consecutively beginning each season with the spelled out number "ONE." In the north Pacific, for ease in differentiation, tropical depression numbers, assigned by NHC or CPHC, will include the suffix "E" for eastern (east of 140°W longitude) or "C," for central (180° to 140°W longitude) respectively, after the number. In both the Atlantic and Pacific, once the depression reaches tropical storm intensity, name it and drop the depression number. The depression number will not be used again until the following year. Give tropical cyclones a name in the first advisory after intensifying to 34 knots (39 mph) or greater.

The following rules apply for tropical cyclones passing from one basin to another: Retain the name if a tropical cyclone passes from one basin into another basin as a tropical cyclone; i.e. advisories are continuous. An unnamed tropical depression will also retain its number (e.g. Tropical Depression Six-E remains Tropical Depression Six-E) if it crosses into another area of responsibility. *For unnamed tropical depressions moving from west to east across 180°, CPHC will use the associated Joint Typhoon Warning Center's (JTWC) number and indicate JTWC in parentheses following the number. For named systems, CPHC will use the associated Regional Specialized Meteorological Center (RSMC) Tokyo and provide the associated JTWC number in parentheses.*

Within a basin, if the remnant of a tropical cyclone redevelops into a tropical cyclone, it is assigned its original number or name. If the remnants of a former tropical cyclone regenerate in a new basin, the regenerated tropical cyclone will be given a new designation.

3.3.2.2. Numbering and Naming Subtropical Storms. A single list of numbers and names will be used for all tropical and subtropical cyclones. Therefore, numbering of subtropical depressions will follow the same procedure as tropical depressions. For example, if the first subtropical depression follows the first tropical depression, the subtropical depression will be given the designation SUBTROPICAL DEPRESSION TWO. If a subtropical depression becomes a subtropical storm, it receives the next available name in the tropical cyclone naming sequence.

3.3.2.3. Numbering Advisories and Tropical/Subtropical Cyclone Discussions. Tropical and subtropical cyclone advisories and discussions in the Atlantic and the Pacific will be numbered similarly. Number scheduled and special advisories and TCDs consecutively beginning with the number 1 (not spelled out) for each new tropical or subtropical cyclone, and continue through the duration of the cyclone. In situations where only TCMs and TCDs are being written (tropical cyclones in the eastern Pacific not threatening land) and at a later time a public advisory is required, the public advisory number will match the corresponding TCM. In both the Atlantic and the Pacific, intermediate advisories and TCDs will retain the advisory number of the scheduled or special advisory they update and append an alphabetic designator (e.g., "HURRICANE ALLISON INTERMEDIATE ADVISORY NUMBER 20A").

3.4. Transfer of Warning Responsibility.

3.4.1. TPC/NHC to CPHC. When a tropical or subtropical cyclone approaches 140ºW, the coordinated transfer of warning responsibility from TPC/NHC to CPHC will be made and the appropriate advisory issued.

3.4.2. CPHC to JTWC/RSMC, Tokyo. When a tropical or subtropical cyclone crosses 180º from east to west, the coordinated transfer of warning responsibility from CPHC to JTWC will be made and the appropriate advisory issued. At the same time, the CPHC will coordinate with the RSMC, Tokyo so that they are aware that CPHC will be suspending the issuance of advisories.

3.4.3. JTWC/RSMC, Tokyo to CPHC. When a tropical or subtropical cyclone crosses 180º from west to east, the coordinated transfer of warning responsibility from JTWC to CPHC will be made. JTWC will append the statement, "Next advisory by CPHC-HNL" to their last advisory. At the same time, the CPHC will coordinate with RSMC, Tokyo so that they are aware that CPHC will be assuming the issuance of advisories.

3.5. Alternate Warning Responsibilities.

3.5.1. Transfer to Alternate. In the event of impending or actual operational failure of a hurricane forecast center, tropical warning responsibilities will be transferred to an alternate facility in accordance with existing directives and retained there until resumption of responsibility can be made. Alternate facilities are as follows:

PRIMARY	ALTERNATE
TPC/NHC	National Centers for Environmental Prediction Hydrometeorological Prediction Center (HPC) Camp Springs, MD
CPHC	TPC/NHC
CARCAH	53rd Weather Reconnaissance Squadron (53 WRS)
JTWC	Fleet Numerical Meteorology and Oceanography Center (FLENUMETOCCEN), Monterey, CA
NWSO Tiyan, Guam	CPHC

3.5.2. Notification. The NAVLANTMETOCCEN, Norfolk, and JTWC, Pearl Harbor, will be advised by TPC/NHC, CARCAH, and CPHC, as appropriate, of impending or actual transfer of responsibility by the most rapid means available. JTWC will advise CPHC and TPC/NHC of impending or actual transfer of JTWC responsibilities. In the event of an operational failure of CARCAH, direct communication is authorized between the 53 WRS and the forecast facility. Contact 53 WRS at DSN 597-2409/COM 601-377-2409 or through the Keesler AFB Command Post at DSN 597-4330/COM 601-377-4330 (ask for the 53 WRS).

Table 3-1. Atlantic Tropical Cyclone Names

2005		**2006**		**2007**	
ARLENE		ALBERTO	al-BAIR-toe	ANDREA	
BRET		BERYL	BER-ril	BARRY	
CINDY		CHRIS		CHANTAL	shan-TAHL
DENNIS		DEBBY		DEAN	
EMILY		ERNESTO	er-NES-toe	ERIN	AIR-in
FRANKLIN		FLORENCE		FELIX	FEEL-ix
GERT		GORDON		GABRIELLE	ga-bree-EL
HARVEY		HELENE	he-LEEN	HUMBERTO	oom-BAIR-to
IRENE		ISAAC	EYE-zak	INGRID	
JOSE	ho-ZAY	JOYCE		JERRY	
KATRINA	ka-TREE-na	KIRK		KAREN	
LEE		LESLIE		LORENZO	
MARIA	ma-REE-ah	MICHAEL	MIKE-el	MELISSA	
NATE		NADINE	nay-DEEN	NOEL	
OPHELIA	o-FEEL-ya	OSCAR		OLGA	
PHILIPPE	fe-leep	PATTY		PABLO	PA-blow
RITA		RAFAEL	ra-fa-EL	REBEKAH	
STAN		SANDY		SEBASTIEN	say-BAS-tyan
TAMMY		TONY		TANYA	TAHN-ya
VINCE		VALERIE		VAN	
WILMA		WILLIAM		WENDY	

2008		**2009**		**2010**	
ARTHUR		ANA		ALEX	
BERTHA	BUR-tha	BILL		BONNIE	
CRISTOBAL		CLAUDETTE	claw-DET	*COLIN*	
DOLLY		DANNY		DANIELLE	dan-YELL
EDOUARD	eh-DWARD	ERIKA	ERR-ree-ka	EARL	
FAY		FRED		*FIONA*	
GUSTAV		GRACE		GASTON	
HANNA		HENRI	ahn-REE	HERMINE	her-MEEN
IKE		IDA		IGOR	e-GOR
JOSEPHINE	JO-ze-feen	JOAQUIN		*JULIA*	
KYLE		KATE		KARL	
LAURA		LARRY		LISA	LEE-sa
MARCO		MINDY		MATTHEW	
NANA		NICHOLAS	NIK-o-las	NICOLE	ni-COLE
OMAR		ODETTE	o-DET	OTTO	
PALOMA	pa-LOW-ma	PETER		PAULA	
RENE	re-NAY	ROSE		RICHARD	RICH-erd
SALLY		SAM		SHARY	SHA-ree
TEDDY		TERESA	te-REE-sa	TOMAS	to-MAS
VICKY		VICTOR	VIC-ter	VIRGINIE	vir-JIN-ee
WILFRED		WANDA		WALTER	

If over 21 tropical cyclones occur in a year, the Greek alphabet will be used following the W-named cyclone. *Colin replaces Charley, Fiona replaces Frances, Igor replaces Ivan, and Julia replaces Jeanne for 2010.*

Table 3-2. Eastern Pacific Tropical Cyclone Names

2005		2006		2007	
ADRIAN		ALETTA	a LET ah	ALVIN	
BEATRIZ	BEE a triz	BUD		BARBARA	
CALVIN		CARLOTTA		COSME	COS may
DORA		DANIEL		DALILA	
EUGENE		EMILIA	ee MILL ya	ERICK	
FERNANDA	fer NAN dah	FABIO	FAH bee o	FLOSSIE	
GREG		GILMA	GIL mah	GIL	
HILARY		HECTOR		HENRIETTE	hen ree ETT
IRWIN		ILEANA	ill ay AH nah	IVO	
JOVA	Ho vah	JOHN		JULIETTE	
KENNETH		KRISTY		KIKO	KEE ko
LIDIA		LANE		LORENA	low RAY na
MAX		MIRIAM		MANUEL	mahn WELL
NORMA		NORMAN		NARDA	
OTIS		OLIVIA		OCTAVE	AHK tave
PILAR		PAUL		PRISCILLA	
RAMON	rah MONE	ROSA		RAYMOND	
SELMA		SERGIO	SIR gee oh	SONIA	SONE yah
TODD		TARA		TICO	TEE koh
VERONICA		VICENTE	vee CEN tay	VELMA	
WILEY		WILLA		WALLIS	
XINA	ZEE nah	XAVIER	ZAY vier	XINA	ZEE nah
YORK		YOLANDA	yo LAHN da	YORK	
ZELDA	ZEL dah	ZEKE		ZELDA	ZEL dah

2008		2009		2010
ALMA	AL mah	ANDRES	ahn DRASE	AGATHA
BORIS		BLANCA	BLAHN kah	BLAS
CRISTINA		CARLOS		CELIA
DOUGLAS		DOLORES		DARBY
ELIDA	ELL ee dah	ENRIQUE	anh REE kay	ESTELLE
FAUSTO	FOW sto	FELICIA	fa LEE sha	FRANK
GENEVIEVE		GUILLERMO	gee YER mo	GEORGETTE
HERNAN	her NAHN	HILDA		HOWARD
ISELLE	ee SELL	IGNACIO	eeg NAH cio	ISIS
JULIO	HOO lee o	JIMENA	he MAY na	JAVIER
KARINA		KEVIN		KAY
LOWELL		LINDA		LESTER
MARIE		MARTY		MADELINE
NORBERT		NORA		NEWTON
ODILE	oh DEAL	OLAF	OH lahf	ORLENE
POLO		PATRICIA		PAINE
RACHEL		RICK		ROSLYN
SIMON		SANDRA		SEYMOUR
TRUDY		TERRY		TINA
VANCE		VIVIAN		VIRGIL
WINNIE		WALDO		WINIFRED
XAVIER	ZAY vier	XINA	ZEE nah	XAVIER
YOLANDA	yo LAHN da	YORK		YOLANDA yo LAHN da
ZEKE		ZELDA	ZEL dah	ZEKE

Table 3-3. Central Pacific Tropical Cyclone Names

COLUMN 1		COLUMN 2	
Name	Pronunciation	Name	Pronunciation
AKONI	ah-KOH-nee	AKA	AH-kah
EMA	EH-mah	EKEKA	eh-KEH-kak
HANA	HAH-nah	HALI	HAH-lee
IO	EE-oo	IOLANA	ee-OH-lah-nah
KELI	KEH-lee	KEONI	keh-ON-nee
LALA	LAH-lah	LI	LEE
MOKE	MOH-keh	MELE	MEH-leh
NELE	NEH-leh	NONA	NOH-nah
OKA	OH-kah	OLIWA	oh-LEE-vah
PEKE	PEH-keh	PAKA	PAH-kah
ULEKI	oo-LEH-kee	UPANA	oo-PAH-nah
WILA	VEE-lah	WENE	WEH-neh

COLUMN 3		COLUMN 4	
Name	Pronunciation	Name	Pronunciation
ALIKA	ah-LEE-kah	ANA	AH-nah
ELE	EH-leh	ELA	EH-lah
HUKO	HOO-koh	HALOLA	hah-LOH-lah
IOKE	ee-OH-keh	IUNE	ee-OO-neh
KIKA	KEE-kah	KIMO	KEE-moh
LANA	LAH-nah	LOKE	LOH-keh
MAKA	MAH-kah	MALIA	mah-LEE-ah
NEKI	NEH-kee	NIALA	nee-AH-lah
OLEKA	oh-LEH-kah	OKO	OH-koh
PENI	PEH-nee	PALI	PAH-lee
ULIA	oo-LEE-ah	ULIKA	oo-LEE-kah
WALI	WAH-lee	WALAKA	wah-LAH-kah

NOTE: Use Column 1 list of names until exhausted before going to Column 2, etc. All letters in the Hawaiian language are pronounced, including double or triple vowels.

Table 3-4. International Tropical Cyclone Names for the Western Pacific and South China Sea

	I	II	III	IV	V
Contributor	**NAME**	**NAME**	**NAME**	**NAME**	**NAME**
Cambodia	Damrey	Kong-rey	Nakri	Krovanh	Sarika
China	Longwang	Yutu	Fengshen	Dujuan	Haima
DPR Korea	Kirogi	Toraji	Kalmaegi	Maemi	Meari
HK, China	Kai-tak	Man-yi	Fung-wong	Choi-wan	Ma-on
Japan	Tembin	Usagi	Kammuri	Koppu	Tokage
Lao PDR	Bolaven	Pabuk	Phanfone	Ketsana	Nock-ten
Macau	Chanchu	Wutip	Vongfong	Parma	Muifa
Malaysia	Jelawat	Sepat	*Rusa*	Melor	Merbok
Micronesia	Ewiniar	Fitow	Sinlaku	Nepartak	Nanmadol
Philippines	Bilis	Danas	Hagupit	Lupit	Talas
RO Korea	Kaemi	Nari	Changmi	Sudal	Noru
Thailand	Prapiroon	Wipha	Mekkhala	Nida	Kulap
U.S.A.	Maria	Francisco	Higos	Omais	Roke
Viet Nam	Saomai	Lekima	Bavi	Conson	Sonca
Cambodia	Bopha	Krosa	Maysak	Chanthu	Nesat
China	Wukong	Haiyan	Haishen	Dianmu	Haitang
DPR Korea	Sonamu	Podul	Pongsona	Mindulle	Nalgae
HK, China	Shanshan	Lingling	Yanyan	Tingting	Banyan
Japan	Yagi	Kajiki	Kujira	Kompasu	Washi
Lao PDR	Xangsane	Faxai	Chan-hom	Namtheun	Matsa
Macau	Bebinca	*Vamei*	Linfa	Malou	Sanvu
Malaysia	Rumbia	Tapah	Nangka	Meranti	Mawar
Micronesia	Soulik	Mitag	Soudelor	Rananim	Guchol
Philippines	Cimaron	Hagibis	*Imbudo*	Malakas	Talim
RO Korea	Chebi	Noguri	Koni	Megi	Nabi
Thailand	Durian	Rammasun	Morakot	Chaba	Khanun
U.S.A.	Utor	*Chataan*	Etau	Aere	Vicente
Viet Nam	Trami	Halong	Vamco	Songda	Saola

NOTE: The official international name list was effective January 1, 2000. Names will be assigned in rotation starting with Damrey for the first tropical cyclone of the year 2000 which is of tropical storm strength or greater. When the last name in column 5 (Saola) is used, the sequence will begin again with the first name in column 1 (Damrey).

3.6. <u>Abbreviated Communications Headings</u>. Abbreviated communications headings are assigned to advisories on tropical and subtropical cyclones and other advisories based on depression numbers or storm name and standard communications procedures. An abbreviated heading consists of three groups with ONE space between each of the groups. The first group contains a data type indicator (e.g., WT for hurricane), a geographical indicator (e.g. NT for Atlantic Basin), and a number. The second group contains a location identifier of the message originator (e.g., KNHC for TPC/NHC). The third group is a date-time group in UTC. An example of a complete header is: WTNT61 KNHC 180400.

3.6.1. Atlantic Headings (see paragraph 3.6.3 also).

ABNT20 KNHC	Tropical Weather Outlook
ABNT30 KNHC	Tropical Weather Summary (monthly)
WTNT31 KNHC	Tropical Cyclone Public Advisory (Atlantic)
WTNT51 KNHC	Tropical Cyclone Position Estimate
WTNT61 KNHC	Tropical Cyclone Update
WONT41 KNHC	Special Tropical Disturbance Statement
FXUS01 KWBC	1-2 Day Discussion
FXUS02 KWBC	3-7 Day Discussion
FXUS04 KWBC	Precipitation Discussion

3.6.2. Pacific Headings (see paragraph 3.6.3 also).

ABPZ20 KNHC	Tropical Weather Outlook (Eastern Pacific)
ABPZ30 KNHC	Tropical Weather Summary (monthly)
ACPN50 PHFO	Tropical Weather Outlook (Central Pacific)
ACPN60 PHFO	Tropical Weather Summary (monthly)
TXPN40 PHFO	Northern Hemisphere Tropical Cyclone Summary (Fixes)
TXPS40 PHFO	Southern Hemisphere Tropical Cyclone Summary (Fixes)
WTPZ51 KNHC	Tropical Cyclone Position Estimate (Eastern Pacific)
WTPA51 PHFO	Tropical Cyclone Position Estimate (Central Pacific)
WTPZ61 KNHC	Tropical Cyclone Update (Eastern Pacific)
WTPA61 PHFO	Tropical Cyclone Update (Central Pacific)
WOPZ41 KNHC	Special Tropical Disturbance Statement (Eastern Pacific)
ACPA80 PHFO	Special Tropical Disturbance Statement (Central Pacific)

3.6.3. Numbering. Depressions are numbered internally and storms are named internally, but the number in the abbreviated headings does not relate to either the internal number of the depression or the name of the storm. The first cyclone would have 21 and 31 in the abbreviated headings, the second cyclone would have 22 and 32, the sixth cyclone would have 21 and 31, etc. The abbreviated heading would not change when a depression was upgraded to storm status.

WTNT21-25 KNHC	Tropical Cyclone Forecast/Advisory (Atlantic)
WTNT31-35 KNHC	*Tropical Cyclone Public Advisory (Atlantic)*

WTNT31-35 KWNH	HPC Public Advisory (Atlantic)
WTNT41-45 KNHC	Tropical Cyclone Discussion (Atlantic)
WTNT51-55 KNHC	*Tropical Cyclone Position Estimate (Atlantic)*
WTNT61-65 KNHC	*Tropical Cyclone Update (Atlantic)*
WTNT71-75 KNHC	Tropical Cyclone Strike Probabilities (Atlantic)
WTPZ 21-25 KNHC	Tropical Cyclone Forecast/Advisory (Eastern Pacific)
WTPZ 31-35 KNHC	Tropical Cyclone Public Advisory (Eastern Pacific)
WTPZ41-45 KNHC	Tropical Cyclone Discussion (Eastern Pacific)
WTPZ51-55 KNHC	*Tropical Cyclone Position Estimate (Eastern Pacific)*
WTPZ61-65 KNHC	*Tropical Cyclone Update (Eastern Pacific)*
WTPA21-25 PHFO	Tropical Cyclone Forecast/Advisory (Central Pacific)
WTPA31-35 PHFO	Tropical Cyclone Public Advisory (Central Pacific)
WTPA41-45 PHFO	Tropical Cyclone Discussion (Central Pacific)
WTPA51-55 PHFO	*Tropical Cyclone Position Estimate (Central Pacific)*
WTPA61-65 PHFO	*Tropical Cyclone Update (Central Pacific)*
WTPQ31-35 PGUM	Tropical Cyclone Public Advisory (Western Pacific)

3.7. Hurricane Liaison Team (HLT).

3.7.1. National Weather Service (NWS) Responsibilities. The NWS supports the HLT through use of Tropical Prediction Center (TPC) meteorologists, Weather Forecast Office (WFO) personnel (typically warning coordination meteorologists and service hydrologists), and River Forecast Center (RFC) hydrologists. Eastern and Southern Region Headquarters will maintain a list of their available HLT candidates.

After HLT deactivation, the Hydrometeorological Prediction Center (HPC) will assume the briefing duties provided the remnants of the tropical cyclone remain a threat to inland areas. TPC and HPC will coordinate prior to the transfer. During the inland event HPC will coordinate with the appropriate WFOs and RFCs and when needed, hydrologists from the RFCs will provide hydrological briefings.

3.7.2. Activation. The HLT may be activated when a tropical cyclone in the Atlantic, Gulf of Mexico, Caribbean or eastern Pacific threatens the United States or its territories, and the Director or Deputy Director of TPC deems HLT assistance is required. TPC makes the request for activation by contacting the Federal Emergency Management Agency (FEMA) Operations Center (FOC). Upon FEMA's approval, the FOC will activate the HLT. The TPC Director or Deputy Director will contact the appropriate NWS Regional Director requesting meteorologic and/or hydrologic support. NWS personnel should arrive at TPC within 24 hours. The HLT will remain active until the hurricane threat has passed, at which time HLT operations will be terminated by FEMA. However, if the storm moves inland and if significant rainfall is expected, the HLT may remain activated.

If the HLT is deactivated, the Hydrometeorological Prediction Center (HPC) will assume the briefing duties provided the remnants of the tropical cyclone remain a threat to inland areas. TPC and HPC will coordinate prior to the transfer. During the inland event, HPC will coordinate with the appropriate WFOs and RFCs and, when needed, hydrologists from the RFCs will provide hydrological briefings.

3.7.3. Training. Completing NWS/FEMA's distance learning training module, Community Hurricane Preparedness, is required by HLT members. The module can be taken via the Internet at: http://meted.ucar.edu/hurrican/chp/index.htm. Other training opportunities are strongly encouraged. They are: FEMA's "Introduction to Hurricane Preparedness" conducted at TPC for emergency mangers and NWS personnel, and FEMA's annual HLT training session held at TPC.

3.7.4. Meteorologic Duties. The HLT meteorologist will:

- Establish and maintain contact with the impacted WFOs, RFCs, and the HPC.
- Facilitate participation of the impacted NWS offices in conference calls, briefings, and in preparation and distribution of graphics.
- Provide meteorological interpretations on National Hurricane Center advisories (NHC), WFO hurricane local statements, HURREVAC products, and storm surge forecasts for federal, state and local agencies on request.
- Provide storm briefings via video/audio teleconferences for federal, state and local organizations.
- Respond to meteorology-related incoming calls from federal, state, and local emergency managers, and as appropriate, refer meteorologic inquires to the local WFO.

3.7.5. Hydrologic Duties. The HLT hydrologist will:

- Establish and maintain contact with the impacted local WFOs, RFCs, and the HPC.
- Facilitate participation of the impacted NWS offices in conference calls, briefings, and in preparation and distribution of graphics.
- Provide hydrologic interpretation on NHC advisories, WFO hurricane local statements, and WFO and RFC hydrologic products for federal, state and local agencies on request.
- Provide technical support for RFC lead during hydrologic portion of video teleconference. In absence of the RFC, lead the hydrologic portion of the video teleconference.
- Respond to hydrology-related incoming calls from federal, state, and local emergency managers and as appropriate, refer hydrologic inquires to the local WFO.

CHAPTER 4

NATIONAL WEATHER SERVICE PRODUCTS FOR THE DEPARTMENT OF DEFENSE

4.1. General. The Department of Defense (DOD) and the Department of Commerce (DOC) weather forecasting, reconnaissance, and distribution agencies share technical information and some responsibilities. Mutually supportive relationships have developed over the years and have resulted in a mutual dependency. Due to the nature and distribution of DOD resources and operations, the DOD requires certain meteorological information beyond that available to the general public. Accordingly, the DOC provides DOD with special observations and advisories on tropical and subtropical storms threatening DOD resources or operations.

4.2. Observations. The Tropical Prediction Center/National Hurricane Center (TPC/NHC) and Central Pacific Hurricane Center (CPHC) will make available to DOD all significant tropical and subtropical cyclone observations that they receive.

4.3. Tropical Cyclone Forecast/Advisories.

4.3.1. General. The TPC/NHC and CPHC will provide to DOD forecasts and related information for tropical and subtropical weather disturbances of depression intensity or greater. Forecasts will include location, movement, intensity, and dimension of the disturbances. Tropical cyclone forecast/advisories will be disseminated through the National Weather Service (NWS) communications facility at Suitland, MD, to the Automated Weather Network (AWN) hub at the Air Force Weather Agency, Offutt AFB, NE, for further relay to DOD agencies. The DOD forecasters, who must give advice concerning an imminent operational decision, may contact the appropriate hurricane center forecaster (see Chapter 2) when published tropical cyclone forecast/advisories require elaboration. Telephone numbers for the hurricane centers are in Appendix I.

4.3.2. Tropical Cyclone Forecast/Advisory Issue Frequency. The first tropical cyclone forecast/advisory will normally be issued when meteorological data indicate that a tropical or subtropical cyclone has formed. Subsequent advisories will be issued at 0300, 0900, 1500, and 2100 UTC from TPC/NHC and CPHC. The public advisories issued by the NWS Forecast Office (NWSO) Tiyan, Guam, are issued 1 hour after the JTWC guidance. Advisories will continue to be issued until the system is classified below the depression intensity level. In addition, special forecasts will be issued whenever the following criteria are met:

- A significant change has occurred, requiring the issuance of a revised forecast package.
- Conditions require a hurricane or tropical storm watch or warning to be issued.

Remarks stating the reason for the special forecast or the relocation will be mandatory in all special forecasts or advisories that include a relocated position.

[NOTE: Tropical cyclone updates are permitted without the requirement of a special forecast, including when coastal warnings are cancelled. However, in some cases, a special forecast may follow.]

4.3.3. Tropical Cyclone Forecast/Advisory Content. Tropical cyclone forecast/advisories issued by the TPC/NHC and CPHC will contain appropriate information as shown in Figure 4-1. The forecast will contain 12, 24, 36, 48, 72, 96, and 120-hour forecast positions. A code string is appended at the end of the line "NATIONAL WEATHER SERVICE MIAMI FL." This is the Automated Tropical Cyclone Forecasting (ATCF) System Storm Identification Character String recognized by the WMO for tracking and verification of tropical cyclones. The ATCF storm identifier is three spaces after "FL" and uses the format below.

NATIONAL WEATHER SERVICE MIAMI FL BSNOYR
where: BS is the basin (AL, EP, or CP)
NO is the storm number (01, 02, 03,...99)
YR is the last two digits of the year.

Tropical cyclone public advisories issued by the NWS Forecast Office, Tiyan, Guam, will contain appropriate information as shown in Figure 4-2.

4.3.3.1. Definition of Wind Radii by Quadrant. The working definition of the wind radius for a quadrant is: use the largest radius of that wind speed found in the quadrant. Example: TPC/NHC's quadrants are defined as NE (0°-90°), SE (90°-180°), SW (180°-270°), and NW (270°-360°). Given a maximum 34-knot radius of 150 nm at 0°, 90 nm at 120°, and 40 nm at 260°, the following line would be carried in the forecast/advisory: 150NE 90SE 40SW 150NW.

4.3.3.2 Numbering of Tropical Cyclone Forecast/Advisories. All tropical cyclone forecast/advisories will be numbered sequentially; for example,

Tropical Depression ONE Forecast/Advisory Number 1
Tropical Depression ONE Forecast/Advisory Number 2
Tropical Storm Anita Forecast/Advisory Number 3
Hurricane (Typhoon) Anita Forecast/Advisory Number 4
Tropical Depression Anita Forecast/Advisory Number 5

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WTNT25 KNHC 230300
TCMAT5

HURRICANE ISIDORE FORECAST/ADVISORY NUMBER 28
NWS TPC/NATIONAL HURRICANE CENTER MIAMI FL   AL1002
0300Z MON SEP 23 2002

A HURRICANE WARNING REMAINS IN EFFECT ALONG THE GULF OF MEXICO AND
CARIBBEAN COASTS OF THE YUCATAN PENINSULA FROM CAMPECHE NORTH AND
EASTWARD TO TULUM...INCLUDING THE ISLAND OF COZUMEL.

HURRICANE CENTER LOCATED NEAR 20.8N 89.5W AT 23/0300Z
POSITION ACCURATE WITHIN 20 NM

PRESENT MOVEMENT TOWARD THE SOUTHWEST OR 220 DEGREES AT 4 KT

ESTIMATED MINIMUM CENTRAL PRESSURE 950 MB
MAX SUSTAINED WINDS 90 KT WITH GUSTS TO 110 KT.
64 KT....... 45NE  25SE  25SW  45NW.
50 KT....... 75NE  50SE  50SW  75NW.
34 KT.......200NE 130SE 100SW 150NW.
12 FT SEAS..300NE 200SE 150SW 300NW.
WINDS AND SEAS VARY GREATLY IN EACH QUADRANT.  RADII IN NAUTICAL
MILES ARE THE LARGEST RADII EXPECTED ANYWHERE IN THAT QUADRANT.

REPEAT...CENTER LOCATED NEAR 20.8N 89.5W AT 23/0300Z
AT 23/0000Z CENTER WAS LOCATED NEAR 21.0N 89.4W

FORECAST VALID 23/1200Z 20.7N 90.3W
MAX WIND  80 KT...GUSTS 100 KT.
64 KT... 40NE  20SE  25SW  40NW.
50 KT... 60NE  40SE  40SW  60NW.
34 KT...180NE  60SE  60SW 150NW.

FORECAST VALID 24/0000Z 21.0N 91.0W
MAX WIND  95 KT...GUSTS 115 KT.
64 KT... 45NE  25SE  25SW  45NW.
50 KT... 75NE  50SE  50SW  75NW.
34 KT...200NE 150SE 100SW 150NW.

FORECAST VALID 24/1200Z 21.8N 92.0W
MAX WIND 115 KT...GUSTS 140 KT.
64 KT... 60NE  45SE  45SW  60NW.
50 KT...100NE  75SE  75SW 100NW.
34 KT...200NE 150SE 125SW 180NW.

FORECAST VALID 25/0000Z 22.8N 92.5W
MAX WIND 125 KT...GUSTS 155 KT.
50 KT...100NE 100SE  75SW 100NW.
34 KT...200NE 200SE 150SW 200NW.

FORECAST VALID 26/0000Z 25.0N 93.0W
MAX WIND 125 KT...GUSTS 155 KT.
50 KT...100NE 100SE  75SW 100NW.
34 KT...200NE 200SE 150SW 200NW.

EXTENDED OUTLOOK.  NOTE...ERRORS FOR TRACK HAVE AVERAGED NEAR 275 NM
ON DAY 4 AND 375 NM ON DAY 5...AND FOR INTENSITY NEAR 20 KT EACH DAY

OUTLOOK VALID 27/0000Z 22.8N 92.5W
MAX WIND 100 KT...GUSTS 120 KT.

OUTLOOK VALID 28/0000Z 25.0N 93.0W
MAX WIND  90 KT...GUSTS 110 KT.

REQUEST FOR 3 HOURLY SHIP REPORTS WITHIN 300 MILES OF 20.8N 89.5W

NEXT ADVISORY AT 23/0900Z

FORECASTER PASCH

$$
NNNN
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Figure 4-1. Tropical cyclone forecast/advisory format

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WTPQ31 PGUM 210931
TCPPQ1

BULLETIN
TROPICAL DEPRESSION 03W ADVISORY NUMBER 4
8 PM GUAM LST THU APR 21 2005

...TROPICAL DEPRESSION 03W CONTINUES MOVING SLOWLY TOWARD YAP...

A TROPICAL STORM WATCH REMAINS IN EFFECT FOR YAP...FAIS...ULITHI AND
NGULU.

TROPICAL STORM CONDITIONS...INCLUDING DAMAGING WINDS OF 39 MPH TO
73 MPH...ARE POSSIBLE. IF TROPICAL DEPRESSION 03W STRENGTHENS MORE
THAN FORECAST...A TROPICAL STORM WARNING COULD BE REQUIRED WITH
LITTLE ADVANCE NOTICE.

RESIDENTS OF YAP STATE SHOULD CONTINUE TO CLOSELY MONITOR THIS
TROPICAL DEPRESSION FOR ANY CHANGES OVER-NIGHT.

AT 7 PM GUAM LST...0900Z...THE CENTER OF TROPICAL DEPRESSION 03W
WAS LOCATED NEAR LATITUDE 8.4 DEGREES NORTH AND LONGITUDE 140.3
DEGREES EAST. THIS IS ABOUT   95 MILES SOUTH OF FAIS
                              115 MILES SOUTH-SOUTHEAST OF ULITHI
                              170 MILES EAST-SOUTHEAST OF YAP
                              190 MILES EAST OF NGULU

TROPICAL DEPRESSION 03W IS MOVING WEST-NORTHWEST AT 5 MPH. OVER THE
NEXT 12 HOURS...TROPICAL DEPRESSION 03W IS EXPECTED TO INCREASE ITS
FORWARD SPEED OF MOTION. THE TROPICAL DEPRESSION IS STILL ORGANIZING
AND ERRATIC MOVEMENT OF THE CENTER IS POSSIBLE UNTIL THE SYSTEM
BECOMES BETTER ORGANIZED.  IF TROPICAL DEPRESSION 03W MAINTAINS THE
CURRENT FORECAST TRACK...WARNINGS WILL NOT BE NEEDED AND THE
TROPICAL STORM WATCH WILL LIKELY BE DROPPED TOMORROW.

MAXIMUM SUSTAINED WINDS ARE 30 MPH. TROPICAL DEPRESSION 03W IS
EXPECTED TO SLOWLY INTENSIFY...BUT WILL LIKELY REMAIN A TROPICAL
DEPRESSION OVER THE NEXT 24 HOURS.

REPEATING THE 7 PM POSITION...8.4 DEGREES NORTH AND 140.3 DEGREES
EAST...MOVING WEST-NORTHWEST AT 5 MPH WITH MAXIMUM SUSTAINED WINDS
OF 30 MPH.

FOR STORM INFORMATION SPECIFIC TO YOUR LOCAL AREA...REFER TO
TROPICAL DEPRESSION 03W LOCAL STATEMENT /WTPQ81 PGUM/ AND OTHER
PRODUCTS FROM YOUR LOCAL WEATHER OFFICE.

AN INTERMEDIATE ADVISORY WILL BE ISSUED AT 11 PM TONIGHT...FOLLOWED
BY THE NEXT SCHEDULED ADVISORY AT 2 AM FRIDAY MORNING.

$$

GUARD/AHN
```

Figure 4-2. Tropical cyclone public advisory format

CHAPTER 5

AIRCRAFT RECONNAISSANCE

5.1. General. All Department of Commerce (DOC) tropical and subtropical cyclone aircraft reconnaissance needs will be requested and provided in accordance with the procedures of this chapter. As outlined in the Air Force Reserve Command (AFRC)/National Oceanic and Atmospheric Administration (NOAA) Memorandum of Agreement (see Appendix F), DOC has identified a requirement for, and the Department of Defense (DOD) maintains aircraft to support, up to five sorties per day (see Figure 5-1). Requirements exceeding five sorties will be accomplished on a "resources-permitting" basis. In times of national emergency or war, some or all DOD reconnaissance resources may not be available to fulfill DOC needs. The Global Decision Support System (GDSS) JCS Priority Code for tasked, operational weather reconnaissance is **1A3** (IAW DOD Regulation 4500.9-R and Joint Publications 4-01 and 4-04). The Force Activity Designator (FAD)/Urgency of Need Designator (UND) Supply Priority Designator Determination code is **IIA2** (IAW Joint Publication 4-01 and Air Force Manual 23-110, Volume 2, Part 13, Attachment 3A-2.)

5.2. Responsibilities. The DOD, through the AFRC's 53rd Weather Reconnaissance Squadron (53 WRS), and DOC, through NOAA's Aircraft Operations Center (AOC), operate a complementary fleet of aircraft to conduct hurricane/tropical cyclone reconnaissance, synoptic surveillance, and research missions.

5.2.1. DOD. The DOD is responsible for:

- Providing operational aircraft for vortex fixes and data, synoptic surveillance missions, and investigative flights in response to DOC needs.
- Developing operational procedures and deploying data buoys to satisfy DOC needs.

5.2.2. DOC. The DOC is responsible for aircraft operations that may be requested to:

- Provide synoptic surveillance soundings (see Figure 5-2).
- Augment AFRC aircraft reconnaissance when DOC needs exceed the capabilities of DOD resources (see Figure 5-3).
- Assume responsibility for hurricane reconnaissance over foreign airspace that may be restricted for military operations.
- Conduct research flights.

Figure 5-1. WC-130 Weather Reconnaissance Aircraft

Figure 5-2. G-IV Weather Surveillance Aircraft

Figure 5-3. NOAA P-3 Weather Surveillance Aircraft

5.2.3. DOT. The DOT is responsible for providing air traffic control services to aircraft when within airspace controlled by the FAA. This includes offshore oceanic airspace. To expedite the handling of reconnaissance aircraft, paragraph 5.5.4, Air Traffic Control Procedures, has been significantly revised to update and incorporate the procedures in the FAA/AFRC/NOAA Letter of Agreement (LOA) entitled, Meteorological Reconnaissance Flights, found in Appendix F.

5.3. <u>Control of Aircraft</u>. Operational control of aircraft flying tropical and subtropical cyclone reconnaissance will remain with the operating agencies which own the aircraft.

5.4. <u>Reconnaissance Requirements</u>.

5.4.1. Meteorological Parameters. Data needs in priority order are as follows:

- Geographical position of the flight level vortex center (vortex fix) and relative position of the surface center, if known.
- Center sea-level pressure determined by dropsonde or extrapolation from within 1,500 ft of the sea surface or from the computed 925 hPa or 850 hPa height.
- Minimum 700, 850 or 925 hPa height, if available.
- Wind profile data for surface and flight level.
- Temperature at flight level.

- Sea-surface temperature.
- Dew-point temperature at flight level.

5.4.2. Accuracy.

5.4.2.1. Geographic Position.

- Aircraft position: within 3 nm.
- Storm surface center (wind/pressure): within 6 nm.
- Flight level storm center (wind/pressure): within 6 nm.

5.4.2.2. Wind Direction.

- Surface: within 10 deg.
- Flight level for winds greater than 20 kt: within 5 deg.

5.4.2.3. Wind Speed.

- Surface: within 10 kt.
- Flight level: within 4 kt.

5.4.2.4. Pressure Height.

- Surface: within 2 hPa.
- Flight level at or below 500 hPa: within 10 m.
- Flight level above 500 hPa: within 20 m.

5.4.2.5. Temperature.

- Sea surface: within lºC.
- Flight level: within lºC.

5.4.2.6. Dew-Point Temperature.

- From -20ºC to +40°C: within lºC.
- Less than -20ºC: within 3ºC.

5.4.2.7. Absolute Altitude: Within 10 m.

5.4.2.8. Vertical Sounding.

- Pressure: within 2 hPa.
- Temperature: within 1ºC.
- Dew-point temperature:
  From -20ºC to +40ºC: within lºC.
  Less than -20ºC: within 3ºC.

- Wind direction: within 10 deg.
  Wind speed: within 5 kt.

[NOTE: Present weather reconnaissance capabilities do not completely satisfy these requirements; data will be collected as close to stated requirements as possible.]

5.4.3. High Density/High Accuracy (HD/HA) Data Requirements. The HD/HA data include time, latitude, longitude, pressure altitude, D-value, radar altitude, peak winds, flight-level wind speed and direction, temperature, and dew-point temperature. All data provided in HDOB messages are 30-second averages, regardless of the interval at which the HDOB messages are reported. See Appendix G for HDOB message formats. The DOC requires rapid acquisition and transmission of tropical cyclone data, especially within the 24-hour period prior to landfall. If HD/HA capability is lost on an operational mission, the airborne meteorologist will immediately contact Chief, Aerial Reconnaissance Coordination, All Hurricanes (CARCAH) to determine data requirements for the remainder of the mission.

5.4.4. Synoptic Surveillance Data Requirements. When required, the TPC/NHC will request mid- and/or upper-tropospheric sounding data on the periphery of systems approaching the United States. The TPC/NHC and HRD will coordinate to provide specific tracks including control points, control times and dropwindsonde frequency allocations to CARCAH for coordination with the reconnaissance units.

Table 5-1. Requirement for aircraft reconnaissance data

	RECCO Section 1 plus 4ddff and 9VTTT as applicable	Vortex Data Message (VDM)	Supplemental Vortex Message (SVM)	Vertical Data WMO Temp Drop Code (FM37-VII)	High Density Observation (HDOB)
En route	Approx. every 30 minutes over water not to exceed 200 nm	NA	NA	Every 400 nm over water	None for WC-130H unless requested 30-sec interval for WC-130J
Invest area	Every 15 minutes and at major turn points	After closing a circulation	NA	NA	1-min interval for WC-130H 30-sec interval for WC-130J
Fix pattern	End points of Alpha pattern legs. When necessary with radar fix information.	Each fix.	2 per mission	Each tasked fix at or above 700 mb. Intermediate fixes and eyewall modules as requested.	1-min interval for WC-130H 30-sec interval for WC-130J

5.4.5. Required Frequency and Content of Observations. Observation requirements are summarized in Table 5-1. Deviations to these requirements will be coordinated through CARCAH. Vortex and Supplemental Vortex message format and information is shown in

Figure 5-4, Figure 5-5, Figure 5-6, and Table 5-2. Other data message formats and code breakdowns can be found in Appendix G.

5.5. Reconnaissance Planning and Flight Notification.

5.5.1. DOC Requests for Aircraft Reconnaissance Data.

5.5.1.1. Coordination. The Tropical Prediction/National Hurricane Center (TPC/NHC) will coordinate with the Central Pacific Hurricane Center (CPHC) to determine a list of the total DOC requirements for data on tropical and subtropical cyclones or disturbances for the next 24-hour period (1100 to 1100 UTC) and an outlook for the succeeding 24-hour period. This coordinated request will be provided to CARCAH as soon as possible, but not later than 1630 UTC each day in the format of Figure 5-7. Amendments will be provided as required.

5.5.1.2. Tropical Cyclone Plan of the Day. From the coordinated DOC request, CARCAH will publish the Tropical Cyclone Plan of the Day (TCPOD). The format for the TCPOD is shown in Figure 5-8. When DOC reconnaissance needs exceed DOD and DOC resources, CARCAH will coordinate with the TPC/NHC to establish priorities of requirements.

5.5.1.3. Anticipated Reconnaissance Requests. Reconnaissance requests can be anticipated for a forecast or actual storm location.

- For the Atlantic, Gulf of Mexico, Caribbean, and Central Pacific areas, the requests can be:

  < Up to four 6-hourly fixes per day when a storm is within 500 nm of landfall and west of 55ºW in the Atlantic.

  < Up to eight 3-hourly fixes per day when a storm is forecast to be within 300 nm of the U.S. coast, Hawaiian Islands, Puerto Rico, Virgin Islands, DOD installations, and other DOD assets when specified.

  < *Up to two* synoptic surveillance missions per 24-hour period for potentially landfalling storms. *Note: The 53 WRS does not view this as a change to current requirements. The 53 WRS will still be held to 5 sorties per day.*

  - In the Eastern Pacific, reconnaissance missions may be tasked when necessary to carry out warning responsibilities.

  - Investigative flights may be requested for disturbances in areas defined above, i.e., one or two flights per day dependent upon proximity of landfall and upon known or suspected stage of development.

  - Exceptions may be made when additional reconnaissance is essential to carry out warning responsibilities.

DATE	SCHEDULED FIX TIME	AIRCRAFT NUMBER	ARWO

WX MISSION IDENTIFICATION	OB

VORTEX DATA MESSAGE

A		DATE AND TIME OF FIX
B	DEG MIN N S	LATITUDE OF VORTEX FIX
	DEG MIN E W	LONGITUDE OF VORTEX FIX
C		MINIMUM HEIGHT AT STANDARD LEVEL
D		ESTIMATE OF MAXIMUM SURFACE WIND OBSERVED
E		BEARING AND RANGE FROM CENTER OF MAXIMUM SURFACE WIND
F		MAXIMUM FLIGHT LEVEL WIND NEAR CENTER
G		BEARING AND RANGE FROM CENTER OF MAXIMUM FLIGHT LEVEL WIND
H		MINIMUM SEA LEVEL PRESSURE COMPUTED FROM DROPSONDE OR EXTRAPOLATED FROM FLIGHT LEVEL. IF EXTRAPOLATED, CLARIFY IN REMARKS.
I		MAXIMUM FLIGHT LEVEL TEMP/PRESSURE ALTITUDE OUTSIDE EYE
J		MAXIMUM FLIGHT LEVEL TEMP/PRESSURE ALTITUDE INSIDE EYE
K		DEWPOINT TEMP/SEA SURFACE TEMP INSIDE EYE
L		EYE CHARACTER: Closed wall, poorly defined, open SW, etc.
M		EYE SHAPE/ORIENTATION/DIAMETER. Code eye shape as: C -Circular; CO - Concentric; E-Elliptical. Transmit orientation of major axis in tens of degree, i.e., 01-010 to 190; 17-170 to 350. Transmit diameter in nautical miles. *Examples*: C8 - Circular eye 8 miles in diameter. EO9/15/5 - Elliptical eye, major axis 090-270, length of major axis 15 NM, length of minor axis 5NM. CO8-14 - Concentric eye, diameter inner eye 8 NM, outer eye 14 NM.
N	–	FIX DETERMINED BY/FIX LEVEL. FIX DETERMINED BY: 1 - Penetration; 2 - Radar; 3 - Wind; 4 - Pressure; 5 - Temperature. FIX LEVEL (Indicate surface center if visible; indicate both surface and flight level centers only when same): 0 - Surface; 1 - 1500ft; 9-925mb; 8 - 850 mb; 7 - 700 mb; 5 - 500 mb; 4 - 400 mb; 3 - 300 mb; 2 - 200 mb; NA - Other.
O	«	NAVIGATION FIX ACCURACY/METEOROLOGICAL ACCURACY
p	REMARKS MAX FL WIND_____KT_____QUAD_____Z SLP EXTRAP FROM (Below 1500 FT/ 925 MB/ 850 MB/ DROPSONDE) SFC CNTR_____/_____NM FROM FL CNTR MAX FL TEMP _____C_____/_____NM FROM FL CNTR	

INSTRUCTIONS: Items A through G (and H when extrapolated) are transmitted from the aircraft immediately following the fix. The remainder of the message is transmitted as soon as available.

Figure 5-4. Vortex data message worksheet

SUPPLEMENTARY VORTEX DATA MESSAGE

WX MISSION ID	OB

SUPPLEMENTARY VORTEX DATA MESSAGE

	($L_aL_aL_a$)	($L_oL_oL_oL_o$)	(jHHH)	(TTT_dT_d)	(ddfff)
01		1	1	1	
02		2	2	2	
03		3	3	3	
04		4	4	4	
05		5	5	5	
06		6	6	6	
07		7	7	7	
MF	($L_aL_aL_a$)	M ($L_oL_oL_oL_o$)	MF (fff)		

OBS 01 AT: Z | OBS AT Z | OBS 01 SFC WND:

	($L_aL_aL_a$)	($L_oL_oL_oL_o$)	(jHHH)	(TTT_dT_d)	(ddfff)
01		1	1	1	
02		2	2	2	
03		3	3	3	
04		4	4	4	
05		5	5	5	
06		6	6	6	
07		7	7	7	
MF	($L_aL_aL_a$)	M ($L_oL_oL_oL_o$)	MF (fff)		

OBS 01 AT: Z | OBS AT Z | OBS 07 SFC WND:

REMARKS (*end of message*)

LEGEND

01 INDICATOR FOR DATA COLLECTED APPROXIMATELY 105 NM FROM STORM CENTER (INBOUND) OR APPROXIMATELY 15 NM FROM CENTER (OUTBOUND)

OTHER INDICATORS (02/2, 03/3...) FOR DATA AT APPROXIMATELY 15 NM INTERVALS INBOUND OR OUTBOUND FROM STORM CENTER. INDICATORS MAY BE EXPANDED BEYOND 07(08,09...) AS NECESSARY AT APPROXIMATELY 15NM INTERVALS.

MF = INDICATOR FOR MAXIMUM FLIGHT LEVEL WIND OBSERVED

fff = SPEED OF WIND IN KNOTS

dd = TRUE DIRECTION OF FLIGHT LEVEL WIND SPEED IN TENS OF DEGREES

TTT_dT_d = TEMP/DEWPOINT IN DEGREES CELSIUS: ADD 50 FOR NEGATIVE VALUES

jHHH = PRESSURE HEIGHT DATA IN RECCO FORMAT

$L_aL_aL_a$ = LATITUDE IN DEGREES/TENTHS

$L_oL_oL_oL_o$ = LONGITUDE IN DEGREES/TENTHS

/ = DATA UNKNOWN/UNOBTAINABLE

Figure 5-5. Supplementary vortex data message

Table 5-2. Vortex data message entry explanation

DATA ITEM	ENTRY
MISSION IDENTIFIER	As determined in Chapter 5, paragraph 5.7.6.
OBSERVATION NUMBER	A two digit number determined by the sequential order in which the observation is transmitted from the aircraft.
A (ALPHA)	Date and time (UTC) of the flight level center fix. If the flight level center cannot be fixed and the surface center is visible, enter the time of the surface center fix.
B (BRAVO)	The latitude and longitude of the center fix associated with item ALPHA. NOTE: If the surface center is fixable, enter bearing and range from the *FL* center in *Remarks*; e.g., SFC CNTR 270/15 nm, if the centers are separated by over 5 nm.
C (CHARLIE)	Indicate the standard atmospheric surface e.g. 925, 850 or 700 hPa. The minimum height of the standard surface observed inside the center. If at 1,500 ft or below or not within 1,500 ft of a standard surface, enter NA.
D (DELTA)	The maximum surface wind observed during the inbound leg associated with this fix.
E (ECHO)	Bearing and range of the maximum surface wind observed (item DELTA) from the coordinates reported in item BRAVO.
F (FOXTROT)	The maximum flight level wind observed during the inbound leg associated with this fix. If a significant secondary maximum wind is observed, report it in remarks.

Table 5-2. Vortex data message entry explanation (continued)

G (GOLF)	Bearing and range of the maximum flight level wind observed (item FOXTROT) from the coordinates reported in item BRAVO.
H (HOTEL)	The minimum sea level pressure (SLP) to the nearest hectopascal observed at the coordinates reported in item BRAVO. Preface the SLP with "EXTRAP" (extrapolated) when the data are not derived from dropsonde or when the SLP is extrapolated from a dropsonde that terminated early. Clarify the difference in remarks (e.g., SLP EXTRAPOLATED FROM BELOW 1500 FEET/850 HPA/DROPSONDE).
I (INDIA)	MAX FLT LVL TEMP--This temperature is taken just outside the central region of a cyclone (i.e., just outside the eyewall or just beyond the maximum wind band). This temperature may not be the highest recorded on the inbound leg but is representative of the environmental temperature just outside the central region of the storm. PRESSURE ALT--Pressure altitude data (meters) are taken at the same location as the maximum temperature data reported in item INDIA.
J (JULIET)	MAX FLT LVL TEMP--The maximum temperature observed within 5 nm of the center fix coordinates. If a higher temperature is observed at a location more than 5 nm away from the flight level center (item BRAVO), it is reported in *Remarks*, including bearing and distance from the flight level center. PRESSURE ALT--Pressure altitude data (meters) are taken at the same location as the maximum temperature data reported in item JULIET.
K (KILO)	Dewpoint temperature/sea surface temperature are collected at the same location as the maximum temperature reported in item JULIET. Enter NA if not observed.

Table 5-2. Vortex data message entry explanation (continued)

L (LIMA)	Only report if at least 50 percent of the center has an eyewall, otherwise enter NA. Closed wall--if the center has 100 percent coverage with no eyewall weakness. Open XX--if the center has 50 percent or more but less than 100 percent coverage. State the direction of the eyewall weakness.
M (MIKE)	Self explanatory. Report only if item LIMA is reported, otherwise enter NA.
N (NOVEMBER)	Fix determined by: Always report 1. Report 2 if radar indicates curvature or banding consistent with fix location. Report 3 if recorded or observed winds indicate a closed center. Report 4 if the fix pressure is lower than all reported on the inbound leg. Report 5 if the fix temperature is at least higher than any reported on the inbound leg. Fix level: Report 0 alone if fix is made solely on surface winds. Report 0 and the flight-level code if the centers are within 5 nm of each other.
O (OSCAR)	Navigational and meteorological accuracy are reported as the upper limit of probable error. Meteorological accuracy is normally reported as one-half of the diameter of the light and variable wind center.
P (PAPA)	Remarks to enhance the data reported above. Required remarks include: (1) mission identifier and observation number; (2) the maximum flight level wind observed, time of observation, and the relative quadrant of the storm of the observed wind on the latest pass through any portion of the storm; (3) the method of deriving the central SLP when extrapolated; and (4) the bearing and range of the surface center and/or maximum flight level temperature if not within 5 nm of the flight level center.

WC-130H

URNT12 KNHC 161821
VORTEX DATA MESSAGE
A. 16/1821Z
B. 15 DEG 30 MIN N
  68 DEG 53 MIN W
C. 700 MB 2818 M
D. 70 KT
E. 263 DEG 13 NM
F. 329 DEG 81 KT
G. 263 DEG 53 NM
H. 967 MB
I. 10 C/ 3073 M
J. 18 C/ 3098 M
K. 8 C/ NA
L. OPEN SOUTH
M. E34/30/20
N. 12345/7
O. 0.1/2 NM
P. AF866 1016A LENNY OB 07
  MAX FL WIND 81 KT W QUAD 1806Z

URNT14 KNHC 161853
SUPPLEMENTARY VORTEX DATA MESSAGE
01154 10713 13080 11106 32035
02154 20710 23074 21008 32039
03154 30708 33074 31107 32031
04154 40705 43064 41008 32036
05154 50703 53052 51007 33042
06154 60700 63029 61007 34056
07154 70697 73006 70909 35045
MF154 M0698 MF081
OBS 01 AT 1746Z
OBS 07 AT 1810Z
OBS 01 SFC WND 01030
01156 10687 13852 11509 13040
02158 20686 23937 21010 14082
03160 30684 33001 31010 16060
04162 40682 43028 41109 16046
05163 50680 53041 51008 17045
06165 60678 63046 61006 17055
07167 70676 73058 70908 17052
MF158 M0686 MF091
OBS 01 AT 1825Z
OBS 07 AT 1849Z
OBS 07 SFC WND /////
RMK AF866 1016A LENNY OB 11

WC-130J

URNT12 KNHC 162129
VORTEX DATA MESSAGE
A. 16/21:16:20Z
B. 15 DEG 41 MIN N
  068 DEG 07 MIN W
C. NA MB 2743 M
D. NA KT
E. NA DEG NM
F. 121 DEG 087 KT
G. 034 DEG 010 NM
H. EXTRAP 957 MB
I. 7 C/ 3056 M
J. 16 C/ 3040 M
K. 10 C/ NA
L. OPEN W
M. E270/30/20
N. 12345/07
O. 0.02 / 3 NM
P. AF301 WXWXA LENNYTEST1 OB 05
MAX FL WIND 87 KT NE QUAD 21:13:30Z
SLP EXTRAP FROM 700 MB

URNT14 KNHC 162152
SUPPLEMENTARY VORTEX DATA MESSAGE
INBOUND
LAT LON jHHH TTDD ddfff
01166 10672 13038 10606 16031
02164 20674 23019 20906 17050
03162 30676 33985 30707 15052
04161 40678 43954 40909 16059
05159 50680 53868 51009 14073
MF158 M0680 MF087
OBS 01 AT 20:53:20Z
OBS 05 AT 21:12:00Z
OBS 01 SFC WND /////
OUTBOUND
LAT LON jHHH TTDD ddfff
01155 10683 13815 11605 32096
02153 20685 23929 20909 30089
03152 30687 33990 31008 31071
04150 40689 43018 41006 31060
05148 50691 53041 50909 30048
06146 60692 63050 61007 29046
07145 70694 73056 70908 28048
MF155 M0684 MF101
OBS 01 AT 21:20:50Z
OBS 07 AT 21:49:40Z
OBS 07 SFC WND 27045
RMK AF301 WXWXA LENNYTEST1 OB 07

Figure 5-6. Example Vortex Data Messages (VDM) and Supplementary Vortex Data Messages (SVDM) for the WC-130H and WC-130J

NHOP COORDINATED REQUEST FOR AIRCRAFT RECONNAISSANCE

__ Original
__ Amendment
(Check One)

I. ATLANTIC REQUIREMENTS

STORM NAME DEPRESSION # SUSPECT AREA	FIX OR ON STATION TIME	COORDINATES	FLIGHT PATTERN	FCST MVMT	NHC PRIORITY

GULFSTREAM _____

SUCCEEDING DAY OUTLOOK _____

_____

REMARKS _____

_____

II. PACIFIC REQUIREMENTS

STORM NAME DEPRESSION # SUSPECT AREA	FIX OR ON STATION TIME	COORDINATES	FLIGHT PATTERN	FCST MVMT	NHC PRIORITY

SUCCEEDING DAY OUTLOOK _____

_____

REMARKS _____

_____

III. DISTRIBUTION

A. TO CARCAH BY 1630Z OR AMEND AT ANY TIME
B. Date_____ Time_____ FCSTR INITIAL_____
C. 53 WRS_____AOC_____Other_____

Figure 5-7. NHOP coordinated request for aircraft reconnaissance

TROPICAL CYCLONE PLAN OF THE DAY FORMAT
--ATLANTIC AND CENTRAL PACIFIC OCEANS--

FM: CARCAH, NATIONAL HURRICANE CENTER, MIAMI, FL

TO: (AFRC-APPROVED ADDRESSEES)/(NOAA-APPROVED ADDRESSEES)

SUBJECT: THE TROPICAL CYCLONE PLAN OF THE DAY
VALID _____Z (MONTH) TO _____Z (MONTH) (YEAR)
TCPOD NUMBER.....(YR)-_____

I. ATLANTIC REQUIREMENTS

1. (STORM NAME, DEPRESSION, SUSPECT AREA) or (NEGATIVE RECON REQUIREMENTS)

FLIGHT ONE (NHC PRIORITY, if applicable)

A. _____Z FIX/INVEST TIME

_____Z

B. _____ MISSION IDENTIFIER

C. _____Z DEPARTURE TIME

D. _____ FORECAST POSITION

E. _____Z TIME ON STATION

F. _____ ALTITUDE(S) ON STATION

G. _____ REMARKS (if needed)

FLIGHT TWO (if applicable, same as FLIGHT ONE)

2. (SECOND SYSTEM, if applicable, same as in 1. above)

3. OUTLOOK FOR SUCCEEDING DAY (NHC PRIORITY, if applicable)

A. POSSIBLE _(Unit)_ ON STATION REQUIREMENT NEAR _(Location)_
AT _(Time)_Z.

II. PACIFIC REQUIREMENTS (Same as in ATLANTIC)

Figure 5-8. Tropical cyclone plan of the day format

5.5.2. DOD and DOC Reconnaissance Aircraft Responsiveness.

5.5.2.1. Requirement Notification. Notification of requirements must precede tasked-on-station time by at least 16 hours plus en route time to the area of concern.

5.5.2.2. Prepositioning. The "Succeeding Day Outlook" portion of the TCPOD provides advance notification of requirements and authorizes units to preposition aircraft to forward operating locations. For missions requiring prepositioning, the "Succeeding Day Outlook" may not provide adequate advance notification. In this situation, an "Additional Day Outlook" may be included in the TCPOD to authorize units to preposition aircraft.

5.5.2.3. Resources Permitting. When circumstances preclude the appropriate notification lead time, the requirement will be levied as "resources permitting." When a "resources permitting" requirement is levied in an amendment, the TPC/NHC will indicate the priority of all existing or remaining requirements.

5.5.2.4. Emergency Requirement. If a storm develops unexpectedly and could cause a serious threat to lives and property within a shorter time than provided for in the paragraphs above, CARCAH will contact the reconnaissance units, or higher headquarters, as appropriate, and request assistance in implementing emergency procedures not covered in this plan. The TPC/NHC and CPHC directors have authority to declare an emergency.

5.5.3. Reconnaissance Tropical Cyclone Plan of the Day.

5.5.3.1. Preparation. CARCAH will coordinate the TCPOD (Figure 5-8) daily during the period from June 1 to November 30 and at other times during the year as required. Transmitted TCPODs will be serially numbered each season.

- CARCAH will coordinate the TCPOD with TPC/NHC, the 53 WRS, and NOAA AOC before publication.

- The TCPOD will list all DOC and DOD required tropical and subtropical cyclone operational reconnaissance. *Research missions will be listed in remarks when available by transmission time.*

- The DOD-required tropical or subtropical cyclone reconnaissance missions in the Atlantic or the Pacific west to 180º will be identified in the TCPOD as USN or USAF requirements.

- Amendments to the TCPOD will be published only when requirements change. When amended, the impact on each listed flight will be identified; i.e., No Change, Change Added, or Cancel.

5.5.3.2. Dissemination. The TCPOD will be made available to appropriate agencies, such as FAA, DOD, and NOAA, that provide support to or control of reconnaissance aircraft or are a part of the tropical cyclone warning service. Under normal circumstances, the TCPOD will be disseminated by 1900 UTC each day including weekends and holidays. If there are no current day or succeeding-day reconnaissance requirements, a negative report, which covers the appropriate time frame, will be disseminated. Amendments will be disseminated as required.

[NOTE: The TCPOD is disseminated under the header "MIAREPRPD" for AWIPS users and "NOUS42 KNHC" for AWDS users. The TCPOD can be accessed via the Internet at www.hurricanehunters.com/wxdata.htm, then click on Plan of the Day or via the Tropical Prediction Center/National Hurricane Center homepage at www.nhc.noaa.gov, then click on aircraft reconnaissance and then on Plan of the Day.]

5.5.4. Air Traffic Control (ATC) Clearances.

5.5.4.1. Air Traffic Control Clearances. Flight plans for reconnaissance and research flights shall be filed with the FAA as soon as practicable before departure time.

5.5.4.2. Prior Coordination. The 53 WRS/DOO, AOC Flight Operations Division, and the appropriate NASA *and NRL facilities* shall contact the Air Traffic Control System Command Center (ATCSCC) at (703) 708-5140/5144 as soon as possible prior to an NHOP/NWSOP reconnaissance, surveillance, or research mission, and provide the following information:

- Mission call sign.
- Departure point and estimated time of departure.
- Approximate route to be flown.
- Requested altitude(s).
- Any special requests.

They shall also contact the affected Air Route Traffic Control Center (ARTCC), or the ATCSCC shall contact the affected ARTCCs, if requested to do so. In addition, the 53 WRS, AOC, NASA, *and NRL* shall transmit via facsimile the information in Appendix D to the U.S. NOTAM office no later than 2 hours prior to departure, or as soon as possible. Transmittal of NOTAM information to the NOTAM office via other electronic means must be agreed upon in advance by the NOTAM office.

5.5.4.2.1. The 53 WRS shall only use the call sign "Teal ##," AOC shall only use "NOAA ##," NASA shall only use "NASA ##," *and NRL shall use only Warlock 587*. ATC will provide TEAL and NOAA aircraft priority handling when specifically requested.

5.5.4.3. Air Traffic Control (ATC) Separation. The FAA will provide ATC services and separation from nonparticipating aircraft on instrument flight rules to the 53 WRS, AOC, NASA, *and NRL* aircraft operating in other than Class G airspace. Aircraft not flying on instrument flight rules may be operating near the storm environment; therefore, adherence to ATC clearances is mandatory for safety. When appropriate, military pilots shall clearly state to ATC that a segment of flight will be conducted under the provisions of "due regard."

5.5.4.3.1. It is the responsibility of the aircraft commander to remain clear of obstacles and nonparticipating aircraft when operating in Class G airspace.

5.5.4.3.2. The 53 WRS, AOC, NASA, *and NRL* are responsible for ensuring that air traffic clearances and messages are relayed to/from the FAA in an accurate manner when those relays are initiated by the 53 WRS, AOC, and NASA and are routed through other than Aeronautical Radio, Inc. (ARINC).

5.5.4.3.3. CARCAH will advise the 53 WRS, AOC, NASA, *and NRL* operations centers whenever more than one PARTICIPATING AIRCRAFT will be in the area of interest at the same time. The respective operations centers will advise the affected flight crews.

5.5.4.3.4. PARTICIPATING AIRCRAFT crews will set 29.92 (inches hg) in at least one pressure altimeter. When contact is made with other PARTICIPATING AIRCRAFT, crews will confirm (as a minimum) other aircraft's pressure altitude, geographic position, and true heading. Crews will not fly within 2,000 feet (vertical) of other participants operating in the same area of interest without concurrence of other PARTICIPATING AIRCRAFT.

5.5.4.4. Assigned Altitudes. When storm aircraft are unable to maintain assigned altitudes due to turbulence, ATC shall be advised. When deviation from assigned altitude is required, the pilot shall coordinate with ATC and obtain a clearance prior to changing altitudes. When numerous changes in altitude will be required, the pilot should request a "block altitude" clearance from ATC. Any deviations from ATC clearance shall first be coordinated with the appropriate ATC facility.

5.5.4.5. Release of Dropsondes. During NHOP missions and when operationally feasible, dropsonde instrument releases from FL 190 or higher and sensor activation shall be coordinated with the appropriate *ARTCC/CERAP* by advising of a pending drop or sensor activation at least 10 minutes prior to the event when in direct radio contact with ATC. When contact with ATC is via ARINC, event coordination shall be included with the position report prior to the point where the action will take place, unless all instrument release points have been previously relayed to the affected ATC center(s). Example: "Teal 63, SLATN at 1215, FL290 block 310, estimating FLANN at 1250, CHAMP next; Weather instrument release at FLANN." Contact between participating aircraft will be made using the frequencies listed in paragraph 5.9.3.

5.5.4.5.1. During NHOP missions, commencing 5 minutes prior to release of dropsondes from FL190 or higher, the aircraft commander will broadcast in the blind on radio frequencies 121.5 MHZ and 243.0 MHZ to advise any traffic in the area of the impending drop. Pilots shall not make these broadcasts if they will interfere with routine ATC communications, such as in the vicinity of an airport approach control facility. The aircraft commander is responsible for determining the content and duration of a broadcast, concerning a dropsonde release or sensor activation.

5.5.4.5.2. The aircraft commander is the sole responsible party for all dropsonde releases or activation of sensors. Aircraft commanders will insure coordination with other PARTICIPATING AIRCRAFT prior to sensor activation or dropwindsonde release.

5.5.4.6. ATC Communications Backup. When 53 WRS, AOC, *NASA, or NRL* flights are unable to contact ATC to request an en route clearance, a clearance request may be relayed through the Chief, Aerial Reconnaissance Coordination, All Hurricanes (CARCAH) or the 53 WRS Mission Commander/Supervisor of Flying. This backup procedure will only be used to preclude a potential emergency or safety-related situation.

5.5.4.7. Hurricane/Tropical Cyclone (NHOP) Mission Procedures. PARTICIPATING AIRCRAFT will comply with procedures in the NHOP in order to provide separation from other PARTICIPATING AIRCRAFT.

5.6. Reconnaissance Effectiveness Criteria.

5.6.1. General. Specified reconnaissance times are established to allow sufficient time for the forecaster to analyze the data before issuing an advisory. Every effort should be made to obtain data at scheduled times. The following criteria will be used to assess reconnaissance mission effectiveness:

5.6.1.1. Tropical Cyclone Fix Mission.

- ON-TIME. The fix is made not earlier than 1 hour before nor later than ½ hour after scheduled fix time.
- EARLY. The fix is made from 1 hour before scheduled fix time to one-half of the time interval to the preceding scheduled fix, not to exceed 3 hours.
- LATE. The fix is made within the interval from ½ hour after scheduled fix time to one-half of the time interval to the succeeding scheduled fix, not to exceed 3 hours.
- MISSED. Data are not obtained within the parameters specified for on-time, early, or late.

[NOTE: Appropriate credit will be given when the aircraft arrives in the requested area but is unable to locate a center due to storm dissipation or rapid movement. Credit will also be given for radar fixes if penetration is not possible due to geographic or other flight restrictions.]

5.6.1.2. Tropical Cyclone Investigative Missions.

- ON-TIME. An observation must be taken within 250 nm of the specified coordinates by the scheduled time.

- LATE. An observation is taken within 250 nm of the specified coordinates after the scheduled time but not later than the scheduled time plus 2 hours.

- MISSED. When the aircraft fails to be within the 250 nm of the specific coordinates by the scheduled time plus 2 hours or is unable to provide meaningful data.

5.6.1.3. Synoptic Surveillance Missions.

- SATISFIED. Requirements are considered satisfied upon completion of the assigned track and the acquired dropwindsonde data are transmitted from the aircraft prior to the HPC/MPC deadline for synoptic analysis.

- MISSED. When the requirements listed above are not satisfied.

5.6.2. Mission Assessment. The TPC/NHC or CPHC will provide CARCAH a written assessment of the reconnaissance mission anytime its timeliness or quality is outstanding or substandard (see Figure 5-9). Mission requirements levied as "resources permitting" will not be assessed for timeliness but may be assessed for quality of data gathered.

5.6.3. Summaries. CARCAH will maintain monthly and seasonal reconnaissance summaries, detailing requirements tasked by TPC/NHC and CPHC and missions accomplished.

5.7. <u>Aerial Reconnaissance Weather Encoding, Reporting, and Coordination</u>.

5.7.1. Vortex Data. A vortex data message (Figure 5-4) will be prepared for all fixes, using all observed vortex fix information, *each time the aircraft penetrates the center*.

5.7.2. Center Fix Data. When proximity to land, air traffic control restriction, or other factors prevent actual penetration of the vortex by the reconnaissance aircraft, it is permissible to fix the cyclone by radar. *Radar fixes may be reported in a vortex data message using available observed information or as a remark appended to a RECCO observation taken at fix time. The remark stating the type of radar fix and quality of the radar presentation is in accordance with Chapter 7, paragraph 7.3.2; e.g., RADAR CENTER FIX 21.5N 83.0W, POOR RADAR PRESENTATION, NAV ACCURACY 5NM.*

5.7.3. Peripheral Data. Storm penetration and collection of peripheral data will normally begin at the operational altitude approximately 105 nm from the center as determined by the flight meteorologist. The Supplementary Vortex Data Message (Figure 5-5) will be encoded and reported as specified in Table 5-1.

5.7.4. Mission Coordination. Mission coordination for all missions will be accomplished through CARCAH. Meteorological discussions for Central Pacific missions may be accomplished directly with the CPHC; however, any changes to tasking will be accomplished through CARCAH.

MISSION EVALUATION FORM

MEMORANDUM FOR: OL-A, 53WRS/CARCAH

FROM:_____(Director, NHC, CPHC)_____.

SUBJECT: Mission _____Evaluation
(Mission Identifier)

PUBLISHED REQUIREMENTS:

Premission Coordinates (As Updated Prior to TKO)_____N_____W

Flight Pattern _____

Mission Requirements Times _____

RECONNAISSANCE MISSION PERFORMANCE:

Flight Flown:	_____Completely	_____Partially	_____Other
Horizontal Data Coverage:	_____Complete _____Incomplete	_____Timely _____Untimely	_____Accurate _____Inaccurate
Vertical Data Coverage:	_____Complete _____Incomplete	_____Timely _____Untimely	_____Accurate _____Inaccurate
Requirements Accomplished:	_____On Time _____Missed	_____Early	_____Late

OVERALL MISSION EVALUATION:

OUTSTANDING_____

UNSATISFACTORY_____ FOR:

COMPLETENESS_____ TIMELINESS_____ ACCURACY_____

EQUIPMENT_____ PROCEDURES_____ OTHER_____

REMARKS: (Brief but specific)

_____
FORECASTER's SIGNATURE

Figure 5-9. Mission evaluation form

5.7.5. Post-flight Debriefing. Unless otherwise directed, the flight meteorologist will provide either an airborne or post-flight debriefing to the appropriate hurricane center through CARCAH to ensure all observations were received and understood.

5.7.6. Mission Identifier. Regular weather and hurricane reconnaissance messages will include the five-digit agency/aircraft indicator followed by the CARCAH-assigned mission/storm-system indicator. Elements of the mission identifier follow:

Agency/Aircraft	Mission Storm System Indicator			
Agency + Aircraft Number[1,2]	Sequential number of mission in this storm For non-tasked missions, WXWX, or for a numbered depression or stronger, WX+ depression number.	Two-digit depression number or two-letter identifier if not a depression or greater	Location A,E,C,or W[3]	Storm name or mission type (i.e., CYCLONE or INVEST)

-EXAMPLES-

AF966 0201C CYCLONE	(USAF aircraft 966 on the second mission on tropical depression number 1 in the Central Pacific. Invest or fix as specified in the TCPOD.)
AF984 0403E CARLOS	(USAF aircraft 984 on the fourth mission on tropical depression 3 which formed in the Eastern Pacific and acquired the name Carlos.)
NOAA2 01CCA INVEST	(NOAA aircraft 42RF on the first mission to investigate the third suspect area in the Atlantic, Gulf of Mexico or Caribbean.)
NOAA3 WX01A AGNES	(NOAA aircraft 43RF on a non-tasked mission into AGNES.)

[1] AF plus last 3 digits of tail number

[2] NOAA, plus last digit of aircraft registration number

[3] A=Atlantic, Caribbean, or Gulf of Mexico, E=Eastern Pacific, C=Central Pacific, W=Western Pacific

5.7.7. Observation Numbering and Content. Air Force aircraft movement information (i.e., departure time and location, and ETA's to locations) will not be included in observation remarks. That information should be passed to CARCAH via SATCOM administrative messages. The mission identifier will be the first mandatory remark followed by the observation number. All observations (RECCO, vortex, supplemental, and dropsonde) from the first to the last will be numbered sequentially. HDOBs will be automatically numbered sequentially but separately from other observations. When an aircraft is diverted from its original mission to fulfill TPC/NHC requirements, conclude the original mission by using the last report remark. The next observation from the diverted aircraft will use the CARCAH-assigned mission identifier, will be numbered OB 01, and will include the time of diversion.

-EXAMPLE-

RMK AF987 0lBBA INVEST OB 01 DPTD AF987 WXWXA AT 05/1235Z

5.8. <u>Operational Flight Patterns</u>. This section details the operational flight patterns that provide vortex and peripheral data on tropical and subtropical cyclones.

5.8.1. Flight Pattern ALPHA Operational Details.

5.8.1.1. Flight Levels and Sequence. Flight levels will normally be 1,500 ft, 925 hPa, 850 hPa, or 700 hPa, depending on data requirements and flight safety. Legs will normally be 105 nm long and flown on intercardinal tracks (45 degrees off cardinal tracks). The flight sequence is shown in Figure 5-10. The pattern can be started at any intercardinal point and then repeated throughout the mission. Prior to starting an inbound or outbound track the aircrew should evaluate all available data, e.g., radar presentation, satellite photo, for flight safety. Once started on course, every effort should be made to maintain a straight track and the tasked altitude. A horizontal observation is required at each leg end point. This data is transmitted immediately. The ALPHA pattern may be modified to satisfy unique customer requirements (such as extending legs to examine the wind profile of a strong storm) or because of proximity of land or warning areas.

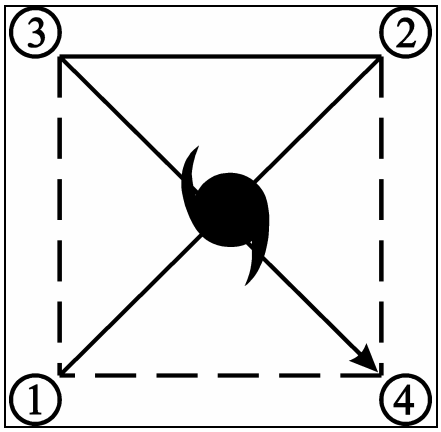

Figure 5-10. Flight pattern ALPHA

5.8.1.2. Vortex fix data. On each transit of the center a fix will be made and a vortex data message completed, using data gathered on the inbound track since the previous fix and will be transmitted immediately. Center dropsonde data will also be provided for scheduled fixes made at 700 hPa or above. The dropsonde will be released at the flight-level center coordinates (item BRAVO of the vortex data message). *For fixes when dropsonde-measured SLP is not available, an extrapolated SLP will be computed and reported.*

5.8.1.3. Supplementary Vortex Data Messages (SVDM). Two SVDM (one ALPHA pattern) will normally be provided per fix mission. Requests for additional SVDM will be directed to CARCAH. When high density data is not available, supplementary vortex data messages will be provided with each fix.

5.8.2. Investigative Missions. An investigative mission is tasked on tropical disturbances to determine the existence or non-existence of a closed circulation, supply reconnaissance observations in required areas, and locate the vortex center, if any.

5.8.2.1. Flight Levels. Flight level will normally be at or below 1,500 ft absolute altitude but may be adjusted as dictated by data requirements, meteorological conditions, or flying safety factors.

5.8.2.2. Vortex Fix. A vortex data message is required if a vortex fix is made.

5.8.2.3. Closed Circulation. A closed circulation is supported by at least one sustained wind reported in each quadrant of the cyclone. Surface winds are preferred.

5.8.2.4. Flight Pattern. The preferred approach is to fly to the tasked coordinates of the forecasted center and then execute a pattern as observed conditions dictate. Suggested patterns are the X, Box, or Delta patterns, but the flight meteorologist may choose any approach. See Figure 5-11. Turns are usually made to take advantage of tailwinds whenever possible.

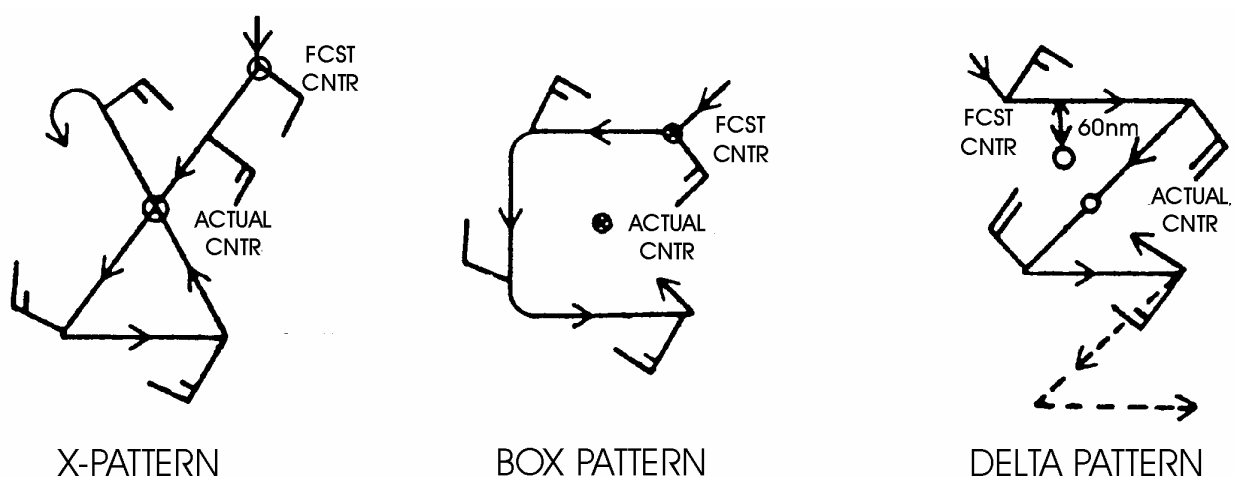

Figure 5-11. Suggested patterns for investigative missions

- On the X pattern, the aircraft is turned to head directly towards the center, as indicated by the surface or flight level winds. The aircraft is flown through the calm center until winds from the opposite direction occur (second quadrant). The aircraft is then turned to a cardinal heading until a wind shift occurs (third quadrant). Finally, the aircraft is turned towards the center and flown straight through the center to the last quadrant.

- On the Box pattern, the aircraft is flown on cardinal headings around the suspected center. The track resembles three sides of a square.

- On the Delta pattern, the aircraft is flown on a cardinal heading to pass 60 nm from the forecasted center. After observing a wind shift (second quadrant) the aircraft is turned to pass through the center until winds from the opposite direction occur (third quadrant). Finally, the aircraft is turned on a cardinal heading (parallel to the initial heading) to pick up the fourth quadrant winds. If data indicate that the aircraft is far north of any existing circulation, the pattern is extended as shown by the dashed lines.

[NOTE: The depicted pattern may be converted to a mirror image if entry is made from a different direction.]

5.8.3. Synoptic Surveillance Missions. A synoptic surveillance mission is tasked to measure the large-scale wind and thermodynamic fields within approximately 800 nautical miles of tropical cyclones. Specific flight tracks will vary depending on storm location and synoptic situation, and multiple aircraft may be required to satisfy surveillance mission requirements.

5.8.4. Eyewall and Outer-Wind Field Sampling Modules. These are patterns of dropwindsonde releases designed to measure the maximum surface wind, as well as the extent of hurricane and tropical storm force surface winds. They are meant to be flown using the operational alpha pattern. Dropwindsonde releases in these modules are in addition to any other releases required by *Table 5-1*.

5.8.4.1. Eyewall Module. While executing a standard alpha pattern to satisfy a fix requirement, one sounding will be taken during each inbound and outbound passage through the eyewall (except as noted below), for a total of four soundings. The releases should be made at or just inward (within 1-2 km) of the flight-level radius of maximum wind (RMW). If the radar presentation is suitable, the inner edge of the radar eyewall may be used to identify the release point. If possible, and when resources and safety permit, two dropwindsondes, spaced less than 30 seconds apart, should be deployed on the inbound leg on the side of the storm believed to have the highest surface winds (normally the right-hand side). In this case, the outer of the two releases should be made at the RMW, with the second release following as soon as possible. Typically, the eyewall module will be tasked within 48 hours of a forecasted hurricane landfall.

5.8.4.2 Outer-Wind Field Module. On an alpha pattern, deploy dropwindsondes at 50 nm intervals from the center on each of two successive inbound and outbound legs, outward to 200 nm. A release should also be made at the midpoint of the cross (downwind) leg, for a total of 17 soundings. The length of the legs and the sounding interval may be adjusted, depending on the size of the storm.

5.9. Aircraft Reconnaissance Communications.

5.9.1. General. The 53 WRS WC-130 and NOAA WP-3D aircraft will normally transmit reconnaissance observations via the Air Force Satellite Communications System (AFSATCOM), commercial SATCOM or high frequency (HF) radio phone patch. Figures 5-12 and 5-13 depict the ASDL and AFSATCOM communications links. The NOAA G-IV will normally transmit WMO Temp Drop messages via commercial SATCOM. Flight meteorologists should contact CARCAH following the first fix, and periodically throughout the mission.

5.9.2. Air-to-Ground Communications (HF Radio). The weather reconnaissance crew may relay weather data via direct telephone patch to the weather data monitor. Monitors will evaluate these reports and disseminate them through the Air Force's Automated Weather Network (AWN) or to the weather communications facility at Suitland, Maryland. When requested, aeronautical stations will provide a discrete frequency for mission use, if possible. Specific radio procedures and terminology will comply with Allied Communications Publication 125, Standard Telephone and Radio Procedures. The use of IMMEDIATE precedence for transmission of hurricane reconnaissance data is authorized because of the perishable nature and potential operational impact of weather data. Data will be routed by direct phone patch between the aircraft and CARCAH.

5.9.3. Air-to-Air Communications. When more than one aircraft is known to be operating in a particular area of interest, the following frequencies will be used for airplane-to-airplane communications and coordination unless otherwise directed by air traffic control:

- Primary: VHF 123.05 MHZ
- Secondary: UHF 304.8 MHZ
- Back-up: HF 4701 KHz USB

5.9.4. Aircraft-to-Satellite Data Link (ASDL) Equipped Aircraft. Aircraft equipped with ASDL have the option to utilize the ASDL system. Prior to the beginning of the hurricane season, each ASDL-equipped aircraft will perform a ground or airborne test of the equipment and data ground handling procedures to determine the equipment reliability, transmission errors, and time lapse between transmission of the data from the aircraft and receipt of the data by the hurricane forecaster. Test data will be forwarded to the Chairman, Working Group for Hurricane and Winter Storms Operations and Research.

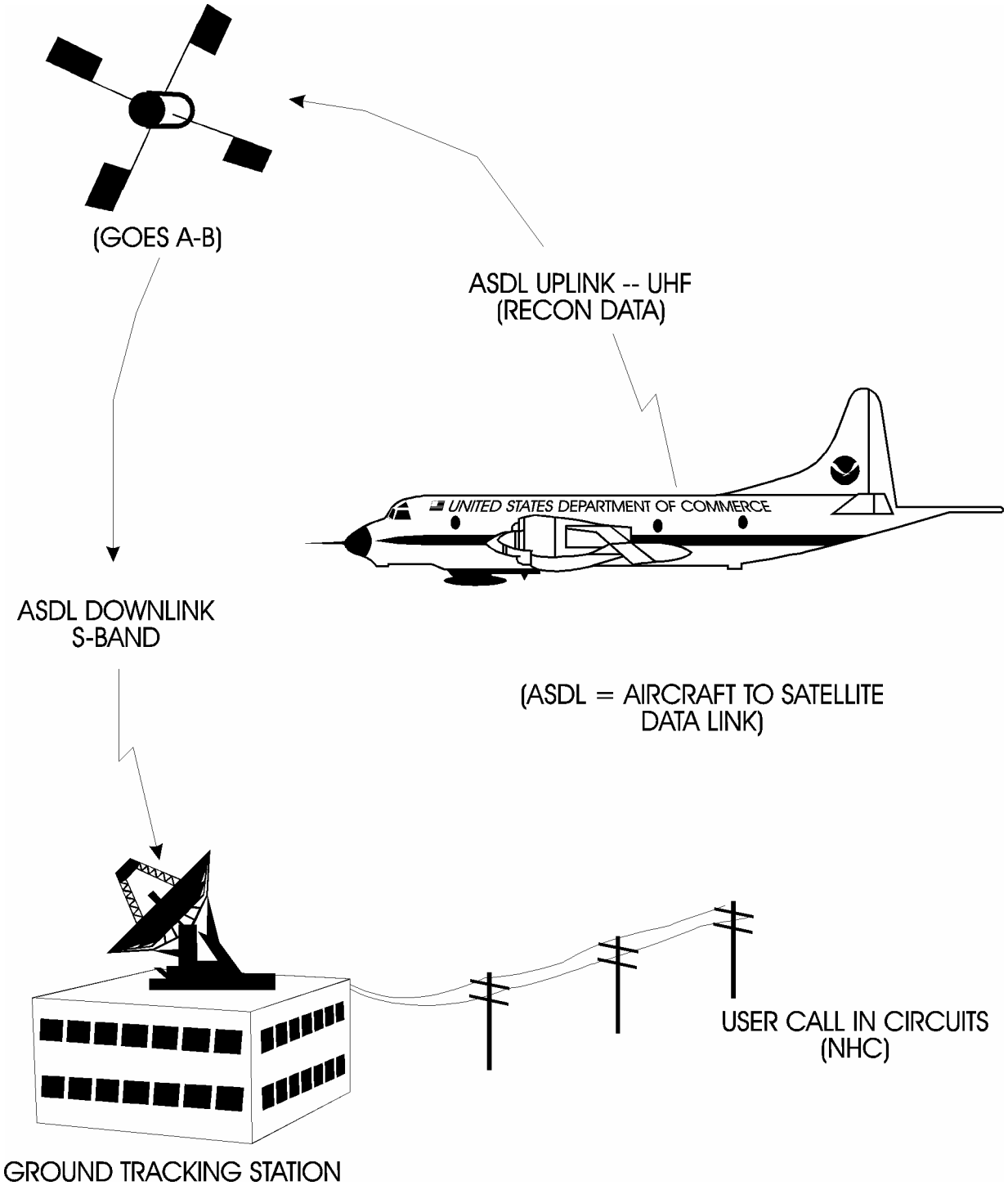

Figure 5-12. Schematic of aircraft-to-satellite data link for NOAA P-3 aircraft

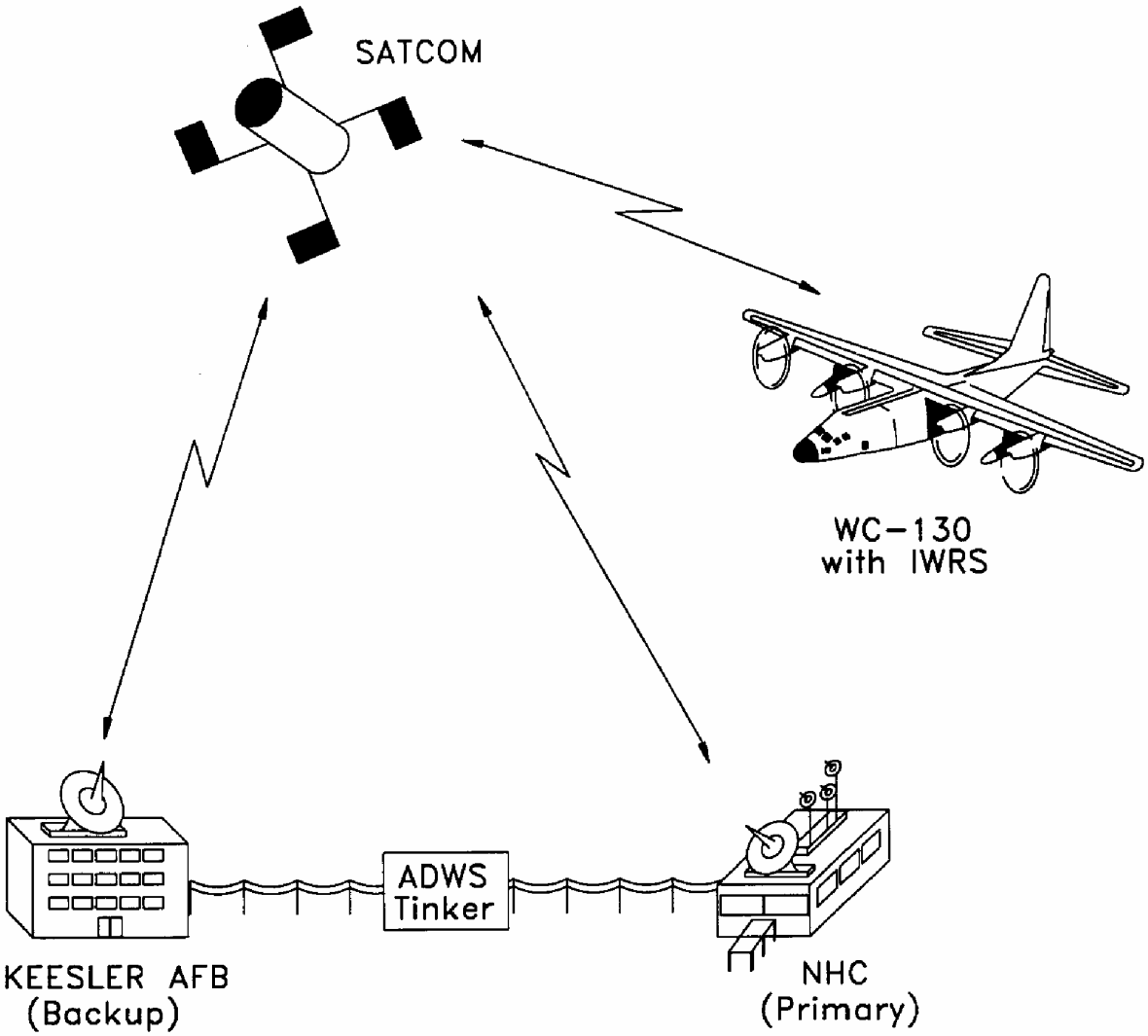

Figure 5-13. Schematic of aircraft-to-satellite data link for AFRC WC-130 aircraft

CHAPTER 6

SATELLITE SURVEILLANCE OF TROPICAL AND SUBTROPICAL CYCLONES

6.1. Satellites.

6.1.1. Geostationary Operational Environmental Satellite (GOES). Using modern 3-axis stabilization for orbit control, GOES-12 at 75°W and GOES-10 at 135°W support the operational two-GOES constellation. Independent imager and sounder instruments eliminate the need to time share, yielding an increase in spatial coverage of image and sounder data at more frequent scanning intervals. The GOES also provides higher resolution and additional spectral channels than its predecessor, affording the hydrometeorological community improvements in detection, monitoring, and analysis of developing tropical cyclones. From 135°W and 75°W, routine GOES satellite data coverage is extensive, stretching from the central Pacific through the Americas to the eastern Atlantic, including the vital breeding grounds for tropical cyclones.

Routinely, each GOES schedule provides two views of the CONUS (GOES-10 view is termed PACUS) every 30 minutes. More frequent interval scans can be employed to support NOAA's warning programs, including the tracking of tropical and subtropical cyclones. Government agencies and the private sector have access to digital data transmissions directly from NOAAPORT or directly from GOES.

The current series of GOES satellites provide satellite data generated from full resolution, and imager and sounder data. Imagery at 1, 4, and 8 km resolution is available for daytime and nighttime applications. The increased resolution of the satellite imagery is a vast improvement from previous satellites. Visible data are available at 1 km, “shortwave” infrared (channel 2 data) as well as the infrared channels 4 and 5 are available at 4 km resolution, and water vapor (channel 3) is available at 8 km resolution on GOES-10 and 4 km resolution on GOES-12. Channel 2 data are valuable for the detection of low clouds, fog, stratus, and surface hot spots; channel 5 data, available on GOES-10, in combination with data from channels 2 and/or 4 are useful for detecting volcanic ash in the atmosphere. On GOES-12, channel 5 is replaced by a new 13.3 micron channel 6 that detects the presence of CO_2. Channel 6 improves the measurement of the height of clouds and volcanic ash, thus improving computer model forecasts and ash warnings to the aviation community. The digital data may be enhanced to emphasize different features as desired. A suite of digital data and products is available to users in the National Weather Service (NWS), the National Environmental Satellite, Data, and Information Service (NESDIS), other Federal agencies, the academic community, and many private agencies, both national and international. These data are made available through NOAAPORT, RAMSDIS, the Internet, and other means such as local networks.

6.1.1.1. GOES-12. GOES-12, launched July 23, 2001, supports the GOES-East station at 75°W and serves NOAA operations, to include the TPC/NHC, other Federal agencies, and the private sector. Various imager channels at higher resolutions are being utilized to monitor the intensification and movement of tropical cyclones over the Atlantic Ocean and a

portion of the East Pacific. In particular, greater detail in the imagery facilitates tropical cyclone monitoring and analysis, and the use of the GOES imager channel 2 has vastly improved the detection of low-level circulation centers at night to assist in storm positioning. Retrievals from the GOES sounder are now being incorporated into NCEP's numerical models to improve model output. In addition, sounder data are being exploited to generate derived product imagery such as total precipitable water, atmospheric stability indices, surface temperatures and cloud heights.

During the 1996 hurricane season, NESDIS instituted a specialized GOES-East sounder schedule consisting of four sectors covering distinct areas of the Atlantic Ocean. Of the four sounder sectors, the CONUS sector is scanned every hour and covers the northern Gulf of Mexico and the east coast of the United States. During routine scanning operations, of the other 3 sounder sectors (the Gulf of Mexico, North Atlantic, and the East Caribbean) the Gulf of Mexico sector is designated as the "primary OCONUS" (off CONUS) sector and is scanned 4 times in a 6 hour period, while the other two sectors are only scanned once in every 6 hour period. Event driven, this "primary OCONUS" sounder sector can be changed by the TPC/NHC. The "primary" OCONUS sector provides frequent scans over the area of interest to generate experimental sounder winds (identifies steering currents) and provide moisture and temperature retrievals. Sounder winds are made available to TPC/NHC as a forecasting tool by the Cooperative Institute for Mesoscale Meteorological Studies (CIMSS), University of Wisconsin.

6.1.1.2. GOES-10. GOES-10 was launched on April 24, 1997, and supports the GOES-West station at 135°W. The routine scanning mode of GOES-10 provides coverage of the Northern and Southern Hemisphere eastern Pacific Ocean as well as the western United States. The GOES-West satellite also supports the missions of both the TPC/NHC and the CPHC, and provides coverage of developing tropical cyclones over the East and Central Pacific. The DOD and other Federal agencies are also supported.

6.1.1.3. GOES-9. GOES-9 was launched May 23, 1995. While the satellite has some momentum wheel problems, GOES-9 is currently stationed over the West Pacific at 155°E and is being used operationally for weather surveillance. This operation is the result of an agreement between NOAA and the Japanese Meteorological Agency (JMA) to ensure the continuity of weather satellite operations when GMS-5 was taken out of operation in mid-2003. *JMA launched MTSAT-1R on February 24, 2005. MTSAT-1R will replace GOES-9 in mid-July 2005.*

6.1.1.4. GOES-11. GOES-11 was launched on May 3, 2000. GOES-11 carries the same imager and instrumentation capabilities as GOES-10. GOES-11 is stored on orbit at 105°W until required to replace either of the older operational satellites.

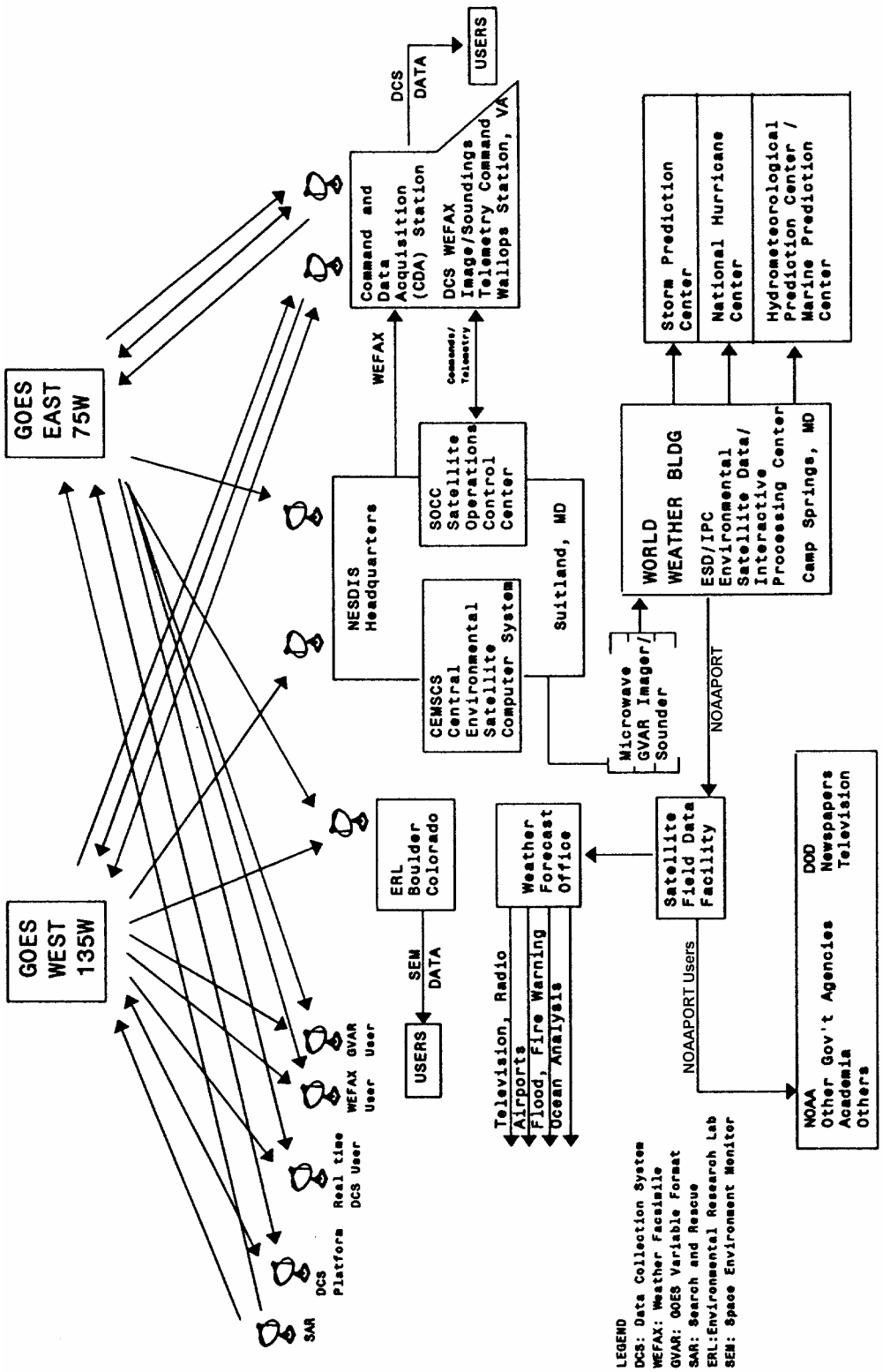

Figure 6-1. The GOES satellite system

6.1.1.5 GOES-N. *GOES-N is scheduled to be launched in May 2005. GOES-N is a clone of and will carry the same imager and instrumentation capabilities as GOES-12.*

(NOTE: For GOES imager/sounding schedules go to http://www.ssd.noaa.gov/PS/SATS/)

6.1.2. EUMETSAT Meteosat Geostationary Satellites. Meteosat-8, launched Aug 28, 2002, will replace Meteosat-7 and provides vital coverage of developing tropical waves off the African Coast and eastern Atlantic Ocean. Conventionally, the full disk IR, visible (VIS), and water vapor imagery have a 3km resolution whereas a specialized VIS sector provides a maximum 1 km resolution. This visible sector has a limited scan, and will shift from the West Indian Ocean to the East Atlantic Ocean from 14:00 UTC to 01:00 UTC every day during hurricane season. This shift will ensure interests monitoring for tropical activity in the North Indian Ocean (Meteo-France) as well as the East Atlantic (TPC) will be satisfied. The digital data are transmitted to NESDIS and NCEP at the NOAA Science Center (NSC) in Camp Springs, MD, every 15 minutes. They are also available to the TPC and the Storm Prediction Center (SPC) through central processing at the NSC. Meteosat WEFAX data are also available and distributed via the GOES WEFAX system and through NOAAPORT as part of a northern hemisphere composite image.

In December 1995, EUMETSAT, the program administrator, began encrypting digital Meteosat data 24 hours per day to regulate use within Europe. Based on international data policy agreements, U.S. non-government users are allowed access via a domestic satellite to non-encrypted Meteosat data 8 times per day at synoptic times; at other times, the data are encrypted. Hence, if half-hourly transmissions are required to support operational requirements, it is necessary for users to register with EUMETSAT to acquire decryption devices for installation at their local site (NOAA/DOD and other U.S. government agencies are registered).

6.1.3. MTSAT-1R. *The Japanese Meteorological Agency (JMA) launched the Multifunction al Transport SATellite – 1R (MTSAT-1R) on February 28, 2005. This satellite is scheduled to replace GOES-9 on or about June 1, 2005. MTSAT-1R will be located at 140° East, covering the West Pacific Ocean, Easter Asia, and the Eastern Indian Ocean. MTSAT-1R is similar to GOES as it will carry a 5 channel imager (one visible channel at 1 km plus four IR channels at 5 km). Data from MTSAT-1R will be available to CONUS users via the DOMestic SATellite (DOMSAT) or from the NOAA Science Center.*

6.1.4. National Oceanic and Atmospheric Administration (NOAA) Polar-Orbiting Satellites. Two primary operational NOAA polar orbiting satellites, NOAA-16 and NOAA-17, provide image coverage four times a day over a respective area in 6 spectral channels (however only 5 channels can be supported at one time; channel switching is used to support the 6th channel). These satellites cross the U.S. twice per day at 12-hour intervals for each geographical area near the Equatorial crossing times listed in Table 6-1. NOAA-16 and NOAA-17 provide the same capabilities as previous NOAA satellites, except for the addition of an Advanced Microwave Sounder Unit (AMSU). Data are available via direct readout--high resolution picture transmission (HRPT) or automatic picture transmission (APT)--or central processing. Data from the Advanced Very High Resolution Radiometer (AVHRR) are available on a limited basis through the GOES distribution system (Figure 6-1). The Air Force Weather Agency (AFWA), Offutt AFB, NE, receives global NOAA imagery data direct from central readout sites on a pass-by-pass basis. The Command and Data Acquisition (CDA) stations at Fairbanks, AK, and Wallops, VA, acquire recorded global area coverage data, and then route the data to NESDIS computer facilities in Suitland, MD, where the data are processed and distributed to the NOAA, the DOD, and private communities. Ground equipment installed at various NWS regions including Kansas City and Miami (TPC), enable direct readout and data processing of AVHRR data from NOAA-16 and NOAA-17. The high resolution polar data and products generated at TPC complement other satellite data sources to support tropical mission objectives.

6.1.4.1. NOAA-N. *NOAA-N is scheduled to be launched in May 2005. NOAA-N will have the same capabilities as NOAA-16 and NOAA-17.*

6.2. National Weather Service (NWS) Support.

6.2.1. Station Contacts. The GOES imagery is available in support of the surveillance of tropical and subtropical cyclones at specific NWS offices. Satellite meteorologists can be contacted at these offices; telephone numbers are in Appendix I.

6.2.2. Products. In addition to the satellite-related products listed in paragraphs 3.6.1, 3.6.2, and 3.6.3, there are two additional satellite products issued by the centers and their alternates.

6.2.2.1. Satellite Tropical Weather Discussions. TPC/NHC issues these discussions four times a day. They describe significant features from the latest surface analysis and significant weather areas for the Gulf of Mexico, the Caribbean, and between the equator and 32°N in both the Atlantic and eastern Pacific east of 140°W.

6.2.2.2. Satellite Interpretation Message. CPHC issues these messages four times a day to describe synoptic features and significant weather areas in the vicinity of the Hawaiian Islands. FAA contractions are used.

6.3. NESDIS Satellite Analysis Branch (SAB). The SAB operates 24 hours a day to provide satellite support to the HPC/OPC, TPC, CPHC, JTWC, and other worldwide users. SAB coordinates, as conditions warrant, four times per day with TPC and CPHC, relaying pertinent

information on tropical cyclone development, including location, tracking, and intensity analysis. A Satellite Weather Bulletin for the Indian Ocean and West Pacific Ocean, providing current position and current intensity of tropical cyclones, is also disseminated four times per day at the times indicated in Table 6-1. For numerical model input and forecasting applications, data from high density cloud motion wind vectors, high density water vapor wind vectors, four layers of derived precipitable water from sounder moisture retrievals, and tropical rainfall estimates are provided to HPC and TPC. Telephone numbers for the SAB are located in Appendix H.

6.4. Air Force Support and the Defense Meteorological Satellite Program (DMSP). Data covering the National Hurricane Operations Plan areas of interest are received centrally at the Air Force Weather Agency (AFWA) and locally at several direct readout sites. The USAF uses all available meteorological satellite data when providing fix and intensity information to NWS hurricane forecasters. The DOD will provide DMSP coverage of tropical and subtropical cyclones whenever possible.

6.4.1. North Atlantic and Eastern Pacific Surveillance. AFWA readouts will augment NESDIS surveillance for the North Atlantic and Eastern Pacific. AFWA will, resources permitting, transmit four daily electronic text bulletins, describing the location and intensity classification of the system, using format shown in Figure 6-2 to the TPC/NHC on organized disturbances evident at the tropical classification of one point five (T-1.5) or higher. AFWA will, resources permitting, provide gale wind radius analysis utilizing SSM/I data for all systems with maximum intensities greater than 50 kt.

6.4.2. Central Pacific Surveillance. AFWA will maintain the capability to provide surveillance support cited in para 6.4.1 to the CPHC. The 17 OWS/WXJ (JTWC Satellite Operations) will provide fix and intensity information to the CPHC on systems upon request.

Table 6-1. Communications headings for satellite tropical weather discussion summaries

WMO HEADING	TIME ISSUED	OCEANIC AREA	TYPE OF DATA
ATHW40 PHFO	0030, 0530, 1230, 1830 UTC	Vicinity of the Hawaiian Islands	VIS/IR
AXNT20 KNHC	0000,0600, 1200,1800 UTC	Atlantic Ocean South of 32EN to Equator.... Caribbean, Gulf of Mexico	VIS/IR
AXPZ20 KNHC	0135, 0735 1335, 1935 UTC	Eastern Pacific South of 32EN to the Equator.... east of 140E W	VIS/IR
WWPN20 KWBC	0400, 1000, 1600, 2200 UTC	West Pacific Ocean	VIS/IR
WWPS20 KWBC	0400, 1000, 1600, 2200 UTC	South Pacific Ocean	VIS/IR
WWIO20 KWBC	0400, 1000, 1600, 2200 UTC	North Indian Ocean	VIS/IR
WWIO21 KWBC	0400, 1000, 1600, 2200 UTC	South Indian Ocean	VIS/IR

MESSAGE HEADING:
TPNT KGWC (Atlantic) or **TPPZ1 KGWC** (Eastern and Central Pacific)

A CYCLONE DESIGNATOR	A.	Designator of tropical cyclone category including name/number. When a cloud system has not yet been designated by name/number enter TROPICAL DISTURBANCE. Sample entry: TROPICAL STORM AMY (15)
B DATE/TIME (Z) OF FIX	B.	Date and nodal crossing time in Zulu; round time to nearest minute. Sample entry: 252303Z.
C LATITUDE OF POSITION	C.	Latitude to nearest tenth of degree (N or S), followed by checksum. Sample entry: 29.9N/0
D LONGITUDE OF POSITION	D.	Longitude to nearest tenth of degree followed by checksum. Sample entry: 56.7 W/8
E VIS/IR POSITION CODE NUMBER SSM/I CONFIDENCE NUMBER	E.	Enter SSM/I Confidence Number and source of data (DMSP, NOAA, etc.). Spell out VIS/IR Position Code Number (PCN). Select MI Confidence Number and PCN number from code below: GEOGRAPHICAL GRIDDING ONE: eye fix THREE: well defined circulation center FIVE: poorly defined circulation center EPHEMERIS GRIDDING TWO: eye fix FOUR: well defined circulation center SIX: poorly defined circulation center Sample entry: MI4/DMSP/SIX
F DVORAK CLASSIFICATION	F.	Dvorak classification for storm intensity as described in NOAA Technical Report NESDIS 11. Dvorak classification will be made a minimum of twice each day based on infrared and/or visual data. If a new Dvorak classification number cannot be derived, use the last reported number. Include in parentheses the date and nodal time of the data on which the Dvorak analysis is based. Sample entry: T 4.5/4.5/D1.0/25HRS (252305Z)
G REMARKS	G.	Include information, as appropriate, on data type, eye characteristics, spiral rainbands, unexpected changes in storm movement, departures from Dvorak (modeled) intensities, etc.
H NADIR REFERENCE DISTANCE	H.	Include crosstrack distance in degrees latitude between fix center and satellite nadir subtrack. Sample Entry: Center WAS 5.4 DEG EAST OF NADIR
I GALE WIND RADIUS ANALYSIS	I.	Experimental gale wind (34kt) radius boundary utilizing image mapped SSM/I ocean surface wind speed algorithm estimates. Sample Entry: Gale Wind Radius Anal-Boundary Compass Points

DIR	DIST-NM	LAT	LONG
1. N	140	29.4N	88.2W
2. NE	130	28.9N	86.6W
3. E	80	27.0N	86.7W
4. SE	65	26.2N	87.4W
5. S	65	25.9N	88.2W
6. SW	65	26.3N	89.3W
7. W	80	27.0N	89.7W
8. NW	95	28.5N	89.2W

Figure 6-2. Center fix data form and message format (satellite)

6.5. <u>Satellites and Satellite Data Availability for the Current Hurricane Season</u>. Table 6-2 lists satellite capabilities for the current hurricane season.

Table 6-2. Satellite and satellite data availability for the current hurricane season

SATELLITE	TYPE OF DATA	LOCAL TIME	PRODUCTS
GOES-9 at 155°E GOES-10 at 135°W GOES-11 *(on-orbit storage at 105°W)* GOES-12 at 75°W	Multispectral Imager and Sounder 5 Channels for Imager 19 Channels for Sounder	*GOES-12 and GOES-10: Every 30 min, in Routine Scan Mode, provides 3 sectors with prescribed coverages: Northern Hemisphere (NH) or Extended NH; CONUS or PACUS; and Southern Hemisphere. Exception is transmission of full disk every 3 hours. (Available Rapid Scan Operations yield increased transmissions to 7.5 minute intervals to capture rapidly changing, dynamic weather events).* *GOES-9: Provides one full disk scan every hour at xx:25, provides a Northern Hemisphere scan in between every three hours including a 9.5 minute "short" full disk scan.*	1. 1, 2, 4, and 8 km resolution visible standard sectors. 2. 4 km equivalent resolution IR sectors. 3. Equivalent and full resolution IR enhanced imagery. 4. Full disk IR every 3 hours. 5. 8 km water vapor sectors.(4 km on GOES-12) 6. Quantitative precipitation estimates; high density cloud and water vapor motion wind vectors; and experimental visible and sounder winds. 7. Operational moisture sounder data (precipitable water) in four levels for inclusion in NCEP numerical models. Other sounder products including gradient winds, vertical temperature and moisture profiles, mid-level winds, and derived product imagery (precipitable water, lifted index, and surface skin temperature). 8. Tropical storm monitoring and derivation of intensity analysis. 9. Volcanic ash monitoring and dissemination of Volcanic Ash Advisory Statements. 10. Daily northern hemisphere snow cover analysis. 11. Twice daily fire and smoke analysis over specific areas within CONUS.

Table 6-2. Satellite and satellite data availability for the current hurricane season (continued)

SATELLITE	TYPE OF DATA	LOCAL TIME	PRODUCTS
METEOSAT-7	Multi-spectral Spin-Scan Radiometer	Full disk image every half hour	1. 2.5 km resolution digital VIS imagery; 5 km resolution digital IR imagery. 2. 5 km resolution VIS and IR WEFAX imagery. 3. 5 km water vapor imagery. 4. Tropical storm monitoring and derivation of intensity analysis.
METEOSAT-8 (will replace METEOSAT-7 by the end of 2005)	*Multi-spectral Spin-Scan Radiometer (SEVIRI) and High Resolution Visible (HRV)*	*SEVIRI: Full disk image every 15 minutes.* *HRV: Sector scan to move with local noon.*	*1. 1 km resolution digital VIS imagery (HRV); 3 km resolution digital IR imagery (SEVIRI.* *2. 3 km resolution VIS and IR WEFAX imagery.* *3. 3 km water vapor imagery.* *4. Tropical storm monitoring and derivation of intensity analysis.* *5. Volcanic ash detection and analysis.*
MTSAT-1R (will replace GOES-9 in July 2005)	*Multi-band imager (Visible plus 4 IR channels)*	*Hourly Full disk and two Northern Hemisphere scans per hour, with special "quadrant" scans four per hour.*	*1. 1 km resolution digital VIS imagery* *2. 5 km resolution digital IR imagery and water vapor* *4. Tropical storm monitoring and derivation of intensity analysis.* *5. Volcanic ash detection and analysis*

Table 6-2. Satellite and satellite data availability for the current hurricane season (continued)

SATELLITE	TYPE OF DATA	LOCAL TIME	PRODUCTS
TRMM (NASA Tropical Rainfall Measuring Mission)	*85 and 37 GHz Microwave*	*Fluctuates from 30°N to 30°S*	*1. 15 km resolution microwave coverage of the tropics from 30°S to 30°N.* *2. Microwave analysis of 85 and 37 GHz radiance composited passes.* *3. Brightness temperature products of the 85 and 37 GHz horizontal and vertical polarization. Derived rain-rate products.*
NOAA-17 NOAA-16	AVHRR; GAC and LAC (recorded); HRPT (direct); AMSU; HIRS	1025D[1]/2225A[2] 0239D/1439A	1. 1 km resolution HRPT and Local Area Coverage (LAC) data. 2. 4 km resolution APT and Global Area Coverage (GAC) data. 3. Mapped imagery. 4. Unmapped imagery (all data types) at DMSP sites. 5. Sea-surface temperature analysis. 6. Soundings. 7. Moisture profiles. 8. Remapped GAC sectors. 9. Sounding-derived products--total precipitable water, rain rate, and surface winds under sounding 10. Daily northern hemisphere snow cover analysis. 11. Twice daily fire and smoke analysis over specific areas within CONUS.

[1] D - descending

[2] A - ascending

Table 6-2. Satellite and satellite data availability for the current hurricane season (continued)

SATELLITE	TYPE OF DATA	LOCAL TIME	PRODUCTS
DMSP F-12	OLS Imagery (direct only), SSM/I (non-functional), SSM/T-1 (non-functional), SSM/T-2 (direct only)	0504D/1704A	1. 0.3 nm (regional) and 1.5 nm (global) resolution (visual and infrared) imagery available via stored data recovery through AFWA. 2. Regional coverage at 0.3 nm and 1.5 nm resolution (visual and infrared) imagery available from numerous DOD tactical terminals. 3. SSM/T-1, SSM/T-2, SSM/I, and *SSM/IS* data transmitted to NESDIS and FNMOC from AFWA.
DMSP F-13	OLS Imagery (recorded and direct), SSM/I, SSM/T-1	0631D/1831A	
DMSP F-14	OLS Imagery (recorded and direct), SSM/I, SSM/T-1 (inop), SSM/T-2	0701D/1901A	
DMSP F-15	OLS Imagery (recorded and direct), SSM/I, SSM/T-1, SSM/T-2	0858D/2058A	
DMSP F-16	OLS Imagery (recorded and direct), *SSM/IS*	0810D/2010A Note: Times are accurate to +/- 5 minutes	

6.6. <u>Current Intensity and Tropical Classification Number</u>. The current intensity (C.I.) number relates directly to the intensity of the storm. The empirical relationship between the C.I. number and a storm's wind speed is shown in Table 6-3. The C.I. number is same as the tropical classification number (T-number) during the development stages of a tropical cyclone but is held higher than the T-number while a cyclone is weakening. This is done because a lag is often observed between the time a storm pattern indicates weakening has begun and the time when the storm's intensity decreases. An added benefit of this rule is the stability it adds to the analysis when short-period fluctuations in the cloud pattern occur. In practice, the C.I. number is not lowered until the T-number has shown weakening for 12 hours or more.

Table 6-3. The empirical relationship* between the C.I. number and the maximum wind speed and the relationship between the T-number and the minimum sea-level pressure

C.I. NUMBER	MAXIMUM WIND SPEED	T-NUMBER	MINIMUM SEA-LEVEL PRESSURE (Atlantic)	(NW Pacific)
1	25 kt	1		
1.5	25	1.5		
2	30	2	1009 hPa	1000 hPa
2.5	35	2.5	1005	997
3	45	3	1000	991
3.5	55	3.5	994	984
4	65	4	987	976
4.5	77	4.5	979	966
5	90	5	970	954
5.5	102	5.5	960	941
6	115	6	948	927
6.5	127	6.5	935	914
7	140	7	921	898
7.5	155	7.5	906	879
8	170	8	890	858

*Dvorak, V, 1984: Tropical Cyclone Intensity Analysis Using Satellite Data.
NOAA Tech Report NESDIS 11, Washington, D.C.

CHAPTER 7

SURFACE RADAR REPORTING

7.1. General. Radar observations of tropical cyclones will be made at Department of Defense (DOD), National Weather Service (NWS), and Federal Aviation Administration (FAA) Weather Surveillance Radar-1988 Doppler (WSR-88D) facilities. Participating radar sites are listed in Table 7-1.

7.2. The WSR-88D. The WSR-88D is a computerized radar data collection and processing system. The design and implementation of the WSR-88D was a joint effort of the DOD, NWS, and FAA, and the utilization of the radar continues to be governed by tri-agency agreement. The WSR-88D is an S-band (10-cm), coherent radar, with a nominal beam width of 1 degree. The maximum data ranges are 248 n mi. (reflectivity) and 124 n mi. (velocity). Radar scanning strategies are selectable, using predetermined volume coverage patterns (VCP). The VCP in use depends upon which weather phenomena are under surveillance. Once the radar data has been collected, it is processed automatically at the radar site by a suite of algorithms which provide graphical products for forecaster use. TPC/NHC, as an external user, obtains these products through a *network* connection. CPHC controls and operates four WSR-88Ds in Hawaii and obtains products directly.

7.3. Procedures. As a tropical cyclone approaches, TPC/NHC uses the WSR-88D to perform radar center-fixing and to obtain other diagnostic information. Therefore, it is important to optimize WSR-88D performance for tropical cyclones and to allow other users, especially the TPC/NHC, access to radar products in the area of landfall. Most of the changes must be issued through the Master System Control Function (MSCF), Human Computer Interface (HCI). To facilitate this process, TPC/NHC in cooperation with the Radar Operations Center (ROC) has developed an operations plan for use during tropical cyclone events. The current tropical cyclone operations plan is available as a sub-link to the National Hurricane Operations Plan on the OFCM web site at http://www.ofcm.gov/homepage/text/pubs.htm. It is also available via fax from the ROC Hotline (1-800- 643-3363).

7.3.1. Radar Observation Requirements, WSR-88D. Chief among the requirements is the appropriate display of hurricane-force winds. Changes must be made at the radar site, guided by the WSR-88D Tropical Cyclone Operations Plan, in order to deal effectively with hurricane conditions. The physical characteristics of the tropical cyclone are best represented by use of the precipitation mode, usually VCP 11, 21 *or 121*, depending upon range. Radar characteristics of hurricanes are given in Federal Meteorological Handbook Number 11 (FMH-11), Part B, Chapter 9. Further discussion of product usage appears in FMH-11, Part D, Unit Description and Operational Applications. A recommended product list appears in FMH-11 Part D, Application versus Product Table 4-1.

Table 7-1. Participating radar stations [1]

LOCATION	RADAR TYPE	LATITUDE	LONGITUDE
	NATIONAL WEATHER SERVICE RADARS U.S. Gulf and Atlantic coast		
Albany, NY	WSR-88D	42E35' N	74E04' W
Atlanta, GA	WSR-88D	33E22' N	84E34' W
Binghamton, NY	WSR-88D	42E12' N	75E59' W
Birmingham, AL	WSR-88D	33E10' N	86E46' W
Boston, MA	WSR-88D	41E57' N	71E08' W
Brandon/Jackson, MS	WSR-88D	32E17' N	89E59' W
Brownsville, TX	WSR-88D	25E55' N	97E25' W
Caribou, ME	WSR-88D	46E02' N	67E48' W
Charleston, SC	WSR-88D	32E33' N	80E47' W
Columbia, SC	WSR-88D	32E39' N	81E03' W
Corpus Christi, TX	WSR-88D	27E47' N	97E31' W
Ft. Worth, TX	WSR-88D	32E34' N	97E18' W
Greer, SC	WSR-88D	34E53' N	82E13' W
Houston, TX	WSR-88D	29E28' N	95E05' W
Huntsville/Hytop, AL	WSR-88D	34E56' N	86E05' W
Jacksonville, FL	WSR-88D	30E29' N	81E42' W
Key West, FL	WSR-88D	24E36' N	81E42' W
Lake Charles, LA	WSR-88D	30E07' N	93E13' W
Melbourne, FL	WSR-88D	28E07' N	80E39' W
Miami, FL	WSR-88D	25E37' N	80E25' W
Mobile, AL	WSR-88D	30E41' N	88E15' W
Morehead City, NC	WSR-88D	34E46' N	76E53' W
New Orleans/Baton Rouge LA	WSR-88D	30E20' N	89E50' W
New York City, NY	WSR-88D	40E52' N	72E52' W
Philadelphia, PA	WSR-88D	39E57' N	74E25' W
Portland, ME	WSR-88D	43E53' N	70E15' W
Raleigh/Durham, NC	WSR-88D	35E40' N	78E29' W
Roanoke, VA	WSR-88D	37E01' N	80E16' W
San Antonio, TX	WSR-88D	30E43' N	97E23' W
Shreveport, LA	WSR-88D	32E27' N	93E50' W
State College, PA	WSR-88D	40E55' N	78E00' W
Sterling, VA	WSR-88D	38E58' N	77E29' W
Tallahassee, FL	WSR-88D	30E24' N	84E20' W
Tampa, FL	WSR-88D	27E42' N	82E24' W
Wakefield, VA	WSR-88D	36E59' N	77E00' W
Wilmington, NC	WSR-88D	33E59' N	78E26' W

[1]The criterion for selection is that the radar site is located within approximately 124 n mi (maximum velocity range) of the coastline.

NATIONAL WEATHER SERVICE RADARS
U.S. Southwest

Phoenix, AZ	WSR-88D	33E17' N	111E40' W
San Diego, CA	WSR-88D	33E49' N	117E38' W
Tucson, AZ	WSR-88D	31E57' N	110E54' W
Yuma, AZ	WSR-88D	32E40' N	114E37' W

FAA RADARS

Molokai, HI	WSR-88D	21E08'N	157E11'W
Kohala, HI	WSR-88D	20E06'N	155E45'W
San Juan, PR	WSR-88D	18E07'N	66E05'W
South Hawaii, HI	WSR-88D	19E06'N	155E34'W
South Kauai, HI	WSR-88D	21E54'N	159E33'W

DEPARTMENT OF DEFENSE
U.S. Gulf and Atlantic coast

Columbus AFB, MS	WSR-88D	33E54'N	88E20'W
Dover AFB, DE	WSR-88D	38E50'N	75E26'W
Eglin AFB, FL	WSR-88D	30E34'N	85E55'W
Fort Hood, TX	WSR-88D	30E43'N	97E23'W
Fort Polk, LA	WSR-88D	31E09'N	92E58'W
Fort Rucker, AL	WSR-88D	31E28'N	85E28'W
Maxwell AFB, AL	WSR-88D	32E32'N	85E47'W
Moody AFB, GA	WSR-88D	30E33'N	83E00'W
Robins AFB, GA	WSR-88D	32E40'N	83E21'W

(NHC has dial-in access to the above DOD sites.)

7.3.2. Central Region Report. The following fix definitions and criteria are used in reporting WSR-88D tropical cyclone radar observations:

- If the central region of a storm is defined by an identifiable circular, or nearly circular, wall cloud with an echo-free center, the fix (the geometric center) is reported as an "**EYE**".

- If the central region is recognizable, but not well-defined by a wall cloud (as in the case of a tropical storm), it is reported as a "**CENTER**."

- When the eye or center is only occasionally recognizable or some other central region uncertainty exists, the eye or center is reported as **"PSBL EYE"** or **"PSBL CENTER."**

- Remarks stating the degree of confidence will be included and will be classified as either "good," "fair," or "poor." If an eye is present, a "good" fix is reported when the eye is symmetrical--virtually surrounded by wall cloud; a "poor" fix is reported when the eye is asymmetrical--less than 50 percent surrounded by wall cloud; a "fair" fix is reported to express a degree of confidence between "good" and "poor." Note that a partial eyewall may be the result of excessive range from the radar, or represent the true structure of the system. Doppler velocities will, in general, increase confidence in the center position and, if available, should always be examined prior to establishing a fix.

7.3.3. Transmission of Radar Reports. When the tropical cyclone is within 200 n mi of a WSR-88D, and the center fix is considered reliable, the appropriate tropical cyclone warning center (TPC/NHC or CPHC) may issue a tropical cyclone position estimate (AFOS category TCE) between 2-hourly intermediate advisories. Note that although the issuance of this product depends upon the quality of the radar fix, other data sources such as aircraft reconnaissance may be blended with the radar estimate to obtain a position. Thus, a radar position based on a particular radar may appear to disagree with the TCE position, but has in fact been taken into consideration.

In the case of communications failure, and the event that TPC/NHC cannot obtain the necessary radar data, the local NWS Weather Forecast Office may be called upon to estimate the radar position and render qualitative assessment of the circulation.

Other radar facilities not having weather transmission capability but wishing to provide information deemed important, should call the nearest NWS Weather Forecast Office or the TPC/NHC.

CHAPTER 8

NATIONAL DATA BUOY CAPABILITIES AND REQUIREMENTS

8.1. General.

8.1.1. Automated Reporting Stations. The National Data Buoy Center (NDBC) maintains automated reporting stations in the Gulf of Mexico, in coastal areas and deep ocean of the Atlantic and Pacific Oceans, and in the Great Lakes. These data acquisition systems collect real-time meteorological and oceanographic measurements for operations and research purposes. Moored buoy station locations and configurations are given in Table 8-1. The locations of Coastal-Marine Automated Network (C-MAN) stations are listed in Table 8-2. Consult NDBC's web page at www.ndbc.noaa.gov to view the station locations and latest station operating status, and for site-specific information. Specific questions may be addressed to NDBC Observing Systems Branch, Stennis Space Center, Mississippi 39529-6000, phone 228-688-3134.

8.1.2. Data Acquisition. Moored buoy and C-MAN stations routinely acquire, store, and transmit data every hour; a few selected stations report more frequently. Data obtained operationally include sea level pressure, wind speed and direction, peak wind, and air temperature. Sea surface temperature and wave spectra data are measured by all moored buoys and a limited number of C-MAN stations. Relative humidity is measured at several stations. Ocean currents and salinity are measured at a few coastal stations.

NDBC acquires, encodes, and distributes data from regional coastal ocean observing systems which is distributed to customers via NWS dissemination systems. Data from participating regional observing systems pass through NDBC data quality control procedures prior to NWS dissemination. Information on these systems may be obtained from their respective web sites that are linked to www.ndbc.noaa.gov.

8.1.3. Drifting Buoys.

8.1.3.1. NDBC. NDBC is capable of acquiring, preparing, and deploying drifting buoys; however, an operational drifting buoy requirement has not been identified or funded.

8.1.3.2. Navy. Since 1998, the Naval Oceanographic Office (NAVOCEANO) has deployed meteorological drifting buoys to report surface meteorological and oceanographic measurements, for operational purposes, as tropical systems move through data sparse regions tracking toward the U.S. East Coast. Additionally, Navy drifting buoys have been deployed in the Intertropical Convergence Zone (ITCZ). The drifting buoy measurements, which are available to tropical forecasters, provide invaluable input for defining tropical storm movement and intensity, improve forecast model initialization, and give tropical forecasters a much better sense of storm characteristics and track as they approach the fleet concentration areas of Jacksonville, FL, and Norfolk, VA. Drifting buoys typically have a life span of 1 to 2 years, and the data are available through the NAVOCEANO homepage and through standard World Meteorological Organization (WMO) data sources.

NAVOCEANO acquires, prepares, and deploys drifting meteorological buoys based on operational requirements identified by Commander-in-Chief, Atlantic Fleet (CINCLANTFLT). Currently, CINCLANTFLT has identified the Navy's drifting buoy support as a standing requirement to support fleet safety, assist in fleet sortie decisions, and enhance tropical weather preparedness.

8.2. <u>Requests for Drifting Buoy Deployment</u>. Drifting buoy deployments should be coordinated through the Department of Commerce (DOC), National Oceanic and Atmospheric Administration (NOAA). *Deployments will be requested through the Office of the Federal Coordinator for Meteorology (OFCM) to HQ Air Force Reserve Command (AFRC).* Deployments in advance of a U.S. land-threatening hurricane require a 36- to 48-hour notification.

8.2.1. Tropical Prediction Center/National Hurricane Center (TPC/NHC). TPC/NHC forecasters will issue through the Tropical Cyclone Plan of the Day (TCPOD) an alert or outlook for drifting buoy deployment 48 hours before the planned deployment. *Hard tasking for the deployment will be issued via the TCPOD 16 hours, plus flying time to the deployment location, before the event.*

8.2.2. Deployment of Buoys. DOC may request the deployment of a drifting buoy and subsurface float array with up to 40 elements at a distance of 200 to 400 nm from the storm center, depending on the dynamics of the storm system. *DOC will ensure the buoys and mission-related DOC personnel are delivered to AFRC.* The specific DOC request for placement of the buoys will depend on several factors, including:

- Characteristics of the storm, including size, intensity, and velocity.
- Storm position relative to the coast and population centers.
- Availability of aircraft and dropsonde operators (DSO) certified for buoy deployment.

8.2.3. Deployment Position. The final deployment position will be provided before the flight crew briefing. An example of a possible buoy and float deployment pattern from the recent CLBAST Experiment is shown in Figure 8-1.

8.3. <u>Communications</u>. Moored buoy and C-MAN data are transmitted via NOAA Geostationary Operational Environmental Satellite (GOES) to the National Environmental Satellite, Data, and Information Service (NESDIS) and then are relayed to the NWS Telecommunications Gateway (NWSTG) for processing and dissemination. Moored buoy observations are formatted into the World Meteorological Organization (WMO) FM13-IX SHIP code. The SHIP code is defined in Federal Meteorological Handbook 2, Surface Synoptic Codes. C-MAN measurements are formatted into C-MAN code, which is very similar to the WMO FM12-IX SYNOP code. Code forms are shown in Table 8-3. The C-MAN code is contained in the C-MAN Users' Guide, which is available from NDBC. Drifting buoy data are sent through the NOAA Polar Orbiting Environmental Satellites (POES) to the U.S. Argos Global Processing Center, Largo, MD. Service Argos processes and formats the data into WMO FM18 BUOY code defined in the WMO *Manual on Codes*, Volume I. The messages are routed to the NWSTG for distribution.

Table 8-1. Moored buoy locations and configurations

SITE	STATION ID	LOCATION	HULL SIZE (m)	ANEMOMETER HEIGHT (m)
GULF OF MEXICO	42001	25.9E N., 89.7E W.	10	10
	42002	25.2E N., 94.4E W.	10	10
	42003	26.0E N., 85.9E W.	10	10
	42007	30.1E N., 88.8E W.	3	5
	42019	27.9E N., 95.4E W.	3	5
	42020	26.9E N., 96.7E W.	3	5
	42035	29.2E N., 94.4E W.	3	5
	42036	28.5E N., 84.5E W.	3	5
	42039[1]	28.8E N., 86.0E W.	3	5
	42040[1]	29.2E N, 88.2E W.	3	5
	42041	27.5E N, 90.5E W.	3	5
ATLANTIC OCEAN	41001	34.7EN., 72.7EW.	6	5
	41002	32.3EN., 75.4EW.	6	5
	41004	32.5EN., 79.1EW.	3	5
	41008	31.4EN., 80.9EW.	3	5
	41009[1]	28.5EN., 80.2EW.	3	5
	41010[1]	28.9EN., 78.5EW.	6	5
	41012	30.0EN, 80.60EW.	3	5
	41013	33.5EN, 77.6EW.	3	5
	41025	35.2EN, 75.3EW.	3	5
	44004	38.5EN., 70.5E W.	6	5
	44005	42.9EN., 69.2E W.	6	5
	44007	43.5EN., 70.1E W.	3	5
	44008	40.5EN., 69.4EW.	3	5
	44009	38.5EN., 74.7EW.	3	5
	44011	41.1EN., 66.6EW.	6	5
	44013	42.4EN., 70.7EW.	3	5
	44014[1]	36.6EN., 74.8EW.	3	5
	44017	40.7EN., 72.0EW.	3	5
	44018	41.3EN., 69.2EW.	3	5
	44025	40.3EN., 73.2EW.	3	5
	44027	44.3EN, 67.3EW	3	5
PACIFIC OCEAN (BETWEEN 10EN. AND 40EN.)	46011	34.9E N., 120.9E W.	3	5
	46012	37.4E N., 122.9E W.	3	5
	46013	38.2E N., 123.3E W.	3	5
	46014	39.2E N., 124.0E W.	3	5
	46023[1]	34.7E N., 121.0E W.	10	10
	46025	33.8E N., 119.1E W.	3	5
	46026	37.8E N., 122.8E W.	3	5
	46011	34.9E N., 120.9E W.	3	5
	46012	37.4E N., 122.9E W.	3	5
	46013	38.2E N., 123.3E W.	3	5
	46014	39.2E N., 124.0E W.	3	5
	46023[1]	34.7E N., 121.0E W.	10	10

continued	46062[1]	35.1E N., 121.0E W.	3	5
PACIFIC OCEAN	46063	34.3E N., 120.7E W.	6	5
(BETWEEN 10EN.	46069	33.6E N., 120.2E W.	3	5
AND 40EN.)	46086	32.5E N., 118.0E W.	3	5
	51001	23.4E N., 162.2E W.	6	6
	51002	17.2E N., 157.8E W.	6	6
	51003	19.2E N., 160.7E W.	6	6
	51004	17.5E N., 152.5E W.	6	5
	51028	0.0E N., 153.9E W.	3	5

[1]Temporary site established with other special funding.

Table 8-2. C-MAN sites

SITE	STATION ID	LOCATION	STATION NAME
GULF OF MEXICO	BURL1	28.9E N., 89.4E W.	Southwest Pass, LA
	CDRF1	29.1E N., 83.0E W.	Cedar Key, FL
	DPIA1	30.3E N., 88.1E W.	Dauphin Island, AL
	DRYF1	24.6E N., 82.9E W.	Dry Tortugas, FL
	GDIL1	29.3E N., 90.0E W.	Grand Isle, LA
	KTNF1	29.8E N., 83.6E W.	Keaton Beach, FL
	LONF1	24.8E N., 80.9E W.	Long Key, FL
	PTAT2	27.8E N., 97.1E W.	Port Aransas, TX
	SGOF1	29.4E N., 84.9E W.	Tydall AFB Tower C, FL
	SRST2	29.7E N., 94.1E W.	Sabine, TX
	VENF1	27.1E N., 82.4E W.	Venice, FL
ATLANTIC OCEAN	ALSN6	40.5E N., 73.8E W.	Ambrose Light, NY
	BUZM3	41.4E N., 71.0E W.	Buzzards Bay, MA
	CHLV2	36.9E N., 75.7E W.	Chesapeake Light, VA
	CLKN7	34.6E N., 76.5E W.	Cape Lookout, NC
	DUCN7	36.2E N., 75.8E W.	Duck Pier, NC
	FBIS1	32.7E N., 79.9E W.	Folly Island, SC
	FPSN7[2]	33.5E N., 77.6E W.	Frying Pan Shoals, NC
	FWYF1	25.6E N., 80.1E W.	Fowey Rocks, FL
	IOSN3	43.0E N., 70.6E W.	Isle of Shoals, NH
	LKWF1	26.6E N., 80.0E W.	Lake Worth, FL
	MDRM1	44.0E N., 68.1E W.	Mt. Desert Rock, ME
	MISM1	43.8E N., 68.9E W.	Matinicus Rock, ME
	MLRF1	25.0E N., 80.4E W.	Molasses Reef, FL
	SANF1	24.5E N., 81.9E W.	Sand Key, FL
	SAUF1	29.9E N., 81.3E W.	St. Augustine, FL
	SMKF1	24.6E N., 81.1E W.	Sombrero Key, FL
	SPGF1	26.7E N., 79.0E W.	Settlement Point, GBI
	TPLM2	38.9E N., 76.4E W.	Thomas Point, MD
EASTERN PACIFIC OCEAN	CARO3	43.3E N., 124.4E W.	Cape Arago, OR
(SOUTH OF 45E N.)	NWPO3	44.6E N., 124.1E W.	Newport, OR
	PTAC1	39.0E N., 123.7E W.	Point Arena, CA
	PTGC1	34.6E N., 120.6E W.	Point Arguello, CA

[1]Temporary site established with other special funding.
[2] Station will operate until platform fails; service visits discontinued due to condemnation of observing site

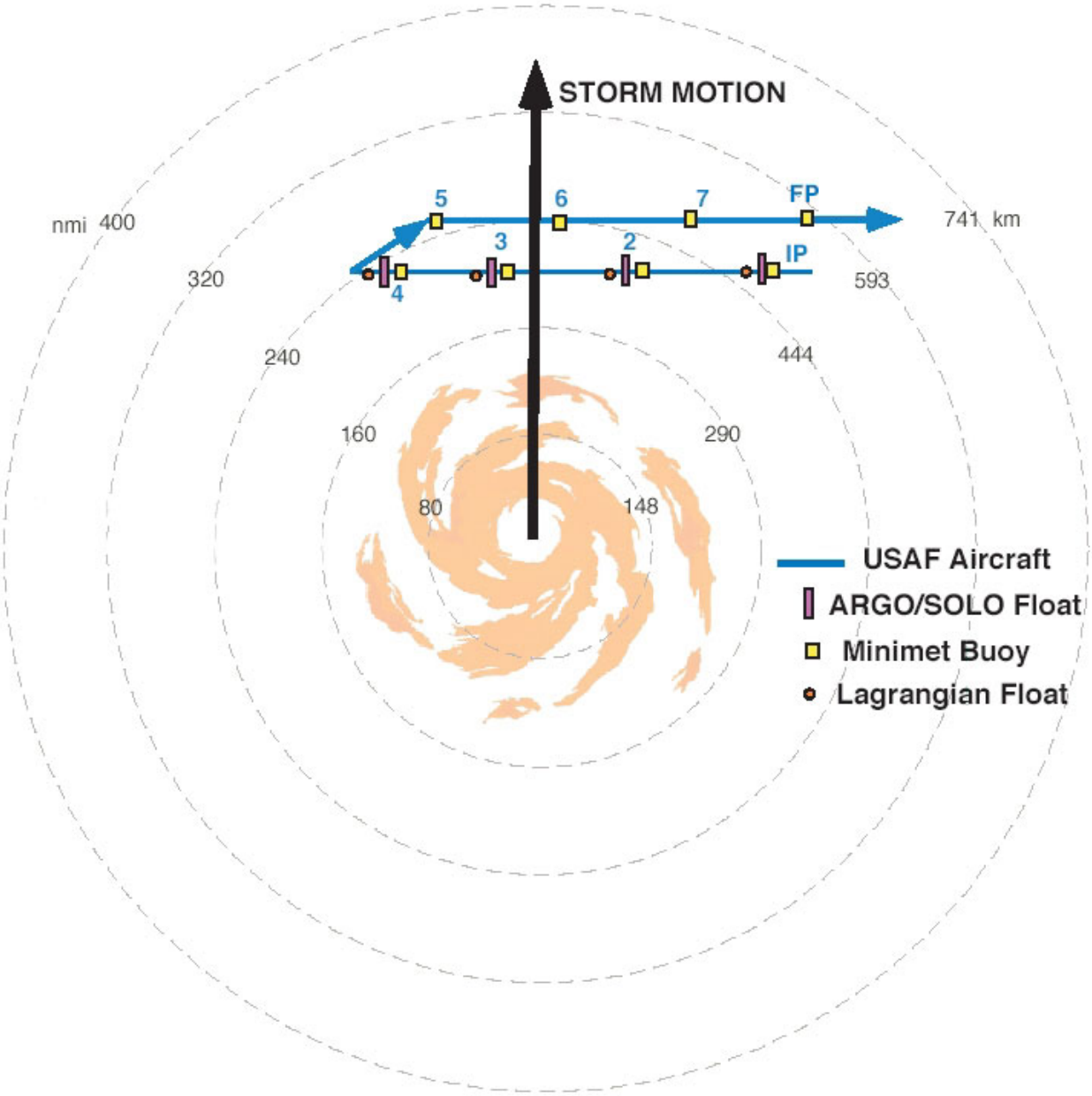

Figure 8-1. Example Buoy and Float Deployment Pattern

Table 8-3. Code forms for moored data buoys, C-MAN stations, and drifting buoys

FORM	CODE
FM13IX (SHIP) REPORT OF SYNOPTIC SURFACE OBSERVATION FROM A SEA STATION (AUTOMATIC WEATHER STATION)	$M_iM_iM_jM_j$ $A_1b_wn_bn_bn_b$ YYGGi_w 99$L_aL_aL_a$ $Q_cL_oL_oL_oL_o$ i_ri_x/// /ddff $1s_nTTT$ ($2s_nT_dT_dT_d$) $3P_oP_oP_oP_o$ 4PPPP 5appp 9GGgg 222oo $Qs_sT_wT_wT_w$ $1P_{wa}P_{wa}H_{wa}H_{wa}$ 7o $H_{wa}H_{wa}H_{wa}$ 333 912ff (oofff) 555 11fff 22fff (3GGgg $4ddf_mf_m$) ($6G_cG_cg_cg_c$ $d_1d_1d_1f_1f_1$ $d_6d_6d_6f_6f_6$) $d_2d_2d_2f_2f_2$ $d_3d_3d_3f_3f_3$ $d_4d_4d_4f_4f_4$ $d_5d_5d_5f_5f_5$
U.S. NATIONAL (C-MAN LAND STATION) MODIFIED FM12-IX SYNOP	CMAN YYGGi_w XXXXn_t i_Ri_xhVV Nddff (oofff) $1s_nTTT$ $2s_nT_dT_dT_d$ $3P_oP_oP_oP_o$ 4PPPP 5appp $6RRRt_R$ 9GGgg 222// $os_nT_wT_wT_w$ $1_{wa}P_{wa}P_{wa}H_{wa}H_{wa}$ $7oH_{wa}H_{wa}H_{wa}$ 333 912ff (oofff) 444 $1P_{av}P_{av}P_{av}$ / 555 11fff 22fff (3GGgg) ($4ddf_mf_mf_m$) ($6G_cG_cg_cg_c$ $d_1d_1d_1f_1f_1$ $d_6d_6d_6f_6f_6$) $d_2d_2d_2f_2f_2$ $d_3d_3d_3f_3f_3$ $d_4d_4d_4f_4f_4$ $d_5d_5d_5f_5f_5$ (TIDE1111)
FM18 BUOY REPORT OF A DRIFTING BUOY OBSERVATION	ZZYY A_1 $b_wn_bn_bn_b$ YYMMJ GGggi_w Q_c $L_aL_aL_aL_a$ $L_oL_oL_oL_oL_o$ $6Q_1$ Q_t O_d / $\underline{111}Q_dQ_x$ $\underline{O}$ddff ($\underline{1}_{SN}$ TTT) [($2_{SN}T_dT_dT_d$) or ($\underline{29}$ uuu)] ($\underline{3}P_oP_oP_oP_o$) ($\underline{4}$PPPP) ($\underline{5}$appp) $222Q_dQ_x$ ($\underline{O}s_nT_wT_wT_w$) ($1P_{wa}P_{wa}H_{wa}H_{wa}$) ($2OP_{wa}P_{wa}P_{wa}$) ($21H_{wa}H_{wa}H_{wa}$) $\underline{333}Q_{d1}Q_{d2}$ (8887k_2 $2z_oz_oz_oz_o$ $3T_oT_oT_oT_o$ $4S_oS_oS_oS_o$ .... $2z_nz_nz_nz_n$ $3T_nT_nT_nT_n$ $4S_nS_nS_nS_n$) (66$k_6$9k_3 $2z_oz_oz_oz_o$ $d_od_oc_oc_oc_o$ .... $2z_nz_nz_nz_n$ $d_nd_nc_nc_nc_n$) 444 ($\underline{1}Q_pQ_2Q_{Tw}Q_4$) ($\underline{2}Q_NQ_L$//) [($Q_cL_aL_aL_aL_a$ $L_oL_oL_oL_oL_o$ or (YYMMJ GGgg/)] ($8V_iV_iV_iV_i$) ($9_{1d}Z_dZ_dZ_dZ_d$)

CHAPTER 9

MARINE WEATHER BROADCASTS

9.1. **General**. The National Weather Service and the Department of Homeland Security's United States Coast Guard (USCG) broadcast forecast products that include information on tropical cyclones issued by the National Hurricane Center and the Central Pacific Hurricane Center. The broadcast of these products supports the U.S. participation in the Global Maritime Distress and Safety System, which provides the communications support to the International Maritime Organization's (IMO) global search and rescue plan.

9.2. **Global Maritime Distress and Safety System (GMDSS)**. The goals of GMDSS are to provide more effective and efficient emergency and safety communications, and to disseminate maritime safety information to all ships on the world's oceans regardless of location or atmospheric conditions. These goals are defined in the International Convention for the Safety of Life at Sea (SOLAS) 1974. GMDSS is based upon a combination of satellite and terrestrial radio services and has changed international distress communications from being primarily ship-to-ship based to ship-to-shore (rescue coordination center) based. GMDSS provides for automatic distress alerting and locating, and requires ships to receive broadcasts of maritime safety information which could prevent a distress from happening in the first place. The NWS participates directly in the GMDSS by preparing weather forecasts and warnings for broadcast via two primary GMDSS systems--NAVTEX and Inmarsat-C SafetyNET.

9.2.1. NAVTEX. NAVTEX is an international, automated system for instantly distributing maritime navigational warnings, weather forecasts and warnings, search and rescue notices, and similar information to ships. It has been designated by the IMO as the primary means for transmitting coastal urgent marine safety information to ships worldwide. NAVTEX is broadcast from the 12 USCG stations. Coverage is reasonably continuous along the east, west, and Gulf coasts of the United States, as well as the area around Kodiak, Alaska, Guam, and Puerto Rico. Typical NAVTEX transmissions range from 200-400 nm.

9.2.2. SafetyNET. Satellite systems operated by Inmarsat Ltd. are an important element of the GMDSS. Inmarsat-C provides ship/shore, shore/ship, and ship/ship store-and-forward data and telex messaging; the capability for sending preformatted messages to a rescue coordination center; and the SafetyNET service. The Inmarsat-C SafetyNET service is a satellite-based worldwide maritime safety information broadcast service of high seas weather warnings, navigational warnings, radionavigation warnings, ice reports and warnings generated by USCG-conducted International Ice Patrol, and other information not provided by NAVTEX.

9.3. <u>Coastal Maritime Safety Broadcasts</u>. In addition to NAVTEX, the USCG and other government agencies broadcast maritime safety information, using a variety of different radio systems to ensure coverage of different ocean areas for which the United States has responsibility and to ensure all ships of every size and nationality can receive this vital safety information.

9.3.1. VHF Marine Radio. The USCG broadcasts nearshore and storm warnings of interest to the mariner on VHF channel 22A (157.1 MHZ) following an initial call on the distress, safety, and calling channel 16 (156.8 MHZ). Broadcasts are made from over 200 sites, covering the coastal areas of the U.S., including the Great Lakes, major inland waterways, Puerto Rico, Alaska, Hawaii, and Guam. All ships in U.S. waters over 20 meters in length are required to monitor VHF channel 16 and must have radios capable of tuning to the VHF simplex channel 22A. Typical coverage is 25 nm offshore.

9.3.2. Medium Frequency Radiotelephone (Voice). The USCG broadcasts offshore forecasts and storm warnings of interest to mariners on 2670 kHz, after first being announced on the distress, safety, and calling frequency 2182 kHz.

9.3.3. NOAA Weather Radio. The NOAA Weather Radio network continually broadcasts coastal and marine forecasts on frequencies near 162 MHZ. Recorded voice broadcasts have largely been supplanted by a synthesized voice. The network provides near-continuous coverage of the coastal U.S., Great Lakes, Hawaii, Guam, and the populated Alaska coastline. Typical coverage is 25 nm offshore.

9.4. <u>High Seas Broadcasts</u>. NWS high seas weather forecasts and warnings are also available on the following high frequency (HF) broadcasts.

9.4.1. HF Radiotelephone (Voice). Weather forecasts and warnings for the high seas are broadcast over scheduled HF radiotelephone channels from USCG communications stations using a very distinctive and recognizable computer-synthesized voice. Limited offshore forecasts are also available.

9.4.2. HF Radiofacsimile. The USCG broadcasts NWS high seas weather maps from five communications stations--Boston, MA (NMF); Point Reyes, CA (NMC); New Orleans, LA (NMG), Honolulu, HI (KVM-70) (a DOD station); and Kodiak, AK (NOJ). Limited satellite imagery, sea surface temperature maps, and text forecasts are also available.

9.4.3. HF Radiotelex (HF SITOR). High seas forecasts in text format, recognized by the GMDSS, are broadcast over scheduled GMDSS HF narrow-band direct printing channels from USCG communications stations. Limited offshore forecasts are also available.

9.4.4. WWV, WWVH HF Voice (Time Tick). Atlantic high seas warnings are broadcast at 7 and 8 minutes past the hour over WWV (Boulder, CO) on the following HF frequencies: 2.5, 5, 10, 15, and 20 MHZ; Pacific high seas warnings are broadcast at 9 minutes past the hour. Pacific high seas warnings are broadcast from 48-51 minutes past the hour over

WWVH (Honolulu, HI) at 2.5, 5, 10, and 15 MHZ. These are the National Institute of Standards and Technology (NIST) standard time/frequency broadcasts.

9.5. <u>Additional Information</u>. Further information concerning these and other marine broadcasts, including schedules, frequencies, and links to products can be found at:

- www.nws.noaa.gov/om/marine/home.htm
- www.navcen.uscg.mil/marcomms/marcomms.htm

In addition, the *National Geospatial-Intelligence Agency (NGA)*, Publication 117, Radionavigation Aids, (http://pollux.nss.nima.mil/pubs/) contains detailed information on maritime safety information broadcasts within the U.S. and worldwide. This publication is also available from the Superintendent of Documents; it can be ordered by calling 1-202-512-1800 or by visiting their Internet site at http://bookstore.gpo.gov.

CHAPTER 10

PUBLICITY

10.1. <u>News Media Releases</u> . News media releases, other than warnings and advisories, for the purpose of informing the public of the operational and research activities of the Departments of Commerce, Defense, and Transportation should reflect the joint effort of these agencies by giving due credit to the participation of other agencies.

10.2. <u>Distribution</u> . Copies of these releases should be forwarded to the following agencies:

- NOAA Office of Public Affairs
  Herbert C. Hoover Building
  14th and Constitution Avenue, N.W.
  Washington, DC 20230

- Commander, Naval Meteorology and Oceanography Command
  1100 Balch Boulevard
  Stennis Space Center, MS 39522-3001

- Hq Air Force Reserve Command (AFRC/PA)
  Robins AFB, GA 31093

- Joint Staff Weather Officer
  The Joint Chiefs of Staff (J3/DDGO-ROD)
  Pentagon Room 2D-921G
  Washington, DC 20318-3000

- Federal Aviation Administration (APA-310)
  800 Independence Avenue, S.W.
  Washington, DC 20591

- Director, NOAA Aircraft Operations Center
  P.O. Box 6829
  MacDill AFB, FL 33608-0829

- Federal Coordinator for Meteorology
  Suite 1500, 8455 Colesville Road
  Silver Spring, MD 20910

APPENDIX A

LOCAL NATIONAL WEATHER SERVICE (NWS) OFFICE PRODUCTS

A.1. Hurricane/Typhoon Local Statements (HLS). WFOs with coastal county responsibilities *and selected inland WFOs* will issue these unnumbered products which are very specific and designed to inform media, local decision makers, and the public on present and anticipated storm effects in their county warning area (CWA) and adjacent coastal waters. Keep HLSs as succinct as possible.

A.1.1. Mission Connection. Alert the public, media, and local decision makers of potential or actual storm affects due to tropical cyclones. The product is intended to provide information to assist in the preparation and implementation of necessary precautions for the protection of life and property, as well as minimize the economic losses as a result of tropical cyclones.

A.1.2. Issuance Guidelines.

A.1.2.1. Creation Software. AWIPS.

A.1.2.2. Issuance Criteria. *The following WFOs will issue HLSs when their area of responsibility is affected by a tropical cyclone watch/warning or evacuation orders. HLSs may also be issued as needed to dispel rumors or to clarify tropical cyclone related information for their CWA. Coastal WFOs have the option to include inland counties in the HLS.*

Coastal WFOs are defined as those having at least one county with significant tidal influences. Those are:

Eastern Region
Caribou, ME
Portland, ME
Boston, MA
New York City, NY
Philadelphia, PA
Baltimore, MD/Washington, DC
Wakefield, VA
Newport/Morehead City, NC
Wilmington, NC
Charleston, SC

Southern Region
Brownsville, TX
Corpus Christi, TX
Houston/Galveston, TX
Lake Charles, LA
New Orleans, LA
Mobile, AL
Tallahassee, FL
Tampa Bay, FL
Miami, FL
Key West, FL
Melbourne, FL
Jacksonville, FL
San Juan, PR

Western Region
San Diego, CA
Los Angles/Oxnard, CA

Pacific Region
Honolulu, HI
Guam
WSO Pago Pago, American Samoa

Inland WFOs listed below will also issue HLSs when hurricane or tropical storm force winds are expected to impact their area of responsibility. Inland offices not issuing HLSs but expecting hurricane or tropical storm force winds may be required to issue an Inland Tropical Storm/Hurricane Wind Watches or Warnings.

Atlanta, GA	*Jackson, MS*
Birmingham, AL	*Huntsville, AL*
Austin/San Antonio, TX	*Midland, TX*
San Angelo, TX	*Lubbock, TX*
Fort Worth, TX	

A.1.2.3. Issuance Times. *The initial HLS should be issued as soon as possible following the first issuance of a tropical storm/hurricane watch/warning for your area of responsibility. When a tropical storm or hurricane is close to the coast, issue HLSs every 2 to 3 hours or more frequently as circumstances warrant. Do not release HLSs immediately before an advisory unless information is coordinated with the appropriate Tropical Cyclone Center and, for watches or warnings, the valid initiation time is specified. HLSs do not need to immediately follow the issuance of a new hurricane advisory. Issuing HLSs midway between advisories maintains a steady flow of information to the media and the public. However, when local storm impacts are changing rapidly, or a new advisory changes the potential impact on a local area, information needs to be distributed in a fresh HLS as soon as possible. Routine HLSs may cease when the tropical cyclone is no longer a threat to an office's CWA.*

A.1.2.4. Valid Time. HLSs are valid at the time of issuance until a subsequent HLS is issued. *HLSs are issued at least once every 6 hours.*

A.1.2.5. Product Expiration Time. Generally 6 hours after the issuance time and should coincide with the next expected update or when the event is forecast to end.

A.1.3. Technical Description. HLSs will follow the format and content described in this section.

A.1.3.1. UGC Type. HLSs will use the zone (Z) form of the UGC.

A.1.3.2. Mass News Disseminator (MND) Header. The HLS MND header product type line is "(TROPICAL CYCLONE TYPE) LOCAL STATEMENT."

A1.3.3. Content. HLSs will add localized details to Tropical Cyclone Center's advisory releases and should not conflict with or repeat advisory information not directly applicable to the local office's CWA. Before the first HLS, use public information statements (PNS) to inform the public on routine hurricane preparedness information. The first HLS can also contain standard preparedness messages. Information may be added to the end of the HLS describing where additional storm information can be found in supporting Center's TCP and TCM as well as PNSs and NOWs (Short Term Forecast) issued by the local office.

HLSs should use tropical cyclone position estimates provided by their tropical cyclone center between advisories when appropriate. When tropical cyclones threaten the Samoas (American Samoa and Samoa), the two local offices will coordinate with RSMC Nadi, CPHC, and with each other to determine the best integrated and internally consistent forecast of conditions expected in the area.

The following table defines which products are issued via the normal suite of product headers during tropical cyclone watches/warnings and those products superceded by tropical cyclone watches/warnings and carried in a HLS.

HLS Product Table

Product	**Tropical Cyclone Watch/Warning**	
	HLS	**Stand-alone**
Flash Flood Watch/Warning/Statement		X
Flood Warning		X
Tornado Warning		X
Inland Tropical Storm Wind or Inland Hurricane Wind Watch/Warning		X
Severe Thunderstorm Warning		X[1]
Coastal Flood Watch/Warning/Statement	X[2]	X[2]
Special Marine Warning		X[3]
Severe Weather Statement		X[1]
Marine Weather Statement		X[1]
Special Weather Statement	X	
Surf Zone Forecast/Surf Forecast	X	
High Surf Advisory/Warning (WFO Honolulu)	X	

[1] *Can be issued as stand-alone products at the discretion of the WFO. However, their use should be confined to peripheral events, such as outer rainbands, prior to sustained tropical storm or hurricane strength winds.*

[2] *If no CFW products were issued by the WFO prior to the issuance of a tropical cyclone watch or warning and an HLS is issued, no CFW products will be issued for the duration of the tropical cyclone event.*

Complications occur when a CFW product is in effect and tropical cyclone watches and/or warnings are issued. The basic premise is if the threat level of a tropical cyclone product equals

or exceeds the threat level of an existing CFW, the CFW will be discontinued. Below are details.

- *A CFW product is in effect for a Coastal Flood Warning and/or High Surf Warning and a tropical cyclone watch is issued - CFW will* ***continue*** *as standalone product along with HLS product.*
- *A CFW product is in effect for a Coastal Flood Warning and/or High Surf Warning and a tropical cyclone warning is issued - CFW will be* ***canceled*** *and users directed to the HLS for further information on coastal hazards.*
- *A CFW product is in effect for a Coastal Flood Advisory, Coastal Flood Watch, and/or High Surf Watch and a tropical cyclone watch or warning is issued - CFW will be* ***canceled*** *and users directed to the HLS for further information on coastal hazards.*

PRODUCTS IN EFFECT	***CONTINUE CFW***	***CANCEL CFW***	***ISSUE HLS***
Coastal Flood ADVISORY (CFW) and Tropical Cyclone WATCH is issued		***X***	***X***
Coastal Flood ADVISORY (CFW) and Tropical Cyclone WARNING is issued		***X***	***X***
Coastal Flood WATCH (CFW) and Tropical Cyclone WATCH is issued		***X***	***X***
Coastal Flood WATCH (CFW) and Tropical Cyclone WARNING is issued		***X***	***X***
Coastal Flood WARNING (CFW) and Tropical Cyclone WATCH is issued	***X***		***X***
Coastal Flood WARNING (CFW) and Tropical Cyclone WARNING is issued		***X***	***X***
High Surf WATCH (CFW) and Tropical Cyclone WATCH is issued		***X***	***X***
High Surf WATCH (CFW) and Tropical Cyclone WARNING is issued		***X***	***X***
High Surf WARNING/ADVISORY (CFW) and Tropical Cyclone WATCH is issued	***X***		***X***
High Surf WARNING (CFW) and Tropical Cyclone WARNING is issued		***X***	***X***

[3] WFOs have the option to issue stand-alone special marine warnings (SMWs) on an as needed basis. This will primarily occur during watch situations prior to the onset of tropical storm winds impacting a marine zone. In cases of waterspouts, SMWs may be issued anytime during tropical cyclone watch/warning situations.

A.1.3.4. *Format. As appropriate, product header options are "Hurricane or Typhoon Local Statement," "Tropical Storm Local Statement" or "Tropical Depression Local*

Statement." All HLSs will contain at least one headline. Prepare each section of the HLS by a content/topic header set off by three dots before and after each header. Prioritize and adjust the order to focus on the greatest threat and the most important information impacting the area.

A.1.4 Essential contents of Hurricane Local Statements:

...Headline...
A minimum of at least one concise lead sentence or headline.

...Areas Affected...
Details of which counties, parishes, or cities are included in the HLS.

...Watches/Warnings...
Watches and warnings in effect and counties or parishes to which they apply.

...Storm Information...
Present location, movement, and winds and expected time of onset of tropical storm/hurricane/typhoon force winds. Give timing of impacts in ranges or general terms such as "afternoon," "evening," and so on. Use the tropical cyclone forecast/advisory as guidance.

...Precautionary/Preparedness Actions...
Short-term precautionary actions and times they should be completed.
This includes any evacuation recommendations contained in the advisory or stated by local authorities. Listing these actions is particularly important once a tropical cyclone watch or warning is announced.

...Storm Surge Flood and Storm Tide Impacts...
Storm surge and storm tide (storm surge plus astronomical tide) information, including times, various heights are expected, present heights, and their locations. If data exists, a comparison of storm surge heights from previous tropical cyclones should be included. Storm surge information must agree with Tropical Cyclone Center forecasts as included in the advisories. Include storm tide information because local officials might not have access to tide tables. Reference storm tide forecasts to appropriate datums understood by local authorities. For many portions of the coast, this would be mean sea level although some areas use mean lower low water.

...Wind Impacts...
Present winds and expected time of onset of tropical storm or hurricane force winds. *WFOs may provide information about the local impacts of the expected winds.*

...Other Impacts...(Substitute appropriate header to reflect most important threat)
Any statements on potential tornado and flood/flash flood threats, rip currents, beach erosion, high wind warnings inland, etc. Headlines would read for example: "...Inland

Flooding Impacts..." or "...Tornado Impacts..."

...Probability of Hurricane/Tropical Storm Conditions...
Information on probability of hurricane/typhoon/tropical storm conditions is optional.

...New Information...
Specific new and vital information which you wish to bring to the attention of your users.

...Next Update...
Time of next or final statement.

Some private sector vendors are parsing and scrolling HLS information. Format consistency of some of the HLS information is required. WFOs should still arrange the sections as they see fit with the most important first. WFOs still retain the option to use whatever headline they wish in the "Other Impact" section. Any section (including the ones the private sector are using) can be omitted if it is not appropriate for a given situation. Below are the headlines and those section headlines which require consistent formatting, e.g. ellipses, carriage returns and the exact section headline wording.

...Headline(s)...
More than one headline allowed with no blank lines in between, each section headline beginning and ending with ellipses

...Precautionary/Preparedness Actions...

...Storm Surge Flood and Storm Tide Impacts...

...Wind Impacts...

For the Headlines section, the vendor's software will key in on the singular blank line between the Time/Date line of the Mass News Dissemination Header and the three ellipses (...) at the beginning and ending of each headline. For the other three sections, the vendor's software will key on a blank line, the headline as written above, and three ellipses (before and after).

EXAMPLE:

HURRICANE LOCAL STATEMENT
NATIONAL WEATHER SERVICE XXXXX
1019 AM CDT TUE JUL 15 2003

...HURRICANE ZENIA MOVING ONTO THE MIDDLE TEXAS COAST
NEAR PORT O'CONNOR...
...A HURRICANE WARNING IS IN EFFECT FROM BAFFIN BAY TO HIGH
ISLAND...

...PRECAUTIONARY/PREPAREDNESS ACTIONS...
TEXT

...STORM SURGE FLOOD AND STORM TIDE IMPACTS...
TEXT

...WIND IMPACTS...
TEXT

Wtaaii CCCC DDHHMM
HLSxxx
`stZXXX-XXX>XXX-DDHHMM-`
(TROPICAL CYCLONE TYPE) LOCAL STATEMENT
NATIONAL WEATHER SERVICE CITY, STATE
time am/pm time_zone day mon DD YYYY

...HEADLINE...

...Areas Affected...

...Watches/Warnings...

...Storm Information...

...Precautionary/Preparedness Actions...

...Storm Surge Flood and Storm Tide Impacts...

...Wind Impacts...

...Other Impacts...(Substitute appropriate header to reflect most important threat)

...Probability of Hurricane/Tropical Storm Conditions...

...New Information...

...Next Update...
$$

Figure A-1. **Hurricane Local Statement Format**

A.1.5. Relationship of HLSs to the NOW. The NOW is a stand-alone product focused on conditions impacting the office's CWA for the next 0 to 6 hours. It will complement the HLS by providing critical storm information in the first eight lines.

A.2. Tornado and Flash Flood Warnings (TOR/FFW). *WFOs should follow policy for the issuance of tornado warnings as per directive 10-511. However, for the 2005 season, the TOR product may be used for the purpose to warn the public to immediately take shelter in an interior portion of a well-built structure due to the onset of extreme tropical cyclone destructive winds.*

A tornado warning for extreme tropical cyclone destructive winds may be issued when all of the following criteria are met:

- *Imminent or occurring onset of tropical cyclone-related sustained winds, greater than or equal to 100 knots (115 mph).*
- *Onset of tropical cyclone-related destructive winds are expected to develop or occur within a WFOs county warning area within an hour.*

The warning valid time should be 2 hours or less using county UGCs.

A.3. Inland Tropical Storm/Hurricane Wind Watch or Warning (NPW). *Coastal and inland WFOs will issue an inland tropical storm watch or warning, or inland hurricane watch or warning, when a tropical cyclone is expected to spread tropical storm or hurricane force winds inland under the non-precipitation weather product NPW. The NPW will be exclusively used for this product's initial issuance, subsequent follow-up, and cancellation. The following WFOs are exempt from this policy and will issue NPWs for high wind watches and/or warnings if tropical storm winds move into their area of responsibility.*

Albany, NY	*Cleveland, OH*
Binghamton, NY	*Pittsburgh, PA*
Buffalo, NY	*State College, PA*
Burlington, VT	*Wilmington, OH*
Charleston, WV	

A.3.1. Mission Connection. Non-precipitation watches and warnings provide our customers and partners advance notice of hazardous non-precipitation weather events which have the potential to threaten life and property.

A.3.2. Issuance Guidelines.

A.3.2.1. Creation Software. Use AWIPS Watch/Warning/Advisory software or other text editors.

A.3.2.2. *Issuance Criteria. WFOs will issue Inland Tropical Storm/Hurricane Watches when tropical storm/hurricane force winds are possible within the watch area within 36 hours. WFOs will issue Inland Tropical Storm/Hurricane Warnings when tropical storm/hurricane force winds are expected within the warning area within 24 hours. For those offices issuing the inland watch/warnings, the NPW product will be updated as conditions warrant. At a minimum this should be every six hours or after the issuance of a six hourly NHC TCP advisory.*

A.3.2.3. Issuance Times. Event driven.

A.3.2.4. *Valid Time. Watch is valid up to 48 hours after the issuance time. The valid time (event start and end times) is described in the watch headline. A warning is valid up to 36 hours after issuance time. The valid time (event start and end times) is described in the warning headline.*

A.3.2.5. Product Expiration Time. Generally 6-8 hours after the issuance time and should coincide with the next expected update or when the event is forecast to end.

A.3.3. Technical Description. NPWs will follow the format and content described in this section.

A.3.3.1. UGC Type. NPWs will use the zone (Z) form of the UGC.

A.3.3.2. Mass News Disseminator Header. Not applicable.

A.3.3.3. *Content. A headline will be "Inland Tropical Storm Watch (or Warning)" or "Inland Hurricane Watch (or Warning)." When the effects of the tropical cyclone can be clearly described to the public and not lead to confusion, inland sections of coastal counties may be placed under inland tropical storm/hurricane watch or warning versus using tropical cyclone watches or warnings. Coordination will occur with all impacted offices and NHC before issuance. The appropriate forecasts and statements will highlight watches and warnings.*

A.3.3.4. *Format*.

```
WWaaii CCCC DDHHMM
NPWxxx

URGENT - WEATHER MESSAGE
NATIONAL WEATHER SERVICE CITY, STATE
time am/pm time_zone day mon DD YYYY

...<Overview headline statement>...

…<General non-precipitation weather synopsis>…

stZxxx-xxx>xxx-DDHHMM-
zone-zone-zone
INCLUDING THE CITIES OF...
time am/pm time_zone day mon dd yyyy

...HEADLINE...

TEXT


$$
```

Figure A-2. **Inland Wind NPW Product Format**

A.4. **Inland Tropical Storm/Hurricane Wind Watch or Warning for Subtropical Storms.** WFOs will issue an inland tropical storm wind watch or warning, or inland hurricane wind watch or warning when a subtropical storm is expected to spread tropical storm or hurricane force winds inland. *Use same procedures as noted in section A.3.*

A.5. **Post-Tropical Cyclone Reports (PSH).** All WFOs issuing HLSs will prepare post-storm reports. Inland offices issuing inland tropical storm/hurricane wind watches or warnings will also submit reports. *Other offices whose CWA's experienced wind gusts greater than 33 knots, flooding, tornadoes, damage, or casualties will also submit reports.*

A.5.1. Mission Connection. The PSH product is intended to provide the NHC, NWS Headquarters, the media, the public, and emergency management officials with a record of peak tropical cyclone conditions. This data is then used to formulate other post-event reports, news articles and historical records.

A.5.2. Issuance Guidelines.

A.5.2.1. Creation Software. AWIPS.

A.5.2.2. Issuance Criteria. If HLSs are issued, a PSH will be issued.

A.5.2.3. Issuance Times. Transmit the reports within 5 days following the transmission of the last HLS or inland tropical storm/hurricane wind watches or warnings addressed to the appropriate Tropical Cyclone Center or National Center and a copy to Weather Service Headquarters, W/OS21. Amend reports as needed.

A.5.2.4. Valid Times. Not applicable.

A.5.2.5. Product Expiration Time. Not applicable

A.5.3. Technical Description.

A.5.3.1. UGC Type. Not applicable.

A.5.3.2. Mass News Disseminator Header. The PSH header block product type line is "POST-TROPICAL CYCLONE REPORT...(TROPICAL CYCLONE TYPE)."

A.5.3.3. Content. Include the following items in the initial report and in any subsequent updated reports:

a. Wind data: If the observed peak gusts are greater than 33 knots, report highest sustained surface wind speed (knots) and duration (1-, 2- 8-, or 10-minute average which ever applies), peak gust (knots), and date/times of occurrence in UTC. Specify anemometer height (feet) if other than 33 feet. Report all NOAA, Department of Defense, and Federal Aviation Administration official observing sites in a NWS office's CWA including ASOS sites, NOAA buoy/Coastal Marine Automated Network (C-MAN) stations, and National Ocean Service stations. Also report other reliable data collected by government sources or other institutions. These include reports from stations maintained by the U. S. Coast Guard; state, county, and local governments; universities; private companies; and experimental networks. List adjusted speeds corrected for instrument type and speed range if known. Data reports from the public are optional. However, NWS offices should encourage these data and include them in the PSH when considered reliable.

b. Pressure data: Report lowest sea level pressure (millibars), and date/time of occurrence (UTC). Report data from all sources given in Section a, and other stations where significant pressure observations are available. Report pressures less than 1005 mb, with pressure greater than 1005 mb reported as needed or as requested by the NHC.

c. Storm total rainfall: Report amount (inches) and duration (dates). In addition, list maximum 1-, 6-, 12-, and 24-hour amounts (inches) identifying date/time (UTC) of occurrence. Report data from all sources given in Section a, and other stations where significant rainfall observations are available. Report storm total rainfalls of 3 inches or more, with amounts under 3 inches reported as needed or as requested by the NHC.

d. Maximum storm tide heights: Reference storm tide to appropriate datums understood by local authorities. For many portions of the coast, this would be National Geodetic Vertical Datum although some areas use mean lower low water. Report storm tide in feet above the datum, and storm surge/wind waves in feet above the normal, predicted (astronomical) tide level. Identify location and date/time (UTC) of occurrence where possible. Report tides of 1 foot or greater above normal, with tides of less than 1 foot above normal reported as needed or as requested by the NHC.

e. Extent of beach erosion: As appropriate.

f. Flooding and/or flash flooding in CWA: Report to include date/times (UTC) and locations of occurrence.

g. Tornadoes in CWA: Report (times and locations).

h. Storm effects: Such as deaths, injuries, dollar damages, number of people evacuated, etc., within an office's CWA.

A.5.3.4. Format.

```
Ataa2i CCCC DDHHMM
PSHxxx

POST TROPICAL CYCLONE REPORT...(TROPICAL CYCLONE TYPE)
NATIONAL WEATHER SERVICE CITY STATE
time am/pm time_zone day mon DD YYYY

Wind data

Pressure data

Storm total rainfall

Maximum storm tide heights

Extent of beach erosion

Flooding and/or flash flooding in CWA

Tornadoes in CWA

Storm effects
$$
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Figure A-3. **Post-Tropical Cyclone Report Format**

A.6. Information for Service Assessments. WFOs will forward a copy of media reports, especially newspaper clippings (online and printed) representative of the event and its impacts. Send reports to the appropriate RH and TPC within 7 days following the issuance of the last product concerning the storm. Reports do not have to include all interviews or radio or television spots concerning the landfall event in each local office's CWA.

A.7 Local Storm Reports (LSR). *WFOs will prepare these reports in accordance with LSR instructions (reference NWS Instruction 10-517, available at http://nws.noaa.gov/directives).*

A.8. Storm Reports. *WFOs will prepare these reports in accordance with Storm Data Preparation instruction (Reference NWS Instruction 10-1605).*

A.9. <u>Correction Procedures</u>. Tropical cyclone centers and WFOs should correct products using the following format:

WTNT KNHC 161441 CCA
TCDAT1

TROPICAL STORM ARTHUR DISCUSSION NUMBER 8...CORRECTED
NWS TPC/NATIONAL HURRICANE CENTER MIAMI FL
11 AM EDT TUE JULY 16 2002

CORRECTED FOR (GIVE REASON)

TEXT FOLLOWS....

CCA - If a second correction is necessary, the "A" becomes a "B" (CCB).
"CORRECTED FOR" is optional but encouraged.

A.9. <u>Procedures for Populating WFO-Generated Wind Forecast Grids for Tropical Cyclone Events</u>. *The following are short-term solutions to be followed by all impacted WFOs for populating WFO wind grids for tropical cyclones. Updates to this directive will take place as better methods for populating WFO-generated wind forecasts are integrated into the Interactive Forecast Preparation System.*

A.9.1. *<u>Wind Speed Values Within the 34 kt Wind Radii</u>*

0-24 hours
Use wind forecast from the TCM as guidance for locating the 34-, 50- and 64-kt wind radii to maintain synoptic consistency. Apply local knowledge and mesoscale expertise to produce explicit/deterministic wind speed forecasts for all CWA/MAR grids using a full continuum of values up to the maximum sustained wind value provided by tropical cyclone centers.

25-72 hours
Use wind forecast from the TCM as guidance for locating the 34-, 50- and 64-kt wind radii to maintain synoptic consistency. Extrapolate the 64-kt radii from the 36-hour model guidance (TCMWind tool will do this). Coordinate consensus with NHC and adjacent WFOs. Apply local knowledge and mesoscale expertise to produce explicit/deterministic wind speed forecasts for all CWA/MAR grids using a full continuum of wind speeds up to 100 knots or up to the maximum sustained wind forecast by the NHC if it is less than 100 knots. For 101 kts and above use the capped value of 100 kts for grid points inside the 64 kt wind radii.

73-120 hours
Use forecast from the TCM as guidance for locating the center positions to maintain synoptic consistency. Extrapolate the 64-kt radii, the 50-kt radii and the 34-kt from model guidance (TCMWind tool will do this). Coordinate consensus with NHC and adjacent WFOs. Apply local knowledge and mesoscale expertise to produce explicit/deterministic wind speed forecasts for all CWA/MAR grids using a full continuum of wind speeds up to 64 knots or up to the maximum sustained wind forecast by the NHC if it is less than 64 knots. For 65 kts and above use the capped value of 64 kts for grid points inside the 64 kt wind radii.

121-168 hours
*Use traditional guidance and WFO discretion to produce explicit/deterministic wind speed forecasts for all CWA/MAR grids using a full continuum of wind speeds up to 30 kts. The choice for 30 kts avoids potential confusion which can result from the automated rounding of 33 kts to 35 kts when generating graphical wind barbs, and with associated textual formatters which convert kts to miles per hour (then round to the nearest 5 mph)***.**

A.9.2. *Wind Speed Values Outside the 34 kt Wind Radii*

0-120 hours
Use deterministic wind speed values.

A.9.3. *Wind Direction Values Inside or Outside the 34 kt Wind Radii*

0-168 hours
Use deterministic wind direction values.

A.9.4. *Wind Gust Values Inside or Outside the 34 kt Wind Radii. At this time, there is no requirement to produce a gust grids. As an option, if a WFO desires to produce a gust grid it will have to be created with little or no guidance.*

A.9.5. *Caveat. It is highly recommended the following caveat be placed on all text and graphical products..."Winds in and near tropical cyclones should be used with caution due to uncertainty in forecast track, size, and intensity."*

A.10. Product Examples.

EXAMPLE: HURRICANE LOCAL STATEMENT

WTUS84 KCRP 151519
HLSCRP
TXZ230>234-241>247-151815-

HURRICANE LOCAL STATEMENT
NATIONAL WEATHER SERVICE CORPUS CHRISTI TX
1019 AM CDT TUE JUL 15 2003

...HURRICANE CLAUDETTE MOVING ONTO THE MIDDLE TEXAS COAST NEAR PORT O'CONNOR...

...A HURRICANE WARNING IS IN EFFECT FROM BAFFIN BAY TO HIGH ISLAND...

...AREAS AFFECTED...
THIS STATEMENT RECOMMENDS ACTIONS TO BE TAKEN BY RESIDENTS IN THE FOLLOWING COUNTIES OF ARANSAS...CALHOUN...KLEBERG...NUECES... REFUGIO...SAN PATRICIO...BEE...GOLIAD...LIVE OAK...MCMULLEN...JIM WELLS AND VICTORIA.

...WATCHES/WARNINGS...
A HURRICANE WARNING IS IN EFFECT FOR THE TEXAS COAST FROM BAFFIN BAY TO HIGH ISLAND. AN INLAND TROPICAL STORM WIND WARNING IS IN EFFECT FOR BEE...GOLIAD...LIVE OAK...JIM WELLS...MCMULLEN AND VICTORIA COUNTIES FOR TODAY. AN INLAND TROPICAL STORM WIND WATCH IS IN EFFECT FOR DUVAL AND LASALLE COUNTIES FOR TONIGHT. A FLASH FLOOD WATCH IS IN EFFECT FOR TODAY FOR THE COUNTIES OF ARANSAS...BEE...CALHOUN...GOLIAD...LIVE OAK...MCMULLEN...REFUGIO... SAN PATRICIO AND VICTORIA.

...STORM INFORMATION...
AT 9 AM CDT...THE CENTER OF HURRICANE CLAUDETTE WAS LOCATED NEAR LATITUDE 28.5 NORTH AND LONGITUDE 96.1 WEST...OR APPROXIMATELY 20 MILES EAST OF PORT O'CONNOR. MAXIMUM SUSTAINED WINDS ARE NEAR 80 MPH WITH HIGHER GUSTS. CLAUDETTE IS MOVING WEST-NORTHWEST NEAR 10 MPH. A CONTINUED MOVEMENT TOWARDS THE WEST-NORTHWEST IS EXPECTED TODAY. GIVEN THIS FORECAST TRACK...THE EYE OF CLAUDETTE IS EXPECTED TO MOVE ACROSS THE PORT OCONNOR TO PALACIOS AREA AROUND 11 AM. WEAKENING IS EXPECTED AFTER THE EYE OF CLAUDETTE MOVES INLAND.

...PRECAUTIONARY/*PREPAREDNESS* ACTIONS...
AS OF 1130 PM MONDAY EVENING...EMERGENCY MANAGEMENT OFFICIALS RECOMMENDED EVACUATIONS OF RESIDENTS OF ARANSAS COUNTY. ALSO...EVACUATIONS HAVE BEEN RECOMMENDED FOR RESIDENTS AND NON-RESIDENTS OF PORT ARANSAS. NO OTHER EVACUATIONS HAVE BEEN REPORTED TO THE NATIONAL WEATHER SERVICE AT THIS TIME. RESIDENTS OF SOUTH TEXAS...ESPECIALLY THOSE WHO LIVE IN THE COASTAL COUNTIES FROM KLEBERG TO CALHOUN...SHOULD COMPLETE ALL NECESSARY ACTIONS TO PROTECT LIFE AND PROPERTY.

...STORM SURGE *FLOOD* AND *STORM* TIDE IMPACTS...
AT 9 AM CDT...TIDES WERE APPROXIMATELY 3.5 FEET ABOVE MEAN SEA LEVEL AT BOBHALL PIER...AND 2.5 FEET ABOVE MEAN SEA LEVEL AT PORT OCONNOR. AS CLAUDETTE MOVES ACROSS THE COASTLINE...TIDES WILL CONTINUE TO INCREASE...ESPECIALLY FROM ROCKPORT NORTHWARD.

TIDES ARE EXPECTED TO RISE TO BETWEEN 3 AND 4 FEET ABOVE MEAN SEA LEVEL SOUTH OF ROCKPORT...AND 5 TO 6 FEET ABOVE MEAN SEA LEVEL BETWEEN ROCKPORT AND PORT OCONNOR BY THIS AFTERNOON.

AT 5 FEET MSL...WATER WILL FLOOD MANY STREETS IN LAMAR...ROCKPORT...INGLESIDE...FULTON...ARANSAS PASS...PORT ARANSAS AND PORT OCONNOR. WATER WILL REACH 1/4 MILE INLAND TO THE SOUTHERN PART OF ROCKPORT. PORTIONS OF HIGHWAY 35 BETWEEN ARANSAS PASS AND ROCKPORT WILL BE UNDER 1 FOOT OF WATER. ROADS WEST OUT OF ROCKPORT WILL BE UNDER WATER. BEACH AND HARBOR FACILITIES WILL BE FLOODED AT PORT ARANSAS. AT 4 FEET MSL...THE JFK CAUSEWAY WILL HAVE AROUND 1 FOOT OF WATER OVER IT. THE T-HEADS WILL BE FLOODED. FLOODING IS LIKELY ALONG HIGHWAY 35 FROM ARANSAS PASS TO ROCKPORT. SOME FLOODING IS LIKELY ALONG WATERFRONT FACILITIES AND ROADS THAT ARE NEAR THE WATER ALONG MANY COASTAL COMMUNITIES.

AT 3 FEET MSL...BEACH ROADS WILL BE FLOODED ON PADRE AND MUSTANG ISLANDS. THE JFK CAUSEWAY WILL HAVE SOME WATER OVER IT BUT NOT ENOUGH TO CLOSE IT DOWN. HIGH TIDES AT PORT ARANSAS OCCURRED AT 745 AM THIS MORNING AND WILL OCCUR AGAIN AT 817 AM ON WEDNESDAY. HIGH TIDES AT PORT OCONNOR WILL BE AT 259 PM THIS AFTERNOON AND 400 PM ON WEDNESDAY.

...WIND IMPACTS...
AT 9 AM CDT...THE COAST GUARD REPORTED WINDS OF 30 TO 40 KNOTS FROM THE NORTHWEST AT PORT O'CONNOR. A MESONET SITE IN PORT

OCONNOR REPORTED A WIND GUST AT 75 MPH AT 940 AM. WINDS ACROSS THE COASTAL WATERS FROM PORT O'CONNOR AND OUT TO 60 NAUTICAL MILES EAST OF PORT OCONNOR...HAVE INCREASED TO HURRICANE FORCE THIS MORNING.

WINDS OVER INLAND LOCATIONS FROM ROCKPORT TO VICTORIA ARE NORTH-NORTHWEST AROUND 25 TO 35 MPH. AS CLAUDETTE CONTINUES TO MOVE INLAND...WINDS WILL GRADUALLY INCREASE ACROSS THE ENTIRE AREA FROM EAST TO WEST.

TROPICAL STORM FORCE WINDS ARE EXPECTED TO SPREAD ACROSS THE REMAINDER OF THE COASTAL WATERS...PRIMARILY EAST OF PORT ARANSAS...THIS MORNING. WINDS GUSTING TO HURRICANE FORCE WILL MOVE INTO REFUGIO AND ARANSAS COUNTIES AROUND 11 AM CDT. THE TROPICAL STORM FORCE WINDS WILL ADVANCE SOUTHWEST DOWN THE COAST WITH TROPICAL STORM FORCE WINDS ENTERING THE COASTAL BEND NEAR CORPUS CHRISTI AROUND NOON. WIND GUSTS TO HURRICANE FORCE COULD OCCUR THIS AFTERNOON AND EVENING NEAR CORPUS CHRISTI AND REDFISH BAYS AND THE ADJACENT LAND AREAS.

...SEAS AND RIP CURRENTS...
AT 9 AM CDT...SEAS WERE AVERAGING AROUND 8 TO 10 FEET OUT TO AROUND20 NAUTICAL MILES...14 TO 18 FEET BEYOND 20 NAUTICAL MILES. AS CLAUDETTE MAKES LANDFALL...SEAS WILL INCREASE TO 12 TO 17 FEET OUT TO 20 NAUTICAL MILES...15 TO 20 FEET BEYOND 20 NAUTICAL MILES OFFSHORE THIS MORNING. THESE LARGE SEAS WILL CONTINUE TO PRODUCE VERY ROUGH SURF AND DANGEROUS RIP CURRENTS ACROSS ALL OF THE SOUTH TEXAS BEACHES. ENTERING THE SURF IS STRONGLY DISCOURAGED THROUGH AT LEAST WEDNESDAY.

...FLOOD IMPACTS...
HEAVY RAINFALL WILL ACCOMPANY CLAUDETTE LATER THIS MORNING INTO THIS EVENING. THE GREATEST POTENTIAL FOR HEAVY RAIN SHOULD BE THIS AFTERNOON THROUGH WEDNESDAY. TOTAL RAINFALL AMOUNTS OF 5 TO 8 INCHES WILL BE POSSIBLE MAINLY TO THE NORTH OF A ROCKPORT TO ENCINAL LINE...WITH 2 TO 4 INCHES POSSIBLE TO THE SOUTH OF THIS LINE. THESE RAINFALL AMOUNTS MAY NEED TO BE REVISED IF THE FORECAST TRACK CHANGES. THIS AMOUNT OF RAINFALL WILL HAVE THE POTENTIAL TO PRODUCE FLOODING OVER THE NORTHERN PORTIONS OF THE COASTAL BEND AND RIO GRANDE PLAINS AREA.

...NEXT UPDATE...
THE NEXT SCHEDULED STATEMENT WILL BE ISSUED AROUND 1 PM.
$$

EXAMPLE: SHORT TERM FORECAST (NOWcast)

FPUS71 KMOB 192130
NOWMOB

SHORT TERM FORECAST
NATIONAL WEATHER SERVICE MOBILE AL
430 PM CDT SAT AUG 19 1995

ALZ051>064-MSZ067-075-076-078-079-192330-

.NOW...
...HURRICANE GARY WILL MOVE ACROSS BALDWIN AND MOBILE COUNTIES BY 530 PM... SUSTAINED WINDS ABOVE 80 MPH WITH HIGHER GUSTS AND TORRENTIAL RAINFALL CAN BE EXPECTED AS THE RAIN BAND MOVES ACROSS. THE RAIN BAND SHOULD WEAKEN SLIGHTLY AS IT MOVES ACROSS CLARKE...WASHINGTON...AND GEORGE COUNTIES BY 6 PM. BUT PEOPLE IN THESE COUNTIES SHOULD EXPECT WIND GUSTS TO NEAR HURRICANE FORCE AND EXTREMELY HEAVY RAINFALL.
&&

SCATTERED AREAS OF MODERATE TO HEAVY RAINFALL WILL CONTINUE ACROSS SOUTHERN ALABAMA AND MISSISSIPPI THROUGH 6 PM. BANDS OF STRONG STORMS WILL MOVE NORTHWESTWARD ACROSS THE AREA. EAST WINDS OF 30-40 MPH AND HEAVY RAIN WILL PERSIST WITH STRONGER WINDS AND HEAVIER RAINFALL NEAR THE RAIN BANDS. TEMPERATURES ACROSS THE REGION WILL REMAIN IN THE 70S.

EXAMPLE: INLAND HURRICANE WARNING

WWUS45 KHGX 101030
NPWHOU

URGENT - WEATHER MESSAGE
NATIONAL WEATHER SERVICE HOUSTON-GALVESTON TX
600 AM CDT FRI SEP 10 1995

...AN INLAND HURRICANE WARNING IN EFFECT FOR SOUTHEAST TEXAS...

HURRICANE FRED...LOCATED 60 MILES SOUTHEAST OF GALVESTON TX AT 6 AM CDT...IS MOVING TO THE NORTH NORTHWEST AT 10 MPH AND IS EXPECTED TO MAKE LANDFALL AROUND NOON CDT ON THE UPPER TEXAS COAST. FRED IS THEN FORECAST TO CONTINUE ON A NORTH NORTHWEST

COURSE MOVING ACROSS HOUSTON AND REACHING THE SAN JACINTO NATIONAL FOREST BY LATE AFTERNOON. SUSTAINED WINDS OF 100 MPH WITH GUSTS TO 120 MPH SHOULD BEGIN SWEEPING ACROSS THE UPPER TEXAS COAST BY LATE MORNING.

TXZ177>179-197>199-210>212-102200-
WALKER-SAN JACINTO-POLK-WASHINGTON-GRIMES-MONTGOMERY-
COLORADO-AUSTIN-WALLER-

...INLAND HURRICANE WARNING...

WINDS ARE EXPECTED TO RAPIDLY INCREASE TO 50 TO 60 MPH BY 12 NOON AND 80 MPH WITH GUSTS TO 100 MPH BY MID AFTERNOON. 75 MPH WINDS WITH HIGHER GUSTS ARE LIKELY AS FAR INLAND AS HUNTSVILLE...NAVASOTA...AND LAKE LIVINGSTON BY LATE AFTERNOON.

BE PREPARED FOR NUMEROUS DOWNED TREES AND WIRES. DO NOT CROSS DOWNED WIRES...WHICH MAY STILL BE LIVE.
$$

TXZ226-227-235-213-200-102200-
WHARTON-FORT BEND-JACKSON-HARRIS-LIBERTY-

...INLAND HURRICANE WARNING...
WINDS FROM WHARTON TO HOUSTON AND LIBERTY ARE EXPECTED TO INCREASE TO 50 TO 60 MPH THIS MORNING AND 90 MPH WITH GUSTS TO NEAR 110 MPH BY MIDDAY...DECREASING TO 50 TO 60 MPH LATE THIS AFTERNOON.

FLYING DEBRIS WILL POSE A MAJOR THREAT TO ALL STRUCTURES IN THE WARNED AREA...ESPECIALLY GLASS FROM HIGH-RISE BUILDINGS IN DOWNTOWN HOUSTON. PEOPLE LIVING IN MOBILE HOMES AND THOSE CONCERNED ABOUT THE ABILITY OF THEIR HOMES TO WITHSTAND HURRICANE WINDS SHOULD MOVE TO A STRONG BUILDING OR SHELTER IMMEDIATELY. BE PREPARED FOR NUMEROUS DOWNED TREES AND WIRES. TAKE SHELTER IN SMALL INTERIOR ROOMS OR REINFORCED STRUCTURES.
$$

EXAMPLE: POST-TROPICAL CYCLONE REPORT

ACUS71 KNEW 032226
PSHNEW

POST-TROPICAL CYCLONE REPORT
NATIONAL WEATHER SERVICE NEW ORLEANS LA
500 PM CDT MON SEP 3 1992

A. HIGHEST WINDS...

NEW ORLEANS INTERNATIONAL AIRPORT...
1 - MINUTE 39 KNOTS FROM 150 DEGREES 0950 UTC AUG 26 1992
PEAK GUST 72 KNOTS FROM 020 DEGREES AT 0728 UTC AUG 26 1992
P92 AMOS LOCATED AT SALT POINT, ST. MARY PARISH 19.5N 91.3W
...ETC

B. LOWEST PRESSURE...

LOWEST PRESSURE NEW ORLEANS INTERNATIONAL AIRPORT - 960.1 MB AT 0805 UTC AUG 26 1992
...ETC

C. RAINFALL...

NEW ORLEANS INTERNATIONAL AIRPORT

STORM TOTAL	5.70 IN.	AUG 25-26 1992
1 HOUR TOTAL	0.89 IN.	0800-0900 UTC 26 AUG 1992

...ETC

D. STORM TIDES...

MARINA	4.28	2100 UTC AUG 26 1992
N END OF CAUSEWAY	4.94	1100 UTC AUG 26 1992

...ETC

E. BEACH EROSION...

LEVEL OF EROSION PRESENTLY UNKNOWN
...ETC

F. FLOODING...

STORM TIDE FLOODING TO THE ENTIRE LOUISIANA COAST FROM LAKE BORGNE WEST TO VERMILION BAY...ETC

G. TORNADOES...

F3 TORNADO FROM LA PLACE TO RESERVE IN ST JOHN THE BAPTIST PARISH...ETC

H. STORM EFFECTS...

TORNADO	2 DEAD	32 INJURED	
HURRICANE	4 DEAD	UNKNOWN	2 MISSING

AN ESTIMATED ONE AND ONE QUARTER MILLION PEOPLE EVACUATED ACROSS SOUTHEAST AND SOUTH CENTRAL LOUISIANA...ETC

APPENDIX B

DEFINING POINTS FOR TROPICAL CYCLONE WATCHES/WARNINGS

La Pesca, MX	23.76EN	97.78EW
Rio San Fernando, MX	25.00EN	97.60EW
Brownsville, TX		
Brownsville, TX	25.95EN	97.16EW
Port Mansfield, TX	26.59EN	97.29EW
Baffin Bay, TX	27.29EN	97.37EW
Corpus Christi, TX		
Baffin Bay, TX	27.29EN	97.37EW
Corpus Christi, TX	27.67EN	97.19EW
Port Aransas, TX	27.83EN	97.08EW
Port O'Connor, TX	28.40EN	96.39EW
Houston, TX		
Port O'Connor, TX	28.40EN	96.39EW
Matagorda, TX	28.63EN	95.93EW
Sargent, TX	28.75EN	95.60EW
Freeport, TX	28.93EN	95.33EW
San Luis Pass, TX	29.08EN	95.13EW
High Island, TX	29.57EN	94.39EW
Lake Charles, LA		
High Island, TX	29.57EN	94.39EW
Sabine Pass, TX	29.71EN	93.85EW
Cameron, LA	29.80EN	93.30EW
Intracoastal City, LA	29.62EN	92.04EW
Morgan City, LA	29.49EN	91.29EW
New Orleans, LA		
Morgan City, LA	29.49EN	91.29EW
Grand Isle, LA	29.25EN	89.96EW
Mouth of Mississippi River, LA	29.12EN	89.11EW
Mouth of Pearl River, LA	30.15EN	89.60EW
Pascagoula, MS	30.37EN	88.55EW
Mobile, AL		
Pascagoula, MS	30.37EN	88.55EW
MS/AL Border	30.40EN	88.40EW
AL/FL Border	30.28EN	87.50EW
Fort Walton Beach, FL	30.41EN	86.62EW
Destin, FL	30.39EN	86.50EW
Tallahassee, FL		
Destin, FL	30.39EN	86.50EW
Panama City, FL	30.12EN	85.70EW
Indian Pass, FL	29.68EN	85.27EW
Apalachicola, FL	29.73EN	84.99EW
Ochlockonee River, FL	29.95EN	84.40EW
St. Marks, FL	30.11EN	84.21EW
Aucilla River, FL	30.05EN	83.92EW
Steinhatchee River, FL	29.70EN	83.40EW
Suwanee River, FL	29.30EN	83.17EW
Tampa Bay, FL		
Suwanee River, FL	29.30EN	83.17EW
Yankeetown, FL	29.03EN	82.74EW
Bayport, FL	28.54EN	82.65EW
Anclote Key, FL	28.18EN	82.85EW
Tarpon Springs, FL	28.15EN	82.77EW
Anna Maria Island, FL	27.53EN	82.75EW
Longboat Key, FL	27.39EN	82.64EW
Englewood, FL	26.94EN	82.38EW
Boca Grande, FL	26.72EN	82.27EW
Bonita Beach, FL	26.33EN	81.85EW
Miami, FL (Gulf)		
Bonita Beach, FL	26.33EN	81.85EW
Chokoloskee, FL	25.80EN	81.36EW
East Cape Sable, FL	25.15EN	81.08EW
Flamingo, FL	25.14EN	80.93EW
Key West, FL (Gulf)		
Flamingo, FL	25.14EN	80.93EW
Dry Tortugas, FL	24.66EN	82.86EW
Key West, FL	24.55EN	81.81EW
Seven Mile Bridge, FL	24.70EN	81.15EW
Craig Key, FL	24.83EN	80.77EW
Key Largo, FL	25.09EN	80.44EW
Ocean Reef, FL	25.32EN	80.26EW
Miami, FL (Atlantic)		
Ocean Reef, FL	25.32EN	80.26EW
Florida City, FL	25.45EN	80.33EW
Golden Beach, FL	25.97EN	80.12EW
Hallandale Beach, FL	25.99EN	80.13EW
Deerfield Beach, FL	26.32EN	80.10EW
Boca Raton, FL	26.36EN	80.07EW
Jupiter Inlet, FL	26.95EN	80.07EW
Melbourne, FL		
Jupiter Inlet, FL	26.95EN	80.07EW
Stuart, FL	27.21EN	80.18EW
Fort Pierce, FL	27.46EN	80.30EW
Vero Beach, FL	27.66EN	80.37EW
Sebastian Inlet, FL	27.84EN	80.43EW
Cocoa Beach, FL	28.32EN	80.61EW
Titusville, FL	28.64EN	80.63EW
New Smyrna Beach, FL	29.03EN	80.89EW
Flagler Beach, FL	29.47EN	81.13EW

Jacksonville, FL

Flagler Beach, FL	29.47EN	81.13EW
St. Augustine, FL	29.89EN	81.31EW
Fernandina Beach, FL	30.66EN	81.45EW
Altamaha Sound, GA	31.30EN	81.29EW

Charleston, SC

Altamaha Sound, GA	31.30EN	81.29EW
Savannah River, GA	32.04EN	80.86EW
Edisto Beach, SC	32.40EN	80.33EW
South Santee River, SC	33.12EN	79.27EW

Wilmington, NC

South Santee River, SC	33.12EN	79.27EW
Murrells Inlet, SC	33.56EN	79.00EW
Little River Inlet, SC	33.85EN	78.55EW
Cape Fear, NC	33.87EN	77.94EW
Surf City, NC	34.44EN	77.50EW

Morehead City, NC

Surf City, NC	34.44EN	77.50EW
New River Inlet, NC	34.32EN	77.34EW
Bogue Inlet, NC	34.39EN	77.11EW
Cape Lookout, NC	34.58EN	76.55EW
Ocracoke Inlet, NC	35.06EN	76.00EW
Cape Hatteras, NC	35.22EN	75.52EW
Oregon Inlet, NC	35.76EN	75.50EW

(The inclusion of Pamlico and Albemarle Sounds should be on a case-by-case basis).

Currituck Beach Light, NC	36.38EN	75.83EW

Wakefield, VA

Currituck Beach Light, NC	36.38EN	75.83EW
NC/VA State Line	36.55EN	75.87EW
Cape Charles Light, VA	37.11EN	75.90EW
Parramore Island, VA	37.53EN	75.63EW
Chincoteague, VA	37.93EN	75.32EW
Chesapeake Bay, New Point Comfort, VA	37.30EN	76.28EW
Chesapeake Bay, Windmill Point,VA	37.61EN	76.28EW
Chesapeake Bay, Smith Point, VA	37.89EN	76.24EW

Sterling, VA

Chesapeake Bay, Smith Point, VA	37.89EN	76.24EW
Tidal Potomac, Cobb Island, MD	38.26EN	76.84EW
Tidal Potomac, Indian Head, MD	38.61EN	77.15EW
Tidal Potomac, Key Bridge, MD	38.89EN	77.07EW
Chesapeake Bay, Drum Point, MD	39.33EN	76.42EW
Chesapeake Bay, North Beach, MD	38.70EN	76.53EW
Chesapeake Bay, Sandy Point, MD	39.02EN	76.40EW
Chesapeake Bay, Pooles Island, MD	39.29EN	76.27EW

Mt. Holly, NJ

Cape Henlopen, DE	38.80EN	75.09EW
Cape May, NJ	38.93EN	74.90EW
Great Egg Inlet, NJ	39.29EN	74.54EW
Little Egg Inlet, NJ	39.49EN	74.31EW
Manasquan Inlet, NJ	40.10EN	74.03EW
Delaware Bay north/south of Slaughter Beach, DE to	38.91EN	75.30EW
East Point, NJ	39.19EN	75.02EW
Sandy Hook, NJ	40.46EN	74.00EW

New York City, NY

Sandy Hook, NJ	40.46EN	74.00EW
Fire Island Inlet, LI, NY	40.63EN	73.30EW
Moriches Inlet, LI, NY	40.77EN	72.75EW
Montauk Point, LI, NY	41.07EN	71.86EW
Port Jefferson Harbor, LI, NY	40.95EN	73.08EW
New Haven, CT	41.30EN	72.91EW
Watch Hill, RI	41.31EN	71.86EW

Boston, MA

Watch Hill, RI	41.31EN	71.86EW
Point Judith, RI	41.35EN	71.49EW
Westport, MA	41.45EN	71.20EW
Woods Hole, MA	41.52EN	70.69EW
Chatham, MA	41.66EN	69.95EW
Plymouth, MA	41.98EN	70.65EW
Gloucester, MA	42.57EN	70.66EW
Merrimack River, MA	42.84EN	70.82EW

Portland, ME

Merrimack River, MA	42.84EN	70.82EW
Portsmouth, NH	43.06EN	70.70EW
Portland, ME	43.64EN	70.20EW
Rockland, ME	44.10EN	69.10EW
Stonington, ME	44.16EN	68.67EW

Caribou, ME

Stonington, ME	44.16EN	68.67EW
Bar Harbor, ME	44.39EN	68.20EW
Eastport, ME	44.92EN	67.00EW

CALIFORNIA BREAKPOINTS

San Diego, CA

CA/Mexico Border	32.53°N	117.12°W
San Mateo Point, CA	33.38°N	117.60°W
Orange Co/Los Angeles Co, CA.	33.75°N	118.11°W

Los Angles/Oxnard, CA

Orange Co/Los Angeles Co.,CA	33.75°N	118.11°W
Point Mugu, CA	34.12°N	119.12°W
Point Conception, CA	34.45°N	120.45°W

Figure B-1. Tropical Cyclone Break Points for the Northeast

Figure B-2. Tropical Cyclone Break Points for the Southeast

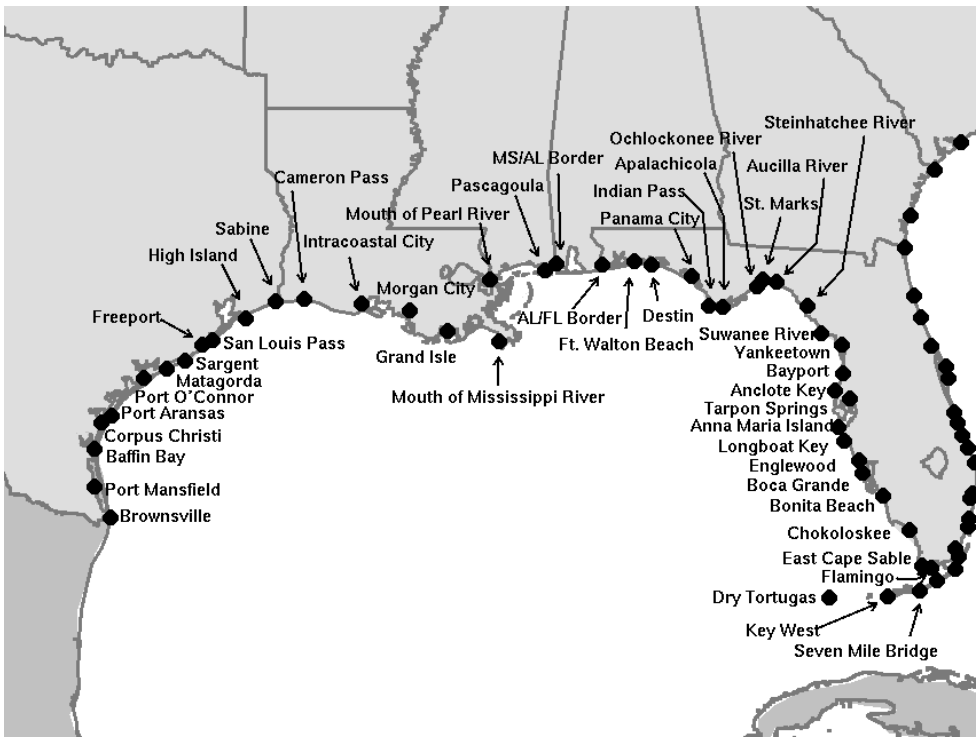

Figure B-3. Tropical Cyclone Break Points for the Gulf of Mexico

APPENDIX C

JOINT TYPHOON WARNING CENTER (JTWC) BULLETINS

Below are the abbreviated communications headers and titles for the products for which JTWC is responsible. A brief description of each product, to include scheduled transmission times, is available in USCINCPACINST 3140.1 (series)–JTWC's governing instruction.

ABIO 10 PGTW	Significant Weather Advisory, Indian Ocean
ABPW 10 PGTW	Significant Weather Advisory, Western Pacific Ocean
WTPN 21-26 PGTW	Tropical Cyclone Formation Alert, Northwest Pacific Ocean
WTPN 31-36 PGTW	Tropical Cyclone Warning, Northwest Pacific Ocean
WDPN 31-36 PGTW	Prognostic Reasoning Bulletin, Northwest Pacific Ocean
WTIO 21-25 PGTW	Tropical Cyclone Formation Alert, North Indian Ocean
WTIO 31-35 PGTW	Tropical Cyclone Warning, North Indian Ocean
WTPS 21-25 PGTW	Tropical Cyclone Formation Alert, Southwest Pacific Ocean
WTPS 31-35 PGTW	Tropical Cyclone Warning, Southwest Pacific Ocean
WTXS 21-26 PGTW	Tropical Cyclone Formation Alert, South Indian Ocean
WTXS 31-36 PGTW	Tropical Cyclone Warning, South Indian Ocean
WTPN 21-25 PHNC	Tropical Cyclone Formation Alert, Northeast Pacific Ocean
WTPN 31-35 PHNC	Tropical Cyclone Warning, Northeast Pacific Ocean
FKPN 31-35 PHNC	Prognostic Reasoning Bulletin, Northeast Pacific Ocean
WTPS 21-25 PHNC	Tropical Cyclone Formation Alert, Southeast Pacific Ocean
WTPS 31-35 PHNC	Tropical Cyclone Warning, Southeast Pacific Ocean

APPENDIX D

FORMAT FOR NHOP/NWSOP FLIGHT INFORMATION FOR INTERNATIONAL AND DOMESTIC NOTAM ISSUANCE

Flight information shall be sent to the NOTAM office *via facsimile* for dissemination as an International and Domestic NOTAM in the following format (Note: The request is made for a domestic NOTAM which will then automatically makes its way into the international NOTAM system):

Header

Request a Domestic NOTAM be Issued

A. Affected Center(s). This field will include all affected ARTCCs in 3-letter identifier format; e.g., ZNY, ZOA, ZAN. Synoptic track flights will probably utilize more than one ARTCC, and any adjacent ARTCC should be included when the flight track is within 100 miles of the adjacent center's airspace. Flights that are flying in the storm environment will utilize the ARTCC whose airspace is mostly affected.

B. Start Time (YYMMDDZZZZ). For example, 0006011600. This time would correspond to the entry time on a reconnaissance track or time at the storm fix latitude/longitude.

C. Ending Time (YYMMDDZZZZ). This would be the completion time of reconnaissance track or the time exiting the storm environment.

E.* Text. This field is free form and should include the following information: route of flight for the mission portion (latitude/longitude, fixes, airways), type of activity (laser, dropsonde, etc.), frequency/location of deployment, broadcast frequencies, any other pertinent information that may concern other flights. *Include a unit/agency phone number and point of contact for possible questions*.

F. Lower Altitude (during mission). Use "Surface" since the dropsonde is the "reason" for the NOTAM as much or more so than the aircraft altitude.

G. Upper Altitude (during mission). For example, FL450.

If only one altitude is to be used, then F and G may be combined. If altitude is going to vary throughout the mission, utilize "see text" and the information can be inserted there and the altitudes may be explained in field E.

* Note that there is no paragraph "D". It is reserved for FAA use.

NOTES:
1. Only ICAO approved contractions may be used.
2. Using this format will help ensure timely and accurate information dissemination.

APPENDIX E

SAFFIR-SIMPSON HURRICANE SCALE

Saffir/Simpson Hurricane Scale (SSHS). A scale ranging from one to five based on the hurricane's present intensity. This can be used to give an estimate of the potential property damage and flooding expected along the coast from a hurricane. This scale may be used in public hurricane releases although the SSHS may not be applicable for all geographical areas; e.g., Hawaii and Guam. In practice, sustained surface wind speed (1-minute average) is the parameter that determines the category since storm surge is strongly dependent on the slope of the continental shelf.

ONE. Winds 74-95 mph (64-82 kts). No real damage to building structures. Damage primarily to unanchored mobile homes, shrubbery, and trees. Also, some coastal flooding and minor pier damage.

TWO. Winds 96-110 mph (83-95 kts). Some roofing material, door, and window damage of buildings. Considerable damage to vegetation and mobile homes. Flooding damages piers, and small craft in unprotected anchorages break moorings.

THREE. Winds 111-130 mph (96-113 kts). Some structural damage to small residences and utility buildings with a minor amount of curtainwall failures. Mobile homes are destroyed. Flooding near the coast destroys smaller structures with larger structures damaged by floating debris. Terrain may be flooded well inland.

FOUR. Winds 131-155 mph (114-135 kts). More extensive curtainwall failures with some complete roof structure failure on small residences. Major erosion of beach areas. Terrain may be flooded well inland.

FIVE. Winds greater than 155 mph (>135 kts). Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. Flooding causes major damage to lower floors of all structures near the shoreline. Massive evacuation of residential areas may be required.

Note 1: A "major" hurricane is one that is classified as a Category 3 or higher.

APPENDIX F

OFFICIAL INTERAGENCY AGREEMENTS

The following enclosure is the Memorandum of Agreement (MOA) between the Air Force Reserve Command (AFRC) and the National Oceanic and Atmospheric Administration (NOAA), October 12, 2000. The purpose of this agreement is to establish policies, principles, and procedures under which the AFRC and NOAA provide aircraft weather reconnaissance and surveillance in support of NOAA's tropical cylone forecast, warning, and research missions.

MEMORANDUM OF AGREEMENT

BETWEEN

THE UNITED STATES AIR FORCE RESERVE COMMAND

AND

THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

PURPOSE: The National Oceanic and Atmospheric Administration (NOAA), an agency of the Department of Commerce, does not have the capability to fully support all operational requirements in support of tropical cyclone and winter storm aerial reconnaissance. This memorandum of agreement establishes policies, principles, and procedures under which the Air Force Reserve Command (AFRC) will provide aircraft weather reconnaissance support to NOAA. NOAA and AFRC enters into this agreement pursuant to its authority under 15 U.S.C. 313.

1. REFERENCES:

   a. *National Hurricane Operations Plan* (NHOP)

   b. *National Winter Storms Operations Plan* (NWSOP)

   c. Department of Defense Appropriations Act, 2000

2. BACKGROUND: The Air Force Reserve Command (AFRC) maintains 10 WC-130s to meet the Department of Commerce (DOC) aircraft reconnaissance requirements. AFRC will conduct up to five (5) sorties per day in support of NHOP requirements and up to two (2) sorties per day in support of NWSOP requirements. The Department of Defense (DOD), through AFRC, will bear all costs directly attributed to providing aircraft weather reconnaissance support. Support will be limited to the number of AFRC congressionally funded aircraft flying hours per year.

   a. Total flying hours used to support the weather reconnaissance mission are set annually in the DOD Appropriations Act. The 53rd Weather Reconnaissance Squadron (53 WRS) manages the flying hour program.

   b. The operational area for AFRC weather reconnaissance includes the Atlantic Ocean, Gulf of Mexico, the Caribbean Sea, and the North Pacific Ocean east of the international date line, as outlined in the NHOP and the NWSOP.

   c. The 53 WRS will be capable of operating from two (2) deployed locations, as well as from home station, simultaneously, supporting a maximum of five tropical cyclone

sorties per day or two winter storm sorties per day.

3. IMPLEMENTATION: Implementation details are contained in "GENERAL PROVISIONS."

4. GENERAL PROVISIONS:

   a. AFRC agrees:

      1) Within the limits of military capability, to meet NOAA's requirements for aerial weather reconnaissance in accordance with the NHOP and NWSOP.

      2) To provide at the Tropical Prediction Center/National Hurricane Center (TPC/NHC) the staff and equipment required to support the mission of the Chief, Aerial Reconnaissance Coordination, All Hurricanes (CARCAH). CARCAH provides 24-hour telecon/aircraft SATCOM operational interface between NOAA/TPC/NHC and AFRC/53WRS for NHOP and NWSOP taskings. CARCAH is a subunit of and reports directly to the 53WRS.

   b. NOAA agrees to promptly notify AFRC/53WRS of the requirements for tropical cyclone or winter storm mission taskings in accordance with the NHOP and the NWSOP. Tropical cyclone missions will be tasked by the Director, TPC/NHC. Winter storm missions will be tasked by the Director, National Centers for Environmental Prediction.

   c. AFRC recognizes the obligation to support winter storm operations and associated research projects as delineated by the DOD Appropriations Act and the NWSOP. Support to research projects will be contingent upon aircraft availability.

5. MOBILIZATION: In times of national emergency or war, some or all AFRC/53WRS reconnaissance resources may not be available to fulfill DOC/NOAA needs.

6. EFFECTIVE AND TERMINATION DATES: This memorandum will become effective on the date signed by the last approving official. The parties will review this memorandum of agreement at least once every three years to determine whether it should be revised, amended, or cancelled. Amendments or revisions to this agreement require the mutual consents of the parties.

7. COORDINATION:

The agency contacts for coordination of the activities under this MOU are:

AOC: CAPT Robert W. Maxson, NOAA, Aircraft Operations Center, DOC, MacDill AFB, Florida; phone: (813) 828-3310 ext. 3001; fax: (813) 828-3266 E-mail Bob.W.Maxson@NOAA.gov

Ms. Julie Robertson, (813) 828-3310 ext. 3010; fax: (813) 828-8923 E-mail Julie.A.Robertson@NOAA.gov

AFRC:

HQ AFRC/DOOX
DSN 497-1161; Commercial (228)327-1161

403 WG/XPL
SSgt Clarence Hester Jr., Logistics Plans Manager
Keesler AFB, MS
DSN 597-3521; Commercial (228) 377-3521
Fax DSN 597-4624; Commercial (228) 377-3521
Email: Clarence.Hester@keesler.af.mil

53 WRS
Lt Col Dennis L. Price, Director of Operation
817 H Street, Keesler AFB, MS 39534
DSN 597-8510; Commercial (228) 377-8510
Fax DSN 597-1923; Commercial (228) 337-1923
Email: Dennis.Price@keesler.af.mil

8. RESOLUTION OF DISAGREEMENTS

Nothing herein is intended to conflict with current DOC or the NOAA Aircraft Operations Center directives. If the terms of this agreement are inconsistent with existing directives of either of the agencies entering into this agreement, then those portions of this agreement which are determined to be inconsistent shall be invalid, but the remaining terms and conditions not affected by the inconsistency shall remain in full force and effect. At the first opportunity for review of the agreement, all necessary changes will be accomplished either by an amendment to this agreement or by entering into a new agreement, whichever is deemed expedient to the interest of both parties.

Should disagreement arise on the interpretation of the provisions of this agreement, or amendments and/or revisions thereto, that cannot be resolved at the operating level, the area(s) of disagreement shall be stated in writing by each party and presented to the other party for consideration. If agreement on interpretation is not reached within thirty (30) days, the parties shall forward the written presentation of the disagreement to respective higher officials for appropriate resolution.

FOR THE UNITED STATES
AIR FORCE RESERVE COMMAND

Date: 2 Oct 2000

FOR THE NATIONAL OCEANIC AND
ATMOSPHERIC ADMINISTRATION

R W Maxson Capt NOAA

Date: 10/12/2000

APPENDIX G

RECCO, HDOB, MINOB, AND TEMP DROP

CODES, TABLES, AND REGULATIONS

DATE	ORGANIZATION	MISSION IDENTIFIER

NUMBER																	
9	RECCO INDICATOR SPECIFYING TYPE OF OBSERVATION *Table 1*	G	TIME OF OBSERVATION *(Hours and Minutes)* *(GMT)*	Y	DAY OF WEEK *SUN-1*	L_o	LONGITUDE DEGREES AND TENTHS *(Note 4)*	h_a	PRESSURE ALTITUDE OF AIRCRAFT REPORTED TO THE NEAREST DECAMETER	d	WIND DIRECTION AT FLIGHT LEVEL *(Tens of deg. true.)*	T	TEMPERATURE WHOLE °C *(Note 6)*	/	INDICATOR
X		G		Q	OCTANT *Table 3*	L_o		h_a		d		T		j	INDEX TO HHH *Table 9*
X		g		L_a	LATITUDE DEGREES AND TENTHS	L_o		h_a		f	WIND SPEED AT FLIGHT LEVEL *(Knots)*	T_d	DEW POINT WHOLE °C *(Note 6)*	H	GEOPOTENTIAL HEIGHT/ D-VALUE OR SLP PER INDEX j *(Note 8)*
X		g		L_a		B	TURBULENCE *Table 4*	d_t	TYPE OF WIND *Table 6*	f		T_d		H	
9		I_d	DEW POINT INDICATOR *Table 2*	L_a		f_c	FLIGHT COND *Table 3* *(Note 5)*	d_a	METHOD OF OBTAINING WIND *Table 7*	f		w	PRESENT WEATHER *(Note 7 Table 8)*	H	
OBSERVATION	1	2		3		4		5		6		7		8	

REMARKS

TYPE AIRCRAFT	CALL SIGN	METEOROLOGIST

1	INDICATOR	C	CLOUD TYPE *Table 11*	C	CLOUD TYPE *Table 11*	C	CLOUD TYPE *Table 11*	1	INDICATOR	C	CLOUD TYPE *Table 11*	C	CLOUD TYPE *Table 11*	C	CLOUD TYPE *Table 11*
k_n	NR OF CLOUD LAYERS *(Note 9)*	h_s	ALTITUDE OF BASE *Table 12*	h_s	ALTITUDE OF BASE *Table 12*	h_s	ALTITUDE OF BASE *Table 12*	K_n	NR OF CLOUD LAYERS *(Note 9)*	h_s	ALTITUDE OF BASE *Table 12*	h_s	ALTITUDE OF BASE *Table 12*	h_s	ALTITUDE OF BASE *Table 12*
N_s	AMOUNT OF CLOUDS *(Note 9)* *Table 10*	h_s		h_s		h_s		N_s	AMOUNT OF CLOUDS *(Note 9)* *Table 10*	h_s		h_s		h_s	
N_s		H_t	ALTITUDE OF TOP *Table 12*	H_t	ALTITUDE OF TOP *Table 12*	H_t	ALTITUDE OF TOP *Table 12*	N_s		H_t	ALTITUDE OF TOP *Table 12*	H_t	ALTITUDE OF TOP *Table 12*	H_t	ALTITUDE OF TOP *Table 12*
N_s		H_t		H_t		H_t		N_s		H_t		H_t		H_t	
9		10		11		12		13		14		15		16	

REMARKS

RECCO RECORDING WORKSHEET

4	INDICATOR	6	INDICATOR *(Note 11)*	6	INDICATOR *(Note 11)*	7	INDICATOR	7	INDICATOR	8	INDICATOR	8	INDICATOR	9	INDICATOR	REMARKS
d	DIRECTION OF SFC WIND *(Tens of deg. true)*	W_s	SIGNIFICANT WEATHER CHANGES *Table 14*	W_s	SIGNIFICANT WEATHER CHANGES *Table 14*	I_r	RATE OF ICING *Table 17*	h_i	ALT OF BASE OF ICING STRATUM (Note 12) *Table 12*	d_r	BEARING OF ECHO CENTER *(Tens of Deg. True)*	E_w	ECHO WIDTH OR DIAMETER *Table 19*	V_i	INFLIGHT VISIBILITY *Table 23*	
d		S_s	DISTANCE OF OCCURENCE OF Ws *Table 15*	S_s	DISTANCE OF OCCURENCE OF Ws *Table 15*	I_t	TYPE OF ICING *Table 18*	h_i		d_r		E_l	LENGTH OF MAJ AXIS *Table 19*	T_w	SEA SURFACE TEMPERATURE DEGREES AND TENTHS	
f	SURFACE WIND SPEED *(knots)* *(Note 10)*	w_d	DISTANT WEATHER *Table 16*	w_d	DISTANT WEATHER *Table 16*	S_b	DISTANCE TO BEGINNING OF ICING *Table 15*	H_i	ALTITUDE OF TOP OF ICING STRATUM *(Note 12)* *Table 12*	S_r	DISTANCE TO ECHO CENTER *Table 19*	c_e	CHARACTER OF ECHO *Table 21*	T_w		
f		d_w	BEARING OF W_d *Table 13*	d_w	BEARING OF W_d *Table 13*	S_e	DISTANCE TO ENDING OF ICING *Table 15*	H_i		O_e	ORIENTATION OF ELLIPSE *Table 20*	i_e	INTENSITY OF ECHO *Table 22*	T_w		
17		18		19		20		21		22		23		24		

REMARKS

Figure G-1. Reconnaissance code recording form

Table G-1. Reconnaissance code tables

TABLE 1 XXX

222 Sec One Observation without radar capability
555 Sec Three (intermediate) observation with or without radar capability
777 Sec One Observation with radar capability

TABLE 2 i_d

0 No dew point capability/acft below 10,000 meters
1 No dew point capability/acft at or above 10,000 meters
2 No dew point capability/acft below 10,000 meters and flight lvl temp -50EC or colder
3 No dew point capability/acft at or above 10,000 meters and flight lvl temp -50EC or colder
4 Dew point capability/acft below 10,000 meters
5 Dew point capability/acft at or above 10,000 meters
6 Dew point capability/acft below 10,000 meters and flight lvl temp -50EC or colder
7 Dew point capability/acft at or above 10,000 meters and flight lvl temp -50EC or colder

TABLE 3 Q

0	0E -90E W	Northern
1	90E W - 180E	Northern
2	180E - 90E E	Northern
3	90E - 0E E	Northern
4	Not Used	
5	0E - 90E W	Southern
6	90E W - 180E	Southern
7	180E - 90E E	Southern
8	90E - 0E E	Southern

TABLE 4 B

0 None
1 Light turbulence
2 Moderate turbulence in clear air, infrequent
3 Moderate turbulence in clear air, frequent
4 Moderate turbulence in cloud, infrequent
5 Moderate turbulence in cloud, frequent
6 Severe Turbulence in clear air, infrequent
7 Severe Turbulence in clear air, frequent
8 Severe Turbulence in cloud, infrequent
9 Severe Turbulence in cloud, frequent

TABLE 5 f_c

0 In the clear
8 In and out of clouds
9 In clouds all the time (continuous IMC)
/ Impossible to determine due to darkness or other cause

TABLE 6 d_t

0 Spot of Wind
1 Average wind
/ No wind reported

TABLE 7 d_a

0 Winds obtained using doppler radar or inertial systems
1 Winds obtained using other navigation equipment and/or techniques
/ Navigator unable to determine or wind not compatible

TABLE 8 w

0 Clear
1 Scattered (trace to 4/8 cloud coverage)
2 Broken (5/8 to 7/8 cloud coverage)
3 Overcast/undercast
4 Fog, thick dust or haze
5 Drizzle
6 Rain (continuous or intermittent precip - from stratiform clouds)
7 Snow or rain and snow mixed
8 Shower(s) (continuous or intermittent precip - from cumuliform clouds)
9 Thunderstorm(s)
/ Unknown for any cause, including darkness

TABLE 9 j

0 Sea level pressure in whole millibars (thousands fig if any omitted)
1 Altitude 200 mb surface in geopotential decameters (thousands fig if any omitted)
2 Altitude 850 mb surface in geopotential meters (thousands fig omitted)
3 Altitude 700 mb surface in geopotential meters (thousands fig omitted)
4 Altitude 500 mb surface in geopotential decameters
5 Altitude 400 mb surface in geopotential decameters
6 Altitude 300 mb surface in geopotential decameters
7 Altitude 250 mb surface in geopotential decameters (thousands fig if any omitted)
8 D - Value in geopotential decameters; if negative 500 is added to HHH
9 Altitude 925 mb surface in geopotential meters
/ No absolute altitude available or geopotential data not within ± 30 meters/4 mb accuracy requirements

TABLE 10 N_s

0 No additional cloud layers (place holder)
1 1 okta or less, but not zero (1/8 or less sky covered)
2 2 oktas (or 2/8 of sky covered)
3 3 oktas (or 3/8 of sky covered)
4 4 oktas (or 4/8 of sky covered)
5 5 oktas (or 5/8 of sky covered)
6 6 oktas (or 6/8 of sky covered)
7 7 oktas or more but not 8 oktas
8 8 oktas or sky completely covered
9 Sky obscured (place holder)

TABLE 11 C

0 Cirrus (Ci)
1 Cirrocumulus (Cc)
2 Cirrostratus (Cs)
3 Altocumulus (Ac)
4 Altostratus (As)
5 Nimbostratus (Ns)
6 Stratocumulus (Sc)
7 Stratus (St)
8 Cumulus (Cu)
9 Cumulonimbus (Cb)
/ Cloud type unknown due to darkness or other analogous phenomena

TABLE 12 $h_sh_sH_tH_th_ih_iH_iH_i$

00 Less than 100
01 100 ft
02 200 ft
03 300 ft
etc, etc
49 4,900 ft
50 5,000 ft
51-55 Not used
56 6,000 ft
57 7,000 ft
etc, etc
79 29,000 ft
80 30,000 ft
81 35,000 ft
82 40,000 ft
etc, etc
89 Greater than 70,000 ft
// Unknown

TABLE 13 d_w

0	No report	5	SW
1	NE	6	W
2	E	7	NW
3	SE	8	N
4	S	9	all directions

TABLE 14 W_s

0 No change
1 Marked wind shift
2 Beginning or ending or marked turbulence
3 Marked temperature change (not with altitude)
4 Precipitation begins or ends
5 Change in cloud forms
6 Fog or ice fog bank begins or ends
7 Warm front
8 Cold Front
9 Front, type not specified

TABLE 15 $S_bS_eS_s$

0 No report
1 Previous position
2 Present position
3 30 nautical miles
4 60 nautical miles
5 90 nautical miles
6 120 nautical miles
7 150 nautical miles
8 180 nautical miles
9 More than 180 nautical miles
/ Unknown (not used for S_s)

Table G-1. Reconnaissance code tables (continued)

TABLE 16 w_d

0 No report
1 Signs of a tropical cyclone
2 Ugly threatening sky
3 Duststorm or sandstorm
4 Fog or ice fog
5 Waterspout
6 Cirrostratus shield or bank
7 Altostratus or altocumulus shield or bank
8 Line of heavy cumulus
9 Cumulonimbus heads or thunderstorms

TABLE 17 I_r

7 Light
8 Moderate
9 Severe
/ Unknown or contrails

TABLE 18 I_t

0 None
1 Rime ice in clouds
2 Clear ice in clouds
3 Combination rime and clear ice in clouds
4 Rime ice in precipitation
5 Clear ice in precipitation
6 Combination rime and clear ice in precip
7 Frost (icing in clear air)
8 Nonpersistent contrails (less than 1/4 nautical miles long)
9 Persistent contrails

TABLE 19 S_r, E_w, E_l

0	0NM	5	50NM
1	10NM	6	60-80NM
2	20NM	7	80-100NM
3	30NM	8	100-150NM
4	40NM	9	Greater than 150NM
		/	Unknown

TABLE 20 O_e

0 Circular
1 NNE - SSW
2 NE - SW
3 ENE - WSW
4 E - W
5 ESE - WNW
6 SE - NW
7 SSE - NNW
8 S - N
/ Unknown

TABLE 21 c_e

1 Scattered Area
2 Solid Area
3 Scattered Line
4 Solid Line
5 Scattered, all quadrants
6 Solid, all quadrants
/ Unknown

TABLE 22 i_e

2 Weak
5 Moderate
8 Strong
/ Unknown

TABLE 23 V_i

1 Inflight visibility 0 to and including 1 nautical mile
2 Inflight visibility greater than 1 and not exceeding 3 nautical miles
3 Inflight visibility greater than 3 nautical miles

RECCO SYMBOLIC FORM

SECTION ONE (MANDATORY)

9XXX9 GGggi$_d$ YQL$_a$L$_a$L$_a$ L$_o$L$_o$L$_o$Bf_c h$_a$h$_a$h$_a$d$_t$d$_a$

ddfff TTT$_d$T$_d$w /jHHH

SECTION TWO (ADDITIONAL)

1k$_n$N$_s$N$_s$N$_s$ Ch$_s$h$_s$H$_t$H$_t$ 4ddff

6W$_s$S$_s$W$_d$d$_w$ 7I$_r$I$_t$S$_b$S$_e$ 7h$_i$h$_i$H$_i$H$_i$ 8d$_r$d$_r$S$_r$O$_e$

8E$_w$E$_l$c$_e$i$_e$ 9V$_i$T$_w$T$_w$T$_w$

SECTION THREE (INTERMEDIATE)

9XXX9 GGggi$_d$ YQL$_a$L$_a$L$_a$ L$_o$L$_o$L$_o$Bf_c h$_a$h$_a$h$_a$d$_t$d$_a$

ddfff TTT$_d$T$_d$w /jHHH

Table G-2. Reconnaissance code regulations

1. At the time of the observation the aircraft observing platform is considered to be located on the axis of a right vertical cylinder with a radius of 30 nautical miles bounded by the earth's surface and the top atmosphere. Present weather, cloud amount and type, turbulence, and other subjective elements are reported as occurring within the cylinder. Flight level winds, temperature, dew point, and geopotential values are sensed or computed and reported as occurring at the center of the observation circle. Radar echoes, significant weather changes, distant weather, and icing are phenomena that may also be observed/reported. Code groups identifying these phenomena may be reported as necessary to adequately describe met conditions observed.

2. The intermediate observation (Section Three) is reported following Section One (or Section Two if appended to Section One) in the order that it was taken.

3. Plain language remarks may be added as appropriate. These remarks follow the last encoded portion of the horizontal or vertical observation and will clearly convey the intended message. Vertical observations will not include meteorological remarks. These remarks must begin with a letter or word-e.g. "FL TEMP" vice "700 MB FL TEMP." The last report plain language remarks are mandatory, i.e., “LAST REPORT. OBS 01 thru 08 to KNHC, OBS 09 and 10 to KBIX."

4. The hundreds digit of longitude is omitted for longitudes from 100E to 180E.

5. Describe conditions along the route of flight actually experienced at flight level by aircraft.

6. TT, T_dT_d. When encoding negative temperatures, 50 is added to the absolute value of the temperature with the hundreds figure, if any, being omitted. A temperature of -52EC is encoded as 02, the distinction between -52EC and 2EC being made from i_d. Missing or unknown temperatures are reported as //. When the dew point is colder than -49.4EC, Code T_dT_d as // and report the actual value as a plain language remark - e.g. "DEW POINT NEG 52EC".

7. When two or more types of w co-exist, the type with the higher code figure will be reported. Code Figure 1, 2 and 3 are reported based on the total cloud amount through a given altitude, above or below the aircraft, and when other figures are inappropriate. The summation principle applies only when two or more cloud types share a given altitude.

8. When j is reported as a /, HHH is encoded as ///.

9. If the number of cloud layers reported exceeds 3, k_n in the first 1-group reports the total number of cloud layers. The second 1-group reports the additional number of layers being reported exclusive of those previously reported. In those cases where a cloud layer(s) is discernible, but a descriptive cloud picture of the observation circle is not possible, use appropriate remarks such as "Clouds Blo" or "As Blo" to indicate the presence of clouds. In such cases, coded entries are not made for group 9. The sequence in which cloud amounts are encoded depends upon type of cloud, cloud base, and vertical extent of the cloud. The cloud with the largest numerical value of cloud type code (C) is reported first, regardless of coverage, base, or vertical extent. Among clouds of the same cloud type code, sharing a common base, the cloud of greatest vertical extent is reported first. The summation principle is not used; each layer is treated as though no other clouds were present. The total amount of clouds through one altitude shared by several clouds will not exceed 8 oktas. Only use code figure 0 as a place holder when you can determine that no additional cloud layers exist. In case of undercast, overcast, etc., use code figure 9 as a placeholder.

10. Due to limitations in the ability to distinguish sea state features representative of wind speeds above 130 knots, surface wind speeds in excess of 130 knots will not be encoded. Wind speeds of 100 to 130 knots inclusive will be encoded by deleting the hundreds figure and adding 50 to dd. For wind speeds above 130 knots, dd is reported without adding 50 and ff is encoded as // with a plain language remark added, i.e., "SFC WIND ABOVE 130 KNOTS."

11. Significant weather changes which have occurred since the last observation along the track are reported for W_s.

12. When aircraft encounters icing in level flight, the height at which the icing occurred will be reported for h_ih_i. The H_iH_i will be reported as //.

HDOB messages are created automatically by system software. Each consists of 20 lines of HD/HA data. Within an HDOB message, the time interval between individual HD/HA observations (the encoding interval) can be set by the operator to be either 30 seconds, 1 minute, or 2 minutes. Regardless of the encoding interval, all HD/HA meteorological parameters except MMM (maximum wind speed, Table G-3) represent 30- second averages ending at the time of the HD/HA observation. The maximum wind speed, however, is the highest 10-sec average wind speed occurring during the encoding interval.

Samples of HDOB messages using different encoding intervals are shown below. HDOB messages with 30 second, 1 minute, and 2 minute encoding intervals will be generated and transmitted every 10 minutes, 20 minutes, and 40 minutes, respectively.

```
SXXX50 KNHC 040952
AF967 1017A OPAL HDOB 39
    0942. 2643N  08846W  03036  5374  127  106  140  136  112  02680  0000000000
    0943  2641N  08847W  03036  5442  116  116  136  136  120  02612  0000000000
    0943. 2640N  08849W  03065  5521  100  087  140  140  099  02561  0000000000
    0944  2638N  08850W  03028  5591  087  059  186  160  074  02454  0000000000
    0944. 2637N  08850W  03053  5630  097  028  202  158  036  02440  0000000000
    0945  2635N  08850W  03059  5647  197  009  218  148  018  02429  0000000000
                                    .
                                    .
```

30-second data interval

```
SXXX50 KNHC 040952
AF967 1017A OPAL HDOB 39
    0942  2644N  08844W  03039  5333  135  094  138  136  096  02724  0000000000
    0943  2641N  08847W  03036  5442  116  116  136  136  120  02612  0000000000
    0944  2638N  08850W  03028  5591  087  059  186  160  099  02454  0000000000
    0945  2635N  08850W  03059  5647  197  009  218  148  036  02429  0000000000
    0946  2632N  08849W  03028  5632  274  052  226  148  067  02413  0000000000
    0947  2628N  08849W  03057  5488  271  118  194  130  124  02587  0000000000
                                    .
                                    .
```

1-minute data interval

```
SXXX50 KNHC 040952
AF967 1017A OPAL HDOB 39
    0942  2644N  08844W  03039  5333  135  094  138  136  096  02724  0000000000
    0944  2638N  08850W  03028  5591  087  059  186  160  120  02454  0000000000
    0946  2632N  08849W  03028  5632  274  052  226  148  067  02413  0000000000
    0948  2625N  08849W  03050  5378  263  113  172  140  124  02690  0000000000
    0950  2620N  08849W  03047  5268  259  094  142  134  109  02797  0000000000
    0952  2614N  08849W  03044  5217  262  075  162  108  090  02845  0000000000
                                    .
                                    .
```

2-minute data interval

Figure G-2. HDOB Description and Sample Messages

Table G-3. HDOB Message Format

HHMM $L_aL_a$mmH $L_oL_oL_o$mmH PPPPP DDDD WWW SSS TTT ddd MMM RRRRR FFFFFFFFFF

HHMM:	The time of observation in hours and minutes (UTC). A period following HHMM indicates a data time of 30 seconds past the minute.
$L_aL_a$mmH:	The latitude of the observation in degrees, minutes and hemisphere (N or S).
$L_oL_oL_o$mmH:	The longitude of the observation in degrees, minutes and hemisphere (E or W).
PPPPP:	The pressure altitude in meters.
DDDD:	The absolute value of the D-value in meters (a 5 occupies the thousands place if the D-value is negative. For example, -34m is encoded as 5034.
WWW:	The wind direction in degrees, with 0 being true north, increasing clockwise.
SSS:	*The 30-second average wind speed in knots.*
TTT:	The air temperature in degrees and tenths Celsius. The tenths digit is even for temperatures at or above 0EC, odd for temperatures below 0EC.
ddd:	The dew point temperature, encoded the same way as air temperature.
MMM:	*The maximum 10-second average wind speed in knots measured during the encoding interval of 30 seconds, 1 minute, or 2 minutes.*
RRRRR:	Radar altitude in meters
FFFFFFFFFF:	Default status for the MINOB/HDOB data. A "1" indicates the parameter is defaulted (suspect value) or based on a parameter that is defaulted. A "0" indicates the value is not defaulted. The field indicate default for (in order): latitude, longitude, pressure altitude, D-value, wind direction, wind speed, air temperature, dew point, maximum wind speed, radar altimeter.

MinOb messages are created automatically by the NOAA P-3 Research Aircraft Measurement System (RAMS). Each MinOb message contains one or more lines of flight level data. Each line consists of data parameters, averaged over an operator-selected sample interval (common settings are 30 seconds and 1 minute). The time interval for collecting lines in a block before forming a message for transmission is also selectable, typically 10 or 15 minutes. The message length is based on the operator's selection of sample interval and block length, but will never exceed 3300 characters (approximately 50 lines) due to satellite transmission protocol limits.

Each line is terminated with an ASCII <cr><cr><lf> sequence (Hex 0D 0D 0A). The line length is variable, depending on whether the optional Stepped Frequency Microwave Radiometer (SFMR) fields are included (see Table G-4 description). All fields are separated by at least one ASCII blank (Hex 20) as shown in the Table by a . symbol.

```
URNT40 KWBC 261950
NOAA3 WX02A BONNIE
194030  3136 07758 6849 +0152 251053 +171 +106 251054 040 005
194100  3138 07758 6847 +0148 247053 +171 +102 249053 040 005
194130  3141 07758 6849 +0146 246053 +166 +106 247053 039 005
194200  3143 07758 6851 +0144 246054 +162 +111 246054 039 004
194230  3145 07758 6849 +0141 246053 +162 +112 246054 999 999
194300  3147 07558 6852 +0134 245053 +160 +114 245053 039 004
194330  3149 07759 6845 +0126 247052 +162 +110 247052 038 000
                                  .
                                  .
```

30-Second Data Interval (with optional SFMR data)

Note: Differences from the Air Force HDOB message include the following:

- Time code includes seconds, rather than a period to show 30-second mark
- Latitude and longitude hemispheres are denoted by a minus sign rather than an alphabetic character (N,S,E,W)
- Pressure altitudes and D-values are in feet
- D-value sign is explicit, rather than coded as a leading `5'
- Temperature and dewpoint signs are explicit, rather than making tenths odd/even
- There is no radar altitude or default status
- There may be SFMR data fields

Figure G-3. MinOb Description and Sample Message

Table G-4. NOAA MinOb Message Format

HHMMSS **.** $L_aL_aL_a$mm **.** $L_oL_oL_o$mm **.** PPPPP **.** ±DDDD **.** WWWSSS **.** ±TTT **.** ±ddd **.** wwwsss **.** *sss* **.** rrr

HHMMSS	The time of the observation in hours, minutes and seconds (UTC). All averages (except peak wind) are centered around this time.
$L_aL_aL_a$mm	The latitude of the observation in degrees and minutes. A negative number signifies the Southern hemisphere. There may be leading blanks in the degree subfield; the minutes will always be a two digit numeric (zero filled as required).
$L_oL_oL_o$mm	The longitude of the observation in degrees and minutes. A negative number signifies the Eastern hemisphere. NOTE: This is opposite the normal convention. There may be leading blanks in the degree subfield; minutes will always be a two digit numeric.
PPPPP	The pressure altitude in feet. There may be leading blanks.
±DDDD	The D-value (Geopotential Altitude - Pressure Altitude) in feet. There will always be a leading sign (+ or -) followed by four numeric characters (leading zeros if required)
WWW	The wind direction in degrees, with 0 being true North, increasing clockwise. There will always be three numeric characters, with leading zeros if required.
SSS	The wind speed in knots. There will always be three numeric characters, with leading zeros if required.
±TTT	The air temperature in degrees and tenths Celsius. There will always be a leading sign (+ or -) followed by three numeric characters (leading zeros if required). For example, 5.3 C would be coded +053.
±ddd	The dewpoint temperature, encoded the same way as air temperature.
www	The direction of the peak wind during this interval (30 sec, 1 min, etc.). The peak wind is defined as the maximum 10 second average wind. Format is the same as wind direction above.
sss	The speed of the peak wind in knots. Format is the same as wind speed above.
sss	The wind speed at the surface in knots, as measured by the Stepped Frequency Microwave Radiometer (SFMR). This is an optional field new for 1999, and may be omitted depending on the version of software being run. If omitted, the rain rate field will also be omitted, and the <cr><cr><lf> sequence will occur immediately after the peak wind speed field (no trailing blank). When present, there will be three numeric characters, with leading zeros if required. If the SFMR wind can not be calculated during the sample interval, it (and the rain rate) will be coded as 999.
rrr	The rain rate in mm/hr, as measured by the SFMR. When present (see SFMR wind speed discussion above), there will be three numeric characters, with leading zeros if required. If rain rate can not be calculated it will be coded as 999.

Table G-5. TEMP DROP CODE

EXTRACT FROM: WMO-No. 306 MANUAL ON CODES
FM 37-X Ext. TEMP DROP - Upper-level pressure, temperature, humidity and wind report from a sonde released by carrier balloons or aircraft. See Figure G-4 for an example TEMP DROP message for tropical cyclone operations.

CODE FORM:

PART A

SECTION 1 $M_iM_iM_jM_j$ YYGGI_d 99$L_aL_aL_a$ $Q_cL_oL_oL_oL_o$ MMM$U_{La}U_{Lo}$

SECTION 2 99$P_oP_oP_o$ $T_oT_oT_{ao}D_oD_o$ $d_od_of_of_of_o$

$P_1P_1h_1h_1h_1$ $T_1T_1T_{a1}D_1D_1$ $d_1d_1f_1f_1f_1$

$P_nP_nh_nh_nh_n$ $T_nT_nT_{an}D_nD_n$ $d_nd_nf_nf_nf_n$

SECTION 3 88$P_tP_tP_t$ $T_tT_tT_{at}D_tD_t$ $d_td_tf_tf_tf_t$
or
88999

SECTION 4 77$P_mP_mP_m$ $d_md_mf_mf_mf_m$ $(4v_bv_bv_av_a)$
or
66$P_mP_mP_m$ $d_md_mf_mf_mf_m$ $(4v_bv_bv_av_a)$
or
77999

SECTION 10 31313

51515 101A_{df} A_{df} 0$P_nP_nP'_nP'_n$.
or
101A_{df} A_{df} $P_nP_nh_nh_nh_n$
61616

62626

PART B

SECTION 1 $M_iM_iM_jM_j$ YYGG8 99$L_aL_aL_a$ $Q_cL_oL_oL_o$ MMM$U_{La}U_{Lo}$

SECTION 5 $n_on_oP_oP_oP_o$ $T_oT_oT_{ao}D_oD_o$

$n_1n_1P_1P_1P_1$ $T_1T_1T_{a1}D_1D_1$

$n_n n_n P_n P_n P_n \quad T_n T_n T_{an} D_n D_n$

SECTION 6 21212 $n_o n_o P_o P_o P_o \; d_o d_o f_o f_o f_o$

$n_1 n_1 P_1 P_1 P_1 \quad d_1 d_1 f_1 f_1 f_1$

$n_n n_n P_n P_n P_n \quad d_n d_n f_n f_n f_n$

SECTION 7 31313 $s_r r_a r_a s_a s_a$ 8GGgg

SECTION 9 51515 $101A_{df}\, A_{df}$ or

$101A_{df}\, A_{df} \quad 0P_n P_n P'_n P'_n.$ or

$101A_{df}\, A_{df} \quad P_n P_n h_n h_n h_n$

SECTION 10 61616

62626

PART ALPHA (A)

IDENTIFICATION LETTERS: $M_J M_J$

Identifier: **$M_J M_J$ -** Identifier for Part A of the report.

DATE/TIME GROUP: $YYGGI_d$

Identifier: **YY -** Date group
Identifier: **GG -** Time group
Identifier: **I_d** - The highest mandatory level for which wind is available.

LATTITUDE: $99L_aL_aL_a$

Identifier: **99 –** Indicator for data on position follows.
Identifier: **$L_aL_aL_a$** – Latitude in tenths of degrees

LONGITUDE: $Q_cL_oL_oL_oL_o$

Identifier: **Q_c** – The octant of the globe.
Identifier: **$L_oL_oL_oL_o$** – Longitude in tenths of degrees

MARSDEN SQUARE: $MMMU_{la}U_{lo}$

Identifier: **MMM -** Marsden square.
Identifier: **$U_{la}U_{lo}$** – Units digits in the reported latitude and longitude.

SEA LEVEL PRESSURE: $99P_0P_0P_0 \quad T_0T_0T_0D_0D_0 \quad d_0d_0f_0f_0f_0$

Identifier: **99** – Indicator for data at the surface level follows
Identifier: **$P_0P_0P_0$** – Indicator for pressure of specified levels in whole millibars (thousands digit omitted)
Identifier: **$T_0T_0T_0$–** Tens and digits of air temperature (not rounded off) in degrees Celsius, at specified levels beginning with surface.

Identifier: $\mathbf{D_0D_0}$ **–** Dewpoint depression at standard isobaric surfaces beginning with surface level.

NOTE

When the depression is 4.9C or less encode the units and tenths digits of the depression. Encode depressions of 5.0 through 5.4C as 50. Encode depressions of 5.5C through 5.9C as 56. Dew point depressions of 6.0 and above are encoded in tens and units with 50 added. Dew point depressions for relative humidities less then 20% are encoded as 80. When air temperature is below –40C report $\mathbf{D_nD_n}$ as //.

Identifier: $\mathbf{d_od_o}$ **–** True direction from which wind is blowing rounded to nearest 5 degrees. Report hundreds and tens digits. The unit digit (0 or 5) is added to the hundreds digit of wind speed.
Identifier: $\mathbf{f_of_of_o}$ **–** Wind speed in knots. Hundreds digit is sum of speed and unit digit of direction, i.e. 295° at 125 knots encoded as 29625.

NOTE: 1. When flight level is just above a standard surface and in the operator's best meteorological judgment, the winds are representative of the winds at the standard surface, then the operator may encode the standard surface winds using the data from flight level. If the winds are not representative, then encode /////.

NOTE: 2. The wind group relating to the surface level ($d_od_of_of_o$) will be included in the report; when the corresponding wind data are not available, the group will be encoded as /////.

STANDARD ISOBARIC SURFACES : $\mathbf{P_1P_1h_1h_1h_1\ \ T_1T_1T_1D_1D_1\ d_1d_1f_1f_1f_1}$

Identifier: $\mathbf{P_1P_1}$ – Pressure of standard isobaric surfaces in units of tens of millibars.
(1000 mbs = 00, 925mbs = 92, 850mbs = 85, 700mbs = 70, 500mbs = 50, 400mbs = 40, 300mbs = 30, 250mbs = 25).
Identifier: $\mathbf{h_1h_1h_1}$ **–** Heights of the standard pressure level in geopotential meters or decameters above the surface. Encoded in decameters at and above 500mbs omitting, if necessary, the thousands or tens of thousands digits. Add 500 to hhh for negative 1000mb or 925mb heights. Report 1000mb group as 00/// ///// ///// when pressure is less than 950mbs.
Identifier: $\mathbf{T_1T_1T_1D_1D_1}$ – Same temperature/dew point encoding procedures apply to all levels.
Identifier : $\mathbf{d_1d_1f_1f_1f_1}$ **–** Same wind encoding procedures apply to all levels.

DATA FOR TROPOPAUSE LEVELS: 88 $\mathbf{P_tP_tP_t\ T_tT_tT_tD_tD_t\ d_td_tf_tf_tf_t}$

Identifier: **88 –** Indicator for Tropopause level follows
Identifier: $\mathbf{P_tP_tP_t}$**–** Pressure at the tropopause level reported in whole millibars. Report $88P_nP_nP_n$ as 88999 when tropopause is not observed.
Identifier: $\mathbf{T_tT_tT_tD_tD_t}$ **–** Same temperature/ dew point encoding procedures apply.
Identifier: $\mathbf{d_td_tf_tf_tf_t}$ **-** Same wind encoding procedures apply.

MAXIMUM WIND DATA: $\mathbf{77P_nP_nP_n\ \ d_nd_nf_nf_nf_n\ 4v_bv_bv_av_a}$

Identifier: 77 – Indicator that data for maximum wind level and for vertical wind shear follow when max wind does not coincide at flight. If the maximum wind level coincides with flight level encode as 66
Identifier: $P_nP_nP_n$.– Pressure at maximum wind level in whole millibars.
Identifier: $\mathbf{d_nd_nf_nf_nf_n}$ **-** Same wind encoding procedures apply.

VERTICAL WIND SHEAR DATA: $\mathbf{4v_bv_bv_av_a}$

Identifier: **4 –** Data for vertical wind shear follow.
Identifier: $\mathbf{v_bv_b}$ **–** Absolute value of vector difference between max wind and wind 3000 feet BELOW the level of max wind, reported to the nearest knot. Use "//" if missing and a 4 is reported. A vector difference of 99 knots or more is reported with the code figure "99".
Identifier: $\mathbf{v_av_a}$ **–** Absolute value of vector difference between max wind and wind 3000 feet above the level of max wind, reported to the nearest knot. Use "//" if missing and a 4 is reported. A vector difference of 99 knots or more is reported with the code figure "99".

SOUNDING SYSTEM INDICATION, RADIOSONDE/ SYSTEM STATUS, LAUNCH TIME: 31313 $s_r r_a r_a s_a s_a$ 8GGgg

Identifier: **$s_r r_a r_a s_a s_a$ -** Sounding system indicator, radiosonde/ system status: $s_a r_a r_a s_a s_a$
Identifier**: s_a** - Solar and infrared radiation correction (**0** – no correction)
Identifier: **$r_a r_a$** – Radiosonde/sounding system used (**96** – Descending radiosonde)
Identifier: **$s_a s_a$** – Tracking technique/status of system used (**08** – Automatic satellite navigation)
Identifier: **8GGgg** – Launch time
Identifier: **8** – Indicator group
Identifier: **GG** – Time in hours
Identifier: **gg** – Time in minutes

ADDITIONAL DATA GROUPS: 51515 101XX 0$P_nP_nP_nP_n$

Identifier: **51515** – Additional data in regional code follow
Identifier: **10166** – Geopotential data are doubtful between the following levels $0P_nP_nP_nP_n$. This code figure is used only when geopotential data are doubtful from one level to another.
Identifier: **10167** – Temperature data are doubtful between the following levels $0P_nP_nP_nP_n$. This code figure shall be reported when only the temperature data are doubtful for a portion of the descent. If a 10167 group is reported a 10166 will also be reported. EXAMPLE: Temperature is doubtful from 540mbs to 510mbs. SLP is 1020mbs. The additional data groups would be : 51515 10166 00251 10167 05451.
Identifier: **10190** – Extrapolated altitude data follows:

When the sounding begins within 25mbs below a standard surface, the height of the surface is reported in the format **10190 $P_nP_nh_nh_nh_n$**. The temperature group is not reported. EXAMPLE: Assume the release was made from 310mbs and the 300mb height was 966 decameters. The last reported standard level in Part A is the 400mb level. The data for the 300mb level is reported in Part A and B as 1019030966.

When the sounding does not reach surface, but terminates within 25mbs of a standard surface, the height of the standard surface is reported in Part A of the code in standard format and also at the end of Part A and Part B of the code in the format as **10190 $P_nP_nh_nh_nh_n$**. EXAMPLE: Assume termination occurred at 980mbs and the extrapolated height of the 1000mb level was 115 meters. The 1000mb level would be reported in Part A of the code as 00115 ///// ///// and in Part B as 10190 00115.

Identifier: **10191** – Extrapolated surface pressure precedes. Extrapolated surface pressure is only reported when the termination occurs between 850mbs and the surface. Surface pressure is reported in Part A as $99P_0P_0P_0$ ///// and in Part B as $00P_0P_0P_0$ /////. When surface pressure is extrapolated the 10191 group is the last additional data group reported in Part B.

AIRCRAFT AND MISSION IDENTIFICATION: 61616 AFXXX XXXXX XXXXX OB X

Identifier: **61616** – Aircraft and mission identification data follows.
Identifier: **AFXXX –** The identifier AF for U.S. Air Force and the last three digits of the aircraft's tail number.
Identifier: **XXXXX XXXXX –** The identifier for the type of mission being flown.

If a training mission the mission identifier is **WXWXA TRAIN.** The fifth letter "A" is the only character that could possibly change. The "A" defining that the flight originated in the Atlantic basin. The letter "C" identifies the Central Pacific area and the letter "E" identifies the Eastern Pacific.

If an operational storm mission: the first two numbers Identifier the number of times an aircraft has flown this system and the second two numbers Identifier the system number. The last character again identifies the basin flown. The name of the storm would replace TRAIN.

EXAMPLE: AF968 0204A MARIE – Aircraft number 50968, this was the second flight into this system and the system was the fourth of the season. The system reached tropical storm strength and was named MARIE.

Identifier: **OB 14** – The observation (both vertical and horizontal) number as transmitted from the aircraft.

NATIONALLY DEVELOPED CODES: 62626

Identifier: **62626** – This is the remarks section. Only the remarks EYE, EYEWALL XXX, MXWNDBND XXX, or RAINBAND will be used. If the remarks EYEWALL is used it will be followed by the radian to the eye center.

Identifier: **SPL XXXXNXXXXXW *hhmm*** - Impact location of the sonde based on its last GPS position *and the splash time*. The splash location will be recorded automatically by computer.

Identifier: **LAST WND XXX** - Height of the last reported wind. If a surface wind is reported the Last Wind remark is omitted. XXX will never be less than 13 meters

Identifier: **MBL WND dddff** - The mean boundary level wind. The mean wind in the lowest 500 meters of the sounding

Identifier: **AEV XXXXX** - This is the software version being used for the sounding.

Identifier: **DLM WND ddfff bbbttt** - The Deep Layer Mean wind. It is the average wind over the depth of the sounding. Where ddfff is the wind averaged from the first to the last available wind (these would correspond to the first and last significant levels for wind); ttt is the pressure at the top of the layer, and bbb is the pressure at the bottom of the layer (in whole mbs, with thousands digit omitted).

Identifier: **WL150 ddfff zzz** - Average wind over the lowest available 150 m of the wind sounding. Where ddfff is the mean wind over the 150 m layer centered at zzz m.

PART ALPHA (B)

DATA FOR SIGNIFICANT TEMPERATURE AND RELATIVE HUMIDITY LEVELSSIGNIFICANT ISOBARIC LEVELS:
$n_0n_0P_0P_0P_0$ $T_0T_0T_0D_0D_0$

IDENTIFICATION LETTERS: M_JM_J

Identifier: **M_JM_J** - Identifier for Part B of the report.

DATE/TIME GROUP: YYGG8

Identifier: **YY** - Date group
Identifier: **GG** - Time group
Identifier: **8** - Indicator for the use of satellite navigation for windfinding.

LATTITUDE: $99L_aL_aL_a$ (Same as Part A)

LONGITUDE: $Q_cL_oL_oL_oL_o$ (Same as Part A)

MARSDEN SQUARE: $MMMU_{la}U_{lo}$ (Same as Part A)
SEA LEVEL PRESSURE: $n_on_oP_0P_0P_0$ $T_0T_0T_0D_0D_0$

Identifier: **nono** – Indicator for number of level starting with surface level. Only surface will be numbered as **"00".**

Identifier: **$P_0P_0P_0$** – Indicator for pressure of specified levels in whole millibars (thousands digit omitted)

Identifier: **$T_0T_0T_0$–** Tens and digits of air temperature (not rounded off) in degrees Celsius, at specified levels beginning with surface.

Identifier: **D_0D_0 –** Dewpoint depression at standard isobaric surfaces beginning with surface level. Encoded the same as Part A.

FOR STORM DROPS ONLY. If SLP is less than 950mb encode the 1000mb group as 00/// ///// /////. When the SLP is between 950mb and 999mb encode 1000mb as 00PoPoPo ///// ///// (500 meters are added to height below surface).

DATA FOR SIGNIFICANT WIND LEVELS: $n_0n_0P_0P_0P_0$ $d_od_of_of_of_o$

Identifier: **n_0n_0 –** Number of level starting with surface level. Only surface will be numbered as **"00".**
Identifier: **$P_0P_0P_0$ –** Pressure at specified levels in whole millibars.
Identifier: **d_od_o –** True direction from which wind is blowing rounded to nearest 5 degrees. Report hundreds and tens digits. The unit digit (0 or 5) is added to the hundreds digit of wind speed.
Identifier: **$f_of_of_o$ –** Wind speed in knots. Hundreds digit is sum of speed and unit digit of direction, i.e. 295° at 125 knots encoded as 29625.

Same notes in Part A apply.

31313, 51515, 61616, 62626 – Repeated from Part A.

FIGURE G-4. EXAMPLE TEMP DROP MESSAGE FOR TROPICAL CYCLONES

UZNT13 KNHC 061851
XXAA 56187 99251 70786 08158 99990 26444 ///// 00540 26247 13070 92827
22856 12565 85560 17834 13075 70200 13045 13585 88999 77999
31313 09608 81828
51515 10166 00270
61616 AF968 0204A MARIE OB 14
62626 MXWNDBND SPL 2525N07835W 1826 LST WND 012 MBL WND 13065
AEV 20200 DLM WND 13075 990699 WL150 13070 843
XXBB 56188 99251 70786 08158 00006 26444 11000 25841 22991 24657 33860
18233 44719 15657 55699 13045
21212 00990 ///// 11983 13570 22959 13065 33865 12560 44787 13075 55719
13575 66699 13585
31313 09608 81828
51515 10166 00270
61616 AF968 0204A MARIE OB 14
62626 MXWNDBND SPL 2525N07835W 1826 LST WND 012 MBL WND 13065
AEV 20200 DLM WND 13075 990699 WL150 13070 843

APPENDIX H

WSR-88D OPERATIONS PLAN FOR TROPICAL CYCLONE EVENTS

In order to perform radar center-fixing and obtain other diagnostic information, TPC/NHC must obtain radar products from WSR-88D sites in the area of landfall. As a tropical cyclone approaches, software commands must be issued at the site, using the Unit Control Position (UCP), in order for TPC/NHC to obtain the necessary products. To facilitate this process, TPC/NHC, in cooperation with the NWS Weather Forecast Office, Melbourne, and the NEXRAD Radar Operations Center (ROC), has developed an operations plan for use during tropical cyclone events.

The latest addition can be found on the OFCM web site at:

http://www.ofcm.gov/homepage/text/pubs.htm .

APPENDIX I

TELEPHONE AND TELETYPE LISTING

DEPARTMENT OF COMMERCE

AGENCY	LOCATION	TTY[1]	TELEPHONE
Alternate NHC (NCEP, HPC)	Camp Springs, MD	B	COM 301-763-8201
AOC	Tampa Bay, FL		COM 813-828-3310
CPHC - Forecaster and Warning Desk	Honolulu, HI	B	COM 808-973-5284
- Admin			COM 808-973-5270
- Director			COM 808-973-5272
- Operations			FAX 808-973-5281
CPHC Satellite Coordinator	Honolulu, HI	B	COM 808-973-5285
NWSO Tiyan, Guam Forecast Warning Desk	Tiyan, Guam	B	COM 671-471-7398
NDBC - *Operations Branch*	SSC, MS		COM *228-688-7720*
NESDIS Satellite Analysis Branch	Camp Springs, MD	B	COM 301-763-8444
NHC	Miami, FL	AB	*COM 305-229-4415*
TAFB Lead Forecaster (TPC/NHC)	Miami, FL	AB	COM 305-229-4425
Hydrometeorological Prediction Center (HPC)	Camp Springs, MD	B	COM 301-763-8201
NCEP Senior Duty Met (Data QC)	Camp Springs, MD	B	COM 301-763-8298
NWS Hydrometeorological Services Core (Headquarters)	Silver Spring, MD		COM 301-713-1858 ext. 108
			FAX *301-713-1520*
	INTERDEPARTMENTAL		
OFCM Silver Spring, MD			COM 301-427-2002
			DSN 851-1460

[1] A AWDS
B AWIPS

DEPARTMENT OF DEFENSE

AGENCY	LOCATION	TTY	TELEPHONE	
AFWA	Offutt AFB, NE	AB	COM	*402-294-7264*
			DSN	*271-7264*
CARCAH OLA, 53 WRS	Miami, FL	A	COM	305-229-4474
			DSN	434-3420
FACSFAC VACAPES OAC	Oceana, VA		COM	804-433-1233
			DSN	433-1233
FACSFAC Roosevelt Roads	Roosevelt Roads, PR		COM	787-865-7007
			DSN	831-7007/5202/5203
17 OWS/WXJ (Satellite Analyst)	Pearl Harbor, HI	A	COM	808-471-3533
			DSN	471-3533
325 OSS/OSW (Southeast Air Defense Sector/WE)	Tyndall AFB, FL	A	COM	904-283-2845
			DSN	523-2845
Keesler AFB Command Post	Keesler AFB, MS		COM	228-377-4330
			DSN	597-4330
NAVLANTMETOCCEN	Norfolk, VA		COM	757-444-7583/7750
			DSN	564-7583/7750
JTWC (Typhoon Duty Officer)	Pearl Harbor, HI	A	COM	808-474-2320
Fleet Numerical Meteorology and Oceanography Center (FNMOC) (Alternate JTWC)	Monterey, CA		COM	831-656-4325
			DSN	878-4325
53 WRS/DO	Keesler AFB, MS	A	COM	228-377-2409
			DSN	597-2409
53 WRS (Office)	Keesler AFB, MS		COM	228-377-3207
			DSN	597-3207
53 WRS (Alternate CARCAH)	Keesler AFB, MS	A	COM	228-377-1939
			DSN	597-1939

ARTCC PHONE DIRECTORY

	ARTCC ID	TMU	ADMINISTRATION	WATCH DESK OPERATIONS MANAGER
ANCHORAGE	ZAN	907-269-1108	907-269-1137	907-269-1103
ALBUQUERQUE	ZAB	505-856-4547	505-856-4601	505-856-4500
CHICAGO	ZAU	630-906-8445	630-906-8221	630-906-8341
BOSTON	ZBW	603-879-6666	603-879-6633	603-879-6655
WASHINGTON	ZDC	703-771-3471	703-771-3440/1	703-771-3470
DENVER	ZDV	303-651-4540	303-651-4101	303-651-4248
FT. WORTH	ZFW	817-858-7520	817-858-7500	817-858-7503
HOUSTON	ZHU	281-230-5530	281-230-5600	281-230-5560
INDIANAPOLIS	ZID	317-247-2267	317-247-2231	317-247-2242
JACKSONVILLE	ZJX	904-549-1570	904-549-1501	904-549-1537
KANSAS CITY	ZKC	913-254-8502	913-254-8403	913-791-8500
LOS ANGELES	ZLA	661-265-8250	661-265-8215	661-265-8205
SALT LAKE CITY	ZLC	801-320-2580	801-320-2501	801-320-2560
MIAMI	ZMA	305-716-1736	305-716-1500	305-716-1588
MEMPHIS	ZME	901-368-8250	901-368-8103	901-368-8234
MINNEAPOLIS	ZMP	651-463-5517	651-463-5510	651-463-5580
NEW YORK	ZNY	631-468-1010	631-468-1001	631-468-5959
OAKLAND	ZOA	510-745-3812	510-745-3000	510-745-3331
CLEVELAND	ZOB	440-774-0319	440-774-0320	440-774-0426
SEATTLE	ZSE	253-351-3525	253-351-3500	253-351-3520
ATLANTA	ZTL	770-210-7697	770-210-7600/3	770-210-7622
HONOLULU	HNL	N/A	808-840-6100	808-840-6201
SAN JUAN	SJU		787-253-8707	787-253-8664/5
TORONTO	YYZ		905-676-4590/1/2	
MONTREAL	YUL		514-633-3211	
MONCTON	YOM		506-867-7176	
WINNIPEG	YWG		204-983-8337	
EDMONTON	YEG		780-890-8304/5	
GANDER	YQX		709-651-5225	
VANCOUVER	YVR		604-775-9601/6	

Note:
TMO - Traffic Management Officer
Area Manager - Watch Supervisor
ARTCC - Air Route Traffic Control Center
Canadian ACC - Area Control Centre

AIR TRAFFIC TACTICAL OPERATIONS ATT-100	COM 703-904-4403
AIR TRAFFIC MANAGEMENT SERVICE	COM 703-904-4401
AIR TRAFFIC CONTROL	800-333-4286
SYSTEM COMMAND CENTER - ATT 2	
HERNDON, VA.	
CENTRAL ALTITUDE	703-904-4427
RESERVATION FUNCTION (CARF)	DSN 725-3331/725-3333
NATIONAL NOTAM OFFICE	
HERNDON, VA	703-904-4557
ATCSCC NATIONAL OPERATIONS	703-904-4525/703-904-4953
MANAGER (NOM)	800-333-4286 MILITARY USE ONLY

CANADIAN OFCF (ARU)

ADMIN HOURS	613-998-6583
TELECONFERENCE	613-954-7425
	613-957-6390
ARU OPS (24 HRS)	613-957-6343
(ATCSCC OF CANADA)	613-992-9740
	613-992-7940
	613-992-9751
ARU FAX	613-957-6412

CENTER WEATHER SERVICE UNITS (CWSU) in FAA Coastal Facilities

Boston ARTCC	603-879-7698
New York ARTCC	631-468-1083
Washington ARTCC	703-771-3480
Jacksonville ARTCC	904-549-1839
Miami ARTCC	305-716-1635
Houston ARTCC	281-230-5676
Los Angeles ARTCC	661-265-8258
Oakland ARTCC	510-745-3457
Seattle ARTCC	253-351-3741
Anchorage ARTCC	907-269-1145

APPENDIX J

PHONETIC PRONUNCIATION LISTING

CARIBBEAN BASIN

Abaco	AB-a-KO
Anguilla	ang-GWIL-a
Antigua	an-TEE-gua
Antilles	an-TILL-leez
Aruba	ah-ROO-ba
Azores	uh-ZOHRZ
Bahamas	ba-HAHM-ahs
Barahona	ba-ra-HO-na
Barbuda	bar-BOO-dah
Barranquilla	bahr-rahn-KEE-yah
Basse-Terre	baha-TER
Bermuda	ber-MYOO-da
Biloxi	bi-LUX-ee
Bimini	BIM-i-ni
Bonaire	ba-NAIR
Cap Haitien	kahp ah-ee-SYAN
Caracas	kah-RAH-kahs
Caribbean	kar-a-BE-an
Castries	KAS-tree
Cayman	kay-MAHN
Charlotte Amalie	SHAR-lot a-MAHL-ye
Cozumel	koh-soo-MEL
Curacao	koor-a-SOH
Dominica	dom-i-NEE-ka
Eleuthera	el-OO-thera
Exuma	ek-SOO-ma
Flores	FLO-rish
Fort de France	for-de-FRAHCS
Grenada	gre-NAY-dah
Guadaloupe	GWAH-deh-loop
Guatemala	gwaht-eh-MAH-la
Leeward	LEE-ward
Maracaibo	mar-a-KYE-boh
Maracay	mah-rah-KYE
Marigot	ma-ree-GOH
Mayaguez	may-yah-GWAYS
Merida	MAY-re-thah
Miami	mye-AM-ee
Montego	mon-TEE-go
Montserrat	mont-se-RAT
Nicaragua	nik-a-RAH-gwah
Ocho Rios	OH-cho REE-os
Oranjestad	o-RAHN-yuh-stat
Paramaribo	par-a-MAR-i-boh
Parguera	par-GWER-a
Pointe-a-Pitre	pwan-ta-PEE-tr
Ponce	PON-sa
Port-au-Prince	port-oh-PRINS
Saba	SAH-ba
Sao Miguel (Azores)	soun ME-gel
St. Croix	SAINT croy
St. Lucia	SAINT LOO-she-a
Soufriere	soo-free-AR
Surinam	SOOR-i-nam
Tampico	tam-PEE-ko
Tela	TAY-lah
Tobago	to-BAY-go
Yucatan	yoo-ka-TAN

APPENDIX K

ACRONYMS/ABBREVIATIONS

-A-

AB	Data type header for Tropical Weather Outlook
ADWS	Automatic Digital Weather Switch
AFB	Air Force Base
AFOS	Automation of Field Operations and Services
AFRC	Air Force Reserve Command
AFSATCOM	Air Force Satellite Communications System
AFWA	Air Force Weather Agency
AIM	Airman's Information Manual
AMOS	Automated Meteorological Observing Station
AMSU	Advanced Microwave Sounding Unit
AOC	Aircraft Operations Center (NOAA)
APT	Automatic Picture Transmission
ARGOS	Argos, Inc., a French data collection system
ARSA	Airport Radar Service Area
ARTCC	Air Route Traffic Control Center
ARWO	Aerial Reconnaissance Weather Officer
APUP	Associated Principal User Processor (WSR-88D)
ASDL	Aircraft-to-Satellite Data Link
ATC	Air Traffic Control
ATCSCC	Air Traffic Control System Command Center
AVHRR	Advanced Very High Resolution Radiometer
AWDS	Automated Weather Distribution System
AWIPS	Advanced Weather Interactive Processing System
AWN	Automated Weather Network

-C-

CARCAH	Chief, Aerial Reconnaissance Coordination, All Hurricanes
CARF	Central Altitude Reservation Function
C.I.	Current Intensity
C-MAN	Coastal-Marine Automated Network
COM	Commercial (telephone)
CONUS	Continental United States
CPHC	Central Pacific Hurricane Center
EC	degree/degrees Celsius

-D-

DA	Daylight Ascending
DCS	Data Collection System
deg	degree (latitude or longitude)
Det	detachment
DMSP	Defense Meteorological Satellite Program
DOC	Department of Commerce
DOD	Department of Defense
DOT	Department of Transportation
DPTD	departed
DROP	dropsonde/dropwindsonde
DSN	Defense Switched Network (formerly AUTOVON)
DTG	date/time group

-E-

EDT	Eastern Daylight Time
ESA	European Space Agency
ETA	Estimated Time of Arrival
ETD	Estimated Time of Departure

-F-

FAA	Federal Aviation Administration
FACSFAC	Fleet Aerial Control and Surveillance Facility
FCM	Federal Coordinator for Meteorological Services and Supporting Research
FCMSSR	Federal Committee for Meteorological Services and Supporting Research
FCST	forecast
FCSTR	forecaster
FL	flight level
FLT LVL	flight level
FMH	Federal Meteorological Handbook
FNMOC	Fleet Numerical Meteorology and Oceanography Center (USN)
ft	foot/feet
FTS	Federal Telephone System

-G-

GAC	Global Area Coverage
GOES	Geostationary Operational Environmental Satellite
GMDSS	Global Maritime Distress and Safety System
GMS	Geostationary Meteorological Satellite
GTS	Global Telecommunications System

-H-

HA	High Accuracy
HD	High Density
HDOB	High Density Observation
HF	High Frequency
hPa	hectopascal/hectopascals
h	hour/hours
HLS	Hurricane Local Statement
HNL	Honolulu (CPHC)
HPC	Hydrometeorological Prediction Center (NCEP)
HRD	Hurricane Research Division (NOAA/OAR/ERL/AOML)
HRPT	High Resolution Picture Transmission

-I-

ICAO	International Civil Aviation Organization
ICMSSR	Interdepartmental Committee for Meteorological Services and Supporting Research
ID	identification
IFR	Instrument Flight Rules
INIT	initials
IR	Infrared
IWRS	Improved Weather Reconnaissance System

-J-

JTWC	Joint Typhoon Warning Center

-K-

km	kilometer/kilometers
KBIX	ICAO identifier for Keesler AFB, MS
KMIA	ICAO identifier for Miami, FL
KMKC	ICAO identifier for Kansas City, MO WSFO
KNEW	ICAO identifier for New Orleans, LA WSFO
KNHC	ICAO identifier for the Tropical Prediction Center/National Hurricane Center, Miami, FL
KSFO	ICAO identifier for San Francisco, CA
kt	knot/knots
KWAL	ICAO identifier for Wallops Island, VA

-L-

LAC	Local Area Coverage
LF	Light Fine (satellite data terminology)
LI	Long Island
LS	Light Smooth (satellite data terminology)

-M-

m	meter/meters
MANOP	communications header
MAX	maximum
METEOSAT	European Space Agency geostationary meteorological satellite
min/MIN	minute
MINOB	Minute Observation
MOU	Memorandum of Understanding
mph	mile/miles per hour
MVMT	movement

-N-

NAPUP	Non-associated Principal User Processor (WSR-88D)
NASA	National Aeronautics and Space Administration
NAVLANTMETOCCEN	Naval Atlantic Meteorology and Oceanography Center
NAVLANTMETOCDET	Naval Atlantic Meteorology and Oceanography Detachment
NAVLANTMETOCFAC	Naval Atlantic Meteorology and Oceanography Facility
NAVMETOCCOM	Naval Meteorology and Oceanography Command
NAVOCEANO	Naval Oceanographic Office
NAVPACMETOCCEN	Naval Pacific Meteorology and Oceanography Center
NAVTRAMETOCFAC	Naval Training Meteorology and Oceanography Facility
NCEP	National Centers for Environmental Prediction (NOAA/NWS)
NCO	NCEP Central Operations
NDBC	National Data Buoy Center
NESDIS	National Environmental Satellite, Data, and Information Service
NFDC	National Flight Data notice to airman Center
NHC	National Hurricane Center
NHOP	National Hurricane Operations Plan
NLT	Not Later Than
nm	nautical miles
NOAA	National Oceanic and Atmospheric Administration
NOM	National Operations Manager (FAA)
NSC	NOAA Science Center
NSTL	National Space Technology Laboratories (NASA)
NWS	National Weather Service

-O-

OAC	Oceanic Aircraft Coordinator (USN)
OB	observation
OFCM	Office of the Federal Coordinator for Meteorological Services and Supporting Research
OPC	Ocean Prediction Center (NCEP)
OSDPD	Office of Satellite Data Processing and Distribution (NESDIS)
OSF	Operational Support Facility (WSR-88D)
OSS	Operations Support Squadron (USAF)

-P-

PA	Public Affairs
PANC	ICAO identifier for Anchorage, AK
PCN	Position Confidence Number
PHFO	ICAO identifier for Honolulu, HI
POD	Plan of the Day
POES	Polar Orbiting Environmental Satellite
PRF	pulse repetition frequency (WSR-88D)

-R-

RECCO	Reconnaissance Code
RECON	reconnaissance
REQT	requested
RPS	routine product set (WSR-88D)
RSMC	Regional/Specialized Meteorological Center (WMO)

-S-

SAB	Satellite Analysis Branch
SFC	surface
SFDF	Satellite Field Distribution Facility
SLP	Sea Level Pressure
SSM/I	Special Sensor Microwave Imager (DMSP)
SSM/IS	*Special Sensor Microwave Imager Sounder*
SSM/T	Special Sensor Microwave Temperature Sounder
SST	Sea Surface Temperature
SPC	Storm Prediction Center (NCEP)
SVD	Supplementary Vortex Data

-T-

TAFB	Tropical Analysis Forecast Branch (TPC)
TCA	Aviation Tropical Cyclone Advisory
TCD	Tropical Cyclone Discussion
TCPOD	Tropical Cyclone Plan of the Day
TD	Tropical Depression
TEMP	temperature
TEMP	temporary
TEMP DROP	Dropwindsonde Code
TF	Thermal Fine
TKO	takeoff
TMO	Traffic Management Officer in air route centers and towers
T-number	Tropical classification number
TOVS	TIROS-N Operational Vertical Sounder
TPC	Tropical Prediction Center

TS	Thermal Smooth
TWO	Tropical Weather Outlook

-U-

UCP	unit control position (WSR-88D)
UHF	Ultra High Frequency
US/U.S.	United States
USAF	United States Air Force
USCG	United States Coast Guard
USN	United States Navy
UTC	Universal Coordinated Time

-V-

VAS	VISSR Atmospheric Sounder
VCP	volume coverage pattern (WSR-88D)
VDM	Vortex Data Message
VDUC	VAS Data Utilization Center
VIS	Visible
VISSR	Visible and Infrared Spin Scan Radiometer
VMI	velocity measurement increment (WSR-88D)
VTPR	Vertical Temperature Profile Radiometer

-W-

WEFAX	Weather Facsimile
WESTPAC	Western Pacific
WMO	World Meteorological Organization
WND	wind
WO	Data type header for special tropical disturbance statements
WRS	Weather Reconnaissance Squadron
WS	Weather Squadron
WSD	Wind Speed and Direction (data buoy)
WSFO	Weather Service Forecast Office
WSR-88D	Weather Surveillance Radar-1988 Doppler
WT	Data type header for hurricane bulletins
WW	Data type header for subtropical storm bulletins

-X-

XMTD	transmitted

-Z-

Z	Zulu (UTC)

APPENDIX L

GLOSSARY

-A-

Agency. Any Federal agency or organization participating in the tropical cyclone warning service.

Airport Radar Service Area (ARSA). Regulatory airspace surrounding designated airports wherein ATC provides radar vectoring and sequencing on a full-time basis for all IFR and VFR aircraft. The service provided in an ARSA is called ARSA Service which includes: IFR/IFR-standard IFR separation; IFR/VFR-traffic advisories and conflict resolution; and VFR/VFR-traffic advisories and, as appropriate, safety alert. The Airman's Information Manual (AIM) contains an explanation of ARSA. The ARSA's are depicted on VFR aeronautical charts.

Air Traffic Control System Command Center (ATCSCC). The facility responsible for the real-time command, control, and oversight of air traffic activity within the National Airspace System. The ATCSCC is a 24 hour a day, 7 day a week operation.

Area Manager. Supervisor in charge of air route traffic control center or airport tower, shift to shift.

-C-

Center Fix. The location of the center of a tropical or subtropical cyclone obtained by means other than reconnaissance aircraft penetration. See also Vortex Fix.

Controlled Airspace. An airspace of defined dimensions within which air traffic control service is provided to IFR flights and to VFR flights in accordance with the airspace classification.

a. Controlled airspace is a generic term that covers Class A, Class B, Class C, Class D, and Class E airspace.

b. Controlled airspace is also that airspace within which all aircraft operators are subject to certain pilot qualifications, operating rules, and equipment requirements in FAR Part 91 (for specific operating requirements, please refer to FAR Part 91). For IFR operations in any class of controlled airspace, a pilot must file an IFR flight plan and receive an appropriate ATC clearance. Each Class B, Class C, and Class D airspace area designated for an airport contains at least one primary airport around which the airspace is designated (for specific designations and descriptions of the airspace classes, please refer to FAR Part 71).

c. Controlled airspace in the United States is designated as follows:

CLASS A: Generally, that airspace from 18,000 feet MSL up to and including FL 600, including the airspace overlying the waters within 12 nautical miles of the coast of the 48 contiguous States and Alaska. Unless otherwise authorized, all persons must operate their aircraft under IFR.

CLASS B: Generally, that airspace from the surface to 10,000 feet MSL surrounding the nations's busiest airports in terms of airport operations or passenger enplanements. The configuration of each Class B airspace area is individually tailored and consists of a surface area and two or more layers (some Class B airspaces areas resemble upside-down wedding cakes), and is designed to contain all published instrument procedures once an aircraft enters the airspace. An ATC clearance is required for all aircraft to operate in the area, and all aircraft that are so cleared receive separation services within the airspace. The cloud clearance requirement for VFR operations is "clear of clouds."

CLASS C: Generally, that airspace from the surface to 4,000 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower, are serviced by a radar approach control, and that have a certain number of IFR operations or passenger enplanements. Although the configuration of each Class C area is individually tailored, the airspace usually consists of a surface area with a 5 nautical mile (NM) radius, an outer circle with a 10 NM radius that extends from 1,200 feet to 4,000 feet above the airport elevation and an outer area. Each person must establish two-way radio communications with the ATC facility providing air traffic services prior to entering the airspace and thereafter maintain those communications while within the airspace. VFR aircraft are only separated from IFR aircraft within the airspace. (See OUTER AREA).

CLASS D: Generally, that airspace from the surface to 2,500 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower. The configuration of each Class D airspace area is individually tailored and when instrument procedures are published, the airspace will normally be designed to contain the procedures. Arrival extensions for instrument approach procedures may be Class D or Class E airspace. Unless otherwise authorized, each person must establish two-way radio communications with the ATC facility providing air traffic services prior to entering the airspace and thereafter maintain those communications while in the airspace. No separation services are provided to VFR aircraft.

CLASS E: Generally, if the airspace is not Class A, Class B, Class C, or Class D, and it is controlled airspace, it is Class E airspace. Class E airspace extends upward from either the surface or a designated altitude to the overlying or adjacent controlled airspace. When designated as a surface area, the airspace will be configured to contain all instrument procedures. Also in this class are Federal airways, airspace beginning at either 700 or 1,200 AGL used to transition to/from the terminal or en route environment,

en route domestic, and offshore airspace areas designated below 18,000 feet MSL. Unless designated at a lower altitude, Class E airspace begins at 14,500 MSL over the United States, including that airspace overlying the waters within 12 nautical miles of the 48 contiguous States and Alaska, up to, but not including 18,000 MSL, and the airspace above FL 600.

Cyclone. An atmospheric closed circulation rotating counter-clockwise in the Northern Hemisphere.

-E-

Extratropical cyclone. A synoptic scale low pressure system whose primary energy source is baroclinic.

Eye. The relatively calm center of the tropical cyclone that is more than one half surrounded by wall cloud.

Eye Wall. An organized band of cumuliform clouds immediately surrounding the center of a tropical cyclone. Eye wall and wall cloud are used synonymously.

-H-

High Density/High Accuracy (HD/HA) Data. Those data provided by automated airborne systems--WP-3s or WC-130s equipped with the Improved Weather Reconnaissance System.

Hurricane/Typhoon. A warm-core tropical cyclone in which the maximum sustained surface wind speed (l-min mean) is 64 kt (74 mph) or more.

Hurricane Season. The portion of the year having a relatively high incidence of hurricanes. The seasons for the specific areas are as follows:

C Atlantic, Caribbean, and the Gulf of Mexico	June 1 to November 30
C Eastern Pacific	May 15 to November 30
C Central Pacific	June 1 to November 30

Hurricane Warning Offices. The designated hurricane warning offices follow:

- C Tropical Prediction Center/National Hurricane Center, Miami, Florida
- C Central Pacific Hurricane Center, Honolulu, Hawaii

Hurricane Warning. A warning that sustained winds of 64 kt (74 mph) or higher associated with a hurricane are expected in a specified coastal area in 24 hours or less. A hurricane warning can remain in effect when dangerously high water or a combination of dangerously

high water and exceptionally high waves continue, even though winds may be less than hurricane force.

Hurricane Watch. An announcement for specific coastal areas that a hurricane or an incipient hurricane condition poses a possible threat, generally within 36 hours.

-I-

ICAO-Controlled Airspace. An airspace of defined dimensions within which air traffic control service is provided to IFR flights and to VFR flights in accordance with the airspace classification. *(Note: Controlled airspace is a generic term which covers Air Traffic Service airspace Classes A, B, C, D, and E).*

-M-

Major Hurricane. A "major" hurricane is one that is classified as a Category 3 or higher.

Maximum 1-Min Sustained Surface Wind. When applied to a particular weather system, refers to the highest 1-minute average wind (at an elevation on 10 meters with an unobstructed exposure) associated with that weather system at a particular point in time.

Micronesia. An area defined by the Commonwealth of the Northern Marianas Islands, the Republic of Palau, the Federated States of Micronesia, and the Republic of the Marshall Islands.

Miles. The term "miles" used in this plan refers to nautical miles (nm) unless otherwise indicated.

Mission Identifier. The nomenclature assigned to tropical and subtropical cyclone aircraft reconnaissance missions for weather data identification. It's an agency-aircraft indicator followed by a Chief, Aerial Reconnaissance Coordination, All Hurricanes (CARCAH) assigned mission-system indicator.

-N-

National Operations Manager. Supervisor in charge of the overall operation of the Air Traffic Control System Command Center.

-P-

Present Movement. The best estimate of the movement of the center of a tropical cyclone at a given time and at a given position. This estimate does not reflect the short-period, small-scale oscillations of the cyclone center.

-R-

Reconnaissance Aircraft Sortie. A flight that meets the requirements of the tropical cyclone plan of the day.

Relocated. A term used in an advisory to indicate that a vector drawn from the preceding advisory position to the latest known position is not necessarily a reasonable representation of the cyclone's movement.

-S-

Storm Surge. An abnormal rise in sea level accompanying a hurricane or other intense storm, and whose height is the difference between the observed level of the sea surface and the level that would have occurred in the absence of the cyclone. Storm surge is usually estimated by subtracting the normal or astronomic tide from the observed storm tide.

Storm Tide. The actual level of sea water resulting from the astronomic tide combined with the storm surge.

Subtropical Cyclone. A low pressure system that develops over subtropical waters that initially has a non-tropical circulation but in which some elements of tropical cyclone cloud structure are present.

Subtropical Depression. A subtropical cyclone in which the maximum sustained surface wind speed (l-min mean) is 33 kt (38 mph) or less.

Subtropical Storm. A non-frontal low pressure system that has characteristics of both tropical and extratropical cyclones.

- The most common type is an upper-level cold low with circulation extending to the surface layer and maximum sustained winds generally occurring at a radius of about 100 miles or more from the center. In comparison to tropical cyclones, such systems have a relatively broad zone of maximum winds that is located farther from the center, and typically have a less symmetric wind field and distribution of convection.

- A second type of subtropical cyclone is a mesoscale low originating in or near a frontolyzing zone of horizontal wind shear, with radius of maximum sustained winds generally less than 30 miles . The entire circulation may initially have a diameter of less than 100 miles. These generally short-lived systems may be either cold core or warm core.

Super Typhoon. A "super" typhoon is one that is classified as having winds of 130 kts (150 mph) or greater.

Sustained Surface Wind. The 1-minute averaged wind at the 10-meter elevation with an unobstructed exposure.

Synoptic Surveillance (formerly Synoptic Track). Weather reconnaissance mission flown to provide vital meteorological information in data sparse ocean areas as a supplement to existing surface, radar, and satellite data. Synoptic flights better define the upper atmosphere and aid in the prediction of tropical cyclone motion and intensity.

-T-

Traffic Management Specialist. ATCSCC personnel responsible for the active management of traffic throughout the National Airspace System.

Tropical Cyclone. A warm-core, non-frontal synoptic-scale cyclone, originating over tropical or subtropical waters, with organized deep convection and a closed surface wind circulation about a well-defined center.

Tropical Cyclone Plan of the Day. A coordinated mission plan that tasks operational weather reconnaissance requirements during the next 1100 to 1100Z UTC day or as required, describes reconnaissance flights committed to satisfy both operational and research requirements, and identifies possible reconnaissance requirements for the succeeding 24-hour period.

Tropical Depression. A tropical cyclone in which the maximum sustained surface wind speed (l-min mean) is 33 kt (38 mph) or less.

Tropical Disturbance. A discrete tropical weather system of apparently organized convection--generally 100 to 300 mi in diameter--originating in the tropics or subtropics, having a nonfrontal migratory character, and maintaining its identity for 24 hours or more. It may or may not be associated with a detectable perturbation of the wind field.

Tropical Storm. A tropical cyclone in which the maximum sustained surface wind speed (l-min mean) ranges from 34 kt (39 mph) to 63 kt (73 mph).

Tropical Storm Warning. A warning for tropical storm conditions including sustained winds within the range of 39 to 73 mph (34 to 63 kt) that are expected in a specified coastal area within 24 hours or less.

Tropical Storm Watch. An announcement that a tropical storm poses or tropical storm conditions pose a threat to coastal areas generally within 36 hours. A tropical storm watch should normally not be issued if the system is forecast to attain hurricane strength.

Tropical Wave. A trough or cyclonic curvature maximum in the trade-wind easterlies. The wave may reach maximum amplitude in the lower middle troposphere or may be the reflection of an upper tropospheric cold low or equatorial extension of a middle latitude trough.

Tropical Weather System. A designation for one of a series of tropical weather anomalies. As such, it is the basic generic designation, which in successive stages of intensification, may be classified as a tropical disturbance, wave, depression, storm, or hurricane.

Typhoon/Hurricane. A warm-core tropical cyclone in which the maximum sustained surface wind speed (l-min mean) is 64 kt (74 mph) or more.

-U-

Uncontrolled Airspace (Class G Airspace). That portion of the airspace that has not been designated as Class A, Class B, Class C, Class D, or Class E and within which Air Traffic Control has neither the authority nor the responsibility for exercising control over air traffic.

-V-

Vortex Fix. The location of the surface and/or flight level center of a tropical or subtropical cyclone obtained by reconnaissance aircraft penetration. See Center Fix, also.

-W-

Wall Cloud. An organized band of cumuliform clouds immediately surrounding the center of a tropical cyclone. Wall cloud and eye wall are used synonymously.

APPENDIX M

DISTRIBUTION

DEPARTMENT OF COMMERCE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Administration Office, Aircraft Operations Center (AOC)	20
Assistant Administrator for Satellite and Information Services (E)	2
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Chief, Library and Information Services Division (E/OC4)	4
Chief, Satellite Services Division (E/SP2)	1
Chief, Library Division MASC (MC5)	2
Assistant Administrator for Ocean Svcs and Coastal Zone Management (N)	1
Director, Office of Public Affairs, NOAA (PA)	2
Assistant Administrator for Oceanic and Atmospheric Research (R)	1
Director, Environmental Research Laboratories (R/E/FS)	4
Chief, International Programs (R/E/FS7)	2
Director, AOML Hurricane Research Division (R/E/AO)	5
Director, Program Development and Coordination Staff (R/PDC)	2
Assistant Administrator for Weather (W)	1
Director, National Data Buoy Center (W/DB)	6
Director, National Centers for Environmental Prediction (W/NP)	1
Director, Central Operations (W/NP1)	2
Director, Environmental Modeling Center (W/NP2)	1
Deputy Director, Environmental Modeling Center (W/NP2x1)	1
Director, Hydrometeorological Prediction Center (W/NP3)	2
Director, Marine Prediction Center (W/NP4)	2
Director, Tropical Prediction Center (W/NP8)	20
Director, Office of Hydrology (W/OH)	1
Director, Office of Meteorology (W/OM)	1
Chief, International Activities Division (W/IA)	1
Chief, Hydrometeorological Services Core (W/OM12)	20
Director, NWS Eastern Region (W/ER)	50
Director, NWS Central Region (W/CR)	16
Director, NWS Southern Region (W/SR)	56
Director, NWS Western Region (W/WR)	15
Director, NWS Pacific Region (W/PR)	15
NOAA Budget Officer, Office of Management and Budget	1

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UNIFIED/SPECIFIED COMMANDS

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USCINCSO/SCJ3-SWO	1
USEUCOM/EPOC-CCPD	
USJFCOM	1
USSOCOM/SCSO-OC-M	1
USSOUTHCOM/SCJ322	1
USSTRATCOM/J3624	2
USTRANSCOM/TCJ3	1

DEPARTMENT OF THE AIR FORCE

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HQ AFMC/DOW	2
HQ AFSPC/XOSW	5
HQ AFSOC/DOW	1
HQ AMC/A3W	10
HQ AOC/XPPD	1
HQ AETC/TTO	2
HQ AETC/DOYW	10
HQ AU/WE	1
HQ AFWA/XO	6
HQ PACAF/DOW	6
HQ USAFE/DOW	2
AFRL/VSB (AFMC)	1
AFCCC (AFWA)	1
AFCWC (AFWA)	
ANG/XOOSW	1
MSD/AOW (AETC)	1
OO-ALC/LHW	2
3 WS/CC	1
17 OWS/CC	1
18 WS/CC	1
25 OWS/CC	2

26 OWS/CC	2
28 OWS/CC	2
36 OSS/OSW (PACAF)	1
45 WS/CC	3
45 SPW/XP and SE	4
46 WS/CC	2
88 WS/CC	1
78 OSS/OSW	1
325 OSS/OSW	1
335 TRS/UAO	2
607 WS/CC	1

AFRC

HQ USAF/REO	3
HQ AFRC/DOO	2
HQ AFRC/DOT/DOTA	2
HQ AFRC/DOVA	2
HQ 22AF/DOT/DOTA	2
403 WG/DO/XP	5
53 WRS	75
CARCAH (OL-A 53 WRS)	10

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NAVLANTMETOCFAC Jacksonville	1
NAVTRAMETOCFAC Pensacola	1
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CINCPACFLT (N3WX)	1
COMTHIRDFLT	1
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Commander, Naval Air Warfare Center, Weapons Division	2
Office of Naval Research (Code 1122MM)	2
NRL, Stennis Space Center, MS	1

NRL, Atmospheric Division, Monterey, CA	2
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Coastal System Station (Code 05W)	1
AFWTF, Roosevelt Roads, PR	1

DEPARTMENT OF TRANSPORTATION

FEDERAL AVIATION ADMINISTRATION

Air Traffic System Requirements Service ARS-1	1
Air Traffic System Requirements Service/Weather ARW-1	1
Air Traffic Operations ATO-1	3
Air Traffic Operations ATO-110	1
Air Traffic Operations ATO-120	3
Air Traffic Resource Management Program ATX-100/ATX-400	2
Air Traffic Control System Command Center (ATCSCC) ATO-200	9
FAA Regional Air Traffic Division Managers	
AAL-500 Anchorage	1
ACE-500 Kansas City	1
AEA-500 New York	1
AGL-500 Chicago	1
ANE-500 Boston	1
ANM-500 Seattle	1
ASO-500 Atlanta	1
ASW-500 Dallas/Fort Worth	1
AWP-500 Los Angeles	1
Albuquerque ARTCC	2
Atlanta ARTCC	3
Boston ARTCC	3
Honolulu ARTCC	3
Houston ARTCC	3
Jacksonville ARTCC	3
Los Angeles ARTCC	2
Memphis ARTCC	1
Miami ARTCC	3
New York ARTCC	3
Oakland ARTCC	2
San Juan ARTCC	3
Seattle ARTCC	2
Washington ARTCC	2
AMA-500, Oklahoma City, OK	1
AIA-100/AIA-200	3
AOP-4	1
APA-300	3
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Director, Meteorology Program	1
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Natural Hazards Research and Applications Information Center	1
Department of Atmospheric Sciences, Colorado State University	1
Cumberland County Maine Emergency Management Agency	1
Meteorological Services, Inc., Tampa, FL	3

GTE Government Systems	1
Larkin Associates	1
Nash C. Roberts, Jr. Consultants, New Orleans, LA	1
Hurricane and Weather Specialists, Inc., Valrico, FL	1

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Atmospheric Environment Service, Downsview, ON	1
Transport Canada, Altitude Reservation Unit	2
Transport Canada, Monkton ACC	2

UNITED KINGDOM

Assistant Director, Head of Defense Services, Meteorological Office	1