U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
FEDERAL COORDINATOR FOR METEOROLOGICAL
SERVICES AND SUPPORTING RESEARCH

NATIONAL HURRICANE OPERATIONS PLAN

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NATIONAL HURRICANE OPERATIONS PLAN

(ATLANTIC, EASTERN PACIFIC, AND CENTRAL PACIFIC)

CONTENTS

Note: # indicates change from previous edition.

INTRODUCTION

An Interdepartmental Plan was first issued in 1962. This is the 13th edition and presents the procedures and agreements reached at the annual Interdepartmental Hurricane Warning Conference (combined Atlantic and Pacific). This Conference is sponsored by the Subcommittee on Basic Meteorological Services (SC/BMS), Interdepartmental Committee for Meteorological Services (ICMS), to bring together cognizant Federal agencies to achieve agreement on items of mutual concern related to the Atlantic and Pacific hurricane warning services.

The following National Oceanic and Atmospheric Administration (NOAA) National Weather Service officials shall provide the designated representatives of the Department of Defense with the basic meteorological information and associated prognostic reasoning concerning location, intensity, and forecast positions of tropical cyclones:

1. The Director, National Hurricane Center (NHC), National Weather Service, Miami, Fla., is responsible for the North Atlantic Ocean, the Caribbean Sea, the Gulf of Mexico, and for the States and possessions of the United States adjacent to these maritime areas.

2. The Meteorologist-in-Charge (MIC), Eastern Pacific Hurricane Center (EPHC), National Weather Service, San Francisco, Calif., is responsible for the Eastern Pacific Ocean east of longitude 140°W. and north of the Equator.

3. The MIC, Central Pacific Hurricane Center (CPHC), National Weather Service, Honolulu, Hawaii, is responsible for the Central Pacific Ocean from longitude 140°W. to the 180th meridian and north of the Equator.

The National Weather Service shall:

1. Make necessary analyses and prepare basic forecasts of tropical cyclones for the use of all Department of Defense interests within the scope of this Plan.

2. Supply tropical cyclone forecasts to Department of Defense weather services in accordance with published interdepartmental agreements.

The Department of Defense shall furnish to the Department of Commerce aircraft reconnaissance observations and other special observations which are required to support the provisions of chapter 3 of this Plan.

The Department of Defense has designated the officer-in-charge, OL-G AWS, as the Chief, Aerial Reconnaissance Coordination, All Hurricanes (CARCAH), to NHC. The CARCAH will be responsible for the coordination and final preparation of the Tropical Cyclone Plan of the Day (TCPOD) and for the scheduling of aircraft required to meet the provisions of chapter 4 of this Plan. An Alternate CARCAH will be designated for the Alternate Hurricane Warning Office (HWO) in support of chapter 8 of this Plan.

The Federal Aviation Administration (FAA) shall provide air traffic control, communications, and flight assistance services as appropriate in support of this Plan.

The chapters specify in further detail the responsibilities and functions of the several agencies cooperating in support of the tropical cyclone warning service.

RESPONSIBILITIES OF COOPERATING AGENCIES

1. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA) responsibilities are performed by three of its components.

a. The National Weather Service, through the Director, National Hurricane Center, Miami (NHC-MIA), the Meteorologist-in-Charge (MIC), Eastern Pacific Hurricane Center, San Francisco (EPHC-SFO), and the MIC, Central Pacific Hurricane Center, Honolulu (CPHC-HNL), shall:

(1) Provide tropical cyclone forecasts and attendant advice for the general public, marine, and aviation interests.

(2) Provide basic tropical cyclone forecasts and attendant advice to the Department of Defense in accordance with the detailed instructions in chapter 3.

(3) Provide the Department of Defense timely access to all significant tropical cyclone reports.

(4) Consult as necessary with the Department of Defense regarding day-to-day requirements for tropical cyclone advice and arrange to meet these requirements within the capabilities of the Hurricane Warning Offices (HWO).

(5) Advise the Chief, Aerial Reconnaissance Coordination, All Hurricanes (CARCAH) of aircraft reconnaissance and other observational requirements of the HWOs, EPHC, and CPHC.

#(6) Through EPHC SFO consult with the Fleet Weather Central (FWC) Pearl Harbor, Hawaii, before issuing the initial Tropical Cyclone Advisory on a tropical cyclone in the Eastern North Pacific area. Through Central Pacific Hurricane Center (CPHC) HNL consult with the FWC Pearl Harbor, Hawaii, and the Base Weather Station, 1st Weather Wing (BWS, 1WWg) Hickam Air Force Base (AFB), Hawaii, before issuing Tropical Cyclone Advisories in the Central North Pacific area. Through NHC-MIA consult with the Fleet Weather Central, Norfolk before issuing the initial tropical cyclone advisory on a tropical cyclone in the North Atlantic, Caribbean Sea, or Gulf of Mexico.

b. The National Environmental Satellite Service (NESS) shall:

(1) Operate Department of Commerce environmental satellite systems capable of providing coverage of meteorological conditions in the tropics during the tropical cyclone season.

(2) Coordinate with the National Aeronautics and Space Administration (NASA) on providing data from its research and development satellites to NOAA operational units for their use on a routine basis.

(3) Receive requirements from NHC, EPHC, and CPHC for areas and times which specific coverage is desired.

(4) Process and transmit available data to meet the requirements of NHC, EPHC, and CPHC.

(5) Monitor all tropical regions by means of satellite data and communicate interpretations from data of disturbed areas as specified in chapter 9 of this Plan.

c. The National Ocean Survey (NOS) through NOAA Data Buoy Office shall:

(1) Provide for development, deployment, and operation of environmental data buoy systems, with special emphasis on improved oceanographic and meteorological sensors.

(2) Provide available data to the environmental science communities--operational, archival, and scientific.

2. The Department of Defense shall:

a. Provide up-to-date information to NHC-MIA, EPHC-SFO, and CPHC-HNL concerning requirements for tropical cyclone advice and pertinent information.

b. Meet the requirements for aircraft reconnaissance and other observations noted in chapter 4 within the limits of service capabilities.

c. Provide access to Aerospace Defense Command (ADC) radar sites under conditions specified in chapter 5, paragraph 6.

d. Meet from its own resources any military reconnaissance requirements that are in excess of the common tropical cyclone requirements as stated in chapter 4, appendix F, of this Plan.

e. Process and transmit Defense Meteorological Satellite Program (DMSP) data as stated in chapter 9 of this Plan.

#3. Department of Commerce and the Department of Defense will cooperate in arranging an annual trip to the Caribbean and the Gulf of Mexico area to carry out a continuing and effective liaison on the warning service with the Directors of Meteorological Services, Air Traffic Control Agencies, and Disaster Prevention Agencies of nations in those areas.

4. Department of Transportation

a. The Federal Aviation Administration (FAA) shall:

(1) Provide air traffic control, communication, and flight assistance services as appropriate in support of this Plan.

(2) Make the necessary arrangements for accommodations and access to appropriate communication and radar facilities that will allow the observation and transmission of hurricane radar data from Air Route Traffic Control Centers (ARTCC).

b. The United States Coast Guard (USCG) shall:

(1) Operate Ocean Weather Station HOTEL.

(2) Provide personnel, vessel, and communications support to the NOAA Data Buoy Office for development, deployment, and operations of environmental data buoy systems.

(3) Provide surface observations to National Weather Service from its numerous coastal facilities and vessels.

(4) Provide communications circuits for relay of weather observations to the National Weather Service in selected areas.

CHAPTER 2

DEFINITIONS

The following definitions will apply for the purposes of this Plan and its appendices:

1. CENTER FIX: The location of the center of a tropical cyclone obtained by means other than reconnaissance aircraft penetration (aircraft, ship, or land-based radar; satellite).

2. CYCLONE: An atmospheric closed-circulation rotating counterclockwise in the Northern Hemisphere.

3. HURRICANE SEASON: The portion of the year having a relatively high incidence of hurricanes. In the North Atlantic, it is usually regarded as the period from June through November; in the East Pacific, from June through November 15; and in the Central Pacific, from June through October.

4. PRESENT MOVEMENT: The best estimate of movement of the center of the tropical cyclone at the time given for the position indicated in the advisory. (In advisories, remarks will be used to amplify significant changes between movement and forecast movement.)

5. SUBTROPICAL CYCLONES. Nonfrontal, low pressure systems comprising initially baroclinic circulations developing over subtropical waters. There are two types: (1) A 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 pressure center. These cyclones sometimes undergo a metamorphosis and become tropical storms or hurricanes. (2) A mesoscale cyclone 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 sometimes encompasses an area initially no more than 100 miles in diameter. These marine cyclones may change in structure from cold to warm core. While generally short-lived, they may ultimately evolve into major hurricanes or into extra-tropical wave cyclones.

Subtropical cyclones are classed according to intensity as follows:

a. Subtropical Depression. A subtropical cyclone in which the maximum sustained surface winds (1-minute mean) is 33 knots (38 miles per hour) or less.

b. Subtropical Storm. A subtropical cyclone in which the maximum sustained surface wind (1-minute mean) is 34 knots (39 miles per hour) or greater.

6. TROPICAL WEATHER SYSTEMS.

a. TROPICAL DISTURBANCE. A discrete system of apparently organized convection--generally 100 to 300 miles in diameter--originating in the tropics or subtropics, having a nonfrontal migratory character, and having maintained its identity for 24 hours or more. It may or may not be associated with a detectable perturbation of the wind field. As such, it is the basic generic designation which, in successive stages of intensification, may be classified as a tropical wave, depression, storm, or hurricane.

b. 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 troposphere cold-low or equatorward extension of a middle-latitude trough.

c. TROPICAL CYCLONE. A nonfrontal low pressure system of synoptic scale developing over tropical or subtropical waters and having definite organized circulation.

(1) TROPICAL DEPRESSION. A tropical cyclone in which the maximum sustained surface wind (1-minute mean) is 33 knots or less.

(2) TROPICAL STORM. A warm-core tropical cyclone in which the maximum sustained surface wind (1-minute mean) ranges from 34 to 63 knots inclusive.

(3) HURRICANE/TYPHOON. A warm-core tropical cyclone in which the maximum sustained surface wind (1-minute mean) is 64 knots or greater.

7. VORTEX FIX. The location of the center of a tropical cyclone obtained by reconnaissance aircraft penetration or by meteorological satellite imagery.

TROPICAL CYCLONE FORECASTS AND INFORMATION TO BE FURNISHED BY THE NATIONAL WEATHER SERVICE TO THE DEPARTMENT OF DEFENSE

1. Reports. The National Hurricane Center, Miami, (NHC-MIA), the Eastern Pacific Hurricane Center, San Francisco (EPHC-SFO), and the Central Pacific Hurricane Center, Honolulu (CPHC-HNL) in their respective areas of responsibility will make available to the Department of Defense all significant tropical cyclone reports which they receive.

2. Advisories. The NHC-MIA, EPHC-SFO, and CPHC-HNL will issue and provide to the Department of Defense basic tropical cyclone forecasts and related information for tropical cyclones of storm or hurricane intensity. Basic tropical cyclone forecasts will include advice as to location, movement, intensity, and dimensions of tropical cyclones. These forecasts and related information will be provided in the form of Military Advisories (Form 1 of this chapter--WS Form C-13).

The NHC will provide dissemination through NWS, Suitland, computer relay to the Automated Weather Network (AWN), Carswell AFB, Tex., for further relay to DOD agencies. Tape and hard copy will be provided by NHC to the Chief, Aerial Reconnaissance Coordination, All Hurricanes (CARCAH). Release time will not be earlier than 30 minutes prior to the scheduled warning time of the material.

a. Time and Circumstances of Issue of Advisories for Department of Defense.

(1) Initial Advisory. The first advisory will normally be issued when surface observations of wind speeds in a closed tropical cyclone system reach sustained values of 34 knots. Consideration will be given to issuing the first advisory before winds reach these values if the wind system is closed and speeds are expected to increase to 34 knots within 24 hours.

(2) Scheduled Advisories. Atlantic, Caribbean, and Gulf of Mexico: After the Initial Advisory is issued, advisories will be issued for the hours 0400, 1000, 1600, and 2200Z (Greenwich Mean Time--GMT). The 12-, 24-, 48-, and 72-hour forecasts will be based on the latest 6-hourly synoptic time for the hours 0000, 0600, 1200, and 1800Z. Advisories will continue to be issued as long as the hurricane or tropical storm exists. Advisories may be issued on tropical depressions under certain conditions.

Pacific: After the Initial Advisory is issued, advisories will be issued for the hours of 0300, 0900, 1500, and 2100Z, and for synoptic positions at hours 0000, 0600, 1200, and 1800Z.

(3) Special Advisories. Scheduled Advisories will be supplemented by Special Advisories issued at intervening hours as required by receipt of new information showing important changes in the cyclone.

Eastern Pacific: Special Advisories will carry the word "amended," "corrected," or "relocated," as appropriate, immediately following the advisory number. This will not change the advisory number. (See Form 1 of this chapter.)

Central Pacific: The term Special Advisory or Bulletin will be reserved for amending information that appeared in the previous advisory or for adding later data that results in the relocation of the storm. Such information is generally obtained after the valid time of the original advisory, and a Special Advisory will be issued with a new number and a later valid time (0330Z or 0400Z) for these cases. A corrected advisory will retain the same number as the original and will not require a Special Advisory.

The term "relocated" may be used whenever a vector drawn from the preceding Tropical Cyclone Advisory position to the latest known position is not necessarily a reasonable representation of the cyclone's movement.

(4) Amended Military Advisory

(a) Last minute changes of hurricane position, direction of motion, and intensity included in a public advisory require an issuance of an amended Military Advisory. The number used for the amended Advisory will be the same as for the Advisory being amended. For example, if Military Advisory number 21 is amended, it will be Military Advisory number 21 amended.

(b) Maximum forecast sustained wind speeds in public advisories may deviate up to 15 knots from those forecast in the current military advisories, provided this does not change the category (depression/storm/hurricane) of the system. If the NHC determines an amendment to the Military Advisory is necessary because of a change only in winds, an amendment to the last Military Advisory will be issued which contains only this change in wind speed. This amendment will have the same number as the Advisory being amended and will also contain the amendment number. For example, if Military Advisory number 21 is being amended for the wind speed, it becomes the First Amendment to Military Advisory number 21. If the wind speed is changed again before the normal advisory time, it becomes the Second Amendment to Military Advisory number 21.

b. Content of Advisories. Advisories provided the Department of Defense will contain the following information:

(1) Time of issue.

(2) Heading, advisory number, amended, corrected, or relocated, type cyclone and name or number, and hour and day.

(3) Warnings in effect.

(4) Position, in degrees and tenths.

(5) Time of position in GMT.

(6) Accuracy of position.

(7) Present movement.

(8) Present winds:

(a) Maximum sustained winds and gusts.*

(b) Maximum sustained winds and gusts* more than 10 miles inland from the coast (Atlantic only).

(c) Radius of 64-, 50-, and 34-knot sustained winds (Atlantic only).

(d) Radius of 100-, 50-, and 34-knot sustained winds (Pacific only).

(9) Radius of seas 15 feet or higher (Atlantic only).

(10) Repeat center location and time.

(11)) Forecasts:

(a) The 12-hour forecast position:

1) Maximum sustained winds and gusts* in 12 hours.

2) Maximum sustained winds and gusts* over inland areas (Atlantic only).

3) Radius of 50-knot sustained winds in 12 hours.

(b) The 24-hour forecast position:

1) Maximum sustained winds and gusts* in 24 hours.

2) Maximum sustained winds and gusts* over inland areas (Atlantic only).

3) Radius of 50-knot sustained winds in 24 hours.

4) Radius of 34-knot sustained winds in 24 hours (Central Pacific only).

(12) Storm-tide forecast (not used in Central Pacific).

(13) Heavy precipitation forecast (not used in Central Pacific).

(14) Extended outlooks:

(a) The 48-hour outlook position:

*If sustained winds are 50 knots or greater.

1) Maximum sustained winds and gusts*in 48 hours.

2) Maximum sustained winds and gusts*over inland areas (Atlantic only).

3) Radius of 50-knot sustained winds in 48 hours.

(b) The 72-hour outlook position:

1) Maximum sustained winds and gusts.*

2) Maximum sustained winds and gusts*over inland areas (Atlantic only).

3) Radius of 50-knot sustained winds in 72 hours.

(15) Reconnaissance plans including scheduled fixes (Central Pacific only).

(16) Time of issuance for next Military Advisory.

*If sustained winds are 50 knots or greater.

c. Format. The format of advisories furnished the Department of Defense will be as shown in Form 1 of this chapter.

3. Tropical Cyclone Bulletin Issuances--Pacific. The EPHC-SFO and CPHC-HNL will issue and provide to the Department of Defense basic tropical cyclone forecasts and related information. Basic tropical cyclone forecasts will include advice as to location, movement, intensity, and dimensions of tropical cyclones. These forecasts and related information will be provided as shown on Form 1 (WS Form C-13) of this chapter.

a. Time and Circumstances of Issue of Bulletins for the Department of Defense. Initial Bulletins, Scheduled Bulletins, and Special Bulletins will be issued for existing tropical depressions in the same manner as advisories.

b. Contents of Bulletins. Bulletins provided the Department of Defense will contain the following information from WS Form C-13.

(1) Time of issue.

(2) Heading, bulletin number, tropical depression, tropical depression number (spelled out), and hour and day.

(a) The tropical depression numbers to be furnished by EPHC-SFO and coordinated with FWC Pearl Harbor and to CPHC-HNL by the JTWC/FWC Guam.

(b) Bulletin issuances will not be numbered sequentially with advisories by NHC-MIA.

(c) In the Eastern and Central Pacific, both bulletins and advisories will be numbered sequentially, that is, Bulletin Number 1, Tropical Depression ONE; Bulletin Number 2, Tropical Depression ONE; Advisory Number 3, Tropical Storm Anita; Advisory Number 4, Hurricane Anita; Bulletin Number 5, Tropical Depression ONE; etc. WOPN11 PHNL (Tropical Depression Bulletins on

WS Form C-13) and WHPA11 PHNL (Tropical Storm or Hurricane Advisories on WS Form C-13) will be numbered sequentially as indicated. WHPN11 PHNL (issuance in public format) will contain the advisory number assigned to the concurrently issued WHPA11 PHNL or WOPN11 PHNL.

(3) Position, in degrees and tenths.

(4) Time of position in GMT.

(5) Accuracy and basis for positions (basis will not be included in military advisory).

(6) Present movement.

(7) Present winds:

(a) Maximum sustained winds and gusts.

(8) Forecast and outlook:

(a) The 12- and 24-hour forecast position:

1) Maximum sustained winds and gusts in 12 and 24 hours.

(b) The 48- and 72-hour outlook positions, maximum sustained winds and gusts, and radius of 50-knot sustained wind (Central Pacific only).

(9) Reconnaissance plans including scheduled fixes (Central Pacific).

(10) Time of issuance for next Military Bulletin.

#4. Tropical Cyclone Discussions--Atlantic. The NHC will issue Tropical Cyclone Discussions at 0300, 0900, 1500, and 2100Z daily whenever advisories are being issued "FOR OFFICIAL USE ONLY". These Discussions, with preliminary prognostic positions up to 72 hours, will be for intragovernment use only, and dissemination will be in the same manner as the Military Advisory.

The Discussion will cover 24-hour forecasts, 24- to 48-hour forecasts, and 48- to 72-hour outlook as related to such items as synoptic features, objective techniques employed, and climatology. They will give reasons for intensity or track changes and will include plans for warnings display. (See example 1 in Appendix B.)

The Saffir/Simpson Hurricane (SSH) scale and the Rainfall Potential Index (RPI) (see Appendix A) will be included with the initial position whenever the tropical cyclone is within 72 hours of the U.S. coast or military installation.

The Marine/Aviation/Military Advisory will give the final forecast positions and will serve as the amendment to the preliminary forecast position in the Tropical Cyclone Discussion.

5. Tropical Weather Outlook - Atlantic. The NHC will issue a Tropical Weather Outlook three times a day during the period from June 1 through November 30. These will be issued at 0930, 1530, and 2130 GMT and distributed on all Radar Report (RAREP) and Warning Coordination (RAWARC) circuits and Circuits 7072 and GT22117. The Outlook will provide the general public and other user groups with: (1) assurance for areas in the main hurricane belt where conditions are stable, and (2) an addition 1- or 2-day notice for areas where conditions are becoming unstable, and favorable to tropical or subtropical cyclone inception.

6. Hourly Tropical Cyclone Position Estimates--Atlantic. The National Weather Service Hurricane Warning Office (HWO) that issues the public advisory will also issue hourly Tropical Cyclone Position Estimates when the tropical cyclone is under effective surveillance by land-based radar and within 200 nautical miles of the conterminous United States. These estimates will be distributed on Circuits 23421, 23420, and 7072 a short time before each hour, except for hours when advisories are issued. The Position Estimates will be available to the public and to other Federal agencies for relay to their own communications system.

7. Marine Weather Broadcasts by Coastal Radio Stations.

a. Atlantic Ocean. Tropical Storm and Hurricane Advisories for marine interests (Marine Advisories) are prepared by NHC at 0400, 1000, 1600, and 2200Z. The Marine Advisories are edited by the Weather Service Forecast Office (WSFO) Washington and then included in Part I (Warnings) of the weather broadcasts for high seas shipping transmitted by the following radio stations:

NAM - Norfolk, Va.
WOO - Ocean Gate, N.J.
NMF - Boston, Mass.

Other coastal radio stations transmit warnings and forecasts for offshore and coastal waters. Complete details of these broadcasts are found in Worldwide Marine Weather Broadcasts, a joint National Weather Service and Naval Weather Service publication.

The National Bureau of Standards Time Signal Station WWV broadcasts two 45-second segments of warning information for the North Atlantic hourly at H+8 and H+10.

b. Pacific Ocean. Marine Advisories are prepared by EPHC San Francisco and CPHC Honolulu at 0300, 0900, 1500, and 2100Z. They are edited and included in Part I (Warnings) of the weather broadcasts for high seas shipping which are transmitted by the following coastal radio stations:

KLC - Galveston, Tex.
WPA - Port Arthur, Tex.
WWD - LaJolla, Calif.
KFS - San Francisco, Calif.
KMI - Dixon, Calif.
KOK - Los Angeles, Calif.
NMQ - Long Beach, Calif.
KOU - San Pedro, Calif.
NMC - Point Reyes, Calif.
*KHK, KQM, KBP, and NMO - Honolulu, Hawaii

*Warnings only are broadcast.

Other coastal radio stations transmit warnings and forecasts for offshore and coastal waters. Complete details of these broadcasts are found in Worldwide Marine Weather Broadcasts, a joint National Weather Service and Naval Weather Service publication.

Radio WWVH, the time-signal radio station in Hawaii, transmits three 45-second segments of warning information for the North and South Pacific hourly at H+48, H+49, and H+50. WWV also transmits one 45-second segment of warning information for the eastern North Pacific at H+12.

8. Bulletins. The NHC-MIA, EPHC-SFO, and CPHC-HNL will make available to the Department of Defense any public bulletins issued by the National Weather Service regarding suspicious areas, tropical disturbances, and tropical depressions.

9. Distribution of Forecasts and Information. The National Weather Service will distribute tropical cyclone advice to the public. In the public advisory, wind speed and speed of translation will be given in miles per hour and distances in statute miles. Each of the other Federal agencies will arrange for its own internal distribution and will take appropriate action to insure that tropical cyclone advice issued for its internal use is not disseminated to the public.

10. Bulletins on Tropical Cyclones After Discontinuance of Advisories. The storm name will be retained until all bulletins have been discontinued on a tropical cyclone.

11. Bulletins on Subtropical Storms. The NHC will issue 6-hourly marine and military bulletins in plain language format and will include a 24-hour forecast on the intensity and track of subtropical storm systems. These systems will be designated by use of numbers. (See example in appendix B.)

12. Definition of Position Reliability (Form 1 of this Chapter, WS Form C-13).

Excellent: Position accurate to within 10 miles.
Good: Position accurate to within 20 miles.
Fair: Position accurate to within 40 miles.

When the position accuracy is greater than 40 miles, it will be expressed as:

Position accurate within_____miles.

Military Advisories will use nautical miles as the measure of distance for the preceding definitions.

WS Form C-13 (4-74)

NOAA/NATIONAL HURRICANE CENTER MARINE/AVIATION/MILITARY _____ *BULLETIN ADVISORY NUMBER_____ AMENDED CORRECTED RELOCATED

SUBTROPICAL STORM
TROPICAL DEPRESSION
TROPICAL STORM
HURRICANE

or

NOAA_____PACIFIC HURRICANE CENTER

_____ _____Z _____

(NAME/NUMBER*) (MONTH) (DAY) (YEAR)

(WARNINGS)

The Eastern and Central Pacific have made minor changes to the heading of this form for their use. The following indicates the second line of their heading:

_____ upgraded to tropical depression / downgraded from tropical storm hurricane _____ _____

(Name/Number) (Name/Number) (Time/Date)

DEPRESSION/STORM/HURRICANE CENTER LOCATED NEAR LATITUDE_____NORTH LONGITUDE_____WEST AT_____/_____Z.

POSITION EXCELLENT/GOOD/FAIR/ACCURATE WITHIN_____MILES BASED ON DOD/NOAA RECONNAISSANCE/**

LAND BASED RADAR/ACFT RADAR/SATELLITE/SHIPS/SYNOPTIC REPORTS/EXTRAPOLATION.

PRESENT MOVEMENT TOWARD THE_____OR_____DEGREES AT_____KT.

MAX SUSTAINED WINDS OF_____KT NEAR CENTER WITH GUSTS TO_____KT.

MAX SUSTAINED WINDS OVER INLAND AREAS_____KT WITH GUSTS TO _____KT.

* RAD OF 100 KT-WINDS_____NE_____SE_____SW_____NW QUAD.

RAD OF 64 KT-WINDS_____NE_____SE_____SW_____NW QUAD.

RAD OF 50 KT-WINDS_____NE_____SE_____SW_____NW QUAD.

RAD OF 34 KT-WINDS_____NE_____SE_____SW_____NW QUAD.

RAD OF SEAS
15 FT OR HIGHER _____NE_____SE_____SW_____NW QUAD. (Atlantic Only)

REPEAT CENTER LOCATED_____N_____W AT _____/_____Z.

12-HOUR FORECAST VALID_____/_____Z LATITUDE_____N LONGITUDE_____W.

MAX SUSTAINED WINDS OF_____KT NEAR CENTER WITH GUSTS TO_____KT.

MAX SUSTAINED WINDS OVER INLAND AREAS_____KT WITH GUSTS TO _____KT.

RADIUS OF 50-KT WINDS_____NE_____SE_____SW_____NW QUAD.

24-HOUR FORECAST VALID_____/_____Z LATITUDE_____N LONGITUDE_____W.

MAX SUSTAINED WINDS OF_____KT NEAR CENTER WITH GUSTS TO_____KT.

MAX SUSTAINED WINDS OVER INLAND AREAS_____KT WITH GUSTS TO_____KT.

RADIUS OF 50-KT WINDS_____NE_____SE_____SW_____NW QUAD.

(AVIATION ADVISORY ENDS HERE)

STORM-TIDE OF (Not used in Central Pacific)

HEAVY PRECIPITATION (Not used in Central Pacific)

(MARINE ADVISORY ENDS HERE)

48-HOUR OUTLOOK VALID_____/_____Z LATITUDE_____N LONGITUDE_____W.
MAX SUSTAINED WINDS OF_____KT NEAR CENTER WITH GUSTS TO_____KT.
MAX SUSTAINED WINDS OVER INLAND AREAS_____KT WITH GUSTS TO_____KT.
RADIUS OF 50-KT WINDS_____NE_____SE_____SW_____NW QUAD
72-HOUR OUTLOOK VALID_____/_____Z LATITUDE_____N LONGITUDE_____W.
MAX SUSTAINED WINDS OF_____KT NEAR CENTER WITH GUSTS TO_____KT.
MAX SUSTAINED WINDS OVER INLAND AREAS_____KT WITH GUSTS TO_____KT.
RADIUS OF 50-KT WINDS_____NE_____SE_____SW_____NW QUAD.

+ RECONNAISSANCE PLANS INCLUDING SCHEDULED FIXES_____

NEXT ADVISORY AT_____/_____Z. (FORECASTER_____)

(*FOR USE IN PACIFIC ONLY) (# FOR USE IN ATLANTIC ONLY) (+ CENTRAL PACIFIC ONLY)
(INLAND AREAS--MORE THAN 10 MILES FROM COAST)
(GUSTS INCLUDED WHEN MAXIMUM SUSTAINED WINDS REACH 50 KNOTS.)
(**FOR MILITARY ADVISORIES, DELETE REFERENCE TO BASIS FOR ACCURACY)
Note: Use of quadrants is optional in the Pacific.

CHAPTER 3
APPENDIX A

SCALES FOR ATLANTIC HURRICANES

#1. Saffir/Simpson's Hurricane (SSH) Scale

ONE.

(a) WINDS* 74-95 mph at standard anemometer elevations (F-scale 1.0-1.4).** Damage primarily to shrubbery, trees, foliage, and unanchored mobile homes. No real damage to building structures. Some damage to poorly constructed signs, or

(b) STORM SURGE (nominally 4-5 feet above normal). Low-lying coastal roads inundated, minor pier damage, some small craft in exposed anchorages break moorings.

TWO.

(a) WINDS 96-110 mph at standard anemometer elevations (F-scale 1.5-1.9). Considerable damage to shrubbery and tree foliage, some trees blown down. Major structural damage to exposed mobile homes. Extensive damage to poorly constructed signs. Some damage to roofing material, windows, and doors; no major damage to building structures, or

(b) STORM SURGE (nominally 6-8 feet above normal). Coastal roads and low-lying escape routes inland cut by rising water 2-4 hours before arrival of center. Considerable pier damage, marinas flooded. Small craft in unprotected anchorages break moorings. Evacuation of some shoreline residences and low-lying island areas required.

THREE.

(a) WINDS 111-130 mph at standard anemometer elevations (F-scale 2.0-2.4). Damage to shrubbery and trees. Foliage off trees, large trees blown down. Practically all poorly constructed signs blown down, some roofing material damage, some window and door damage, some structural damage to small residences and utility buildings, and mobile homes destroyed. Minor amount of curtainwall failures, or

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*Definition of a sustained wind (from Fujita and Simpson 1972) - A sustained wind is one which persists for the minimum time period to establish optimal dynamic forces on a nominal building structure.

**T. Fujita, 1971: "Proposed Characterization of Tornadoes and Hurricanes by Area and Intensity," University of Chicago (SMRP) Research Paper No. 91.

(b) STORM SURGE (nominally 9-12 feet above normal). Serious flooding at coast with many smaller structures near coast destroyed. Larger structures damaged by battering of floating debris. Low-lying escape routes inland cut by rising water 3-5 hours before center arrives. Terrain continuously lower than 5 feet may be flooded inland 8 miles or more. Evacuation of low-lying residences within several blocks of the shoreline may be required.

FOUR.

(a) WINDS 131-155 mph at standard anemometer elevations (F-scale 2.5-2.9). Shrubs and trees down, all signs down. Extensive roofing material damage, extensive window and door damage, complete failure of roof structures on many small residences, and complete destruction of mobile homes. Some curtainwall failure, or

(b) STORM SURGE (nominally 13 to 18 feet above normal). Terrain continuously lower than 10 feet may be flooded inland as far as 6 miles. Major damage to lower floors of structures near the shore due to flooding and battering action. Low-lying escape routes inland cut by rising water 3-5 hours before center arrives. Major erosion of beach areas. Massive evacuation of all residences within 500 yards of the shoreline may be required and of single-story residences on low ground within 2 miles of the shoreline.

FIVE.

(a) WINDS greater than 155 mph at standard anemometer elevations (F-scale 3.0 or greater). Shrubs and trees down, roofing damage considerable, all signs down. Very severe and extensive window and door damage. Complete failure of roof structures on many residences and industrial buildings. Extensive glass failures, some complete building failures, small buildings overturned and blown over or away, and complete destruction of mobile homes, or

(b) STORM SURGE (height nominally greater than 18 feet above normal). Major damage to lower floors of all structures located less than 15 feet above sea level and within 500 yards of the shoreline. Low-lying escape routes inland cut by rising water 3-5 hours before center arrives. Massive evacuations of residential areas situated on low ground within 5-10 miles of the shoreline may be required.

#2. Rainfall Potential Index (RPI)

The Rainfall Potential Index (RPI) is an experimental attempt to quantitatively estimate the total rainfall expected in a location directly in the path of the hurricane. The numerical value is obtained from vortex profile data (Chapter 4, Form 4), and has been scaled to approximate the

storm's rainfall in inches with values nominally ranging from one to ten. The computational formula is:

$$RPI = \frac{\sum_{i=1}^{16} M_i S_i}{10} \Big/ S_v$$

where:

i = 16 reporting points in Vortex Profile Pattern

S_v = $\frac{\text{Observed forward speed of the hurricane (kt)}}{12}$

M = Character of the precipitation (Table 10 of the Standard RECCO Code)

S = Duration of the precipitation (See Chapter 4, Form 4)

RPI = Rainfall Potential Index

The current RPI will be transmitted on the Tropical Cyclone Discussion next to the Saffir/Simpson Hurricane (SSH) scale when a hurricane is within 72 hours of landfall in the United States, Puerto Rico, or the Virgin Islands.

EXAMPLE OF ISSUANCES

EXAMPLE 1--TROPICAL CYCLONE DISCUSSION

FOR OFFICIAL USE ONLY

08/1500

NOAA NATIONAL HURRICANE CENTER
MIAMI TROPICAL CYCLONE DISCUSSION HURRICANE INEZ

ATTN WSFOS NMC/FD

A SATELLITE PICTURE AND AIR FORCE AIRCRAFT DATA THIS AM SHOW THAT THE CENTER OF INEZ IS WELL TO WEST OF PREVIOUS FIXES. THE PICTURE INDICATES A SMALLER AND WEAKER SYSTEM HOWEVER AIRCRAFT DATA DEPICTS A MINIMAL HURRICANE. SEQUENCE OF FIXES WITH PRESSURES AT HOTEL AND HATTERAS RATHER STEADY SUGGEST TIGHT LOOPING TRACK CAUSED BY THE UPPER CYCLONE WHICH DEVELOPED NEAR HATTERAS. CURRENT THINKING IS THAT THIS INFLUENCE HAS BEEN EXPENDED AND THAT INEZ WILL LOOP OR FLOUNDER UNTIL THE DOMINANT WESTERLIES...AS DEPICTED BY NMC 500 PROG VALID 09/12Z...TAKE OVER AND GRADUALLY CARRY INEZ AWAY FROM OUR SHORES. THE SANBAR DEPICTS A LOOP AND NONE OF THE OBJECTIVE TECHNIQUES PREDICT A LANDFALL. NO WATCHES OR WARNINGS...EXCEPT FOR SMALL CRAFT AND FOR BEACH CONDITIONS... HOWEVER ALL INTERESTS ARE ADVISED TO BE ALERT FOR SPECIAL ADVISORIES.

DOE

PRELIM PROG PSNS

INITIAL	08/1600Z	36.0N	73.2W	SSH ONE RPI TWO
12 HR VT	09/0000Z	35.5N	72.8W	
24 HR VT	09/1200Z	36.8N	71.8W	
48 HR VT	10/1200Z	39.8N	68.5W	
72 HR VT	11/1200Z	42.5N	62.0W	

EXAMPLE 2--SUBTROPICAL STORM MARINE/MILITARY BULLETIN.

WHNT11 KMIA 151600

NOAA NATIONAL HURRICANE CENTER BULLETIN NO. 4, SUBTROPICAL STORM ONE, 1600Z, OCTOBER 15, 1974.

THE SUBTROPICAL STORM WAS CENTERED NEAR LATITUDE 29.5N, LONGITUDE 57.5W AT 1600Z. THIS POSITION IS ACCURATE WITHIN 20 MILES.

THE PRESENT MOVEMENT IS TOWARD THE NORTH 10 KNOTS.

MAXIMUM SUSTAINED WINDS ARE 50 KNOTS WITH GUSTS TO 70 KNOTS. THE LOWEST CENTRAL PRESSURE IS 990 MILLIBARS. 34-KNOT WINDS EXTEND OUTWARD 200 MILES NORTH OF THE CENTER AND 50 MILES TO THE SOUTH.

24-HOUR FORECAST POSITIONS, VALID 16/1200Z, LATITUDE 33.0N, LONGITUDE 57.5W.

THE NEXT BULLETIN WILL BE ISSUED AT 16/2200Z.

DOE

ABBREVIATED HEADINGS FOR TROPICAL STORM MESSAGES

An abbreviated heading will be assigned to the first message issued for a storm and it will be used exclusively for that storm. Should other storms develop during the same period as the first storm, they will be assigned different individual abbreviated headings. These abbreviated headings will be reused after the storms they identify have dissipated in accordance with the instructions given below.

Since it is anticipated that no more than five storms will be in progress simultaneously, five abbreviated headings are authorized for each type of issuance.

1. Advisories. The abbreviated headings under which advisories on tropical storms and hurricanes are disseminated are as follows:

a. Public Format.

WHCA11 KMIA through WHCA15 KMIA
WHCA11 MJSJ through WHCA15 MJSJ
WHNT11 KBOS through WHNT15 KBOS
WHNT11 KDCA through WHNT15 KDCA
WHPN11 KSFO through WHPN15 KSFO
WHPN11 PHNL through WHPN15 PHNL

b. Marine/Aviation Format. (CPHC INCLUDES MILITARY)

WHCA21 KMIA through WHCA25 KMIA
WHPN21 KSFO through WHPN25 KSFO
WHPN21 PHNL through WHPN25 PHNL

c. Military Messages

WHNT11 KMIA through WHNT15 KMIA
WHPA11 KSFO through WHPA15 KSFO
WHPA11 PHNL through WHPA15 PHNL. (RESERVED)

2. Tropical Cyclone Discussion. The abbreviated headings under which tropical cyclone discussions are disseminated is as follows:

WHXX11 KMIA through WHXX15 KMIA.

3. Subtropical Storm Bulletins. These bulletins will be disseminated to marine interests using 1b and to military interests using 1c. The public special weather bulletin issued by an HWO will use the appropriate WWUS1 heading as shown in the RAWARC Manual.

4. Relationship of Heading to Storm Name. The relationship of the numbers in the abbreviated headings is to the first letter of the names of storms as follows:

11 and 21 for storms A, F, K, P, W
12 and 22 for storms B, G, L, R
13 and 23 for storms C, H, M, S
14 and 24 for storms D, I, N, T
15 and 25 for storms E, J, O, V.

Example: The first issuance on storm Ada may come from San Juan, and would be under the abbreviated heading WHCA11 MJSJ. WHCA21 KMIA, WHNT11 KMIA and WHXX11 KMIA would then be issued. While Ada is in progress, the first issuance on storm Belle may come from Miami, and would be under the abbreviated heading WHCA12 KMIA. WHCA22 KMIA, WHNT12 KMIA and WHXX12 KMIA would then be issued. While Ada and Belle are in progress, the first issuance on storm Candy may come from Miami, and would be under the abbreviated heading WHCA13 KMIA. WHCA23 KMIA, WHNT13 KMIA and WHXX13 KMIA would then be issued. At that point, issuances being generated would be under the abbreviated headings WHCA11 MJSJ, WHCA12 KMIA, WHCA13 KMIA, WHCA21 KMIA, WHCA22 KMIA, WHCA23 KMIA, WHNT11 KMIA, WHNT12 KMIA, WHNT13 KMIA, WHXX11 KMIA, WHXX12 KMIA, and WHXX13 KMIA with each abbreviated heading identifying the storm and format contained in each issuance. If storm Belle moved into the Washington area of responsibility, Washington would begin issuing WHNT11 KDCA messages (replacing the WHCA11 KMIA messages) so that all issuances on Ada would be under an abbreviated heading with 11 or 21 as the number.

#5. Bulletins. The abbreviated headings under which bulletins on tropical depressions and suspicious areas are disseminated are as follows:

a. Atlantic.

WOCA11 KMIA through WOCA15 KMIA
WOCA11 MJSJ through WOCA15 MJSJ
WONT11 KBOS through WONT15 KBOS
WONT11 KDCA through WONT15 KDCA

b. Pacific.

WOPN11 KSFO (MARINE/MILITARY) through WOPN15 KSFO
WOPN11 PHNL through WOPN15 PHNL

6. Relationship of Heading to Depression Number. The relationship of the numbers in the abbreviated headings is to the internal numbers of depressions as follows:

11 for depressions 1, 6, 11, 16, etc.
12 for depressions 2, 7, 12, 17, etc.
13 for depressions 3, 8, 13, etc.
14 for depressions 4, 9, 14, etc.
15 for depressions 5, 10, 15, etc.

7. Tropical Cyclone Position Estimates. The abbreviated headings under which tropical cyclone position estimates are disseminated are as follows:

a. Atlantic.

WHXX KBOS
WHXX KDCA
WHXX KMIA
WHXX MJSJ

b. Pacific.

WHXX KSFO
WHXX PHNL.

8. Tropical Weather Outlook. The abbreviated heading under which the tropical weather outlook is disseminated is ABCA KMIA.

9. Other Issuances. Special weather bulletins, local action statements, etc., are disseminated under abbreviated headings shown in the RAWARC Manual.

AIRCRAFT RECONNAISSANCE

1. General.

Current fiscal constraints under which the United States Government is operating require continuing efforts to insure that expenditure of any resource is accomplished in the most cost-effective manner possible. Aerial Weather Reconnaissance provided in support of the National Hurricane Operations Plan is an item of considerable recurring cost. Another compounding factor is the continuing shortage of aviation fuels. All agencies supporting this plan must insure that aerial reconnaissance missions are levied only after due regard has been given to the cost of the mission versus the value of the data to be obtained.

The basic criteria to consider when requesting reconnaissance support is that each sortie requested be essential to the immediate forecast problem.

#2. Responsibility.

a. Atlantic: The Department of Defense, backed up by the Research Facility Center (RFC), will have the operational reconnaissance responsibility for providing fixes and investigative flights on tropical cyclones in the Atlantic Ocean, Caribbean Sea, and Gulf of Mexico in accordance with the general priorities and procedures outlined below:

(1) Whenever a storm is forecast* to be within 300 nautical miles of the U.S. Coast, Puerto Rico, the Virgin Islands, or DOD installations, up to 8, 3-hourly fixes per day may be requested.

(2) Whenever a storm is forecast* to be within 500 nautical miles of landfall in the Gulf of Mexico, Caribbean, and North Atlantic west of 55°W. and north of 8°N., up to 4, 6-hourly fixes per day may be requested.

(3) Data on all storms within the remaining area of the Atlantic will be derived primarily from satellites, ships, and observations of opportunity.

(4) Investigative flights may be requested as required for disturbances in areas defined in paragraphs (1) and (2) above (i.e., 1 or 2 flights per day dependent upon proximity of landfall and upon known or suspected stage of development). NHOP requirements are satisfied on investigative missions when an observation is or could have been taken at the specified location within the interval from 1 hour before to 30 minutes after the scheduled time.

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*Forecast for the day of the reconnaissance flight.

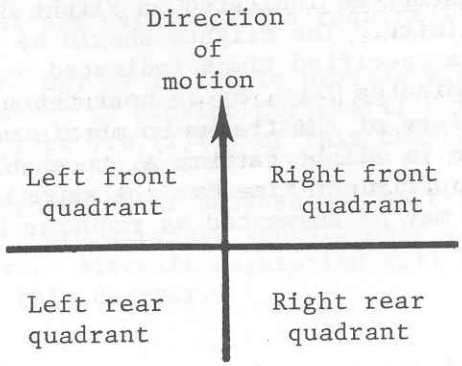
c. Investigative Reconnaissance: An investigative reconnaissance flight is a special mission to investigate the stage of development of a known tropical disturbance, specifically to determine: (a) whether a pressure center exists near the surface, and (b) the maximum low-level winds associated with the disturbance. Whenever possible, these flights shall be scheduled with on-station time during daylight hours.

3. Operational Control of Aircraft. Operational control of aircraft engaged in tropical cyclone reconnaissance will be exercised by the respective services which operate them.

4. Reconnaissance Requirements.

a. Atlantic:

(1) Standard Flight Patterns. Operational hurricane reconnaissance flights will fly the flight pattern (as shown and described in appendix A of this chapter) designated in the TCPOD. The flight tracks will use a quadrant system (see diagram below), based upon predicted direction of motion of the cyclone center in the last Military Advisory or the TCPOD before departure. Altitudes indicated in flight patterns are pressure altitudes, except those 5,500 feet and below. Any tasked pattern can be adjusted (without prior NHC approval) to match the capabilities or operational limitations of the aircraft or service concerned.



(a) Pattern A will be used for a steady state or quasi-steady state hurricane. Its objectives are to locate the center of the vortex and acquire vortex data, including two 6-hourly fixes.

(b) Pattern B will be used to acquire a vortex fix and vortex data on a tropical cyclone too distant to make two vortex fixes.

(c) Pattern C will be used for tropical cyclones in the decay or rapid intensification stage to provide two 6-hour vortex fixes, with a special requirement for equivalent potential temperature data at 27,000 feet or sea-surface temperature, sea level pressure, and wind data at 1,500 feet.

(d) Pattern D will be used for investigative missions to obtain pressure center, maximum sustained winds, and peripheral data at 1,500 feet. Deviation will be permitted from the forecast coordinates contained in the TCPOD to that position which the on-board weather officer determines to be the center of the disturbance he has been tasked to investigate. After the location of the disturbance center is determined, the Pattern designated in the TCPOD will be flown. The size of the Pattern flown will be adjusted to allow for remaining aircraft capabilities.

These flight patterns will be flown and vortex data obtained at specified flight altitudes within the limits of operational safety. A particular flight pattern is not restricted to any specific direction of motion.

#(2) Vortex or Center Fixes. Hurricane reconnaissance flights that are assigned operational responsibility for obtaining vortex fixes and profile data of the storm area (80-n.mi. radius of center) by quadrant have the highest NHC priority. All vortex fixes will be made preferably at 700 millibars (10,000 ft), except as indicated in Flight Patterns C and D, and within aircraft safety limits. The flights should be planned so that vortex fixes are obtained at the specified times indicated below within the range from 1 hour early to 30 minutes late, or as near those times as operational conditions permit. The legs of the tracks to obtain vortex peripheral data may be adjusted, as shown in Flight Pattern A, to enable the aircraft to return to the vortex in sufficient time for the second 6-hour fix. The frequency of these fixes may be augmented as required by NHC and as specified in the TCPOD.

1200Z (0700 EST) for forenoon reconnaissance.
1800Z (1300 EST) for afternoon reconnaissance.
0000Z (1900 EST) for evening reconnaissance.
0600Z (0100 EST) for night reconnaissance.

Flexibility for fix requirements is necessary. Whenever possible, flights should be planned to provide first and last light fixes in addition to synoptic time fixes. Three-hourly fixes should be scheduled only when a storm is in close proximity to landmasses or operating forces and when additional data are required to fix and forecast the storm movement accurately.

(3) Research Facilities Center (RFC). When the RFC is requested to fly operational missions, the standard operation patterns listed in appendix A of this chapter will be flown and operational data will be supplied.

The RFC will be conducting research flights in both seeded and unseeded storms on standard research patterns as shown in appendix B of this chapter. In addition, some nonstandard research patterns may occasionally be flown. The research pattern or nonstandard pattern by geographical coordinates will be specified in the TCPOD.

The RFC will conduct research or operational flights under one of the following four conditions after coordination with CARCAH, with the Director, NHC, and with the Director, National Hurricane and Experimental Meteorology Laboratory, as appropriate. When more than one aircraft is in the storm, separation will be as defined in paragraph 5.a.(1)(c) of this chapter. In all cases, safety of flight is of paramount importance.

(a) The RFC may fly research patterns in the storm between completion of one operational pattern tasked to the Department of Defense and the start of the next complete pattern. The RFC aircraft will enter late enough and depart early enough from the storm area to insure required separation.

(b) The RFC may be tasked to provide vortex and peripheral data, with no Department of Defense participation required.

(c) The RFC may be tasked to provide vortex data, with the Department of Defense tasked to provide peripheral data. Aircraft separation will be defined in paragraph 5.a.(1)(c) of this chapter.

(d) The Department of Defense may be tasked to provide vortex and peripheral data, with RFC aircraft concurrently satisfying requirements of research pattern Zebra. Aircraft separation will be as defined in paragraph 5.a.(1)(c) of this chapter.

b. Eastern Pacific:

Center Fixes. Operational hurricane reconnaissance flights will fly the flight pattern (as shown in appendix A) designated in the TCPOD. A plain-text message will be sent on the initial fix of the center of each flight. This message will be transmitted separately and as soon as possible in the interest of reducing time delay for delivery to EPHC-SFO. All radar fix reports will be made in plain text. The method of obtaining the location of the center should always be included in center position reports from

reconnaissance aircraft. The vortex should be located according to the priority in paragraph 9.a.(3), (a) through (d) of this chapter.

c. Atlantic and Eastern Pacific:

Cumulonimbus "Blowoffs." Direction of blowoffs from the tops of cumulonimbus clouds should be reported by flights operating below 25,000 feet. In the Atlantic, there is an additional requirement for this information east of longitude 60°W. as an aid in determining upper tropospheric winds.

5. Reconnaissance Planning and Flight Notification.

DOC Requests for Reconnaissance Aircraft:

The Director, NHC, will coordinate with EPHC-SFO to determine the total NOAA requirements for aircraft reconnaissance during the next 48 hours into tropical and subtropical cyclones. This coordinated request will be given to CARCAH not later than 1630Z each day. CARCAH will advise the NHC of the availability or nonavailability of U.S. Air Force, and RFC aircraft. The NHC will then determine and advise CARCAH of the NWS priorities for the next 48 hours if sufficient aircraft are not available and then inform the EPHC when any Pacific reconnaissance request cannot be filled.

a. Reconnaissance Tropical Cyclone Plan of the Day (TCPOD).

(1) Preparation. The TCPOD (Form 6 of this chapter) shall be prepared by CARCAH after consultation with the Director, NHC or his representative. When flights by the RFC are to be made, the Chief, RFC, or his designee, shall participate. Once a flight is assigned to the Atlantic in the TCPOD issued at 1800Z, that aircraft will not be reassigned to any other tropical cyclone mission.

The TCPOD will include an outlook for possible reconnaissance in the 24-48 hour period (item J, TCPOD, Succeeding Day). After CARCAH coordination, aircraft will be prepositioned to cover requirements beyond range from their CONUS home bases, for example, investigative flights east of the Antilles. There may be occasions when an aircraft will be deployed and then no reconnaissance requirement will develop on the succeeding day.

On a named storm, when advisories are being issued, the name of the storm will be entered in Item F (Storm or Forecast Position) in the TCPOD. The agency scheduled to fly reconnaissance on this storm is responsible for maintaining current forecast positions to insure meeting NHC fix-time requirements. The format of the TCPOD will list in chronological order such items as the reconnaissance flight(s) for each hurricane, storm, depression, and disturbance. Reconnaissance research flights that are not requested by NHC, but require a listing in the TCPOD, will be listed with the storm, etc., to which they apply after the NHC-requested flights are listed. In preparation of the Reconnaissance TCPOD, consideration will be given to the following:

(a) The data-gathering efforts of the available reconnaissance aircraft will be coordinated to effect procurement of the maximum amount of reconnaissance data.

(b) Although requirements for operational data are primary, every possible effort should be made to meet requirements for research data.

(c) Aircraft of more than one agency may operate simultaneously in the storm, and the aircraft having responsibility for obtaining the vortex fix will have priority for air traffic clearance. This aircraft will be designated the on-the-scene coordinator and, as such, will insure that:

1. If a positive method of maintaining lateral separation is available and two or more aircraft are operating in the vicinity of a storm, a vertical separation of 2,000 feet and/or a lateral separation of 30 nautical miles will be maintained.

2. If a positive method of maintaining lateral separation is not available, a vertical separation of 5,000 feet will be maintained.

3. Within the radius of the 50-knot wind (into the center of the storm), a 5,000-foot vertical separation will always be maintained when U.S. Air Force aircraft are involved.

4. Climb and/or descent will be made under Visual Meteorological Conditions (VMC) unless positive voice contact exists along with the means to determine lateral separation; that is, such means as radar or Tactical Air Navigation (TACAN).

5. Common ultrahigh frequency (UHF) or very high frequency (VHF) communications exist between aircraft.

(d) The aircraft Reconnaissance TCPOD, as coordinated and disseminated by CARCAH, assumes no responsibility for either vertical or horizontal separation of aircraft. The TCPOD involves aircraft used for both research purposes and operational missions in connection with storm reconnaissance. The Remarks section of the TCPOD will include appropriate comments whenever research and operational flights overlap.

(e) Amendments to the TCPOD will be prepared and disseminated in accordance with the foregoing procedures.

(f) The TCPOD will be prepared and disseminated daily during the period from June 1 through November 30.

(g) To satisfy Department of Defense needs in the storm environment, NHC patterns may be revised with NHC concurrence on a sortie-by-sortie basis. All unclassified tropical cyclone weather reconnaissance flights solely in support of Department of Defense requirements performed by the Air Force Weather Reconnaissance in the Atlantic area will be coordinated with CARCAH, included in the TCPOD, and specifically identified as Navy or Air Force required sorties.

(h) Weather reconnaissance organizations will be responsible for notifying CARCAH of any weather reconnaissance aircraft under their control that are anticipating flights into or near storm areas so that these flights may be coordinated in the TCPOD.

(i) Flight plans of reconnaissance aircraft flying in support of NHC into or through Warning Areas W-151, W-470 and W-497, controlled by Missile Test Ranges at Patrick Air Force Base (AFB), Fla., (Air Force Eastern Test Range) and Eglin AFB, Fla. (Eglin Gulf Test Range), will be coordinated by CARCAH. CARCAH will contact the controlling agency and attempt to obtain permission for reconnaissance aircraft to enter the areas; however final clearance responsibility rests with the aircraft commander or the agency unit operating the aircraft. Such coordination effected by CARCAH for an aircraft to enter an area constitutes permission only, and does not provide for a positive clearance. Therefore, risk caused by missile or rocket flight in the area is assumed by the aircraft commander and/or the agency operating the aircraft.

After coordination has been effected and there is no potential conflict, the TCPOD will contain the statement "FLIGHT PLAN COORDINATED WITH MISSILE TEST RANGE." This statement will serve to notify the appropriate Air Route Traffic Control Center (ARTCC) of the Federal Aviation Administration (FAA) that the flight has permission to enter the warning area. This statement should also be contained in the Remarks section of the aircraft flight plan to confirm further that the flight has permission to enter the warning area.

(j) The organization having operational control of aircraft expected to penetrate warning area (other than W-151, W-470, and W-497) during an NHC requested mission will have the primary responsibility for obtaining permission for their aircraft to enter the subject area. If access to a warning area is denied to an airborne aircraft, CARCAH will assist in obtaining access. In the event there is a potential conflict, coordination will be effected between CARCAH and NHC to adjust the requirements by either altering fix times, routes, or alternates to provide the required margin of safety.

(k) Flight plans for reconnaissance aircraft flying in support of EPHC, through controlled airspace, warning areas, etc., will be coordinated by the service responsible for the aircraft involved through the agencies or services controlling the airspace. Detailed procedures on flight planning, clearance, and reporting will be outlined in appropriate local Operations Order (OP-Order) or Letter of Instruction (LOI).

(2) Dissemination of the Reconnaissance TCPOD. The TCPOD will be made available to all appropriate agencies that provide support to or exercise control of missions. The CARCAH will be responsible for disseminating the TCPOD by 1800Z on the day preceding the planned missions to the Department of Defense, NHC, and FAA. The CARCAH will be advised immediately by the appropriate agency of any changes in the status of missions scheduled in the TCPOD; for example, delayed takeoffs or aborts.

The ARTCC at Miami will notify appropriate ARTCCs of the TCPOD immediately upon receipt.

b. Eastern Pacific--Request for Reconnaissance. The EPHC-SFO shall inform the Director, NHC, or his representative, whenever there is an aircraft reconnaissance requirement for eastern or central Pacific tropical cyclones. During this coordination, they will determine the total NOAA requirement for reconnaissance for the following 48 hours and their priorities. This conference shall not be later than 1600Z. The Director, NHC, will inform the EPHC whenever aircraft are not available to meet their requirements. The EPHC will notify the CPHC when their requests cannot be filled.

c. Central Pacific--Request for Reconnaissance. The CPHC-HNL will coordinate, through a conference call with EPHC-SFO, all reconnaissance requirements for tropical cyclones in their area of responsibility. The deadline for requesting their reconnaissance will be 1545Z on the day preceding the wanted flight. An outlook for the following 48 hours should be given.

#d. Flight Patterns--Atlantic. Any additional operational and RFC research flight patterns will be filed with FAA for information.

#e. Flight Plans. The flight plans for hurricane reconnaissance flights will be filed with FAA as soon as practicable (at least 2 hours in advance is desirable) before departure time. In the Atlantic, NHC will be included as an information addressee (KMIAYM).

f. Reconnaissance Flights--Atlantic:

(1) Flight Tracks. The U.S. Air Force will advise FAA of changes in routine Gull flight tracks by forwarding planned changes as appropriate to the following ARTCC's: Houston, Miami, Jacksonville, Washington, D.C., New York, Boston, and San Juan, allowing 30 days' notice before implementation of the changes.

(2) Flight-Level Changes. Gull flights will accept flight-level changes when requested by FAA.

(3) Flight Levels. Only ARTCC-assigned flight levels will be flown. Block altitudes to permit flight exactly at a standard pressure level will not be requested.

#(4) Dropsondes. Dropsonde release will be coordinated with the appropriate ARTCC at least 10 minutes before droptime, except for those released in the eye of a storm or outside of control airspace (airways and control zones) which do not require coordination (see note (5), page 55 of this Plan).

6. Aircraft Reconnaissance Communications.

a. Atlantic:

(1) Appropriate Joint Army, Navy, Air Force Procedures (JANAP) and Allied Communication Procedures (ACP) will be used when contacting Air/Ground (A/G) stations. All activities will comply with procedures outlined in ACP 121 US Supp. 2 with respect to message headings, date-time groups, and monitoring systems which are external to the message text in formatting messages for transmission to applicable ground stations.

#(2) U.S. Air Force flights will use communications procedures as shown in appendix C of this chapter.

#(3) RFC aircraft will utilize U.S. Air Force Aeronautical Station facilities as shown in appendix C of this chapter.

(4) When two or more reconnaissance aircraft are operating in the storm center, the dropsonde sounding shall be coordinated by the on-the-scene coordinator.

#(5) When two or more reconnaissance aircraft are operating in the storm area, voice communications between the aircraft will be established and conducted on:

VHF frequency 123.05 MHz
UHF frequency 304.8 MHz
HF frequency 4701 kHz.

If initial contact fails on these frequencies, the following will be used to establish communications:

UHF Guard frequency 243.0 MHz
VHF Guard frequency 121.5 MHz.

Prefix GULL will be used for contacting U.S. Air Force aircraft and NOAA for RFC. As the aircraft approaches the storm area, calls will be made on the hour and every 15 minutes thereafter until contact is established.

b. Eastern Pacific:

(1) Appropriate JANAP and ACP will be used when contacting A/G stations. All activities will comply with procedures outlined in ACP 121 US Supp. 2 with respect to message headings, date-time groups, and numbering systems which are external to the message text in formatting messages for transmission to applicable ground stations.

(2) Air Traffic Control (ATC) Communications. Normal ATC procedures will be followed. Should it be necessary to use other A/G communications, appropriate relay instructions will be included in the message.

(3) All hurricane aircraft reconnaissance reports received by the Mather Monitor will be expeditiously transmitted to KAWN for relay to NWS circuitry and distribution to the EPHC-SFO.

(4) Hurricane aircraft reconnaissance reports for areas west of longitude 130°W. received by the Mather Monitor will be relayed expeditiously to CPHC-HNL if it appears that the storm system will be entering CPHC's area of responsibility.

#7. U.S. Air Force ATC Communications--Atlantic. U.S. Air Force aircraft operating within the San Juan, Houston, Miami, and New York Flight Information Regions (FIRs) will conduct ATC A/G communications with the following facilities in priority as listed:

a. U.S. Air Force Aeronautical Stations--MacDill AFB, Fla.; Loring AFB, Maine; and Albrook AFB, C.Z.

b. FAA Stations--6568 kHz (Miami, New Orleans, La., New York, and San Juan).

c. ARINC Stations as contained in current DOD Flight Information Publication Enroute--Supplement.

8. Air-Ground Communications with FAA Stations--Atlantic. If the primary A/G communications outlined in appendix C fails, reconnaissance aircraft may transmit their hurricane data in plain language by voice to WBR (Miami), WSY (New York), MSY (New Orleans), or WRW (San Juan) in that order of priority. Such messages should be addressed to KMIAYM. The appropriate FAA stations will relay the data to NHC.

#9. Aerial Reconnaissance Weather Encoding and Reporting:

a. Atlantic and Eastern Pacific:

(1) A uniform system of identification and continuity of weather and hurricane reconnaissance reports will be followed. Meteorological reports from reconnaissance flights will be coded and transmitted in reconnaissance code (RECCO). RECCO reports will be sent at least hourly until the aircraft is within 200-nautical-mile radius of the center of the storm. Then reports will be sent at least every 30 minutes.

(a) U.S. Air Force will follow RECCO and dropsonde encoding procedures as outlined in AWSR 105-25 and 9WRWR 105-1, Vol. I.

(b) NOAA/RFC will follow RECCO and dropsonde encoding procedures as outlined on WS Form G-12, RECCO Code, and World Meteorological Organization (WMO) guidelines.

(2) The following is a description of the minimum RECCO report content that is desirable.

(a) Include all mandatory groups (first 8 groups of the RECCO code) plus optional groups 4ddff, and/or $5DFSD_k$, and 99999 GGggi ddfff TTT_dT_dw mjHHH as shown in appendix A of this chapter.

(b) Plain language will be appended to include a brief description of significant or unusual features observed since the last observation, including radar patterns indicative of organization. Any evidence of tornadoes, water spouts, or funnel clouds within 200 nautical miles of land should also be reported in this manner.

(c) Supplementary hurricane reconnaissance data taken along the peripheral legs will be appended to the routine reports.

(d) For suitably equipped aircraft, the sea-surface temperature (SST) will be reported in degrees and tenths Celsius following the mandatory RECCO groups and optional groups as shown in appendix A.

(e) Following the last group of the RECCO report, the coded latitude and longitude groups, flight level wind group and/or surface wind groups will be repeated.

(f) If differences arise between the coding procedures (recon only) of differing agencies, CARCAH will attempt to alleviate the problem in accordance with the needs of NHC.

(3) Vortex Data: All observed vortex or center fix information will be included in the Detailed Center/Vortex Data Message (Form 2 of this chapter). A plain-text message (Form 1 of this chapter) will be sent on all fixes of the center or vortex for each flight. This message will be transmitted as soon as possible in the interest of reducing time delay for delivery to NHC. All radar fix reports will be made in plain text (Form 3 of this chapter). The method of obtaining the location of the vortex should always be included in center position reports from reconnaissance aircraft.

The vortex should be located according to the following priority:

(a) Pressure vortex. This is obtained by proper flight patterns to locate the position of the lowest surface pressure.

(b) Wind vortex. If practicable, this is to be used to obtain accurate observations of spot winds.

(c) Cloud vortex. This is obtained within the eye by visual and/or radar observations.

(d) Radar eye. This is obtained by coverage of the storm from outside the eye.

All aircraft center or vortex fixes will be reported in degrees and minutes.

(4) Vortex Profile Data. Penetration and collection of vortex data will normally start at 700 millibars (10,000 ft) and at a radius of 80 nautical miles from the center as indicated by aircraft radar. Patterns will be flown and data collected as indicated in appendix A to this chapter.

The storm vortex profile data to be collected are:

(a) Central Pressure. When reconnaissance aircraft have entered the eye, central pressure should be obtained by dropsonde observations at the center while height observations should be obtained at and in close proximity to the center, preferably at 700 millibars (10,000 ft), so that the central pressure at the surface may be accurately calculated. As a minimum, these data should be obtained at 6-hour intervals whenever a storm (tropical cyclone) is within 30 hours of landfall.

(b) Wind Profile. The flight-level wind speed profile should be obtained from 80-nautical-mile radius to the center at the designated flight-pattern altitude. The maximum radial distance from the center of the 64-, 50-, and 34-knot values should be observed in each quadrant. Surface wind speed profile, when observed, should be included in the Remarks section of the Supplementary Vortex Data/Message (Form 4 of this chapter).

(c) Maximum D-Value Profile. During the transit of all quadrants, the D-value (in ft) radial profile will be reported at the center and at the 15-, 30-, 45-, and 80-nautical-mile radius from the center.

(d) Temperature and Dew-Point Profile. During the transit of all quadrants, a temperature and dew-point profile will be made at the center and at the 15-, 30-, 45-, and 80-nautical-mile radius from the center.

(e) Height of Eye Wall. The height of the eye wall will be reported by quadrant.

(f) Precipitation. The character and extent of precipitation will be reported at the 15-, 30-, 45-, and 80-nautical-mile radius positions in all quadrants.

These data will be transmitted in the Supplementary Vortex Data Message (Form 4 of this chapter).

(5) Vortex Peripheral Data. After the vortex fix, the reconnaissance aircraft will proceed along the prescribed flight pattern at 1,500 feet, or 10,000 feet except that Flight Pattern C will be at either 1,500 or 27,000 feet to collect data for operational forecasts. Observations will be made at each alphabetic point on the tracks. (See appendix A of this chapter.) Three or four intermediate observations will be made at equidistant intervals (60 to 80 n.mi.) along each leg of the track. Because the length of these legs is flexible, the intermediate observation points should be determined before departure on each leg. The data to be collected are: wind, temperature, dew point, D-value or sea level pressure, and sea-surface temperature. The data will be transmitted as soon as practicable after each standard observation point in standard RECCO (see Form 5 of the chapter).

#(6) Inflight Summary. A summary of the pertinent meteorological data observed is required and should be transmitted inflight whenever sufficient data for a detailed vortex message cannot be collected. The reason for the nonavailability of the detailed vortex data message should be included. This report will also contain all significant additional information not previously transmitted in RECCO reports on detailed center data and will be transmitted as soon as feasible.

#(7) Post Flight Summary. The flight meteorologist should prepare a summary of pertinent meteorological data observed during the reconnaissance flight. In the Atlantic, the summary should be sent "FOR OFFICIAL USE ONLY" over circuit GT 22117 with the heading ABXN KNCF. Carswell Automatic Digital Weather Switch (ADWS) will maintain this heading in its Message Distribution Library with no routing specified in order to preclude further dissemination of this message. In the Pacific, the flight meteorologist will telephone it to the EPHC San Francisco or CPHC Honolulu, as appropriate.

#(8) Mission Identifier. Each reconnaissance report will include the mission identifier. The identifier will be a part and constitute the opening text of each message. Regular weather and hurricane reconnaissance missions will include the agency indicator--AIR FORCE GULL for U.S. Air Force (USAF) and NOAA for NOAA/RFC--followed by the numerical mission number for a particular storm (1, 2, etc.), the storm/track/investigative name (such as BETSY, INDIA, or INVEST), and the numerical sequence of the report during the flight (1--end of flight).

EXAMPLES:

First named tropical cyclone, first mission by USAF, first report--
AIR FORCE GULL 1 AMY 1.

First named tropical cyclone, second mission by USAF, tenth report--
AIR FORCE GULL 2 AMY 10.

Second named tropical cyclone, first mission by NOAA/RFC, sixth report--
NOAA 1 BETSY 6.

First investigative mission by USAF, second report--
AIR FORCE GULL 1 INVEST 2.

(a) For investigative/special flights, the numerical mission number will start with 1 for each agency at the beginning of the hurricane season and will continue consecutively within the agency throughout the season.

(b) CARCAH is responsible for assigning mission identifiers on all flights requested and/or diverted by NHC. The mission identifiers will be assigned or confirmed in the TCPOD.

(9) Observation Numbering and Content:

(a) The first weather message will be an out/departure message and will include departure station (ICAO--International Civil Aviation Organization--four-letter designator), time of departure, and estimated time of arrival (ETA) for the coordinates or storm.

#EXAMPLES

AIR FORCE GULL 10 INVEST 1
DPTD KBIX AT 10/2100Z ETA 31.5N 75.0W AT 11/0000Z.

AIR FORCE GULL 27 INVEST 1
DPTD FOXTROT TRACK AT 05/1438Z ETA 18N 85W AT 05/1615Z.

(b) All observations (such as departure, RECCO, center, supplemental, and dropsonde) from the first to the last will be numbered sequentially. There is, however, one exception: When a standard synoptic-track mission is diverted to an NHC-requested investigative or storm mission, the first observation from the diverted aircraft will be an out-departure message giving time of diversion and other required data as in the second example above. This becomes observation 1 of the newly assigned mission.

#(c) When an investigative flight becomes a named-storm flight, the observation numbers will continue sequentially. However, on the first observation under the storm name, a remark on the name change is appropriate such as:

AIR FORCE GULL 1 AMY 9
97779 TEXT TEXT.....OBS 1 THRU 8 XMTD AS AIR FORCE GULL 7 INVEST.

(d) The final weather message will be transmitted AFTER the aircraft reaches the destination that terminates the mission. This will be the last-numbered observation and will include: where aircraft landed (ICAO four-letter designator), actual time of arrival (ATA), number of observations (includes RECCO, center data, first, last, but not drops or oceanographic messages), number of dropsonde and oceanographic observations transmitted, and the monitor station(s) that copied the observations.

EXAMPLE:

AIR FORCE GULL 33 INVEST 16
ARVD KCOF 15/2300Z 14 OBS 2 DROPS 1-16 KMCF.

INITIAL TROPICAL CYCLONE CENTER/VORTEX REPORT

_____

_____

AIR FORCE
*NOAA _____ _____ _____ CENTER/VORTEX LOCATED BY_____

AT_____DEGREES_____MINUTES NORTH_____DEGREES_____

MINUTES WEST AT_____ _____ _____ _____ZULU

CENTRAL PRESSURE_____MB. FLGT LVL_____METERS. MAX WIND LEFT REAR

QUAD_____KTS. 700 MB HEIGHT_____METERS.

*NOAA participates only in the Atlantic area.

1. The first center fix obtained on each flight will be dispatched as rapidly as possible using Form 1.

2. This form is used in the Atlantic and Eastern Pacific areas.

3. Flight level, max wind left rear quad, and 700 mb height are optional items for initial reports in the EPHC area whenever collection of such data would cause delays resulting in late fixes. Whenever adequate time is available, all data should be reported in all areas.

DETAILED CENTER/VORTEX DATA MESSAGE			ADDRESSEE(S)
MISSION NUMBER	DATE	SCHEDULED FIX TIME Z	
AIRCRAFT COMMANDER	AIRCRAFT NUMBER	ARWO	
SIMULTANEOUS FIX WITH OTHER AIRCRAFT /___/ Yes /___/ No	TRANSMISSION TIME Z	GROUND STATION RECEIPT TIME Z	PRECEDENCE: IMMEDIATE
MESSAGE HEADING			

A	SQUADRON CALL SIGN	MISSION NUMBER	CYCLONE STORM NAME	OBS NUMBER	
B		Z			B. DATE AND TIME OF FIX (Zulu)
C	DEG	Min N S			C. LATITUDE VORTEX/CENTER FIX (Degrees/Minutes) (Circle N or S)
D	DEG	Min E W			D. LONGITUDE VORTEX/CENTER FIX (Degrees/Minutes (Circle E or W)
E	/				E. CENTER DETERMINED BY/: (Enter appropriate number) 1 - Penetration; 2 - Radar (indicate aircraft position and wall cloud data in Sec. S, REMARKS); 3 - Wind; 4 - Pressure; 5 - Other. FIX LEVEL: 0 - Surface; 1 - 1500 Feet; 8 - 850 MB; 7 - 700 MB; 5 - 500 MB; 4 - 400 MB; 3 - 300 MB; 2 - 200 MB; 9 - Other (Radar)
F	/	NM1			F. NAVIGATION FIX AND METEOROLOGICAL ACCURACY (in nautical miles)
G		MB			G. MINIMUM SEA-LEVEL PRESSURE (in millibars). (Computed, unless otherwise stated).
H	MB	M			H. MINIMUM HEIGHT AT STANDARD LEVEL (millibars/meters).
I		K			I. ESTIMATE OF MAXIMUM SUSTAINED SURFACE WIND OBSERVED WITHIN FLIGHT PATTERN FLOWN (in knots).
J	° /	NM1			J. BEARING AND RANGE FROM CENTER OF MAXIMUM SURFACE WINDS J. (Degrees, nautical miles).
K	DEG	K			K. MAXIMUM FLIGHT LEVEL WINDS WITHIN FLIGHT PATTERN FLOWN (degrees and knots).
L	° /	NM1			L. BEARING AND RANGE OF MAXIMUM OBSERVED FLIGHT LEVEL WINDS FROM CENTER (Degrees and Nautical Miles).
M	°				M. MAXIMUM FLIGHT LEVEL TEMPERATURE INSIDE THE EYE (degrees Celsius).
N	°				N. MAXIMUM FLIGHT LEVEL TEMPERATURE OUTSIDE THE EYE (degrees Celsius).
O	M /	M			O. ABSOLUTE ALTITUDE OUTSIDE/INSIDE EYE (meters)
P	°/ Min N S : °/ Min E W :				P. CONFIRMATION OF FIX. Position (Degrees/Minutes); Date and Time (Zulu)
					Q. EYE SHAPE/ORIENTATION/DIAMETER, Code eye shape as: C - Circular; CO - Concentric; E - Elliptical. Transmit orientation of major axis in tens of degrees, i.e., 01-010 to 190; 17-170 to 350. Transmit diameter in nautical miles. Examples: C8 - Circular eye 8 miles in diameter. E09/15/5 - Elliptical eye, major axis 090-270, length of major axis 15 NMi, length of minor axis 5 NMi. CO8-14 - Concentric eye, diameter inner eye 8 NM1, outer eye 14 NMi.
R					R. EYE CHARACTER: Closed Wall, Poorly Defined, Open SW, etc.
S					S. REMARKS (Storm movement data should not be included in this section.)
T	°/ Min N S °/ Min E W				T. AIRCRAFT POSITION IF RADAR FIX (Degrees/Minutes).

INSTRUCTIONS: Make every effort to eliminate ambiguous or misleading statements. Use authorized contractions. Transmit in flight only that portion beginning with "Message Heading." Significant clouds observed in the Vortex/Center should be reported under "Remarks" or be summarized in the written Post-Flight Report. Enter "N/A" for items that are not available.

FORMAT TO BE USED WHEN REPORTING RADAR CENTER FROM OUTSIDE EYE APPENDED TO RECCO CODE (1)

AIR FORCE
*NOAA _____ 97779 11304 10189 68466 -----etc.-----X

(RADAR EYE)
(RADAR EYE BY HOLE IN SEA RETURN) (Note 1) CNTRD (AT) (NEAR) (Note 2)_____

DEGREES _____ MINUTES NORTH _____ DEGREES _____ MINUTES WEST X

CNTR SELECTION (POSITIVE) (GOOD) (FAIR) (Note 3) X LOCATION (POSITIVE) (GOOD) (FAIR) (Note 4) X

NAV (Note 5) ACCURATE WITHIN _____ MI BY (LORAN)

(CELESTIAL) (RADAR) (TACAN#) (DOPPLER) (DEAD RECKONING) _____

(RADAR WEATHER REMARKS) (NOTE 6).

*NOAA participates only in the Atlantic.
#Tactical Air Navigation (Radio).

(1) This form is used in the Atlantic and Eastern Pacific areas.

AMPLIFYING NOTES

1. a. "RADAR EYE" is obtained by coverage of the storm from outside the eye.

   b. "HOLE IN SEA RETURN" is used only when the eye is detected in this manner. Experience has shown that a well-organized tropical storm or hurricane traveling at slow or moderate speeds in the open ocean presents a field of intense and widespread surface clutter or sea return. The sea return is primarily wave-face reflection, but may include hydrometeor reflection from airborne spray in the higher velocity wind areas. Depending upon the aircraft altitude, range to the center, and antenna tilt, the eye of the storm can usually be revealed as a circular area of comparatively light or no sea return. This is interpreted as a function of the circulation and may vary slightly in position with the apparent center of the precipitation pattern.

2. The word "AT" or "NEAR" will be used to indicate the overall reliability of the present solution of the center report problem; that is, the report represents a summation of the individual accuracies applicable to identification and location solutions which may or may not include aircraft navigation. When all considerations indicate the center target to be significant, conservative, and its reported position to be accurate to within 10 nautical miles, "AT" will be used, otherwise "NEAR."

   "AT" will be used with "SELECTION POSITIVE," "LOCATION POSITIVE."
   "AT" may be used with "SELECTION POSITIVE," "LOCATION GOOD."
   "AT" may be used with "SELECTION GOOD," "LOCATION POSITIVE."
   "AT" could possibly be used with "SELECTION GOOD," "LOCATION GOOD."

3. The reliability of the selection of a center target will be indicated in three categories. In every case, interpretation of a storm center will be based on a continuous scope observation during which the aircraft altitude, antenna tilt, and other principal factors have been duly considered.

   a. Selection "POSITIVE" will be used:

      (1) For all cases where a "HOLE IN SEA RETURN" is reported.

      (2) For persistent characteristic precipitation patterns detected with an inner periphery comprising at least one-half of a complete circle and the radius of curvature is 10 nautical miles or less.

   b. Selection "GOOD" will be used for persistent characteristic precipitation patterns composed of arcs, crescents, curved bands, or spirals whose inner periphery comprises less than one-half of a complete circle and/or the radius of curvature is greater than 10 nautical miles.

c. Selection "FAIR" will be used:

(1) For those cases where through aircraft probing or other means the observer is confident that a given area involves a storm center but the precipitation patterns on radar are weak, poorly organized, or define such a large eye area that center selection with a 10-nautical-mile accuracy cannot be accomplished with confidence.

(2) When the characteristic precipitation target lacks reasonable persistence or loses continuity by evolution of its defining elements.

(3) When continuous observation of the eye target is seriously hampered by severe ground clutter interference, partial electronic failure, or unusually adverse maneuvering requirements.

4. An evaluation of the accuracy of the center target-location computation will be indicated in one of three categories. When the radar scope presentation includes two or more usable terrain targets as well as the storm center target, location of the latter can be accomplished accurately and independently of the aircraft navigation.

a. Location "POSITIVE" will be used:

(1) When a combination of three or more ranges and/or bearings from terrain targets fall within a mutual tolerance of 4 nautical miles.

(2) When center target range and bearing from the aircraft are plotted from a simultaneous ground-wave loran fix, and when this position agrees with a radar line of position plotted from a terrain target.

(3) With Omega or similar type of sophisticated navigation equipment.

b. Location "GOOD" will be used:

(1) When center target range and bearing from the aircraft are plotted from a simultaneous ground-wave loran or three-star celestial fix.

(2) When center target location is determined by radar range and bearing data from a single terrain target.

c. Location "FAIR" will be used:

(1) When center target lines of position by radar from terrain features fail to fall within a mutual tolerance of 10 nautical miles.

(2) When center target location is relative to the aircraft position determined by dead reckoning, substandard loran, or radio direction-finding.

5. Navigation accuracy will be reported only when it enters directly into the center target-location problem.

6. Description of radar precipitation targets includes items such as: Character (stratiform or cumuliform), shape, intensity, location, extent, and height of major cells in various regions.

7. Operational information.

8. Plain-language remarks should be used to the maximum when appropriate. However, observers must pay particular attention to the avoidance of any statement which might be construed to be of a forecast nature.

SUPPLEMENTARY VORTEX DATA/MESSAGE

Date | Time | Z to Z

Acft Type | Unit | Observer

MESSAGE HEADING

DTG

Mission Identifier | Ob. No.

VORTEX DATA PROFILE | AZIMUTH

1	2	3	4	5
LEFT	REAR	QUAD	IWALL	hhhhh
6 80ZZZ 80	7 45ZZZ 45	8 30ZZZ 30	9 15ZZZ 15	10 00ZZZ 00
11 8TTQQ 8	12 4TTQQ 4	13 3TTQQ 3	14 1TTQQ 1	15 0TTQQ 0
16 MXFFF MX	17 000RR	18 64RRR 64	19 50RRR 50	20 34RRR 34
21 80WMS 80	22 45WMS 45	23 30WMS 30	24 15WMS 15	25
26	27	28	29	30 hhhhh
RIGHT	FRONT	QUAD	IWALL	
31 80ZZZ 80	32 45ZZZ 45	33 30ZZZ 30	34 15ZZZ 15	35 00ZZZ 00
36 8TTQQ 8	37 4TTQQ 4	38 3TTQQ 3	39 1TTQQ 1	40 0TTQQ 0
41 MXFFF MX	42 000RR	43 64RRR 64	44 50RRR 50	45 34RRR 34
46 80WMS 80	47 45WMS 45	48 30WMS 30	49 15WMS 15	50
51	52	53	54	55 hhhhh
LEFT	FRONT	QUAD	IWALL	
56 80ZZZ 80	57 45ZZZ 45	58 30ZZZ 30	59 15ZZZ 15	60 00ZZ 00
61 8TTQQ 8	62 4TTQQ 4	63 3TTQQ 3	64 1TTQQ 1	65 0TTQQ 0
66 MXFFF MX	67 000RR	68 64RRR 64	69 50RRR 50	70 34RRR 34
71 80WMS 80	72 45WMS 45	73 30WMS 30	74 15WMS 15	75
76	77	78	79	80 hhhhh
RIGHT	REAR	QUAD	IWALL	
81 80ZZZ 80	82 45ZZZ 45	83 30ZZZ 30	84 15ZZZ 15	85 00ZZZ 00
86 8TTQQ 8	87 4TTQQ 4	88 3TTQQ 3	89 1TTQQ 1	90 0TTQQ 0
91 MXFFF MX	92 000RR	93 64RRR 64	94 50RRR 50	95 34RRR 34
96 80WMS 80	97 45WMS 45	98 30WMS 30	99 15WMS 15	100 .

REMARKS:

80, 45, 30 - 15, 00 - Group indicators. The indicator designates the distance from the center (nautical miles) that a report will be taken. These same reporting points are indicated in the TTQQ group by the numbers 8, 4, 3, 1 and 0.

hhhhh - **height of the eyewall (feet).**

ZZZ - "D" value (tens of feet). Add 500 to the absolute values for negative values and if the value is greater than 1,000 indicate by plain language in the remarks section.

TTQQ - Temperature/Dewpoint (degrees Celsius). Add 50 to the absolute value for negative values.

FFF - Maximum wind speed (kts.).

000RR - Bearing and range of the maximum wind from the center.

RRR - Radial distance (nautical miles of the 64kt, 50kt and 30kt isotachs from the center.

W - Present weather (table 9 of the standard RECCO code).

M - Character of the precipitation (table 10 of the standard RECCO code). The numbers 6-9 will not be used.

S(0) - none encountered since the last observing point.

S(1) - reported at the present or past position but covering less than half of the distance between positions.

S(2) - reported at the present or past position but covering more than half the distance between positions.

S(3) - continuous since the last position.

// - data are unknown or unobtainable

MONITOR TOR

WS Form G-12
11-70
(Formerly WB Form 611-6)

RECCO CODE

(Aerial Meteorological Reconnaissance Reporting Code)

U. S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

Section	Code	Description	SEE TABLE	SEE NOTE
Section 1 – MANDATORY	9 xxx 9	Group	1	8
	GGgg	Time (GCT) of Observation (hours and minutes)	–	9
	i_u	Humidity Indicator	2	–
	Y	Day of Week	3	9
	Q	Octant of Globe	4	–
	$L_aL_aL_a$	Latitude (in tens, units, and tenths of degrees)	–	10
	$L_oL_oL_o$	Longitude (in tens, units, and tenths of degrees)	–	10
	B	Turbulence	5	11
	f_c^t	Flight Conditions	6	12
	hhh	True Altitude of Aircraft (100s of ft. or decameters above m. s. l.)	–	13
	d_t	Type of Wind at Flight Altitude	7	14
	d_a	Reliability of Wind at Flight Altitude	8	15
	dd	Wind Direction at Altitude "hhh" (10s of degrees, true)	–	15
	fff	Wind Speed at Altitude "hhh" (knots)	–	15
	TT	Temperature (in Whole Degrees Celsius)	–	16
	T_dT_d	Dew Point (in Whole Degrees Celsius)	–	17
	w	Present Weather	9	18
	m	Remarks on Present Weather	10	19
	j	Index pertaining to HHH	11	–
	HHH	Altitude and Other Data	–	–
Section 2 – OPTIONAL	1	Group Indicator	–	20
	k_n	Total Number of Cloud Layers Reported	–	21
	N_1	Cloud Amount (1st. layer) (Ascending Order)	12	22
	N_2	Cloud Amount (2nd. layer) (Ascending Order)	12	22
	N_3	Cloud Amount (3rd. layer) (Ascending Order)	12	22
	C	Cloud Type	13	23–25
	hh	Altitude of Base of Cloud Type Reported by C	14	23–25
	HH	Altitude of Top of Cloud Type Reported by C	14	23–25
	C	Cloud Type	13	23–25
	hh	Altitude of Base of Cloud Type Reported by C	14	23–25
	HH	Altitude of Top of Cloud Type Reported by C	14	23–25
	C	Cloud Type	13	23–25
	hh	Altitude of Base of Cloud Type Reported by C	14	23–25
	HH	Altitude of Top of Cloud Type Reported by C	14	23–25
	4	Group Indicator	–	26
	dd	Direction of Surface Wind (10s of degrees true)	–	27
	ff	Wind Speed at Surface (knots)	–	28
	5	Group Indicator	–	26
	D	Direction of Surface Wind	15	29
	F	Force of Surface Wind	16	30
	S	State of Sea	17	–
	D_K	Direction of Swell	15	31
	6	Group Indicator	–	32
	W_S	Significant Changes in Weather	18	33
	S_S	Distance of Occurrence of Ws	19	34
	W_C	Weather Off Course	20	35
	D_W	Bearing (true) of Weather Off Course	15	36
	7	Group Indicator	–	37
	I_r	Rate of Icing	21	38
	I_t	Type of Icing and contrails	22	39
	S_b	Distance to Beginning of Icing	19	40
	S_e	Distance to Ending of Icing	19	41
	7	Group Indicator	–	37
	h_ih_i	Altitude of Base of Icing	14	42
	H_iH_i	Altitude of Top of Icing	14	43
	8	Group Indicator	–	44
	d_rd_r	Bearing of Echo Center from Aircraft (10s of degrees, true)	–	45
	S_r	Distance to Echo Center (10s of naut. mi.)	–	46
	O_e	Orientation of Ellipse	23	–
	8	Group Indicator	–	44
	w_e	Ellipse Width or Echo Diameter (10s of naut. mi.)	–	–
	a_e	Length of Major Axis (10s of naut. mi.)	–	–
	c_e	Character of Echo	24	47
	i	Intensity of Echo	25	–
		Plain Language Remarks	–	54 – 55

STANDARD RECONNAISSANCE CODE

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

FM OL-G, HQ AWS CORAL GABLES FL/CARCAH

TO AIG 8227/GT22117/GT7072/KSFOYM

- -

TROPICAL CYCLONE
RECON POD FROM_____Z (month)(year) THRU_____Z (month)(year) FOLLOWS

I. ATLANTIC (NEGATIVE RECONNAISSANCE REQUIREMENT, or format as below)

1. (STORM NAME, DEPRESSION, SUSPECT AREA)

FLIGHT ONE (PRIORITY, if applicable)

A. _____Z FIX TIMES/ON STATION TIMES

_____Z

B. _____ MISSION CALL SIGN

C. _____Z ETD

D. _____ DEPARTURE POINT

E._____FT ENROUTE ALTITUDE (in feet)

F. _____ FORECAST POSITION/STORM NAME

G. _____ DESTINATION

H. _____ FLIGHT PATTERN

I. _____ FORECAST MOVEMENT

J. _____ OUTLOOK FOR SUCCEEDING DAY (PRIORITY, if applicable)

K. _____ REMARKS

FLIGHT TWO (if applicable, same as FLIGHT ONE)

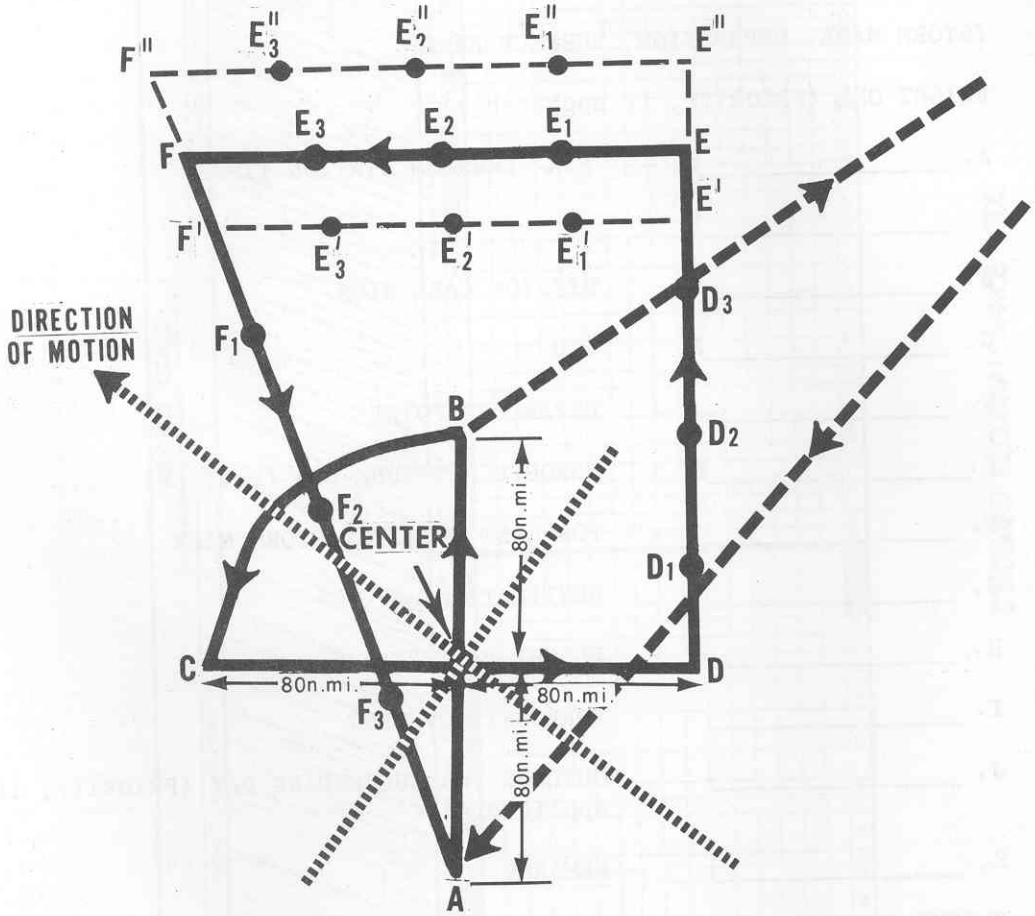
2. (SECOND SYSTEM, if applicable, same as in 1. above)

II. EASTERN PACIFIC (Same as in ATLANTIC above.)

III. CENTRAL PACIFIC (Same as in ATLANTIC above.)

OPERATIONAL FLIGHT PATTERN "A"

Used for a steady state or quasi-steady state hurricane. Its objectives are to locate the center of the vortex and acquire vortex data, including two 6-hourly fixes.



PLAN A

FLIGHT ALTITUDES
A B C D -- 10,000 FEET
D E F A -- 1,500 FEET

OBSERVATION DETAILS FOR OPERATIONAL FLIGHT PATTERN "A"

ALPHABETIC POINT	OBSERVATION DATA	TRANSMIT ASAP AFTER
A	First 8 groups RECCO code.	A
Center	Center/vortex and dropsonde.	Center (initial center)--Dropsonde may be appended to Point B Message.
B	First 8 groups RECCO code.	B--Detailed Center/Vortex Data Message.
C	First 8 groups RECCO code.	C
Center	Center/vortex and dropsonde.	Center (initial center)--Dropsonde may be appended to Point D Message.
D	First 8 groups RECCO code.	D--Add new Detailed Center/Vortex Data Message if any significant changes.
D_1	99999 GGggi ddfff TTT_dT_dw mjHHH SST (see note 3).	E--Data for Point E transmitted first, then data for D_1, D_2, and D_3 in chronological order, followed by SST for E, D_1, D_2, and D_3. See example below.
D_2	Same as D_1, except omit 99999.	
D_3	Same as D_2.	
E	First 8 groups RECCO code and SST (see note 3).	
E_1	99999 GGggi ddfff TTT_dT_dw mjHHH SST (see note 3).	F--Data for Point F transmitted first, then data for E_1, E_2, and E_3 in chronological order, followed by SST for F, E_1, E_2, and E_3. See example below.
E_2	Same as E_1, except omit 99999.	
E_3	Same as E_2.	
F	First 8 groups RECCO code and SST (see note 3).	
VORTEX	Vortex data.	Supplementary Vortex Data Message transmitted between Points F and A.
F_1	99999 GGggi ddfff TTT_dT_dw mjHHH SST (see note 3).	A--Data for Point A transmitted first, then data for F_1, F_2, F_3, and F_4 in chronological order, followed by SST for A, F_1, F_2, F_3, and F_4. See example below.
F_2	Same as F_1, except omit 99999.	
F_3	Same as F_2.	
F_4	Same as F_2.	
A	First 8 groups RECCO code and SST (see note 3).	
Center	Center/vortex and dropsonde	Center (initial center)--Dropsonde may be appended to Point B Message.
B	First 8 groups RECCO code.	B--Detailed Center/Vortex Data Message.
VORTEX	VORTEX data for last penetration (See note 5).	B

EXAMPLE OF RECON MESSAGE TRANSMITTED AT POINT E:

9xxx9 GGggi YQLaLaLa(1) LoLoLoBf(1) hhhdtda ddfff TTTdtdw mjHHH 99999 GGggi(2) ddfff TTT_dT_dw mjHHH GGggi(3) ddfff TTT_dT_dw mjHHH GGggi(4) ddfff TTT_dT_dw mjHHH SST(5) 287 265 270 280

(1) Latitude and longitude of Point E.

(2) Time at Point D_1.

(3) Time at Point D_2.

(4) Time at Point D_3.

(5) Sea-Surface Temperature at:

	E	D_1	D_2	D_3
SST	28.7°C	26.5°C	27.0°C	28.0°C

NOTES: (1) The track and altitude to observation Point A is unspecified as is the track home from the last observation point.

(2) The lengths of the vortex pattern legs (DE, EF, FA) may be adjusted to permit the aircraft to return to Point A in time for a fix 6 hours after the first penetration. Because of this adjustment, the supplemental observation points (D_1, D_2, E_3, E_1, etc.) will be selected before departure on each leg. The points should be equidistant (approximately 60 n.mi. apart) on each leg.

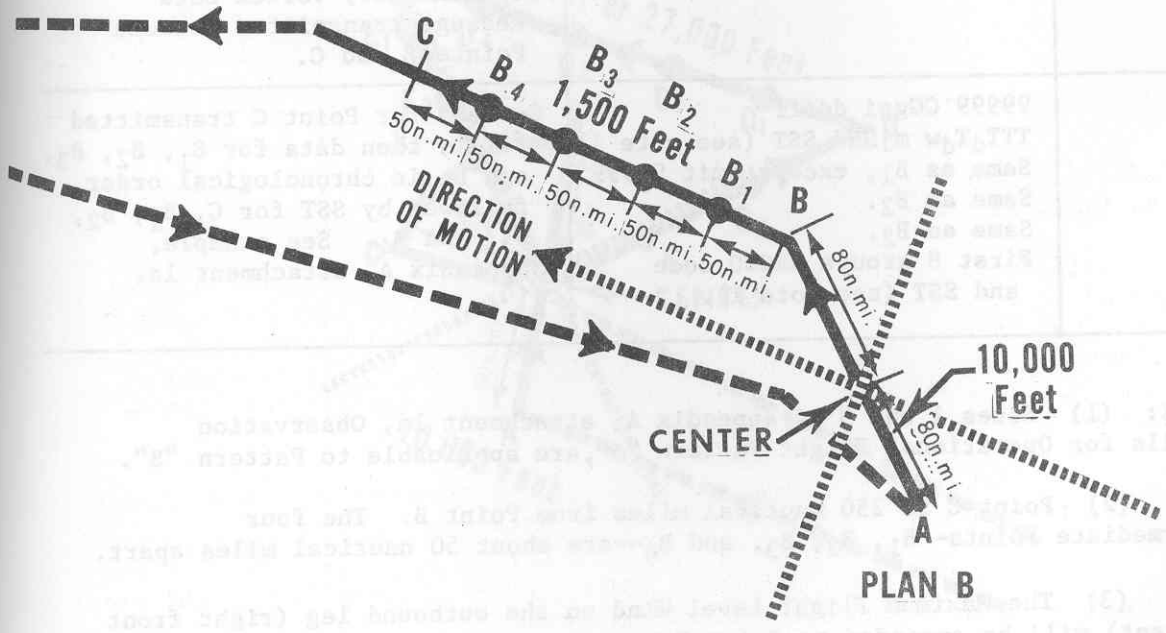
(3) Sea-surface temperatures should be reported only when measured at 1,500 feet or lower. Otherwise, slants should be reported.

(4) The Maximum Flight Level Wind in the outbound leg (right front quadrant) will be appended to Point B Message.

(5) The vortex data are from Point A to Point B. An additional two-quadrant supplemental vortex data message will be sent after Point B containing data gathered between Points A and B on the final pass through the cyclone center.

OPERATIONAL FLIGHT PATTERN "B"

Used to acquire a vortex fix and vortex data on a tropical cyclone too distant to make two vortex fixes.



OBSERVATION DETAILS FOR

OPERATIONAL FLIGHT PATTERN "B"

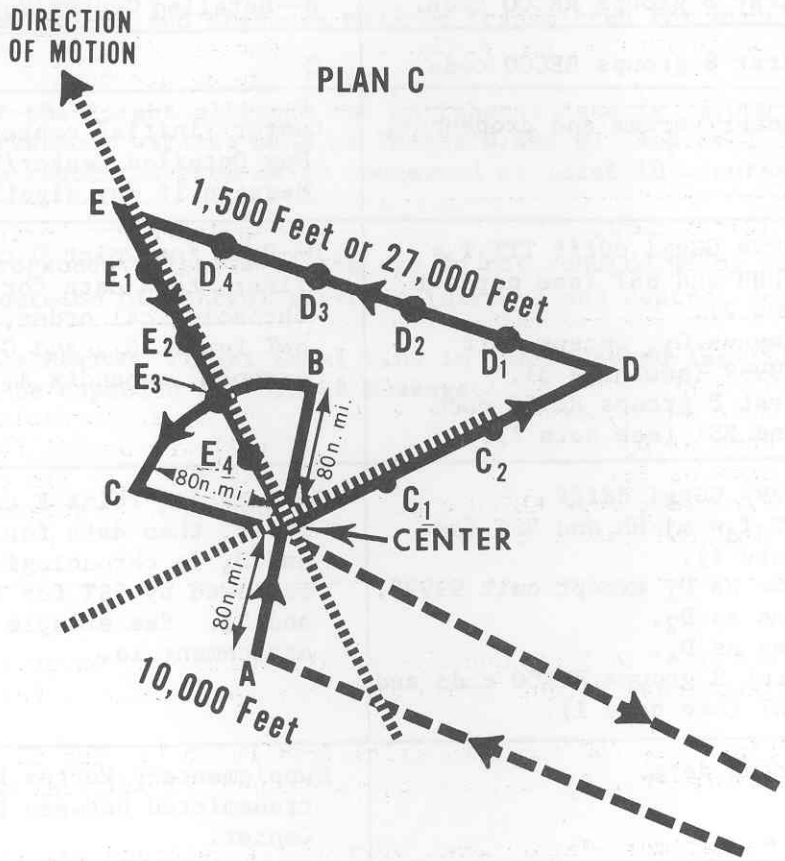
ALPHABETIC POINT	OBSERVATION DATA	TRANSMIT ASAP AFTER
A	First 8 groups RECCO code.	A
Center	Center/vortex and dropsonde.	Center (initial center)--Dropsonde may be appended to Point B Message.
B	First 8 groups RECCO code.	B--Detailed Center/Vortex Data Message.
VORTEX	Vortex data.	Supplementary Vortex Data Message transmitted between Points B and C.
B_1	99999 GGggi ddfff TTT_dT_dw mjHHH SST (see note 1).	C--Data for Point C transmitted first, then data for B_1, B_2, B_3, and B_4 in chronological order, followed by SST for C, B_1, B_2, B_3, and B_4. See example, appendix A, attachment 1a.
B_2	Same as B_1, except omit 99999.	
B_3	Same as B_2.	
B_4	Same as B_2.	
C	First 8 groups RECCO code and SST (see note 1).	

NOTES: (1) Notes 1 and 3 of appendix A, attachment 1a, Observation Details for Operational Flight Pattern "A", are applicable to Pattern "B".

(2) Point C is 250 nautical miles from Point B. The four Intermediate Points--B_1, B_2, B_3, and B_4--are about 50 nautical miles apart.

(3) The Maximum Flight Level Wind on the outbound leg (right front quadrant) will be appended to Point B Message.

OPERATIONAL FLIGHT PATTERN "C"



Used for tropical cyclones in the decay or rapid intensification stage to provide two 6-hour vortex fixes, with a special requirement for equivalent potential temperature data at 27,000 feet or sea surface temperature, sea level pressure, and wind data at 1,500 feet.

OBSERVATION DETAILS FOR
OPERATIONAL FLIGHT PATTERN "C"

ALPHABETIC POINT	OBSERVATION DATA	TRANSMIT ASAP AFTER
A	First 8 groups RECCO code.	A
Center	Center/vortex and dropsonde.	Center (initial center)--Dropsonde may be appended to Point B Message.
B	First 8 groups RECCO code.	B--Detailed Center/Vortex Data Message.
C	First 8 groups RECCO code.	C
Center	Center/vortex and dropsonde.	Center (initial center)--Dropsonde. New Detailed Center/Vortex Data Message if any significant changes.
C_1	99999 GGggi ddfff TTT_dT_dw mjHHH and SST (see notes 1 and 2).	D--Data for Point D transmitted first, then data for C_1 and C_2 in chronological order, followed by SST for D, C_1, and C_2. See example, appendix A, attachment 1a.
C_2	Same as C_1, except omit 99999 (see note 3).	
D	First 8 groups RECCO code and SST (see note 1).	
D_1	99999 GGggi ddfff TTT_dT_dw mjHHH and SST (see note 1).	E--Data for Point E transmitted first, then data for D_1, D_2, D_3, and D_4 in chronological order, followed by SST for E, D_1, D_2, D_3, and D_4. See example, appendix A, attachment 1a.
D_2	Same as D_1 except omit 99999.	
D_3	Same as D_2.	
D_4	Same as D_2.	
E	First 8 groups RECCO code and SST (see note 1).	
VORTEX	Vortex data.	Supplementary Vortex Data Message transmitted between Point E and Center.
E_1	99999 GGggi ddfff TTT_dT_dw mjHHH and SST (see note 1).	Center (initial center)--Initial Center/Vortex Data Message transmitted first, then data for E_1, E_2, E_3, and E_4 in chronological order, followed by SST for E_1, E_2, E_3, and E_4. See example appendix A, attachment 1a.
E_2	Same as E_1 except omit 99999.	
E_3	Same as E_2.	
E_4	Same as E_2.	
Center	Center/vortex and dropsonde.	Detailed Center/Vortex Data Message and dropsonde.
VORTEX	Vortex data for last penetration.	Center.

NOTES: (1) Notes 1 through 3 of appendix A, attachment 1a, Observation Details for Operational Flight Pattern "A", are applicable to Pattern "C".

(2) Intermediate Points C_1 and C_2 are between center and Point D.

(3) Flight altitude from C_2 for peripheral data is either 1,500 feet for sea-surface temperature or 27,000 feet for equivalent potential temperature, but dependent upon flight safety and aircraft endurance. Because equivalent potential temperature will not be computed onboard the aircraft, temperature, dew point, and pressure will be transmitted for each observation point.

(4) If the flight altitude for peripheral data is 27,000 feet, dropsonde observations will be made at Points D and E. Approval of dropsonde release will be requested from ARTCC concerned at least 10 minutes before the drop point.

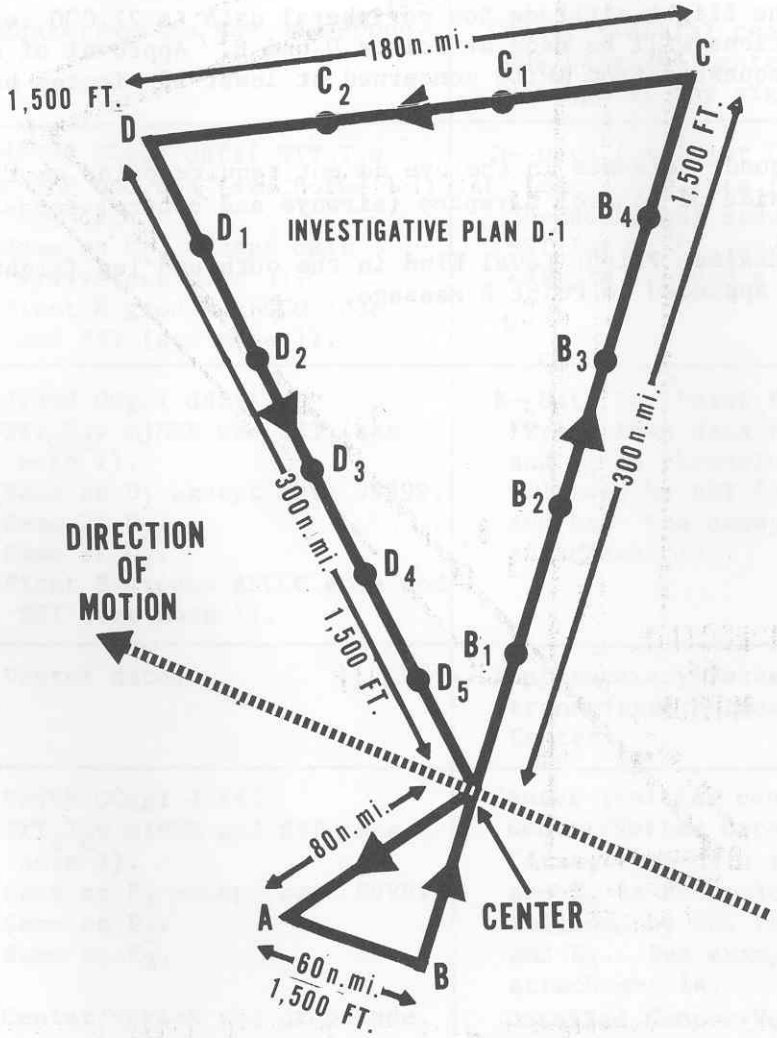
(5) Dropsonde releases in the eye do not require prior coordination with ARTCC or outside of control airspace (airways and control zones).

(6) The Maximum Flight Level Wind in the outbound leg (right front quadrant) will be appended to Point B Message.

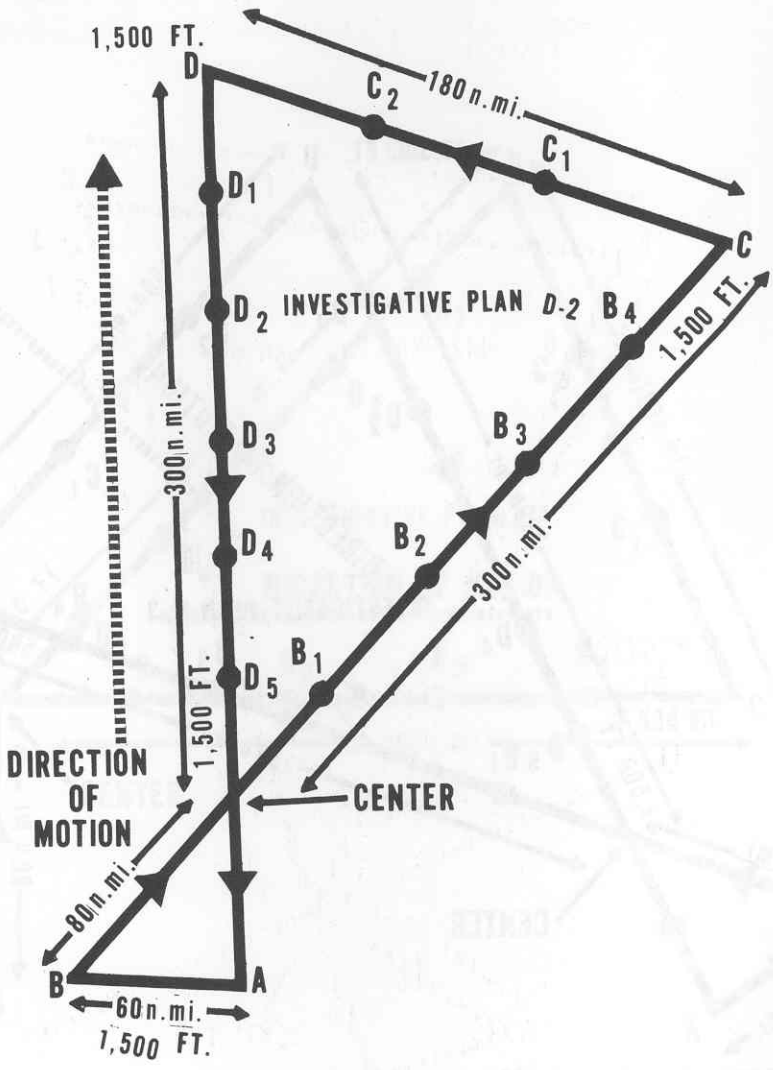
CHAPTER 4
APPENDIX A
ATTACHMENT 4
FIGURE 1

OPERATIONAL FLIGHT PATTERN D-1

Used for investigative missions to obtain pressure center, maximum sustained winds, and peripheral data at 1,500 feet.

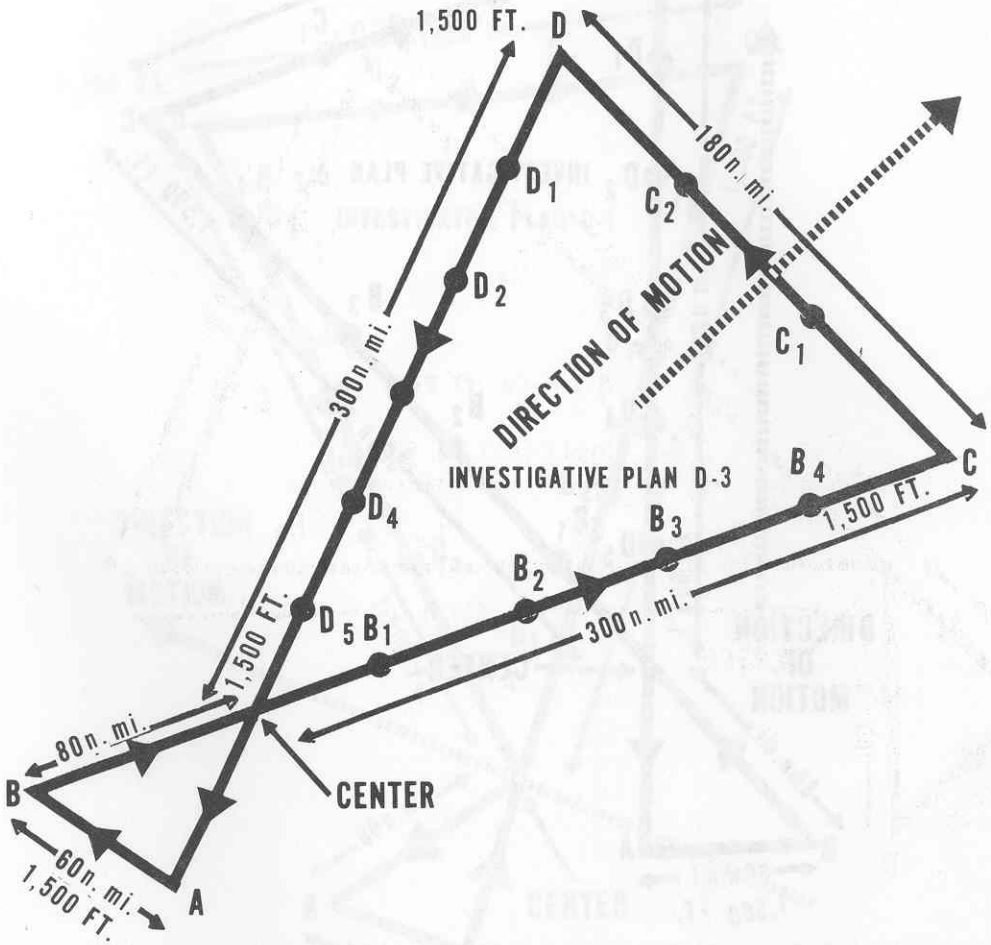


OPERATIONAL FLIGHT PATTERN D-2



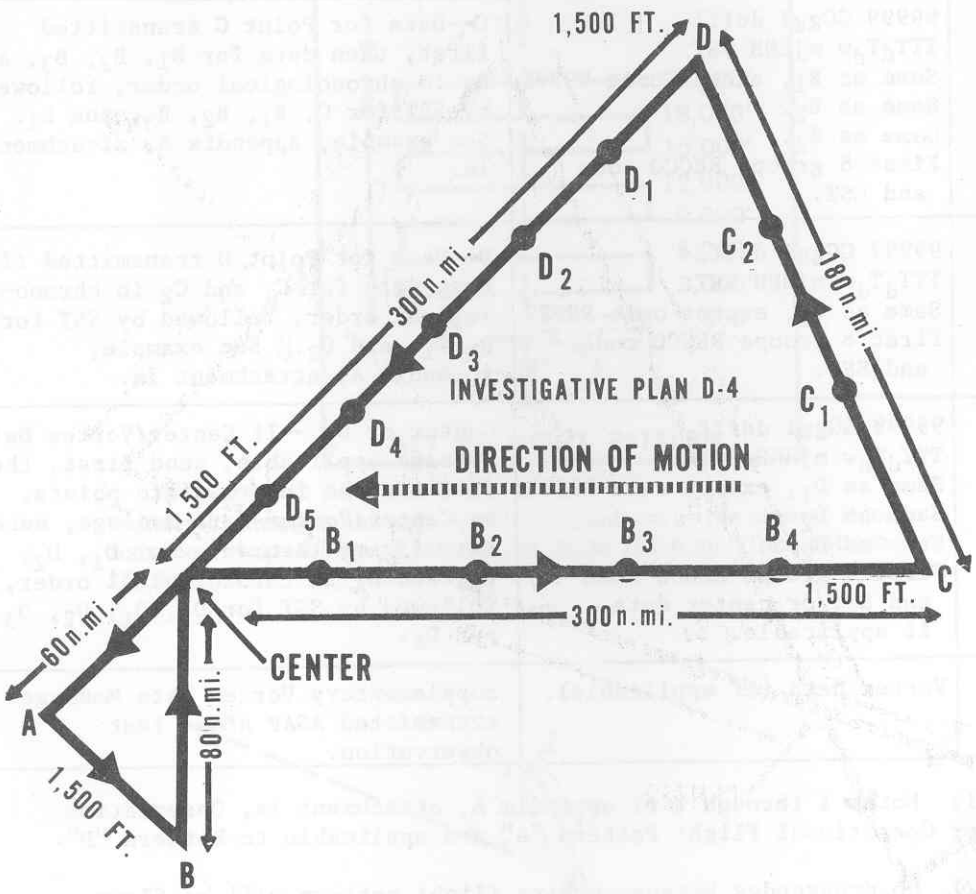
Used for investigative missions to obtain pressure center, maximum sustained winds, and peripheral data at 1,500 feet.

OPERATIONAL FLIGHT PATTERN D-3



Used for investigative missions to obtain pressure center, maximum sustained winds, and peripheral data at 1,500 feet.

OPERATIONAL FLIGHT PATTERN D-4



Used for investigative missions to obtain pressure center, maximum sustained winds, and peripheral data at 1,500 feet.

OBSERVATION DETAILS FOR
OPERATIONAL FLIGHT PATTERN "D"

ALPHABETIC POINT	OBSERVATION DATA	TRANSMIT ASAP AFTER
A	First 8 groups RECCO code and SST.	A
B	Same as A.	B
Center	Center.	Center (Initial Center/Vortex Data Message when applicable).
B_1	99999 GGggi ddfff TTT_dT_dw mjHHH SST.	C--Data for Point C transmitted first, then data for B_1, B_2, B_3, and B_4 in chronological order, followed by SST for C, B_1, B_2, B_3, and B_4. See example, appendix A, attachment 1a.
B_2	Same as B_1, except omit 99999.	
B_3	Same as B_2.	
B_4	Same as B_2.	
C	First 8 groups RECCO code and SST.	
C_1	99999 GGggi ddfff TTT_dT_dw mjHHH SST.	D--Data for Point D transmitted first, then data for C_1 and C_2 in chronological order, followed by SST for D, C_1, and C_2. See example, appendix A, attachment 1a.
C_2	Same as C_1, except omit 99999.	
D	First 8 groups RECCO code and SST.	
D_1	99999 GGggi ddfff TTT_dT_dw mjHHH SST.	Center or D_5.--If Center/Vortex Data Message applicable, send first, then data for the intermediate points. If no Center/Vortex Data Message, send D_5 data first, then data for D_1, D_2, D_3, and D_4 in chronological order, followed by SST for D_5, D_1, D_2, D_3, and D_4.
D_2	Same as D_1, except omit 99999.	
D_3	Same as D_2.	
D_4	Same as D_2.	
D_5 or Center	First 8 groups RECCO code and SST or center data, if applicable.	
VORTEX	Vortex data (if applicable).	Supplementary Vortex Data Message transmitted ASAP after last observation.

NOTES: (1) Notes 1 through 3 of appendix A, attachment 1a, Observation Details for Operational Flight Pattern "A", are applicable to Pattern "D".

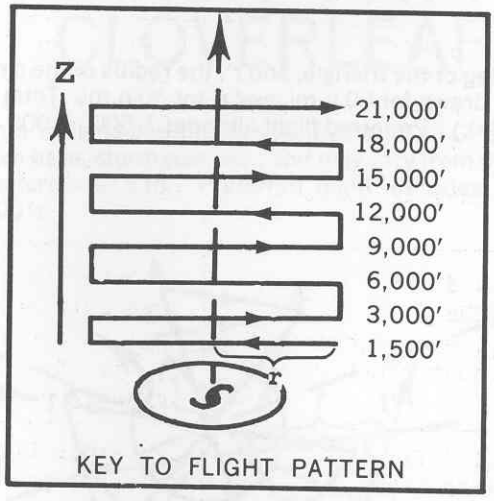
(2) No dropsondes because entire flight pattern will be flown at 1,500 feet.

(3) If Leg B to C is along or parallel to an easterly wave, this leg should be flown parallel to the wave on either side. The side of wave (easterly) should be reported in Remarks.

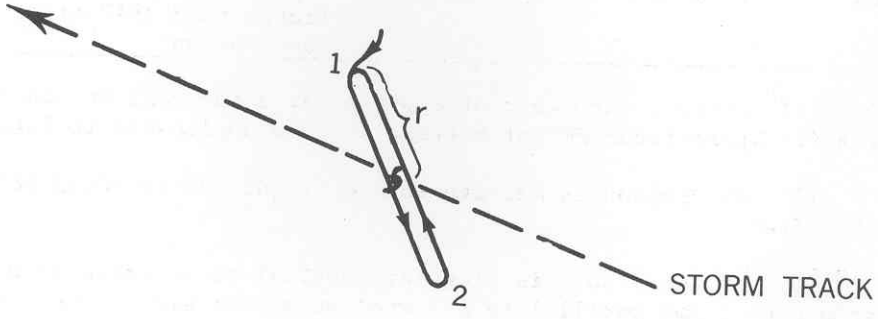
(4) The Maximum Flight Level Wind in the outbound leg will be appended to Point C Message.

RESEARCH FACILITIES CENTER FLIGHT PATTERN

PLAN V (VICTORY) STAIRSTEP RESEARCH PATTERN



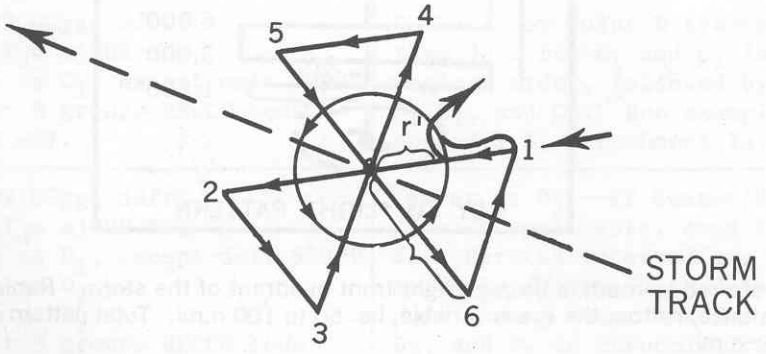
Preferred azimuth is through right front quadrant of the storm. Radial distance, r, from the eye is variable, i.e. 50 to 100 n.mi. Total pattern = 16r n.mi.



RESEARCH FACILITIES CENTER FLIGHT PATTERN

PLAN W (WHISKEY) RESEARCH CLOVERLEAF PLUS CIRCUMNAVIGATION

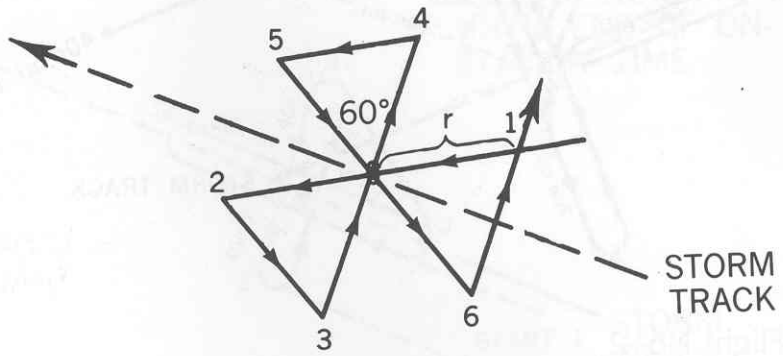
Both r, the leg of the triangle, and r′, the radius of the circle, are variable. (r has been drawn for 60 n.mi. and r′ for 30 n.mi. Total pattern distance $= 9r + 6.28r'$.) Preferred flight altitudes 1,500, 7,000, 13,000, 18,000 ft.



RESEARCH FACILITIES CENTER FLIGHT PATTERN

PLAN X (X-RAY) RESEARCH PATTERN CLOVERLEAF

The distance r is variable and will be specified in the TCPOD. It will depend on distance from base, storm size, etc., and may vary from 50 to 100 n.mi. Total flight pattern = 9r n.mi. Preferred flight altitudes, 1,500, 7,000, 13,000, 18,000 ft.



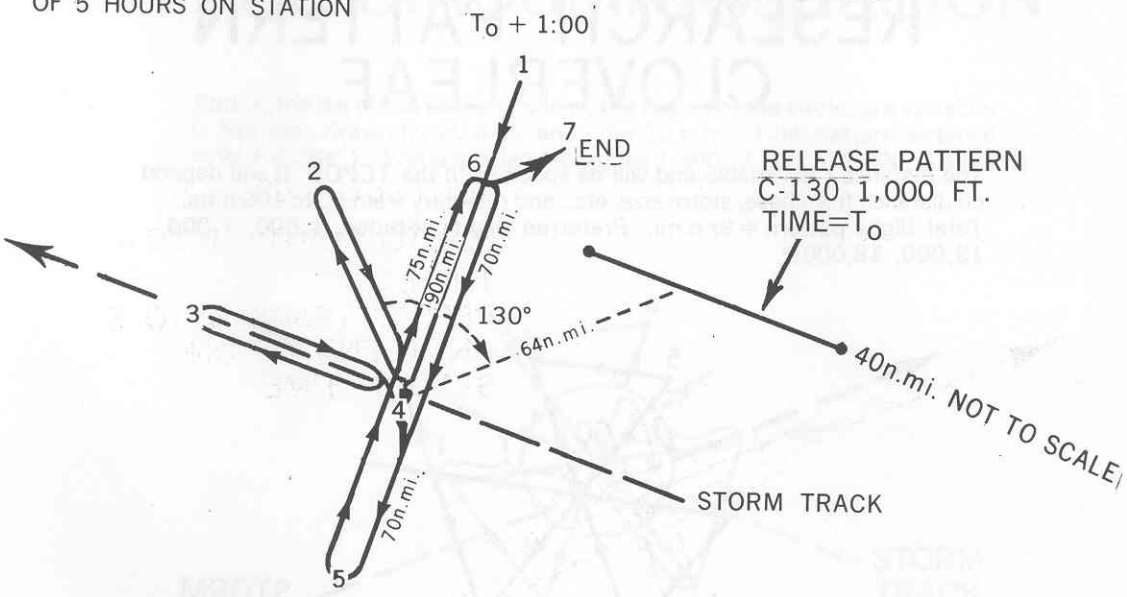
RESEARCH FACILITIES CENTER FLIGHT PATTERN

PLAN Y (YANKEE)
TRACER EXPERIMENT (SF)

Sampling Flight No. 1

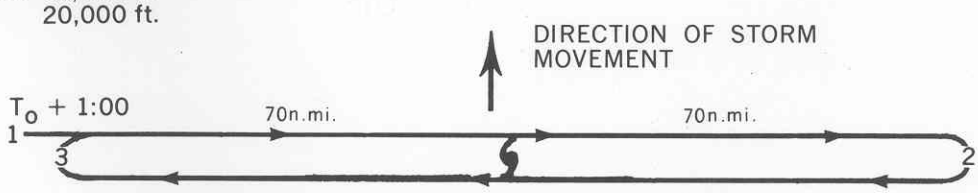
REPEAT PATTERN (5)-(6) FOR MINIMUM OF 5 HOURS ON STATION

DC-6 4,000 ft.



Sampling Flight No. 2

DC-6 14,000 ft.
20,000 ft.



REPEAT PATTERN (3)-(2) FOR MINIMUM OF 5 HOURS ON STATION AT 14,000 FT. FOR LAST PASS, CLIMB TO MAXIMUM POSSIBLE ALTITUDE (~20,000 FT.)

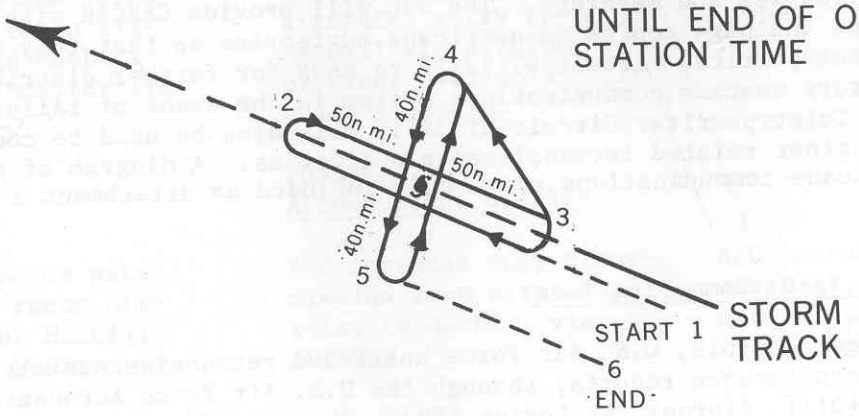
RESEARCH FACILITIES CENTER FLIGHT PATTERN

PLAN Z (ZEBRA)
WIND SPEED MONITORING

ALTITUDE 5,000 FT.

FLY TO POINTS 1-2-3-4

THEN:
REPEAT TRACK 4 TO 5
UNTIL END OF ON-
STATION TIME



ATLANTIC

U.S. AIR FORCE COMMUNICATIONS SUPPORT PLAN

FOR

U.S. AIR FORCE HURRICANE RECONNAISSANCE

1. General. WC-130-type aircraft of the 53d Weather Reconnaissance Squadron (53 WRS) of the Air Weather Service (AWS) will operate from Keesler AFB, Miss., during the hurricane season. Reconnaissance observations initiated by these aircraft will be transmitted by voice by means of high frequency single sideband (HF/SSB) radio through the U.S. Air Force Aeronautical Station complex to a weather monitor at MacDill AFB, Fla. The MacDill Weather Monitor will evaluate and edit the reports to insure meteorological and technical accuracy. The Monitor will relay these edited reports to CARCAH who is collocated with NHC at the University of Miami, Coral Gables, Fla., and to the Automatic Digital Weather Switch, Carswell AFB, Tex., by means of teletypewriter Circuit GT 22117, for further distribution over the military weather communications system as required. The CARCAH will provide these reconnaissance reports to NHC for use in developing advisories and warnings. The NHC will provide CARCAH with teletypewriter tape and page copies of hurricane advisories so that they can be relayed by teletypewriter circuit GT 22117 to KAWN for further distribution over the military weather communications system in the event of failure of the NHC CRT. Teletypewriter Circuit GT 22117 will also be used to coordinate the TCPOD and other related reconnaissance activities. A diagram of the USAF Atlantic hurricane communications network is included as attachment 1 to this appendix.

2. Air/Ground (A/G) Communications.

a. Whenever possible, U.S. Air Force hurricane reconnaissance aircraft will relay reconnaissance reports, through the U.S. Air Force Aeronautical Stations at MacDill, Albrook, or Loring AFBs. The specific Station contacted will depend upon aircraft location and radio propagation conditions. The HF/SSB frequencies to be used for initial contact with each Aeronautical Station are listed in DOD Flight Information Publication Enroute--Supplement. Subsequent to initial contact, the Aeronautical Station will assign a primary and secondary frequency for use by hurricane reconnaissance aircraft during each mission. Frequencies assigned may or may not be the same as frequencies published in the Enroute Supplement for the contacted Stations. Whenever possible, frequencies will be assigned to reduce interference and congestion from other high frequency air/ground (HF A/G) traffic. When specifically requested by the aircrew and circuit conditions will permit, a direct voice-phone patch between the aircraft and the MacDill Weather Monitor will be

provided by the Aeronautical Station. The U.S. Air Force has authorized the use of "Immediate" precedence for transmission of hurricane reconnaissance reports. To further facilitate such voice patching, direct Automatic Voice Network (AUTOVON) access lines have been provided. Specific methods for handling hurricane reconnaissance messages are listed below for each Station:

PRIMARY METHODS	FIRST ALTERNATE	SECOND ALTERNATE
	MACDILL AERONAUTICAL STATION	
Direct phone patch between recon aircraft and MacDill Weather Monitor via phone.	A/G operator copy transmission from aircraft; relay by voice to MacDill Weather Monitor via phone.	A/G operator copy from aircraft; relay to MacDill Weather Monitor via teletypewriter Circuit GT 22117.
	ALBROOK AERONAUTICAL STATION	
Direct phone patch between recon aircraft and MacDill Weather Monitor via AUTOVON.	A/G operator copy from aircraft; relay to MacDill via AUTOVON or other available voice circuits.	
	LORING AERONAUTICAL STATION	
Direct phone patch between recon aircraft and MacDill Weather Monitor via AUTOVON.	A/G operator copy transmission from aircraft; relay to MacDill via AUTOVON.	A/G operator copy from aircraft; relay to MacDill using commercial long-distance phone.

b. The following is a typical sequence of actions required for passing an observation message from the aircraft, through the MacDill Aeronautical Station, to the receiving facility at the MacDill Weather Monitor:

(1) MACDILL - THIS IS GULL ONE - ON FOUR SEVEN - OVER.

(2) GULL ONE - MACDILL - GO AHEAD.

(3) MACDILL - GULL ONE - REQUEST IMMEDIATE PHONE PATCH TO MACDILL WEATHER MONITOR - OVER.

(4) GULL ONE - MACDILL - STAND BY.

(5) The A/G operator conditions his console for a ground subscriber call and calls the MacDill Weather Monitor. When the MacDill Weather Monitor answers, the operator advises:

(6) THIS IS MACDILL - STAND BY FOR PHONE PATCH FROM GULL ONE - OVER.

(7) ROGER - STANDING BY.

(8) The A/G operator then conditions his console for phone patch and advises the aircraft:

(9) GULL ONE - THIS IS MACDILL - YOUR PATCH TO MACDILL MONITOR IS READY - GO AHEAD.

(10) MACDILL MONITOR - THIS IS GULL ONE - MESSAGE FOLLOWS - BREAK BREAK - AIR FORCE GULL ONE BETSY FOUR TEXT TEXT TEXT - OVER.

(11) GULL ONE - MACDILL MONITOR - ROGER - OUT.

(12) GULL ONE - OUT.

(13) The MacDill A/G operator then breaks the patch.

c. If at item (11) above, MacDill has any question or comment on the observation message, it will be resolved before discontinuation of the patch. If, at time (3) above, phone patch cannot be provided, the following sequence of actions would be typical:

(1), (2), and (3) See paragraph 2.b. above.

(4) GULL ONE - MACDILL - UNABLE TO PROVIDE PATCH AT THIS TIME - YOUR SIGNAL IS NOT PATCH QUALITY - I CAN PROVIDE RELAY TO ADDRESSEE - OVER.

(5) MACDILL - GULL ONE - PASS TO MACDILL MONITOR - BREAK BREAK - AIR FORCE GULL ONE BETSY FOUR TEXT TEXT TEXT - OVER.

(6) MACDILL.

(7) The A/G operator then passes the copied message to the MacDill Weather Monitor by telephone or teletypewriter Circuit GT 22117.

#3. Point-to-Point Teletypewriter Communications Capability.

a. Circuit GT 22117 (JQGAGP28) will be configured as shown in attachment 1, appendix D of this chapter. The NHC will have a receive-only reperforator on this Circuit to provide it with the hurricane reconnaissance reports for further relay over the FAA weather networks. The MacDill Weather Monitor will act as network control station and maintain circuit discipline. Authorized uses of this Circuit are:

(1) Relay of aircraft hurricane traffic to CARCAH/NHC.

(2) Coordination of the TCPOD and other related matters.

(3) Aeronautical Stations (MacDill) to pass reports received from reconnaissance aircraft to MacDill Monitor whenever they cannot be handled by primary first alternate, or preferred second alternate (telephone) methods.

(4) Essential coordination between CARCAH and Alternate CARCAH concerning transfer of responsibility and similar matters will be handled over this Circuit.

(5) In the event responsibility is transferred from NHC to the Alternate National Hurricane Center (ALT NHC), National Weather Service, Washington Hurricane Warning Office (HWO), traffic received at MacDill by means of AUTOVON will be relayed to the Alternate CARCAH over this Circuit. The Alternate CARCAH will arrange for the relay of these data to ALT NHC by the most expeditious means available.

(6) Dissemination of Air Force Storm Reconnaissance Aircraft "Departure" and "Arrival" messages from the 53d Weather Reconnaissance Squadron (53 WRS) in the following format:

10 LTRS
AA CR 4LF
URXX RMCS DTG
TEXT CR 4LF
NNNN
10 LTRS

(7) Coordination on hurricane matters by FWC Norfolk Alternate.

b. Teletypewriter circuit GT 22117 (JQGAGP28) is installed at CARCAH and will be used as the first alternate method (CRT to Suitland is primary) for transmitting hurricane advisories to KAWN at Carswell AFB for further distribution to military customers as required. COMET II at the MacDill Monitor may be used as a second alternate method for relay of hurricane advisories, warnings, and reconnaissance report to KAWN.

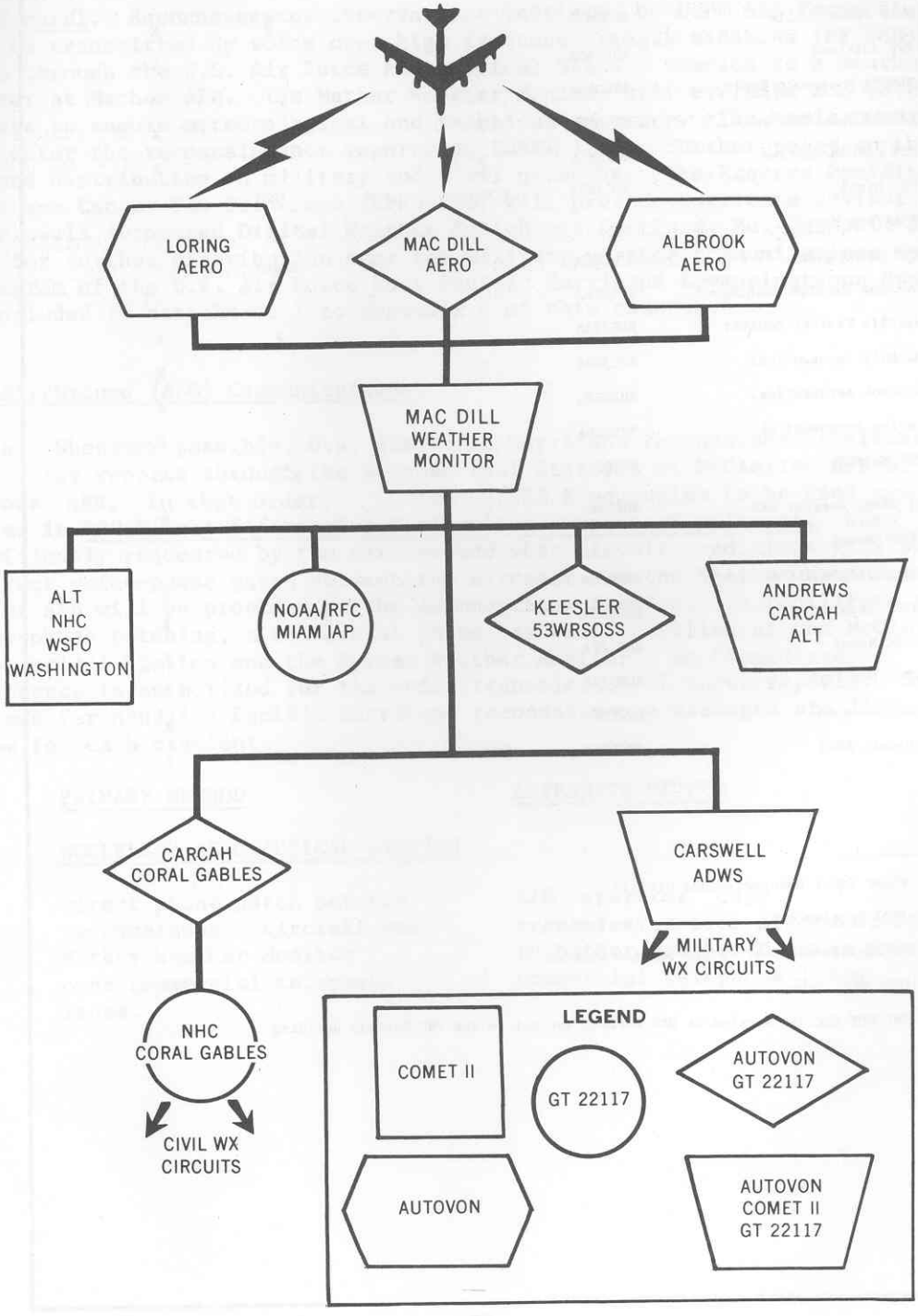
#4. Miscellaneous Communications Services and Support.

a. Routine communications between weather reconnaissance aircraft and Aeronautical Stations for normal ATC services will be handled in accordance with standard procedures. Where contact cannot be made with Aeronautical Stations, ATC communications may be conducted in accordance with paragraph 7 of this chapter.

b. The NOAA Research Facilities Center (RFC) hurricane aircraft is authorized to utilize the facilities of the U.S. Air Force Aeronautical Stations for relay of hurricane reconnaissance reports to MacDill Weather Monitor, as in paragraph 2a.

c. Messages for CARCAH should be addressed as follows: RUCJBBF/CARCAH CORAL GABLES, FLA. They will then be relayed on commercial dial teletypewriter by MacDill Air Force Base on dial TWX 305-271-2144.

USAF ATLANTIC HURRICANE COMMUNICATIONS SYSTEM



COMMON COMMUNICATIONS CAPABILITIES--ATLANTIC

STATIONS	AUTODIN	GT22117#	7072	COMET	AUTOVON
NWSF Jacksonville	RUEDABA			X	X
FWF Suitland	RUEBEGA				X
NAVSTA Roosevelt Roads	RULGANA				X
CARCAH Coral Gables	RUCJBBF	X			X
ALT CARCAH Andrews	RUEBBAA	X		X	X
NHC Miami	RUCJBBF	X(RO)	X	X(RO)	
NOAA/RFC Miami		X			
NMC Washington	RUEOLMA		X	X(RO)	
Weather Service Washington	RUEOLMA		X		
MacDill Weather Monitor	RUCJAAA	X		X	X
MacDill Aeronautical	RUCJBBB	X			X
Albrook Aeronautical	RUEOEFA				X
Loring Aeronautical	RUEDLDA				X
FWC Norfolk	RUEBJNA	X		X**	X
53 WRSMC Keesler AFB	RUCLERA	X			X
IFSS* Miami					
ARTCC Jacksonville	RUWTAIA				X
ARTCC Washington	RUEONEA				X
ARTCC Miami	RUCLFPA				X
ARTCC New York	RUEDJKA				X
ARTCC Houston	RUWTDPA				X
Carswell ADWS	RUCLDAA	X(RO)		X	X

#East Coast Reconnaissance Circuit

(RO) Receive only

*IFSS-International Flight Service Station

(SO) Send only

**COMET Circuit located at NAS Norfolk but not in the FWC Norfolk building

U.S. AIR FORCE COMMUNICATIONS SUPPORT PLAN
FOR
U.S. AIR FORCE EASTERN PACIFIC HURRICANE RECONNAISSANCE

1. General. Reconnaissance observations initiated by U.S. Air Force aircraft will be transmitted by voice over high frequency single sideband (HF/SSB) radio through the U.S. Air Force Aeronautical Station complex to a weather monitor at Mather AFB. The Mather Weather Monitor will evaluate and edit the reports to ensure meteorological and technical accuracy. The Monitor will then enter the reconnaissance reports on COMET II for further relay to the AWN and distribution on military and civil networks. The Eastern Pacific Hurricane Center-San Francisco (EPHC-SFO) will provide hurricane advisories to Carswell Automated Digital Weather Switch via Suitland, Md.-Carswell ADWS Link for further distribution over the military weather communications system. A diagram of the U.S. Air Force East Pacific Hurricane Communications System is included as attachment 1 to appendix E of this chapter.

2. Air/Ground (A/G) Communications.

a. Whenever possible, U.S. Air Force hurricane reconnaissance aircraft will relay reports through the Aeronautical Stations at McClellan AFB or Albrook AFB, in that order. The HF/SSB frequencies to be used are listed in DOD Flight Information Publication Enroute--Supplement. When specifically requested by the aircrew and when circuit conditions will permit, a direct voice-phone patch between the aircraft and the Weather Monitor at Mather AFB will be provided by the Aeronautical Station. To facilitate such voice-phone patching, a commercial phone has been installed at the McClellan Aeronautical Station and the Mather Weather Monitor. An "Immediate" precedence is authorized for the voice transmission of these reports. Specific methods for handling Pacific hurricane reconnaissance messages are listed below for each station:

PRIMARY METHOD	ALTERNATE METHOD
MCCLELLAN AERONAUTICAL STATION:	
Direct phone patch between reconnaissance aircraft and Mather Weather Monitor over commercial telephone lines.	A/G operator copy transmission from aircraft; relay to Mather Weather Monitor over commercial telephone lines.

#	ALBROOK AERONAUTICAL STATION	
	Direct phone patch between reconnaissance aircraft and Mather Weather Monitor over AUTOVON. Mather Monitor phone number 916-363-1344 or AUTOVON 828-4377. A direct phone patch can also be provided over AUTOVON to the McClellan Aeronautical Station, extended to Mather Weather Monitor over local telephone circuits.	A/G operator copy transmission from aircraft and pass to Mather via AUTOVON. (Secondly)

b. The following is a typical sequence of actions required for passing an observation message from the aircraft, through the McClellan Aeronautical Station, and to the receiving facility at Mather Weather Monitor:

(1) MCCLELLAN - THIS IS LARK ONE - ON FOUR SEVEN - OVER.

(2) LARK ONE - MCCLELLAN - GO AHEAD.

(3) MCCLELLAN - LARK ONE - REQUEST IMMEDIATE PHONE PATCH TO MATHER WEATHER MONITOR - OVER.

(4) LARK ONE - MCCLELLAN - STAND BY.

(5) The A/G operator conditions his console for a ground subscriber call and calls the Mather addressee using the commercial telephone line. When the Mather party answers, the operator advises:

(6) THIS IS MCCLELLAN - STAND BY FOR PHONE PATCH FROM LARK ONE - OVER.

(7) ROGER - STANDING BY.

(8) The A/G operator then conditions his console for phone patch and advises the aircraft:

(9) LARK ONE - THIS IS MCCLELLAN - YOUR PATCH TO MATHER MONITOR IS READY - GO AHEAD.

(10) MATHER MONITOR - THIS IS LARK ONE - MESSAGE FOLLOWS - BREAK BREAK - AIR FORCE LARK ONE AGATHA FOUR TEXT TEXT TEXT - OVER.

(11) LARK ONE - MATHER MONITOR - ROGER - OUT.

(12) LARK ONE - OUT.

(13) The McClellan A/G operator then breaks the patch.

c. If, at Item (10) above, the Mather Weather Monitor has any question or comment on the observation message, it will be resolved before discontinuation of the patch. If, at Item (3) above, the phone patch cannot be provided, the following sequence of actions would be typical:

(1), (2), and (3). See paragraph 2.b. above.

(4) LARK ONE - MCCLELLAN - UNABLE TO PROVIDE PATCH AT THIS TIME - YOUR SIGNAL IS NOT PATCH QUALITY - I CAN PROVIDE RELAY TO ADDRESSEE - OVER.

(5) MCCLELLAN - LARK ONE - PASS TO MATHER WEATHER MONITOR BREAK BREAK - AIR FORCE LARK ONE AGATHA FOUR TEXT TEXT TEXT - OVER.

(6) MCCLELLAN.

(7) The A/G operator then passes the copied message to the Mather Weather Monitor over the commercial telephone.

3. Teletypewriter Communications Capability and Communications Procedures. East Pacific hurricane information will be exchanged in the following manner:

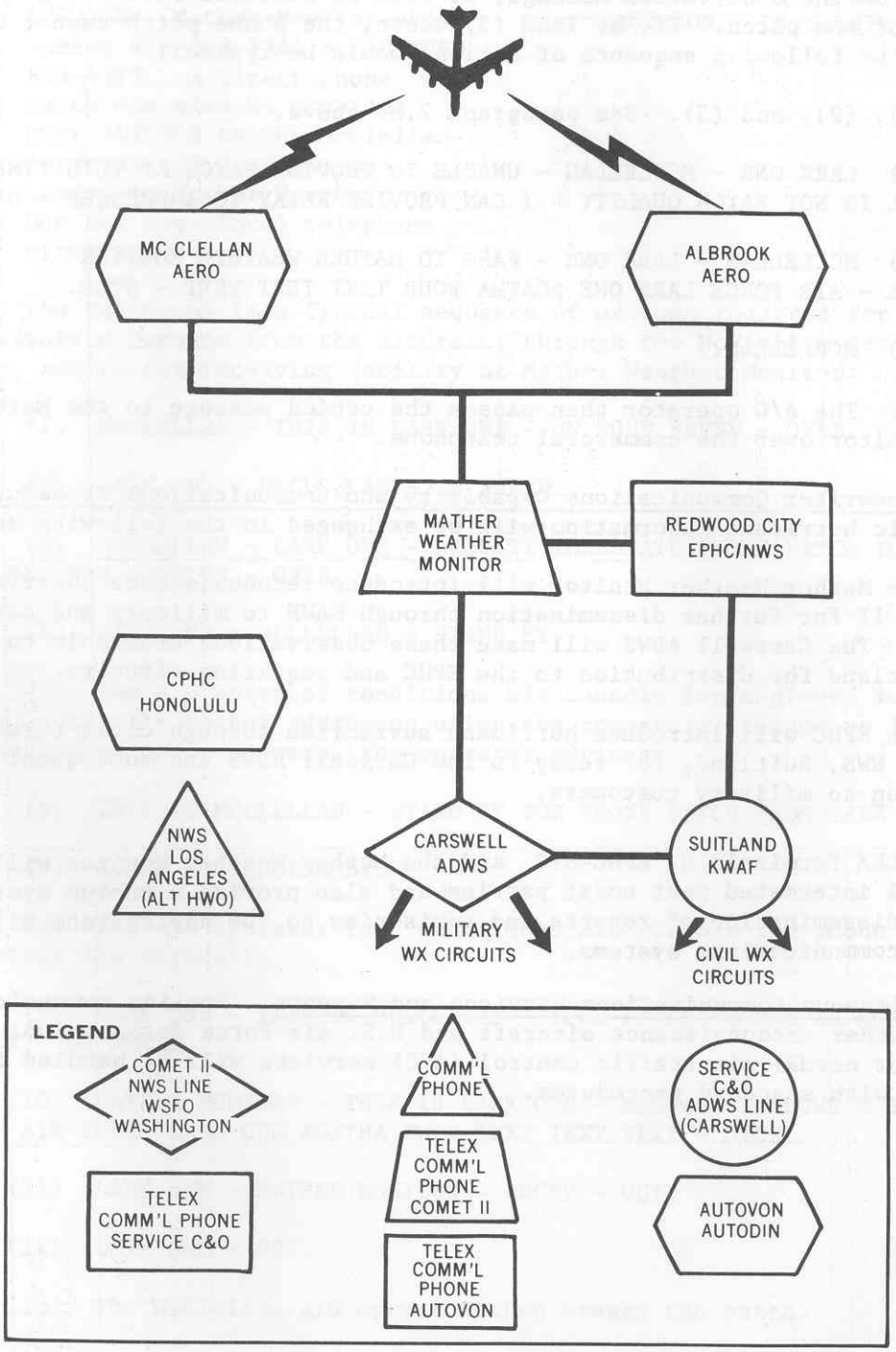
a. The Mather Weather Monitor will introduce reconnaissance observations into COMET II for further dissemination through KAWN to military and civil customers. The Carswell ADWS will make these observations available to the NWS at Suitland for distribution to the EPHC and requiring circuits.

b. The EPHC will introduce hurricane advisories through civil circuits and to the NWS, Suitland, for relay to the Carswell ADWS and subsequent distribution to military customers.

c. TELEX terminals at EPHC-SFO and the Mather Weather Monitor will connect all interested west coast parties and also provide a backup system to insure dissemination of reports and advisories to the appropriate military and civil communications systems.

4. Miscellaneous Communications Services and Support. Routine communications between weather reconnaissance aircraft and U.S. Air Force Aeronautical Stations for normal air traffic control (ATC) services will be handled in accordance with standard procedures.

USAF EAST PACIFIC HURRICANE COMMUNICATIONS SYSTEM



JOINT REQUIREMENTS FOR AIRCRAFT RECCO DATA

Data required	Altitudes at which data are required	Areal portion of cyclone in which data are needed	Time or frequency of observation	Accuracy required
Location of center	At 700 mb or below*	At center or within radar range.	Atlantic--Up to 8, 3-hourly fixes per day when cyclone is forecast* to be within 300 n.mi. of the U.S. Coast, Puerto Rico, the Virgin Islands, or DOD installations. Up to 4, 6-hourly fixes per day when cyclone is forecast* to be within 500 n.mi. of landfall in the Gulf of Mexico, Caribbean, and North Atlantic west of 55°W. and north of 8°N. Eastern and Central Pacific--Up to 2 consecutive 6-hourly fixes when cyclone is forecast* to be within 300 n.mi. of U.S. territory or DOD installations. *Forecast for the day of the reconnaissance flights.	± 10 mi
Dimensions and configuration of center	At 700 mb or any lower level.	Do.	Do.	Indeterminate
Central pressure	Do.	At center.	Do.	± 2 mb

JOINT REQUIREMENTS FOR AIRCRAFT RECCO DATA--(Continued)

Data required	Altitudes at which data are required	Areal portion of cyclone in which data are needed	Time or frequency of observation	Accuracy required
Radius and strength of maximum winds	Surface or by Doppler radar, preferably at 700 mb.	Whenever maximum winds are found, but usually within 50 nautical miles of center.	Do.	± 5 mi ± 5 kt
Radar echoes and direction of Cb blow-offs	Do.	Radar echoes--areas outside the principal rain shield. Blowoffs observed.	Irregular.	Indeterminate
Winds, pressure heights, clouds, and weather en route to cyclone and return	Winds and pressure heights at flight level; clouds and weather as observed from flight level.	From latitude 30°N. southward.		Winds, ± 5 kt; Pressure heights, ± 10 meters
Winds, pressure heights, and weather in suspicious areas	Daily tracks as per interservice agreements. At 700 mb or as low as 1,500 ft for investigative flights, as required.	Variable radius 100 to 300 miles.	Same as for location of center.	± 5 kt; ± 10 meters

JOINT REQUIREMENTS FOR AIRCRAFT RECCO DATA--(Continued)

Data required	Altitudes at which data are required	Areal portion of cyclone in which data are needed	Time or frequency of observation	Accuracy required
Height of eye wall #	Atlantic: as specified in flight pattern. Eastern Pacific: 300 mb.	Atlantic: by quadrant at eye wall within radar range.	Atlantic: as specified in flight pattern. Eastern Pacific: daily observation.	2,000 ft
Wind profile	Specified flight-pattern altitude.	By quadrant of cyclone.	Radial distance from center of maximum, at 64 kt, 50 kt, and 34 kt.	± 5 mi
Temperature profile	Do.	Do.	Center, R = 15 n.mi., R = 30 n.mi., R = 45 n.mi., and R = 80 n.mi.	± 0.5°C
Dew-point profile	Do.	Do.	Do.	± 0.5°C
D-value profile	Do.	Do.	Do.	± 10 ft
Sea-surface temperature	1,500 ft.	Vortex periphery along specified operational flight pattern.	Equally spaced observations.	± 0.5°C
Equivalent# potential temperature or temperature, dew point, and pressure.	27,000 ft.	Vortex periphery along specified operational flight pattern.	Equally spaced observations.	± 0.5°C ± 1 mb

*Reconnaissance to be terminated whenever, in the judgment of the aircraft commander, the safety of the aircraft and crew would be jeopardized by continuing.
#Not applicable in Central Pacific.

CHAPTER 5

JOINT RADAR TROPICAL CYCLONE OBSERVING AND REPORTING PLAN

ATLANTIC

1. General. Radar observations of hurricanes will be taken and reported at radar stations of the Department of Defense and National Weather Service in accordance with the plan and procedures described in the paragraphs which follow. Radar stations of other cooperators will provide radar observations of hurricanes on a voluntary basis in accordance with arrangements which are in effect between them and the National Weather Service.

2. Procedures for taking radar observations of hurricanes will be those given in the Weather Radar Observations (FMH No. 7). Stations which do not normally transmit hourly radar weather observations will begin to transmit hurricane observations in accordance with paragraph 5, whenever they first observe a tropical cyclone-associated radar echo feature (for example, the precursor squall line, leading spiral band, etc.). Stations will continue to transmit such hurricane observations until tropical cyclone-associated echo features are no longer visible. Stations which do normally transmit hourly radar weather observations will simply include tropical cyclone features in routine transmissions and will transmit half hourly specials in accordance with paragraph 5, for as long as tropical cyclone-associated echo features are observed.

#3. Participants. Participating radar stations are listed below. If radar observations are needed from participating Aerospace Defense Command's (ADC) Radar Squadrons and/or Aircraft Control and Warning (AC&W) sites and Federal Aviation Administration (FAA) Air Route Traffic Control Centers (ARTCC), the National Weather Service will furnish the necessary weather radar operators for the purpose of making and transmitting these observations. (See paragraphs 6 and 7 below.)

a. National Weather Service

	Radar	Latitude	Longitude
Apalachicola, Fla.	WSR-57	29°44' N.	84°59' W.
Atlantic City, N.J.	WSR-57	39°27' N.	74°35' W.
Baton Rouge, La.	WR-100-5	30°32' N.	91°09' W.
Brownsville, Tex.	WSR-57	25°54' N.	97°26' W.
Brunswick, Maine	WSR-57	43°54' N.	69°56' W.
Cape Hatteras, N.C.	WSR-57	35°16' N.	75°33' W.
Charleston, S.C.	WSR-57	32°54' N.	80°02' W.
Chatham, Mass.	WSR-57	41°39' N.	69°57' W.
Daytona Beach, Fla.	WSR-57	29°11' N.	81°03' W.
Galveston, Tex.	WSR-57	29°18' N.	94°48' W.
Jackson, Miss.	WSR-57	32°19' N.	90°05' W.
Key West, Fla.	WSR-57	24°33' N.	81°45' W.
Lake Charles, La.	WSR-57	30°07' N.	93°13' W.
Miami, Fla.	WSR-57	25°43' N.	80°17' W.

	Radar	Latitude	Longitude
New York, N.Y.	WSR-57	40°46'N.	73°59'W.
Patuxent, Md.	WSR-57	38°17'N.	76°25'W.
Pensacola, Fla.	WSR-57	30°21'N.	87°19'W.
San Juan, P.R.	FPS-67*	18°16'N.	65°46'W.
Slidell, La.	WSR-57	30°19'N.	89°46'W.
Tampa, Fla.	WSR-57	27°58'N.	82°32'W.
Victoria, Tex.	WR-100-5	28°51'N.	96°55'W.
Waycross, Ga.	WSR-57	31°15'N.	82°24'W.
Wilmington, N.C.	WSR-57	34°16'N.	77°55'W.

b. Department of Defense

	Radar	Latitude	Longitude
Andrews AFB, Md.	FPS-77	38°48' N.	76°53' W.
Barksdale AFB, La.	FPS-77	32°30' N.	93°40' W.
Cape Kennedy AFS, Fla.	FPS-77	28°28' N.	80°33' W.
Cherry Point MCAS, N.C.	FPS-81	34°54' N.	76°53' W.
Corpus Christi NAS, Tex.	FPS-81	27°42' N.	97°16' W.
Eglin AFB, Fla.	FPS-77	30°29' N.	86°31' W.
Homestead AFB, Fla.	FPS-77	25°29' N.	80°23' W.
Howard AFB, Canal Zone	FPS-77	08°77' N.	79°36' W.
Jacksonville NAS, Fla.	FPS-106	30°14' N.	81°41' W.
Keesler AFB, Miss.	FPS-77	30°24' N.	88°55' W.
Lakehurst NATTC, N.J.	FPS-81	40°02' N.	74°20' W.
MacDill AFB, Fla.	CPS-9	27°51' N.	82°30' W.
Maxwell AFB, Ala.	CPS-9	32°23' N.	86°22' W.
McGuire AFB, N.J.	FPS-77	40°00' N.	74°36' W.
NAS Bermuda	FPS-106	32°22' N.	64°41' W.
New Orleans NAS, La.	FPS-81	29°50' N.	90°01' W.
Norfolk FWC, Va.	FPS-81	36°56' N.	76°18' W.
Pope AFB, N.C.	CPS-9	35°12' N.	79°01' W.
Randolph AFB, Tex.	FPS-77	29°32' N.	98°17' W.
Robins AFB, Ga.	FPS-77	32°38' N.	83°36' W.
Seymour Johnson AFB, N.C.	FPS-77	35°20' N.	77°58' W.
Sudbury, Mass.	CPS-9 and FPS-68	42°25' N.	71°29' W.

*FAA-U.S. Navy joint-use radar.

ADC Sites

(1) 20 NORAD Region Control Center (20th NRCC)

	Latitude	Longitude
632 Radar Sq., Roanoke Rapids AFS, N.C.	36°27' N.	77°44' W.
**645 Radar Sq., Patrick AFB, Fla.	28°13' N.	80°36' W.
**660 Radar Sq., MacDill AFB, Fla.	27°50' N.	82°28' W.
**678 Radar Sq., Tyndall AFB, Fla.	30°05' N.	85°37' W.
**679 Radar Sq., Jacksonville AFS, Fla.	30°13' N.	81°41' W.
701 Radar Sq., Ft. Fischer AFS, N.C.	33°59' N.	77°55' W.
702 Radar Sq., Hunter AAF, Ga.	32°01' N.	81°10' W.
770 Radar Sq., Ft. George G. Meade RSI, Md.	39°07' N.	76°44' W.
**771 Radar Sq., Cape Charles AFS, Va.	37°08' N.	75°57' W.
**792 Radar Sq., North Charleston AFS, S.C.	32°54' N.	80°01' W.
861 Radar Sq., Aiken AFS, S.C.	33°39' N.	81°41' W.

(2) 21 NORAD Region Control Center (21st NRCC)

**648 Radar Sq., Benton AFS, Pa.	41°21' N.	76°18' W.
**656 Radar Sq., Saratoga Springs AFS, N.Y.	43°01' N.	73°41' W.
762 Radar Sq., North Truro AFS, Mass.	42°02' N.	70°03' W.
772 Radar Sq., Gibbsboro, NJ.	39°49' N.	74°57' W.
773 Radar Sq., Montauk AFS, N.Y.	41°04' N.	71°52' W.
**907 Radar Sq., Bucks Harbor AFS, Maine	44°38' N.	67°24' W.

**Remoted in the FAA ARTCC: see paragraph 7.

c. Cooperating Sites

Bay St. Louis, Miss. (NASA)	CPS-9	30°42' N.	89°07' W.
Cambridge, Mass. (Massachusetts Institute of Technology)	CPS-9 and M-33	42°42' N.	71°06' W.
College Station, Tex. (Texas A. & M. Univ.)	CPS-9	30°37' N.	96°21' W.
Coral Gables, Fla. (University of Miami)	SP-1M and CPS-6B	25°43' N.	80°17' W.
#Wallops Station, Va. (NASA)	MPS-19	37°50' N.	75°29' W.
	SPS-12	37°56' N.	75°28' W.
	FPS-16	37°50' N.	75°29' W.
	FPQ-6	37°52' N.	75°31' W.

#Radar used depends upon the location of the hurricane; the one in use will be properly identified.

4. Procedures to be Used When Radar Units are Collocated (Within 25 Miles).

a. When the National Weather Service and Department of Defense radar stations are collocated (within 25 miles), the WSR-57 radars of the National Weather Service will be the primary source for reports of storm and storm eye characteristics. The Department of Defense radar units will provide backup service in case the WSR-57 radar fails.

b. When radar units less powerful than the WSR-57 are collocated with an ADC radar unit or other more powerful units, the ADC unit will be the primary source for reports of storm and storm eye characteristics providing it is manned by a competent weather radar operator. The less powerful units will provide backup or coordination service.

c. Normally, only the hurricane radar reports from the primary source, as defined above, will be transmitted. However, when significant phenomena are detected by any of the other collocated radars but not by the primary source, such phenomena should be reported.

d. Consultation between all radar sites will be by telephone.

5. Communications. Hurricane observations must be transmitted in a manner to assure receipt at the National Hurricane Center (NHC) with the least possible delay. In essence, communications procedures are directed toward getting hurricane radar data onto Radar Report and Warning Coordination (RAWARC) Circuit 23421 or teletypewriter (T/T) Circuit 7072, with a minimum number of relays, as quickly as possible. The Department of Defense stations not having transmission capability on Circuits 23421 or 7072 may use COMET II as an alternate means. When commercial telephone is used to pass hurricane observations to the Weather Service Office (WSO), the WSO will accept "reverse charges" calls for this purpose. The following procedures will be used in communicating hurricane radar observations:

a. From ADC Sites:

(1) Commercial telephone to the nearest WSO for entry on weather teletypewriter circuits, or

(2) Hot line to the supporting base weather station for entry on weather teletypewriter circuits.

b. From Other Air Force Stations: Radar Reports (RAREPS) and other hurricane observation information received or observed will be transmitted every one-half hour at H+10 and H+40 on RAWARC Circuits 23420 or 23421 if send-receive capability is available on either of these Circuits. If not, hurricane observation information from those stations listed in paragraph 3.b. above will be transmitted by COMET II as an alternate.

c. From WSOs: The RAREPS and other hurricane observation information received or observed will be transmitted over either RAWARC Circuit 23420 or 23421 every one-half hour at H+05 and H+35.

d. From Navy Stations: The Navy stations having send-receive drops on either RAWARC Circuits 23420 or 23421 or on T/T Circuit 7072 or GT 22117 shall transmit reports on one of these Circuits every one-half hour. If not, those stations having transmit capability on COMET II will transmit hurricane observations by that circuit as an alternate means.

e. From the ARTCCs: Hurricane information will be telephoned to the nearest WSO having a drop on either teletypewriter Circuits 23420, 23421, or 7072.

6. Procedures for Detailing National Weather Service Radar Specialist to ADC Sites to Make Hurricane Radar Observations.

a. The Director of the National Weather Service has been authorized to send radar meteorologists to ADC radar sites on the Atlantic and gulf coasts during periods when hurricanes threaten these regions for the purpose of making and reporting hurricane radar observations. To expedite the granting of access to a site and to maintain proper security measures, the following procedures will be used:

(1) The National Weather Service must notify the appropriate coordinator by wire or telephone of the intent to visit a site. Notification will normally be done by the responsible Regional Headquarters, but in case this function cannot be so handled, the Emergency Warnings Branch, Silver Spring, Md., will make the necessary arrangements. The coordinator will notify the site commander(s) concerned of the impending visit. This notification will include name, security clearance, and date(s) of the visit.

(2) Staff weather offices of the North American Air Defense (NORAD) Regional Control Centers (NRCC) indicated in paragraph 3.b. will act as coordinators for these visits. Addresses and commercial telephone numbers for these staff weather offices are:

(a) 20th NRCC--Commander, Detachment 41, 12th Weather Squadron, Ft. Lee AFS, Va. Telephone, area code 703, 732-0313, Ext. 765. (For those sites from Maryland south.)

(b) 21st NRCC--Commander, Detachment 27, 12th Weather Squadron, Hancock Field, Syracuse, N.Y. Telephone, area code 315, 458-5500, Ext. 620. (For those sites from Pennsylvania north.)

b. The National Weather Service personnel are authorized to use Government quarters and messing facilities. They are authorized to visit site operations to view and transmit radar weather observations from the PPI and RHI scopes. Normal commercial telephone facilities will be used to transmit hurricane information to the nearest WSO location.

c. Due to the limited facilities at some sites, the National Weather Service agrees that not more than two persons will visit a site at any given time. Each visit will normally be short, 1 or 2 days, but will depend upon the progress of the hurricane under observation.

d. The permission to visit and security status of the National Weather Service personnel listed in paragraph 6.e below must be on file at the ADC radar sites listed in paragraph 3.b above. It will be the responsibility of the Emergency Warnings Branch, Meteorological Services Division (MSD), National Weather Service Headquarters in Silver Spring to coordinate additions, changes, and/or deletions in this list with Headquarters, ADC, at least 2 weeks in advance of the effective date of the change. The coordinating correspondence from the National Weather Service Headquarters to ADC should refer to this document and paragraph and will include the security clearance, effective date, and authority for the clearance. Correspondence should be addressed as follows:

Hq. ADC (DOW)
Ent AFB, Colo. 80912

After authorization, Hq. ADC (DOW) will notify the NRCC staff weather officers and ADC radar sites of additions (or deletions) from the list of authorized National Weather Service personnel.

#e. The following National Weather Service personnel have SECRET security clearances and are authorized by the ADC to visit ADC radar sites listed in paragraph 3.b. above after compliance with paragraphs 6.a.(1) and (2) above. Positive identification must be presented to the ADC radar site entry post before entry to the site will be granted. The purpose of these visits is to make and transmit radar hurricane observations. These personnel have also been authorized by the FAA to visit the ARTCCs listed in paragraph 7 for the same purpose:

NAME	SOCIAL SECURITY NO.	DUTY STATION	INVESTIGATIVE AUTHORITY	DATE
Baskerville, Robert W., Jr.	128-26-7982	WSO N.Y., N.Y.	CSC*	4-11-69
Benton, Davis	429-36-2305	WSO Galveston, Tex.	CSC	8-04-60
Bianchi, Albert C.	013-24-6281	WSO Lake Charles, La.	CSC	5-02-60
Black, Dale A.	428-72-5368	WSMO Centerville, Ala.	CSC	6-24-63
Boudreaux, Jerry F.	463-54-4520	WSO Galveston, Tex.	OIS**	8-20-69
Bowser, Carl O., Jr.	188-24-0965	NWSH	CSC	4-14-69
Brown, Warren E.	494-32-4537	WSO Victoria, Tex.	OIS	9-16-60
Capo, Rafael A.	580-58-8863	WSO Lake Charles, La.	CSC	3-14-67
Cathey, Gerald	461-54-6262	WSFO Oklahoma City, Okla.	CSC	12-20-66
Conway, Charles L.	519-26-9457	NWSH	CSC	4-16-71
Crane, Billy D.	525-60-1385	WSO Midland, Tex.	CSC	9-15-60
Crouch, Billy J.	419-36-5778	WSFO New Orleans, La.	CSC	4-24-67
Dixon, Kenneth E.	224-42-8501	WSO Cincinnati, Ohio	CSC	11-10-59
Drybala, Francis J.	191-16-1786	NHC Miami, Fla.	CSC	5-28-68
Filion, Joseph	037-24-1775	WSO Wilmington, N.C.	CSC	8-08-62
Fisher, Robert E.	149-22-6695	WSFO Buffalo, N.Y.	CSC	1-07-66
Flanders, Allen F.	030-18-3762	NWSH	CSC	11-03-60

NAME	SOCIAL SECURITY NO.	DUTY STATION	INVESTIGATIVE AUTHORITY	DATE
Fortenberry, Stephen W.	456-50-5783	DATAC, SRH	CSC	09-17-70
Foster, Harrie E., Jr.	016-14-8374	NSSFC Kansas City, Mo.	OIS	10-26-56
Fuertsch, Francis E.	362-28-5667	WSMO Albuquerque, N. Mex.	CSC	12-10-68
Fulcher, Melvin S.	023-26-9455	WSMO Chatham, Mass.	CSC	12-07-61
Gill, Robert L.	253-54-6861	WSO Appalachicola, Fla.	CSC	01-23-67
Gray, Elwood C.	245-60-5235	WSO Cape Hatteras, N.C.	CSC	09-30-65
Hadsock, James R., Jr.	248-36-0861	WSFO San Juan, P.R.	CSC	06-23-71
Hamilton, Robert E.	312-32-7947	WSFO St. Louis, Mo.	CSC	01-05-66
Harris, Gordon W.	397-22-3412	WSMO Brunswick, Maine	OIS	01-16-63
Hexter, Paul L., Jr.	012-30-6909	NWSH	CSC	10-27-59
Holmes, David W.	483-18-9671	NWSH	CSC	09-20-60
Keener, Robert W.	232-34-4596	WSO Atlantic City, N.J.	CSC	04-11-68
King, Thomas L.	242-62-4339	WSMO Patuxent, Md.	CSC	07-05-66
Kuhn, Ronald E.	227-48-7562	WSO Wilmington, N.C.	CSC	05-07-69
Lockhart, William D.	026-20-5632	WSMO Patuxent River, Md.	CSC	01-25-71
Monroe, Harold J., Jr.	166-12-9223	WSMO Slidell, La.	CSC	06-14-61
Montagne, Wilfred J.	437-52-2521	WSO Victoria, Tex.	CSC	05-18-61
Nordland, Robert C.	040-32-4865	WSMO Patuxent, Md.	CSC	10-26-71
Oldmixon, Donald H.	462-24-1916	RFC Slidell, La.	CSC	07-29-60
Parrish, Samuel K.	265-26-5577	WSO Charleston, S.C.	CSC	11-25-60
Phipps, Carl L.	498-36-7104	DATAC, SRH	CSC	03-17-61
Robinson, John M.	233-46-1635	WSO Cincinnati, Ohio	CSC	04-10-68
Sadowski, Alexander F.	134-10-7603	NWSH	CSC	08-06-59
Samet, Alvin M.	263-34-6359	NHC Miami, Fla.	CSC	05-28-68
Sarnowski, Edward	115-16-7916	WSFO Buffalo, N.Y.	CSC	09-16-65
Schulz, Walter A., Jr.	450-24-8888	WSFO Jackson, Miss.	CSC	07-05-66
Sheffield, Richard K.	051-22-8591	WSFO Buffalo, N.Y.	CSC	05-17-65
Smith, Robert L.	465-24-0810	WSO Appalachicola, Fla.	OIS	04-15-54
Warden, John D.	035-16-3068	WSO Daytona Beach, Fla.	CSC	06-17-60
Wilk, Kenneth E.	340-22-0234	NSSL	CSC	12-17-62
Whitehead, Robert E.	428-46-0702	WSO Appalachicola, Fla.	OIS	07-21-60

*CSC: Civil Service Commission
**OIS: Office of Investigation and Security

7. Procedures for Detailing National Weather Service Radar Meteorologist to the FAA's ARTCCs.

a. The National Weather Service has been authorized by FAA to send National Weather Service radar meteorologists to ARTCCs during the hurricane season. These meteorologists will make, record, and transmit hurricane radar observations as well as act as a focal point to solicit and process pilot reports from the hurricane areas.

b. Due to the limited facilities at ARTCCs, the National Weather Service agreed that no more than two persons will visit a Center at any given time. Each visit will normally be short, one or two days, but will depend upon the progress of the hurricane under observation.

c. Security clearances are required by FAA of all personnel visiting ARTCCs.

(1) The National Weather Service must notify the appropriate FAA facility coordinator by wire of the intent of weather service personnel to visit such a facility. This may be done by telephone in an emergency. Notification will normally be handled by the responsible National Weather Service Regional Office or the Emergency Warnings Branch, Silver Spring, Md. This notification will include the name of individuals, security clearance data, social security account number, site to be visited, and inclusive date(s) of visit.

(2) The permission to visit, and security status of the National Weather Service personnel listed in paragraph 6.e., Chapter 5, must be on file at the FAA facilities included in paragraph 7.e. It will be the responsibility of the Emergency Warnings Branch, Meteorological Services Division (MSD), National Weather Service Headquarters, Silver Spring, Md., to coordinate additions, changes, and/or deletions in the list of their personnel included in paragraph 6.e. with the FAA Regional Investigation and Security Divisions 2 weeks in advance of effective date of change. Coordinating correspondence should refer to this document and appropriate paragraph and should include the following security clearance data: name, degree of clearance to which access is authorized, basis for clearance, and effective date.

(3) Positive identification must be presented for access to FAA facilities.

(4) Only those personnel who have been certified by wire and whose names appear in paragraph 6.e. of Chapter 5, as amended, will be admitted to FAA facilities.

(5) The list of cleared personnel will be updated annually by National Weather Service.

(6) Copies of this plan shall be forwarded to appropriate ARTCCs and FAA regional Air Transportation Security Divisions.

d. The FAA Regional Investigation and Security Division will insure that appropriate ARTCCs are properly briefed.

e. The National Weather Service Regional Headquarters will keep themselves advised of the radar site locations and be prepared to detail radar meteorologists to ARTCCs if conditions warrant. The listed ADC locations below are remoted to ARTCCs:

FAA--ARTCCs	FAA RADAR SITES	MILITARY RADAR SITES
New York ARTCC (Islip, N.Y.) Long Island MacArthur Airport Ronkonkoma, L.I., N.Y. 11779 COM: 516-737-3401 FTS: 8-516-737-3401	New York, N.Y. Trevose, Pa. Benton, Pa.	648 Radar Sq., Benton AFS, Pa.
Washington ARTCC Leesburg, Va. 22075 COM: 202-783-0745 x4201 703-777-4400 x4201 FTS: 8-703-777-4201	Washington, D.C. Bedfor, Va. Benson, N.C. Cape Charles, Va.	771 Radar Sq., Cape Charles AFS, Va. 649 Radar Sq., Bedford AFS, Va.
Boston ARTCC Federal Aviation Administration Air Route Traffic Control Center Northeastern Blvd. & Harris Rd. Nashua, New Hampshire 03060 COM: 603-889-1171 x633 FTS: 8-603-889-7633	Boston, Mass. Bucks Harbor, Maine Saratoga Springs, N.Y.	656 Radar Sq., Saratoga Springs AFS, N.Y. 907 Radar Sq., Bucks Harbor AFS, Maine
Miami ARTCC 7500 N.W. 58th St. and Palmetto Expressway Miami, Fla. 33166 COM: 305-635-7741 FTS: 8-305-634-5266	MacDill, Fla. Patrick, Fla. Richmond, Fla.	644 Radar Sq., Richmond AFS, Fla. 645 Radar Sq., Patrick AFB, Fla. 660 Radar Sq., MacDill AFB, Fla.
Jacksonville ARTCC P.O. Box 98 Hilliard, Fla. 32046 COM: 904-845-3311 (Hilliard) 904-791-2581 (Jacksonville) FTS: 8-904-791-2581	Jacksonville, Fla. Charleston, S.C. Tyndall, Fla. Valdosta, Ga. Jedburg, S.C.	678 Radar Sq., Tyndall AFB, Fla. 679 Radar Sq., Jacksonville AFS, Fla. 861 Radar Sq., Aiken AFS, S.C.
Houston ARTCC P.O. Box 60308 Houston, Tex. 77060 COM: 713-443-8535 FTS: 8-713-990-3070	Alexandria, La. Ellington, Tex. Lackland, Tex. New Orleans, La. Oilton, Tex.	

FAA--ARTCCs	FAA RADAR SITES	MILITARY RADAR SITES
Oakland ARTCC 5125 Central Avenue Fremont, Calif. 94536 COM: 415-797-3200 FTS: 8-415-797-3301	Fallon, Nev. Oakland, Calif. Paso Robles, Calif. Red Bluff, Calif. Sacramento, Calif.	858 Radar Sq., Navy Aux. Air Sta., Fallon, Nev.
Los Angeles ARTCC 2555 E. Avenue P. Palmdale, Calif. 93550 COM: 805-947-4101 x201 FTS: 8-213-947-4201	San Pedro, Calif. Boron, Calif. Cedar City, Utah Las Vegas, Nev. Mt. Laguna, Calif. Paso Robles, Calif.	670th Radar Sq., Ft. MacArthur, Calif. 750th Radar Sq., Boron AFS, Calif. 751 Radar Sq., Mt. Laguna AFS, Calif.

EASTERN PACIFIC

1. General. Radar observations of hurricanes will be taken and reported in accordance with the plan and procedures described in the Weather Radar Observations (FMH No. 7).

2. Participants. Normally, the FAA radar stations at Mt. Laguna, Paso Robles, and San Pedro, Calif., which are remoted into the Los Angeles ARTCC, are the only source of hurricane radar information for the southernmost part of California. The National Weather Service has a limited staff of radar meteorologists presently located at this Center. However, if a hurricane is threatening this area, continuous surveillance will be maintained.

3. Communications. Los Angeles ARTCC radar-composited overlays are prepared by National Weather Service personnel when on duty and then transmitted hourly by means of facsimile to the Weather Service Forecast Office (WSFO) Los Angeles and to the Salt Lake City, Utah, ARTCC radar unit. The Salt Lake City ARTCC radar unit composites these data and communicates them to the Kansas City, Mo., Radar Analysis and Development Unit (RADU) where they are included on the National Facsimile (NAFAX) Radar Summary Chart 16 times each day. Special radar overlays are prepared at more frequent intervals, when requested, and transmitted to the WSFO Los Angeles over the radar facsimile circuit. The WSFO San Francisco must rely on RAWARC, telephone calls, and the NAFAX Radar Summary Chart for radar data.

CENTRAL PACIFIC

1. There is a weather-dedicated radar operated at the following location: Barking Sands, Kauai, AN/FPS 77 RADAR. RAREPS are entered on the FAA inter-island circuit 351 for delivery to all interested weather agencies in Hawaii.

2. The Hawaiian Air Defense Division has agreed to allow the following radar units to supply radar data.

326 Air Division:

150 AC&W Sq., Kokee, Kauai	22°09'N.	159°39'W.
169 AC&W Sq., Mt. Kaala, Oahu	21°31'N.	158°09'W.

3. These units will provide Radar Reports (RAREPS) once each hour whenever weather echoes appear on their radar and each one-half hour whenever eye or center positions are observed in the area of surveillance.

4. RAREPS will be provided by the Base Weather Division, 1st Weather Wing (BWS, 1WWg), Hickam AFB, from their weather dedicated radar (CPS-109). Reports will be transmitted by teletypewriter to National Weather Service Honolulu and to Fleet Weather Center Pearl Harbor. Kokee, Kauai, and Mt. Kaaia, Oahu RAREPS are telephoned directly to CPHC who encodes and enters these reports on circuit 351.

5. During a critical situation, National Weather Service radar meteorologists with SECRET clearance will be detailed to ADC radar sites to take radar observations.

COLLECTION AND DISTRIBUTION OF TROPICAL CYCLONE REPORTS

ATLANTIC

1. Transmission of Reports to the National Hurricane Center (NHC). All reports and information regarding tropical cyclones received by the National Weather Service, Department of Defense, or Federal Aviation Administration (FAA) will be transmitted immediately to NHC at Miami. When reports and information of operational significance are available from research aircraft, they will be transmitted immediately to NHC in the same manner as meteorological reports from hurricane reconnaissance aircraft.

The address group KMIAYM, assigned to NHC, and the group KNGU, assigned to Fleet Weather Central (FWC) Norfolk, will be utilized as an action addressee following the date-time group. The Washington Alternate Hurricane Center (KWBCYM)# and the Fleet Weather Facility (FWF) Suitland (YLGP) will also be included in the distribution if transfer of responsibility to KWBCYM appears imminent. When FAA is unable to effect delivery of messages to KMIAYM, it will immediately transmit them to KWBCYM.

If, during emergencies, responsibility has been transferred from Miami to the Washington Alternate Hurricane Center (WAHC), the addressee indicating the group KWBCYM will be used in place of KMIAYM. (See chapter 8.)

The respective services will assign an appropriate high precedence to messages to NHC or reports containing initial indication of the genesis or existence of a tropical cyclone.

2. Transmissions on National Weather Service Hurricane Circuit. Relays from Circuit 7072 to 23421 will be handled on a semiautomatic basis at the World Weather Building Weather Service Communications Operating Branch (WBC). Manual backup relay capability will be retained at NHC. In addition, such local circuits will be installed as necessary to provide channels for local coordination in Miami. During the hurricane season, drops on the National Weather Service Circuit 23421 will be installed in Department of Defense offices as required.

3. Transmission on Service O. Reconnaissance reports and advisories will be afforded priority handling on the Service O system.

4. Transmission from U.S. Air Force Ground Stations. Hurricane reconnaissance messages will be handled in accordance with "Atlantic U.S. Air Force Communications Support Plan for U.S. Air Force Hurricane Reconnaissance." (See appendix C, chapter 4.)

#The designator KWBCYM is the communications address for this office. For purposes other than communications, it is also referred to as WAHC.

DESIGNATION OF TROPICAL DEPRESSIONS AND CYCLONES

1. Numbering of Tropical Depressions

a. Atlantic.

(1) Tropical depressions will be numbered as soon as their identity can be established; the first one for the year being numbered "one."

(2) The National Hurricane Center (NHC) assigns numbers to tropical depressions. The NHC will telephone the U.S. Navy at Norfolk to give them information on each tropical depression. This call will include the number of the depression, its location, an indication of its intensity, and its potential to develop into a storm.

b. Pacific. Each tropical depression will be assigned a number that will be retained throughout the life cycle of the cyclone. However, the tropical depression number will not be disseminated after the depression becomes a named storm.

(1) For the area east of longitude 140°W., a list of tropical depression numbers will be maintained by the Eastern Pacific Hurricane Center, San Francisco, Calif. Numbering will start at the beginning of each calender year.

(2) For the area west of longitude 140°W., a list of tropical depression numbers from 01 through 99 will be maintained by the Joint Typhoon Warning Center (JTWC), Guam. Renumbering will be at the end of sequence or, in all cases, at the beginning of each calendar year.

(3) When a tropical depression generates in the Pacific, the Eastern Pacific Hurricane Center-San Francisco (EPHC-SFO) will assign the number after coordination with FWC Pearl Harbor. The Central Pacific Hurricane Center-Honolulu (CPHC-HNL) will request a number from JTWC Guam. When forecast responsibility is passed from one warning office to another, the number assigned will be retained.

2. Tropical Cyclone Names

a. Atlantic and Eastern Pacific:

A separate set of names will be used each calendar year, beginning with the first name in the set. The list of names in appednix A of this chapter will be used for identifying tropical cyclones in the Atlantic Ocean, Caribbean Sea, and Gulf of Mexico, In 10 years, after the 10 sets will have been used, the same 10 sets will be used again. The list of names in appendix B of this chapter will be used for identifying tropical cyclones in the Eastern Pacific Ocean east of longitude 140°W. In 4 years, after the four sets will have been used, the same four sets will be used again. Names beginning with the letters Q, U, X, Y, and Z are not included because of the scarcity of suitable names beginning with these letters.

b. Central North Pacific

(1) When a tropical depression intensifies into a tropical storm or hurricane between longitude 140°W. and the 180th meridian, the CPHC-HNL will request a name (see appendix C of this chapter) from JTWC Guam. The depression number will be discontinued and be replaced by the appropriate name.

(2) For tropical cyclones originating east of longitude 140°W., names will be assigned by the Meteorologist in Charge (MIC), EPHC-SFO. Tropical cyclones that cross longitude 140°W. from either west or east will retain their original assigned name.

LIST OF ATLANTIC TROPICAL CYCLONE NAMES

1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
AMY	ANNA	ANITA	AMELIA	ANGIE	ABBY	ARLENE	AGNES	ALICE	ALMA
BLANCHE	BELLE	BABE	BESS	BARBARA	BERTHA	BETH	BETTY	BRENDA	BECKY
CAROLINE	CANDICE	CLARA	CORA	CINDY	CANDY	CHLOE	CARRIE	CHRISTINE	CARMEN
DORIS	DOTTIE	DOROTHY	DEBRA	DOT	DINAH	DORIA	DAWN	DELIA	DOLLY
ELOISE	EMMY	EVELYN	ELLA	EVE	ELSIE	EDITH	EDNA	ELLEN	ELAINE
FAYE	FRANCES	FRIEDA	FLOSSIE	FRANNY	FELICIA	FERN	FELICE	FRAN	FIFI
GLADYS	GLORIA	GRACE	GRETA	GWYN	GEORGIA	GINGER	GERDA	GILDA	GERTRUDE
HALLIE	HOLLY	HANNAH	HOPE	HEDDA	HEDY	HEIDI	HARRIET	HELEN	HESTER
INGRID	INGA	IDA	IRMA	IRIS	ISABEL	IRENE	ILENE	IMOGENE	IVY
JULIA	JILL	JODIE	JULIET	JUDY	JUNE	JANICE	JANE	JOY	JUSTINE
KITTY	KAY	KRISTINA	KENDRA	KAREN	KIM	KRISTY	KARA	KATE	KATHY
LILLY	LILIAS	LOIS	LOUISE	LANA	LUCY	LAURA	LUCILLE	LORETTA	LINDA
MABEL	MARIA	MARY	MARTHA	MOLLY	MILLIE	MARGO	MAE	M ADGE	MARSHA
NIKI	NOLA	NORA	NOREEN	NITA	NINA	NONA	NADINE	NANCY	NELLY
OPAL	ORPHA	ODEL	ORA	OPHELIA	OLIVE	ORCHID	ODETTE	ONA	OLGA
PEGGY	PAMELA	PENNY	PAULA	PATTY	PHYLLIS	PORTIA	POLLY	PATSY	PEARL
RUBY	RUTH	RAQUEL	ROSALIE	ROBERTA	ROSIE	RACHEL	RITA	ROSE	ROXANNE
SHEILA	SHIRLEY	SOPHIA	SUSAN	SHERRY	SUZY	SANDRA	SARAH	SALLY	SABRINA
TILDA	TRIXIE	TRUDY	TANYA	TESS	THEDA	TERESE	TINA	TAM	THELMA
VICKY	VILDA	VIRGINIA	VANESSA	VESTA	VIOLET	VERNA	VELMA	VERA	VIOLA
WINNIE	WYNNE	WILLENE	WANDA	WENDA	WILLETTE	WALLIS	WENDY	WILDA	WILMA

LIST OF EASTERN NORTH PACIFIC TROPICAL CYCLONE NAMES

1975	1976	1977	1978
Agatha	Annette	Ava	Aletta
Bridget	Bonny	Bernice	Blanca
Carlotta	Celeste	Claudia	Connie
Denise	Diana	Doreen	Dolores
Eleanor	Estelle	Emily	Eileen
Francene	Fernanda	Florence	Francesco
Georgette	Gwen	Glenda	Gretchen
Hilary	Hyacinth	Heather	Helga
Ilsa	Iva	Irah	Ione
Jewel	Joanne	Jennifer	Joyce
Katrina	Kathleen	Katherine	Kristen
Lily	Liza	Lillian	Lorraine
Monica	Madeline	Mona	Maggie
Nanette	Naomi	Natalie	Norma
Olivia	Orla	Odessa	Orlene
Priscilla	Pauline	Prudence	Patricia
Ramona	Rebecca	Roslyn	Rosalie
Sharon	Simone	Sylvia	Selma
Terry	Tara	Tillie	Toni
Veronica	Valerie	Victoria	Vivian
Winifred	Willa	Wallie	Winona

CHAPTER 7
APPENDIX C

LIST OF CENTRAL NORTH PACIFIC TROPICAL CYCLONE NAMES

Column 1 list will be repeated with Alice when the last name in Column 4, Winnie, has been used.

Column 1	Column 2	Column 3	Column 4
Alice	Anita	Amy	Agnes
Betty	Billie	Babe	Bess
Cora	Clara	Carla	Carmen
Doris	Dot	Dinah	Della
Elsie	Ellen	Emma	Elaine
Flossie	Fran	Freda	Faye
Grace	Georgia	Gilda	Gloria
Helen	Hope	Harriet	Hester
Ida	Iris	Ivy	Irma
June	Joan	Jean	Judy
Kathy	Kate	Kim	Kit
Lorna	Louise	Lucy	Lola
Marie	Marge	Mary	Mamie
Nancy	Nora	Nadine	Nina
Olga	Opal	Olive	Ora
Pamela	Patsy	Polly	Phyllis
Ruby	Ruth	Rose	Rita
Sally	Sarah	Shirley	Susan
Therese	Thelma	Trix	Tess
Violet	Vera	Virginia	Viola
Wilda	Wanda	Wendy	Winnie

ALTERNATE HURRICANE WARNING OFFICES, ATLANTIC-TRANSFER CONTROL MASTER PLAN, AND NATIONAL WEATHER SERVICE TRANSFER PLAN

1. If it appears probable that the National Hurricane Center (NHC) may be disabled, the duty forecaster will notify the Chief, Aerial Reconnaissance Coordination, All Hurricanes (CARCAH); Fleet Weather Center (FWC) Norfolk; and appropriate Weather Service Offices (WSO). The Alternate Hurricane Warning Office (HWO) for NHC will be the Washington Alternate Hurricane Center (WAHC) at Weather Service Forecast Office (WSFO) Washington. In the absence of any earlier alert, hoisting of hurricane warnings for the Miami area will be considered standby notification of a possible later requirement for transfer of responsibility. At the time of hoisting of warnings or other alert to a possible transfer, pertinent information necessary for an effective transfer will be exchanged. To provide "hard copy," telephone or radio messages will be supplemented by teletypewriter whenever possible.

2. If incapacitation of NHC appears imminent, NHC will maintain constant contact with WAHC and FWC Norfolk by teletypewriter, hot-line telephone, or radio. Transfer may be accomplished at the discretion of the Director, NHC, or may be delayed until contact between WAHC and NHC is lost. If such contact is lost, WAHC will automatically assume responsibility for NHC. Contact will be assumed lost if attempts at communication have failed for a period of 15 minutes.

3. Immediately upon assuming forecast responsibility for NHC, WAHC will notify the Alternate CARCAH at Andrews AFB and FWC Norfolk. It is expected that Alternate CARCAH will report to WAHC. Communication with FWC Norfolk will be by telephone and over teletypewriter circuits.

4. If NHC becomes incapacitated without prior notification to WAHC, the procedures of paragraphs 2. and 3. above will apply.

5. After communications to NHC have been restored or the threat to effectiveness has passed, NHC will so notify CARCAH, WAHC, and FWC Norfolk; duty responsibilities will then be restored to NHC.

6. Geographical areas of responsibility for the National Weather Service HWOs are delineated in appendix A of this chapter, along with assignment of alternate responsibilities in case of disability of a Center.

7. Essentially, the same transfer procedures will apply whenever loss of communications is possible or imminent at other HWOs. Transfer will be to the Alternate HWO listed in the last paragraph of appendix A of this chapter.

8. At the discretion of the Director, NHC, a combined Department of Defense-National Weather Service drill in the above procedures will be held during the early part of June. Explicit instructions will be distributed in advance to all concerned in case a drill is planned.

NATIONAL WEATHER SERVICE TRANSFER PLAN

Geographical areas of responsibility for Hurricane Warning Offices (HWO). Areas of responsibility for tropical cyclone forecasting and warning are assigned to HWOs as follows:

Caribbean Sea, Gulf of Mexico, and Atlantic Ocean:

San Juan : Caribbean Sea, islands, and ocean areas south of latitude 20°N. and longitudes 70°W. to 55°W. (warning responsibility only);

New Orleans : Gulf of Mexico and its coasts west of longitude 85°W. and north of latitude 25°N. (forecasting and primary warning issuance responsibilities are assigned to NHC, Miami).

Washington : Coastal and ocean areas from latitude 35°N. to 41°N. and eastward to longitude 65°W. (warning responsibility only);

Boston : Coastal and ocean areas north of latitude 41°N. and west of longitudes 65°W. (warning responsibility only);

Miami : Forecast responsibility for all coastal and ocean areas. Warning responsibility for all areas in the Gulf of Mexico and Caribbean Sea not assigned to HWO New Orleans or HWO San Juan, and those areas in the Atlantic Ocean not assigned to HWO Boston or HWO Washington.

Alternate responsibilities in event of disability of a Center due to communications failure or other cause are assigned as follows:

Offices with primary HWO responsibility	First alternate	Second alternate
NHC Coral Gables	HWO Washington	HWO New Orleans
HWO New Orleans	NHC Coral Gables	HWO Washington
HWO San Juan	NHC Coral Gables	HWO Washington
HWO Washington	NHC Coral Gables	HWO Boston
HWO Boston	HWO Washington	NHC Coral Gables
# EPHC San Francisco	CPHC Honolulu	CPHC Honolulu
# CPHC Honolulu	Fleet Weather Central Pearl Harbor	EPHC, San Francisco

CHIEF, AERIAL RECONNAISSANCE COORDINATION ALL HURRICANES-TRANSFER PLAN

Transfer of responsibility for coordination of the Tropical Cyclone Reconnaissance Plan of the Day (TCPOD) and the dissemination of the Military Hurricane Warning Advisory from CARCAH to the Alternate CARCAH--Base Weather Station (6th Weather Wing/WX), Andrews AFB--are described below.

1. Procedures

a. Whenever "hurricane warnings" are in effect for the Greater Miami area and the NHC is thereby threatened with becoming inoperative due to inclement weather or loss of communications, the CARCAH will advise the Alternate CARCAH and the FWC Norfolk of the following:

(1) Current and planned reconnaissance missions of Department of Defense and Research Facilities Center (RFC) aircraft.

(2) Capability and location of Department of Defense and RFC aircraft.

(3) Status of coordination of reconnaissance aircraft into or through the U.S. Air Force Missile Test Range warning areas.

(4) The latest Military Hurricane Warning Advisory.

(5) Status of the requirements for any special surface and radar weather observations.

(6) Notification to maintain continuous contact between CARCAH and Alternate CARCAH on the U.S. Air Force hurricane teletypewriter Circuit (GT 22117/JQGAGP28) or on any other communication facilities available.

b. In the event that it becomes necessary later to effect actual transfer the NHC will advise CARCAH of the planned transfer time. The CARCAH will immediately notify the Alternate CARCAH and FWC Norfolk of any later developments since the initial alert and will provide the following additional information:

(1) Specific time of transfer of responsibility.

(2) Latest position of any storms.

(3) Last numbered Military Hurricane Warning Advisory and time issued.

(4) The current Reconnaissance TCPOD.

c. In the event that communications are unexpectedly disrupted between the initial alert and the orderly transfer as outlined, the Alternate CARCAH after unsuccessful contact with CARCAH for any 15-minute period will coordinate with the Washington Alternate Hurricane Center (WAHC) and automatically assume CARCAH responsibility. Under these conditions, however, the primary responsibility for notification of transfer to the Alternate CARCAH rests with WAHC.

2. CARCAH Resumption of Responsibility. The NHC will advise CARCAH when it is again operational. If all required communications are restored, CARCAH will resume normal responsibility in the same manner as it was relinquished and at the same time that NHC resumes normal operation; CARCAH will notify the Alternate CARCAH.

3. Transfer Drill. At the discretion of the Director, NHC, a complete transfer of CARCAH responsibility drill will be conducted in conjunction with any NHC transfer drill early in June. During this drill, the Alternate CARCAH will coordinate a Reconnaissance TCPOD with the Department of Defense and RFC and will disseminate a Military Hurricane Warning Advisory to the U.S. Air Force and FWC Norfolk. If feasible, this drill will also include a flight by U.S. Air Force aircraft to test alternate routing of weather reconnaissance observations. Detailed instructions for this transfer drill will be disseminated to all concerned sufficiently in advance of the drill.

U.S. NAVY TRANSFER PLAN

1. In the event of impending or actual operational failure of the Fleet Weather Central (FWC) Norfolk, its responsibilities will be transferred to the Fleet Weather Facility (FWF) Suitland in accordance with current directives. When FWC Norfolk can resume its responsibilities, FWF Suitland will be so notified. Procedures for transfer of responsibilities will be as follows:

a. The FWC Norfolk shall request the Commanding Officer, FWF Suitland, by appropriate available communications channels to assume the responsibilities at a specified time, if foreseeable.

b. Notify addressees in paragraph 1.e. below.

c. In the event of an operational failure occurring before the above action being taken, it is requested that FWF Suitland assume the responsibilities as soon as cognizant of the failure.

d. Time permitting, FWF Suitland will be briefed by telephone of any special forecasting responsibilities of which FWF Suitland would not be cognizant.

e. When possible, actions of paragraphs a. and b. above shall be carried out by one message. Format of the request for transfer follows:

FM FLEWEACEN NORFOLK VA
TO FLEWEAFAC SUITLAND WASHINGTON DC
INFO CNO WASHINGTON DC
CINCLANTFLT NORFOLK VA
COMNAVAIRLANT NORFOLK VA
COMNAVWEASERV WASHINGTON DC
NHC CORAL GABLES FL
CARCAH CORAL GABLES FL

UNCLAS
EMERGENCY TRANSFER OF RESPONSIBILITY
1. FLEWEACEN NORFOLK CASUALTY IMMINENT
2. REQUEST FLEWEAFAC SUITLAND ASSUME HURRICANE WARNING AND FORECAST RESPONSIBILITIES AND TCPOD COORDINATION
3. RECON FLIGHT SCHEDULE IAW TCPOD_____Z.

2. After assumption of responsibilities, FWF Suitland will coordinate directly the Tropical Cyclone Plan of the Day (TCPOD) with CARCAH and warnings with NHC by AUTOVON numbers 434-1750 or 968-3356, or by commercial telephone patch to (305) 666-3912 or 666-4612.

EASTERN PACIFIC

ALTERNATE HURRICANE WARNING OFFICE

Actions of the National Weather Service as the Alternate (ALT) Hurricane Warning Office Honolulu (CPHC-PHNL), in case of failure of normal operations at the Eastern Pacific Hurricane Center San Francisco (EPHC-SFO) and with the Chief, Aerial Reconnaissance Coordination, All Hurricanes, CARCAH, Miami, are detailed below:

1. Pacific ship reports normally received at EPHC-SFO will be rerouted by communication agencies concerned to CPHC, Honolulu. The Fleet Weather Central (FWC) Pearl Harbor will telephone selected ships in the area of concern of ALT CPHC-PHNL.

2. Public bulletins, advisories, and warnings from ALT CPHC-PHNL will be transmitted on Services C and O and will be available to military bases with drops on these Circuits.

3. The Mather Weather Monitor will telephone hurricane reconnaissance reports to ALT CPHC-PHNL.

4. Coordination and liaison with CARCAH will be by telephone calls.

5. Requests for hurricane reconnaissance flights will be made by telephone to Director, NHC, or his representative.

6. After telephone coordination with CARCAH, final military tropical cyclone forecasts using WS Form C-13 will be read to them for entry on military communication circuits. The Mather Weather Monitor will enter the forecast on COMET II.

The above procedures apply when failure of normal operations occur at EPHC-SFO.

CENTRAL NORTH PACIFIC

TRANSFER OF WARNING RESPONSIBILITY

1. When a tropical cyclone approaches longitude 140°W., the transfer of responsibility will be accomplished through the San Francisco and Honolulu Weather Service Forecast Offices (WSFO). The Central Pacific Hurricane Center-Honolulu (CPHC-HNL) will advise other agencies concerned regarding transfer of warning responsibility.

2. When a tropical cyclone crosses the 180° meridian from west to east, the Joint Typhoon Warning Center (JTWC) Guam will append to the last warning issued on its area of responsibility the statement, "NEXT WARNING BY CPHC-HNL." The Fleet Weather Central (FWC) Pearl Harbor will acknowledge and notify all interested local agencies of assumption of tropical cyclone warning responsibility by CPHC-HNL. In similar fashion, CPHC-HNL, through FWC Pearl Harbor, will pass responsibility to JTWC Guam for a tropical cyclone crossing the 180° meridian from east to west. All local agencies will be notified when acknowledgment is received.

3. Transfer of responsibility will not affect the name or numbering sequence used to identify the tropical cyclone.

4. The Fleet Weather Central, Pearl Harbor will assume all CPHN-HNL functions when failure of normal operations at CPHC-HNL is imminent.

5. If failure of normal operations at the JTWC Guam is imminent, the Alternate Joint Typhoon Warning Center (AJTWC) in Japan will assume warning responsibility west of the 180° meridian to the Malay Peninsula and north of the Equator. In this event, all references to JTWC Guam in this Plan will be replaced by AJTWC Japan.

CHAPTER 9

#TROPICAL CYCLONE SURVEILLANCE BY SATELLITES

1. Geostationary Operational Environmental Satellite (GOES). The GOES system presently consists of two operational satellites. SMS-1 (Synchronous Meteorological Satellite), the first operational prototype of the GOES System was launched in May 1974 and SMS-2 was launched on February 6, 1975. SMS-1 is now located at 75°W and SMS-2 is located at 115°W. The principal GOES products are pictures produced at 30-minute intervals. During the daylight hours 1 mile resolution (2Km) standard sectors are routinely produced. During nighttime equivalent 1 mile IR sectors are produced. These sectors are automatically gridded. The products will be delivered in near real-time to the SFSSs and WSFOs. In addition to the fixed standard sectors each SFSS is capable of displaying floating sectors at 1/2, 1 and 2 mile resolution to augment the standard sector coverage.

2. NOAA Polar Orbiting Satellites. The NOAA satellites provide coverage of the U.S. twice a day (at approximately 9:00 a.m. and 9:00 p.m. local). Properly equipped ground stations can obtain day and night pictures (visible and infrared) from the direct automatic picture transmission (APT) system. Global visible and infrared data are centrally received, processed and disseminated to appropriate SFSSs and WSFOs via FOFAX. Soundings from the Vertical Temperature Profile Radiometer (VTPR) taken at 0900 a.m. and 0900 p.m. local are available for NMC analyses, forecasts and teletype transmission on an orbit basis. High quality data (1 Km resolution in visible and infrared from the Very High Resolution Radiometer (VHRR) is available twice daily.

3. Satellite Field Services Stations (SFSS). Under the NESS Satellite Field Services Station (SFSS) support concept, GOES imagery will be distributed by the Central Data Distribution Center at the World Weather Building in Marlow Heights, Md., to the SFSSs at Miami, San Francisco, Honolulu, Kansas City, Washington, and to NESS Analysis and Evaluation Branch (AEB). The SFSSs are collocated with the NWS's Weather Service Forecast Offices at those locations. The Miami SFSS is responsible for the provision of support to NHC and the San Francisco SFSS is responsible for support provided the Eastern Pacific Hurricane Center (EPHC). (The GOES operational data flow is depicted in Attachment 1 to this chapter.)

a. The Miami SFSS operates 24 hours per day. Satellite Meteorologists can be contacted at 305-350-4310.

b. The San Francisco SFSS operates 24 hours per day. Satellite Meteorologists can be contacted at 415-876-9122 and 9123.

c. The Honolulu SFSS will be established in July or August 1975. Until the Honolulu SFSS is fully operational the NESS Synoptic Analysis Section (SAS) will continue to advise the CPHC via 6 hourly bulletins, of the location, intensity, movement and development characteristics of all tropical cyclones in the Central Pacific. Phone numbers for reaching Satellite Meteorologists will be provided after activation of the Honolulu

SFSS. The NESS Synoptic Analysis Section operates 24 hours per day. Satellite Meteorologists can be reached at 301-763-8444.

4. The NESS Synoptic Analysis Section will distribute 4 daily teletype messages entitled "Satellite Tropical Disturbance Summary" (attachment 2 of this chapter). These messages will describe areas of significant weather in the Tropics observed by the visible (day) and infrared (night) data received from the NOAA satellites according to the following table.

Time Available	Ocean Area	Type of Data	Time of Data
0000Z	Atlantic, E. Pacific	VIS	08Z-20Z
0800Z	Central Pacific	VIS	19Z-02Z
1300Z	Atlantic, E. Pacific	IR NITE	21Z-07Z
2000Z	Central Pacific	IR NITE	07Z-14Z

These "Satellite Tropical Disturbance Summary" messages are available on the following teletype circuits:

(1) 8283, 8285, 8273 (Service O)
(2) GF 10211 (Honolulu)
(3) GD 60159 (Toyko)
(4) GDA 60146 (Bracknell)
(5) GD 20300 (Carswell AFB)
(6) GD 90488 (Kansas City)

5. Guidelines for Classifying Tropical Cyclones as named tropical storms, hurricanes, or typhoons based solely on information from satellites, are as follows:

a. Classification will be based on the definitions in NOAA Technical Memorandum NESS 45 and supplements thereto.

b. Disturbances classified CI 0.5 through CI 2.5 may be labeled as tropical disturbances, waves, or depressions.

c. Disturbances classified CI 2.5 through CI 4.0 may be labeled as tropical storms.

d. Disturbances classified CI 4.0 or greater may be labeled as hurricanes or typhoons.

6. The Defense Meteorological Satellite Program (DMSP) will provide coverage of tropical areas four times a day. Visual and infrared data will be available from two operational satellites in 0830/2030 and 1230/0030 local 450 NM polar orbits. Data covering the NHOP areas of interest will be received centrally at the Air Force Global Weather Central (AFGWC) at Offutt AFB, Nebr., and locally at direct readout sites at Hickam AFB, Hawaii, and Howard AFB, Canal Zone. When named storms are observed in these DMSP readouts, teletype bulletins describing the location and intensity classification of the storm will be transmitted as follows:

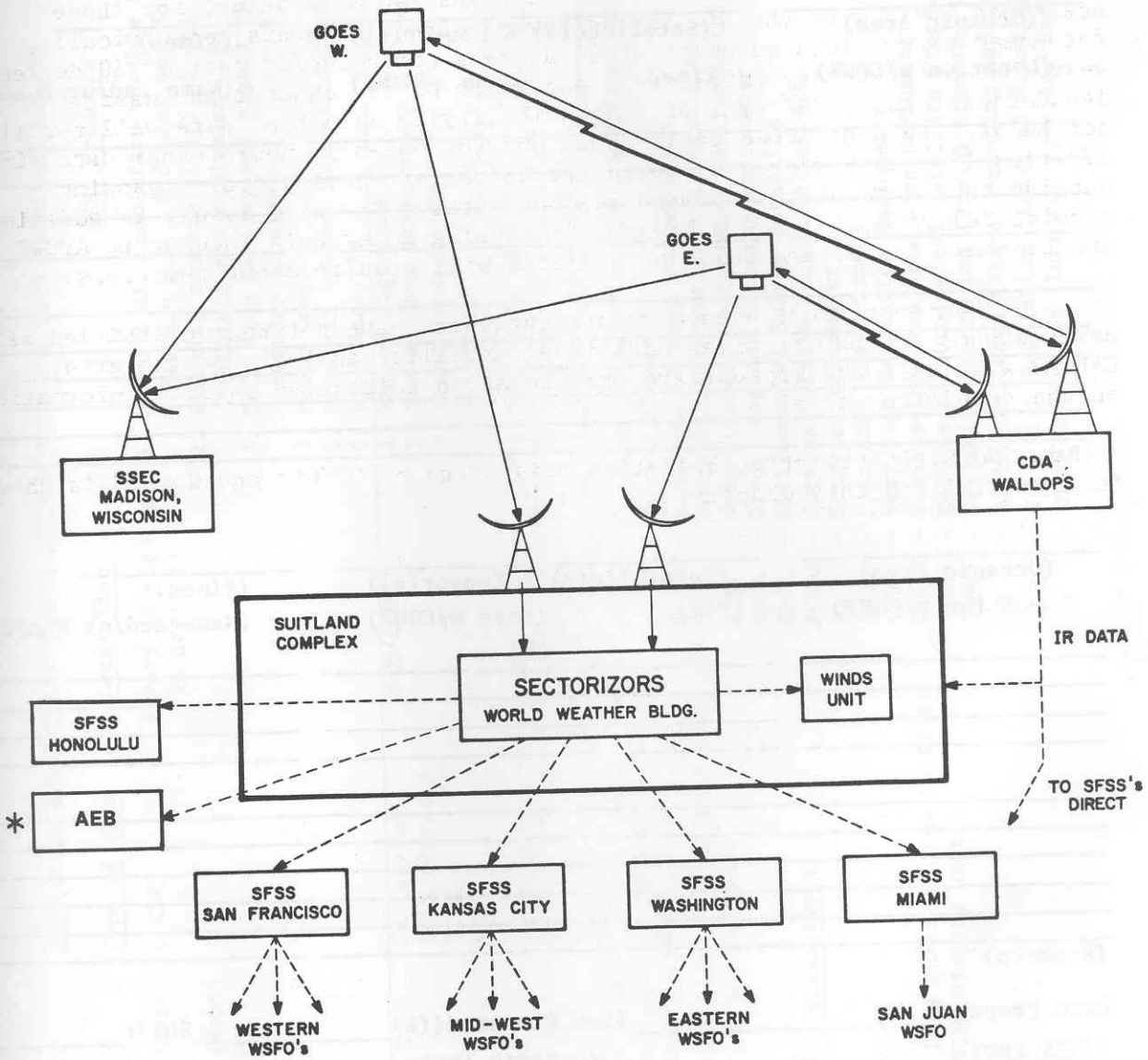
a. The Hickam direct readout covers most of the CPHC area of responsibility: copies of these data will be provided directly to the CPHC along with the location and intensity classification information. The Howard direct readout covers basically the Caribbean area south of 30 degrees north and west of 60 degrees west: teletype bulletins (para. d below) will be provided to NHC.

b. AFGWC will provide teletype bulletins (para. d below) for those areas not covered by the Hickam and Howard direct readouts; specifically, for named storms located north of 30 degrees north and/or east of 60 degrees west (NHC area of responsibility), and north of the equator and east of 140 degrees west (EPHC area of responsibility). Note that data will normally not be available at AFGWC until about one and one-half hours after data time. Additionally, data stored on board the spacecraft during orbits passing outside the range of the command readout sites (CRS) will result in additiona receipt delays of 1 1/2 - 3 hours. Processing after data receipt to AFGWC and transmission of the teletype bulletin will require about two hours.

c. When suspicious areas are present which have not been classified as named storms and NHC requires additional satellite analysis of the area, CARCAH will call the appropriate DMSP location to receive telecon information on the suspicious area.

d. Format of teletype bulletins originated by Offutt and Howard is shown in Appendix A to this chapter.

GOES
OPERATIONAL DATA FLOW



* Analysis and Evaluation Branch

CHAPTER 9
ATTACHMENT 2

*ABXX(#) KWBC

SATELLITE TROPICAL DISTURBANCE SUMMARY

ALL MOVEMENTS AND TRENDS 24 HRS UNLESS OTHERWISE STATED

(Oceanic Area) (Location w/CONF)	(Satellite(s) & Sensor(s)) (Time)	(Code w/CONF)	(Times) (Name and/or Number)

(Remarks)

(Oceanic Area) (Location w/CONF)	(Satellite(s) & Sensor(s)) (Time)	(Code w/CONF)	(Times) (Name and/or Number)

(Remarks)

Date Prepared (Z)_____ Time Prepared((Z)_____ Shift_____

*(HEADING)	(OCEANIC AREA)	(TYPE DATA)
ABXX11	Atlantic, East Pacific (to 140W)	VIS/IR DAY
ABXX13	Central, West and South Pacific	VIS/IR DAY
ABXX15	Atlantic, East Pacific (to 140W)	IR NITE
ABXX16	Central, West and South Pacific	IR NITE

SATELLITES AND SATELLITE DATA AVAILABILITY FOR 1975 HURRICANE SEASON

Satellite	Type of Data	Local Time	NESS Products
SMS-1/GOES (East) 75.0°W *SMS-2/GOES (West) 115.0°W	VISSR	#Every 30 minutes (24 hrs/day)	1. 1 and 2 mi. resolution visible sectors covering Western U.S., Mid-West and Eastern U.S. 2. Floating sectors at 1/2, 1 and 2 mi. resolution (visible and equivalent IR) 3. Full disc IR (day and night) and equivalent IR sectors at night. 4. Movie Loops 5. Tropical Cyclone Classifications 6. Wind Analysis
ITOS (NOAA 3 and/or 4)	SR (stored) DRSR (direct) VTPR VHRR	0900/2100	1. Mapped digitized SR 2. Sea-surface Temperature Analysis 3. Moisture Analysis 4. Soundings 5. Tropical Cyclone Classifications
ESSA-8	APT (direct)	1000	1. APT Video Signal
DMSP	VHR HR WHR MI	0830/2030 1230/0030	1. VHR and HR displays 2. WHR and MI displays

*SMS-2/GOES - Temporary position. Final position under consideration for West GOES is 130° - 135°W.

#Except for scheduled interrupts for preventive maintenance.

Methods of Distribution:

FOFAX
Telephone
WEFAX
Direct Data Quality Lines to SFSSs and WSFO display units.

VTPR - Vertical Temperature Profile Radiometer
WEFAX - Weather Facsimile
APT - Automatic Picture Transmission
SMS - Synchronous Meteorological Satellite
GOES - Geostationary Operational Environmental Satellite
DRSR - Direct Readout Scanning Radiometer
ESSA - Environmental Survey Satellite
FOFAX - Forecast Office Facsimile Network
SR - Scanning Radiometer
SSCC - Spin-Scan Cloud Camera
VHRR - Very High Resolution Radiometer
VISSR - Visible-Infrared Spin Scan Radiometer
DMSP - Defense Meteorological Satellite Program
VHR - Very High Resolution (Visual Scanning Radiometer 1/3 nm)
HR - High Resolution (Visual Scanning Radiometer 2 nm)
WHR - Very High Resolution (Infrared Scanning Radiometer 1/3 nm)
MI - High Resolution (Infrared Scanning Radiometer 2 nm)

CENTER FIX DATA FORM AND MESSAGE FORMAT (DMSP SATELLITE)

Message Heading TPPA CCCC	Code Form (WMO FM 85.3-SAREP): $M_iM_iM_jM_j$ $YYGG_g$ IIiii (or $99L_aL_aL_a$ $Q_cL_oL_oL_oL_o$) Name of cyclone $N_tN_tL_aL_aL_a$ $Q_cL_oL_oL_oL_o$ $A_tS_tW_fa_tt_m$ DDDD Name of satellite Remarks. Repeat name of cyclone $N_tN_tL_aL_aL_aQ_cL_oL_oL_oL_o$ $A_tS_tW_fa_tt_m$ and Remarks if more than one cyclone appears on the satellite photo.
$M_iM_iM_jM_j$	CCAA for land stations. DDAA for sea stations.
$YYGG_g$	Day of the month and nodal crossing time in tenths of minute (GMT).
IIiii (or $99L_aL_aL_aQ_cL_oL_oL_oL_o$)	Block number and international station number of land reporting locations or the latitude/longitude in tenths of degree and quadrant of the globe (Code 3333) for sea stations.
Name of cyclone	Self explanatory. Include if available.
$N_tN_tL_aL_aL_a$ $Q_cL_oL_oL_oL_o$ $A_tS_tW_fa_tt_m$	Cyclone number (01-99) if known and latitude position in tenths of degree. Quadrant of the globe (Code 3333) and longitude position in tenths of degree. Accuracy of the position A_t (Code 0252) report as: 1 - Visible Eye 2 - Well defined C. C. 3 - Poorly defined C. C. Intensity (S_t) based on the Dvorak classification (Code 3752). Mean width or diameter of the CDO (W_f - Code 4536). Apparent 24-hr change in intensity (a_t - Code 0252). Report t_m as not included (Code 4044). (Note: $S_tW_fa_t$ values are only reported when visible data available; report as undetermined when infrared data is used to determine A_t.)

Name of satellite	Designate DMSP BLK V/C or BLK V/D, NOAA-3, etc.
Remarks:	Include check sums, Latitude (LT/X) and Longitude (LG/X) for cyclone position and specify whether ephemsris or geographic gridding was used. Also include, as appropriate, information on eye characteristics, spiral rainbands, unexpected changes in storm movement, etc.

CODE TABLES

Code table 0152

A_t - Accuracy of the determination of the geographical position of the tropical cyclone

Code figure

0 - cyclone center within 10 km of the transmitted position
1 - " " " 20 km " " " "
2 - " " " 50 km " " " "
3 - " " " 100 km " " " "
4 - " " " 200 km " " " "
5 - " " " 300 km " " " "
/ - undetermined

Code table 0252

a_t - Apparent 24-hour change in intensity of tropical cyclone

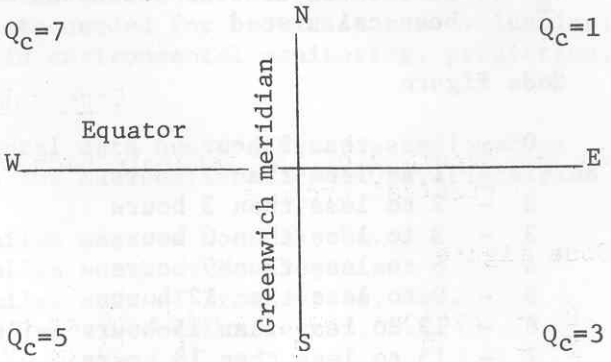
Code figure

0 - much apparent weakening
1 - apparent weakening
2 - no apparent change
3 - apparent intensification
4 - apparent strong intensification
5 -)
6 -)
7 -) not used
8 -)
9 - not observed previously
/ - undetermined

Code 3333

Q_c - Quadrant of the globe

Code figure	Latitude	Longitude
1	North	East
3	South	East
5	South	West
7	North	West



Note: The choice is left to the observer in the following casts:

- When the ship is on the Greenwich meridian or the 180th meridian ($L_oL_oL_oL_o$ = 0000 or 1800 respectively):
  Q_c = 1 or 7 (northern hemisphere) or
  Q_c = 3 or 5 (southern hemisphere;

- When the ship is on the Equator ($L_aL_aL_a$ = 000):
  Q_c = 1 or 3 (eastern longitude) or
  Q_c = 5 or 7 (western longitude).

Code table 3752

S_t - Classification of the tropical cyclone

Code figure	Current Intensity (CI Number)*	Max, sustained wind speed (knots)	Max. sustained wind speed (m/sec.)
1	1,5	25	13
2	2	30	15
3	3	40	20
4	4	60	30
5	5	85	43
6	6	110	56
7	7	135	68
8	8	170	86
9	Becoming extra-tropical		
0	Decaying		
/	Undetermined		

Code table 4044

t_m - Time interval over which the movement of the tropical cyclone has been calculated

Code figure

0 - less than 1 hour
1 - 1 to less than 2 hours
2 - 2 to less than 3 hours
3 - 3 to less than 6 hours
4 - 6 to less than 9 hours
5 - 9 to less than 12 hours
6 - 12 to less than 15 hours
7 - 15 to less than 18 hours
8 - 18 to less than 21 hours
9 - 21 to less than 30 hours
/ - movement group is not included

Code table 4536

W_f - Mean width or mean diameter of the feature specified by S_fS_f or mean diameter of the overcast cloud of the tropical cyclone

Code figure

0 - < 1° of latitude
1 - 1° to less than 2° of latitude
2 - 2° " " " 3° " "
3 - 3° " " " 4° " "
4 - 4° " " " 5° " "
5 - 5° " " " 6° " "
6 - 6° " " " 7° " "
7 - 7° " " " 8° " "
8 - 8° " " " 9° " "
9 - > 9° of latitude
/ - undetermined

ENVIRONMENTAL DATA BUOYS

1. Mission. The mission of the experimental environmental data buoys deployed in the Gulf of Mexico and off the east coast of the U.S. is to gather environmental and engineering data needed for buoy test and evaluation; for improved buoy design; and for use in environmental monitoring, prediction, and research.

2. Locations. Experimental environmental data buoys (EBs) are deployed at the following locations of interest to the National Hurricane Operations Plan.

EB-01	36.5°N	73.5°W	125 miles east of Norfolk, Va.
EB-10	27.5°N	88.0°W	225 miles south of Mobile, Ala.
EB-12	26.0°N	94.0°W	200 miles east of Brownsville, Tex.
EB-13	32.3°N	75.2°W	250 miles east of Charleston, S.C.

Additional buoys are being considered for deployment in these areas.

3. Description. These buoys are 40-foot discus buoys providing scheduled meteorological and limited oceanographic data from improved data acquisition components. Additional buoys may carry more oceanographic instrumentation.

4. Environmental Data

a. Meteorological and oceanographic parameters can be measured every hour and stored on the buoy. Normal shore interrogation to obtain data is once every three hours, but the system is capable of hourly interrogation. The parameters sampled, stored aboard the buoy, and transmitted to shore now consist of the following:

- Barometric Pressure
- Wind Direction and Speed
- Air Temperature
- Dew Point Temperature
- Sea Surface Temperature
- Sea Surface Salinity

Additional oceanographic sensors, such as wave height and period, will be considered at the conclusion of present tests.

5. Reception of Data. The U.S. Coast Guard-operated Shore Collection Station (SCS) at Miami will routinely collect surface synoptic information from the buoy eight times daily. These data are converted into physical units and then translated into World Meteorological Organization (WMO) FM21D ship code. Relay to the National Weather Service at Suitland, Md., is by means of NWS Circuit 7072 within one (1) hour of synoptic acquisition.

6. Special Requests for Data. The National Hurricane Center (NHC) requests for special or more frequent interrogations during critical storm periods will be accommodated by telephone request to the Miami Radio Station Duty Officer, telephone (305) 233-3062. The start-and-stop time for special hourly reports should be given and limited to 12-hour consecutive operation unless an emergency exists. In an emergency, the NOAA Data Buoy Office should also be consulted.

7. System Status. System maintenance and final buoy data quality are under the technical control of the NOAA Data Buoy Office. Requests for system status, schedule and data quality information should be directed to the NOAA Data Buoy Office, Mississippi Test Facility, Bay St. Louis, Miss. 39520; telephone (601) 688-2836.

PUBLICITY

News media releases, other than warnings and/or advisories for the purpose of informing the public of the operational and research activities of the Department of Defense and the National Weather Service, should reflect the joint effort of these agencies by giving due credit to the participation of other agencies. Copies of these releases should be forwarded to:

Deputy Director for Operations (Environmental Services)
The Joint Chiefs of Staff
Washington, D.C. 20301

Headquarters, Naval Weather Service Command
Building 200
Washington Navy Yard
Washington, D.C. 20374

Headquarters, Military Airlift Command (MAC/OIP)
Scott Air Force Base, Ill. 62225

NOAA, Office of Public Affairs
6010 Executive Boulevard
Rockville, Md. 20852

Commandant, Marine Corps
Headquarters, U.S. Marine Corps
Washington, D.C. 20380