U.S. DEPARTMENT OF COMMERCE / National Oceanic and Atmospheric Administration

FEDERAL COORDINATOR FOR METEOROLOGICAL SERVICES AND SUPPORTING RESEARCH

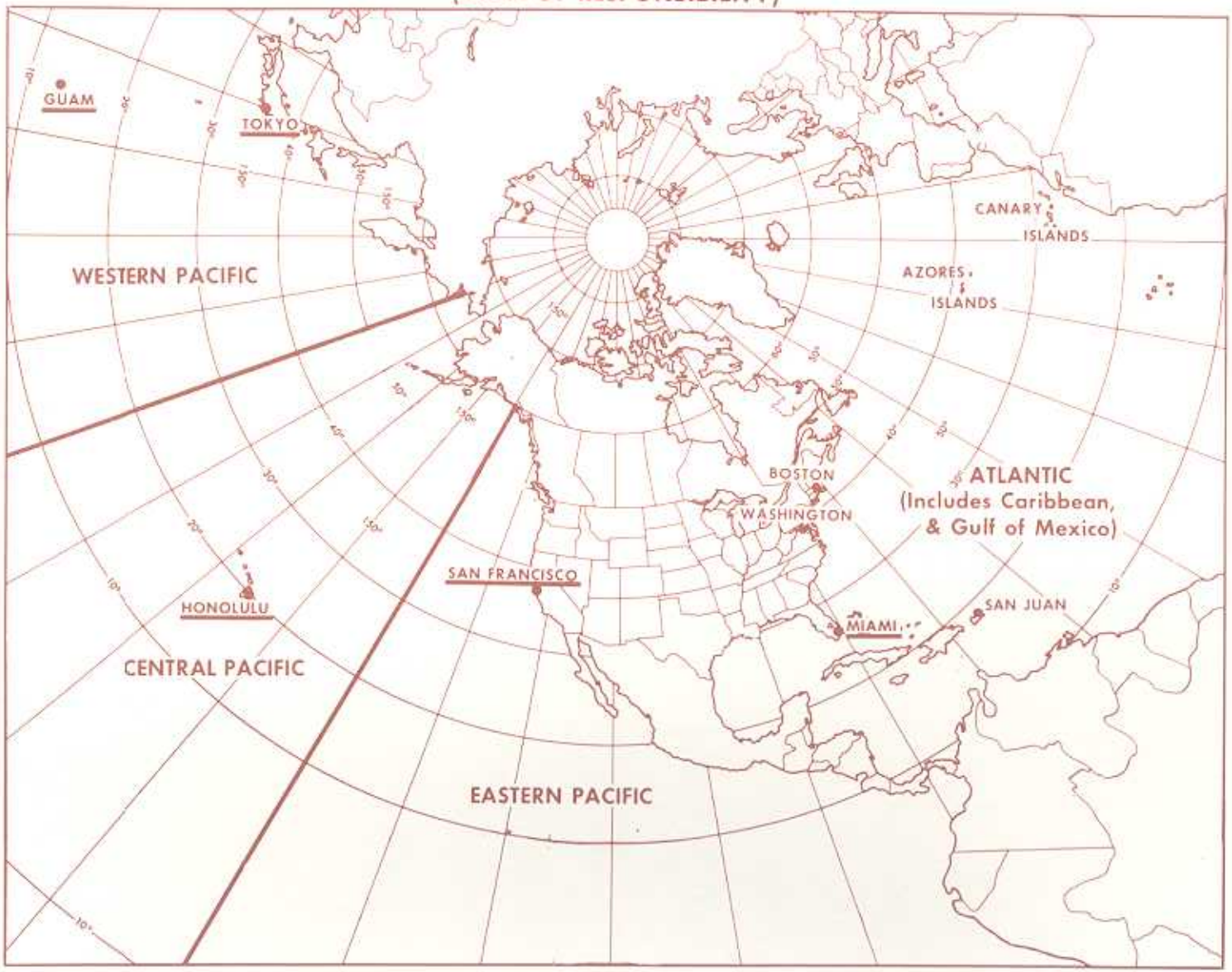
National Hurricane Operations Plan

FCM 76-1

Washington, D.C.
May 1976

NATIONAL HURRICANE OPERATIONS PLAN

(AREA OF RESPONSIBILITY)



U.S. DEPARTMENT OF COMMERCE
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Change No.	Page numbers	Date posted	Signature
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

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 14th 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 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 Service (HWS).

#(5) Advise the Chief, Aerial Reconnaissance Coordination, All Hurricanes (CARCAH) of aircraft reconnaissance and special observational requirements of the Hurricane Warning Service.

(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 Detachment 4, 1st Weather Wing (DET4, 1WW) 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.

#(7) Provide CARCAH with facility and administration support as agreed to by Department of Commerce and Department of Defense.

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 for 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 (ADCOM) 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 E, of this Plan.

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

#f. Coordinate and prepare the Tropical Cyclone Plan of the Day (TCPOD) and be responsible for the scheduling of aircraft required to meet the provisions of Chapter 4 of this Plan.

#g. Provide any extra upper air observations according to the procedures in Chapter 3.

#h. Provide broadcast facilities of radio station NAM for tropical storm and hurricane forecasts and warnings.

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 the 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.

#(5) Provide coastal broadcast facilities at selected locations for tropical storm and hurricane forecasts and warnings.

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.

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. MISSION IDENTIFIER: The identifier assigned to reconnaissance flights by CARCAH for weather data identification. As shown in the example of Chapter 4, paragraph 10.h, mission identifiers used by the 815 WRS Air Force Reserve will contain the words "Air Force Tealy"; 53WRS mission identifiers will contain the words "Air Force Gull"; RFC mission identifiers will contain "NOAA".

5. 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.)

6. 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.

7. 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.

8. VORTEX FIX. The location of the center of a tropical cyclone obtained by reconnaissance aircraft penetration.

CHAPTER 3

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 (CPHN-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). In addition, all public advisories, when issued, will be provided to DOD.

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 CARCAH. Release time will not be earlier than 30 minutes prior to the scheduled warning time of the material.

DOD forecasters who must give advice concerning an IMMINENT OPERATIONAL DECISION may call the NHC forecaster directly when he believes the latest available releases require elaboration (Tel. (305) 350-5547 or 350-4303).

a. Time and Circumstances of Issue of Standard 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 standard 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.

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 or to make changes in warnings if required.

Atlantic, Caribbean, and Gulf: Special Advisories will be numbered in sequence with scheduled advisories.

Eastern and Central 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.)

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, type cyclone and name and number, advisory number, amended, corrected, or relocated, issuing office, and hour and day.

(3) Warnings in effect.

(4) Position, in degrees and tenths.

(5) Time of position in GMT.

(6) Accuracy of position and basis for positioning.

(7) Present movement.

#(8) Diameter of eye (if known).

(9) 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).

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

(11) Repeat center location and time.

(12) 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).

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

*If sustained winds are 50 knots or greater.

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

(15) Extended outlooks:

(a) The 48-hour outlook position:

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.

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

(17) 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. Abbreviated Tropical Depression Advisory Issuances. The EPHC-SFO, CPHC-HNL, and NHC will issue and provide to the Department of Defense basic tropical depression forecasts and related information. Basic tropical depression forecasts will include advice as to location, movement, intensity, and dimensions of tropical depressions.

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

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

(1) Time of issue.

(2) Heading, tropical depression, tropical depression number (spelled out), advisory number, issuing office, and hour and day.

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

(b) In the Eastern and Central Pacific, all advisories will be numbered sequentially, that is, Advisory Number 1, Tropical Depression ONE; Advisory Number 2, Tropical Depression ONE; Advisory Number 3, Tropical Storm Anita; Advisory Number 4, Hurricane Anita; Advisory Number 5, Tropical Depression ONE; etc. WOPN11 PHNL (Tropical Depression Advisories 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. NHC will number these advisories consecutively, but the numbering will revert to "1" if the system is named.

(3) Position, in degrees and tenths.

(4) Time of position in GMT.

(5) Accuracy and basis for positions.

(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.#

#In the Atlantic, Caribbean and Gulf Abbreviated Tropical Depression Advisories will consist of items (1) through (7).# In addition a 24-hour forecast position will be given along with maximum sustained winds. Gusts will only be included if forecast speeds are expected to be greater than 50 knots.

#4. Tropical Cyclone Discussions--Atlantic. The NHC will issue Tropical Cyclone Discussions at 0300, 0900, 1500, and 2100Z daily whenever tropical storm and hurricane advisories are being issued "FOR INTRAGOVERNMENT 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 (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 when the Nation is on daylight saving time (and at 1030, 1630, and 2230 GMT when it is on standard time) and distributed on all Radar Report (RAREP) and Warning Coordination (RAWARC) circuits and Circuit 7072. 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, and (3) tropical depression, storm and hurricane forecasts for tropical cyclones east of 35°W which pose no threat to any land areas around the western Atlantic, otherwise an Advisory would be issued.

#6. Hourly Tropical Cyclone Position Estimates--Atlantic. The National Weather Service Hurricane Warning Office (HWO) that issues the public advisory may 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 when prepared 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 including DOD 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+9 with an additional segment available at H+11 if needed.

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 with an additional segment at H+51 if needed. WWV also transmits one 45-second segment of warning information for the eastern North Pacific at H+10.

8. 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.

#9. Storm Summaries on Tropical Cyclones After Discontinuance of Advisories. The storm name will be retained until all summaries have been discontinued on a tropical cyclone.

#10. Advisories on Subtropical Storms. The NHC will issue 6-hourly marine and military advisories 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)

11. 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.

#12. Tasking for DOD Upper Air Support. NHC may require extra upper air observations from DOD stations during tropical cyclone emergencies. NHC will make such requests to CARCAH which will then make the necessary arrangements.

CHAPTER 3
FORM 1

WS Form C-13 (6-76)

PACIFIC USE ONLY

SUBTROPICAL STORM
TROPICAL DEPRESSION
TROPICAL STORM
HURRICANE _____ (NAME/NUMBER)

UPGRADED FROM TROPICAL DEPRESSION
DOWNGRADED TO TROPICAL STORM
HURRICANE _____ (NAME/NUMBER)

ADVISORY NUMBER _____ AMENDED / CORRECTED / RELOCATED

NATIONAL WEATHER SERVICE _____ CITY _____ STATE

_____ Z _____ (TIME) (MONTH) (DAY) (YEAR)

_____
(WARNINGS)

DEPRESSION
STORM
HURRICANE CENTER LOCATED NEAR _____ NORTH _____ WEST AT _____ Z.

POSITION { EXCELLENT / GOOD / FAIR / ACCURATE WITHIN _____ NM }

BASED ON { DOD RECONNAISSANCE TIME OF FIX _____ Z. / NOAA RECONNAISSANCE TIME OF FIX _____ Z. / LAND BASED RADAR / ACFT RADAR / SATELLITE IMAGE / SHIP REPORT / SYNOPTIC REPORT / EXTRAPOLATION }

_____

PRESENT MOVEMENT _____ OR _____ DEGREES AT _____ KT.
DIAMETER OF EYE _____ NM (IF KNOWN)
MAX SUSTAINED WINDS _____ KT WITH GUSTS TO _____ KT.
MAX SUSTAINED WINDS OVER INLAND AREAS _____ KT WITH GUSTS TO _____ KT.
RAD OF 100 KT-WINDS _____ NE _____ SE _____ SW _____ NW
#RAD OF 64 KT-WINDS _____ NE _____ SE _____ SW _____ NW
RAD OF 50 KT-WINDS _____ NE _____ SE _____ SW _____ NW
RAD OF 34 KT-WINDS _____ NE _____ SE _____ SW _____ NW
RAD OF SEAS
15 FT OR HIGHER _____ NE _____ SE _____ SW _____ NW
REPEAT CENTER LOCATED _____ N _____ W AT _____ Z.

_____

12-HOUR FORECAST VALID _____ Z _____ N _____ W.
MAX SUSTAINED WINDS _____ KT 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 _____ N _____ W.
MAX SUSTAINED WINDS OF _____ KT 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 _____ N _____ W.
MAX SUSTAINED WINDS _____ KT 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 _____ N _____ W.
MAX SUSTAINED WINDS _____ KT 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 ATLANTIC ONLY) (+ CENTRAL PACIFIC ONLY)
(INLAND AREAS--MORE THAN 10 MILES FROM COAST)
(GUSTS INCLUDED WHEN MAXIMUM SUSTAINED WINDS REACH 50 KNOTS)
NOTE: Use of quadrants is optional in the Pacific.

CHAPTER 3
APPENDIX A

DISASTER POTENTIAL SCALE 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.

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 NMC HURRICANE MODEL PREDICTS 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
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 ADVISORY.

WHNT11 KMIA 151600
MIA
#SUBTROPICAL STORM ONE ADVISORY NUMBER 4
NATIONAL WEATHER SERVICE MIAMI FL
1600Z MON OCT 15, 1974

THE SUBTROPICAL STORM WAS CENTERED NEAR 29.5N 57.5W AT 1600Z.
POSITION IS GOOD BASED ON DOD RECONNAISSANCE AT 151450Z.
PRESENT MOVEMENT IS NORTH OR 360 DEGREES AT 10KT.
MAX SUSTAINED WINDS 50 KTS WITH GUSTS TO 70 KTS.
RAD OF 34-KNOT WINDS 200 NM NORTH 50 NM SOUTH
REPEAT CENTER LOCATED 29.5N 57.5W AT 1600Z.

24-HOUR FORECAST POSITIONS VALID 161200Z 33.0N 57.5W.
MAX SUSTAINED WINDS 55KT WITH GUSTS TO 70KT.
RAD OF 50 KT WINDS 60 NM NORTH 30 NM SOUTH.

THE NEXT ADVISORY WILL BE ISSUED AT 162200Z.

DOE

CHAPTER 3
APPENDIX C

ABBREVIATED HEADINGS FOR TROPICAL STORM MESSAGES

An abbreviated communications 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. Tropical Storm and Hurricane 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 PHNL through WHPN15 PHNL

b. Marine/Aviation Format.

WHCA21 KMIA through WHCA25 KMIA
WHPN21 KSFO through WHPN25 KSFO (INCLUDES PUBLIC FORMAT)
WHPN21 PHNL through WHPN25 PHNL (CPHC INCLUDES MILITARY)

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 Advisories. These Advisories will be disseminated to marine interests using 1b and to military interests using 1c.

4. Relationship of Heading to Storm Name. The relationship of the numbers in the abbreviated headings to the first letter of the names of storms is 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 Anna may come from Miami, and would be under the abbreviated heading WHCA11 KMIA. WHCA21 KMIA, WHNT11 KMIA and WHXX11 KMIA would then be issued. While Anna 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 Anna and Belle are in progress, the first issuance on storm Candice 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 KMIA, 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 Anna moved into the Washington area of responsibility, Washington would begin issuing WHNT11 KDCA messages (replacing the WHCA11 KMIA messages) so that all issuances on Anna would be under an abbreviated heading with 11 or 21 as the number.

#5. Abbreviated Tropical Depression Advisories. The abbreviated headings under which advisories 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 to the internal numbers of depressions is 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. Storm summaries, local 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 criterion to consider when requesting reconnaissance support is that each sortie requested be essential to the immediate forecast problem.

a. DOD will attempt to fulfill all tasked NHC requirements. However, based on stated DOC requirements, DOD will normally be prepared to generate five reconnaissance aircraft per day. Requirements exceeding this capability will be executed on a "resources permitting" basis. All NHC tropical or subtropical cyclone missions will be requested in accordance with procedures of this chapter.

b. The DOD has designated the Officer-in-Charge, OL-G, Hq. AWS, as the Chief, Aerial Reconnaissance Coordination, All Hurricanes (CARCAH), to NHC. The CARCAH is responsible for final preparation of the Tropical Cyclone Plan of the Day (TCPOD) and coordinating scheduling of aircraft required to meet the provisions of this chapter. An alternate CARCAH is designated in Chapter 8 of this plan to the Alternate Hurricane Warning Office (HWO).

2. Responsibility.

a. Atlantic. The DOD, backed up by the Research Facilities Center (RFC), has operational reconnaissance responsibility for providing fixes and investigative flights on tropical and subtropical cyclones in the Atlantic Ocean, Caribbean Sea and Gulf of Mexico in accordance with the 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 eight 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 four 6-hourly fixes per day may be requested.

*Forecast for the day of the reconnaissance flight.

(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., one or two flights per day dependent upon proximity of landfall and upon known or suspected stage of development).

(5) Reconnaissance will be on a flight pattern coordinated and specified in the TCPOD.

(6) When RFC is requested to fly operational missions, the flight pattern will be flown as specified in the TCPOD. The RFC will make the vortex fix and provide the peripheral data. When more than one agency has simultaneous missions into the same storm, flight profiles will be thoroughly coordinated with CARCAH and the appropriate control agency. See paragraph 4d for special research conditions. Mission conflicts will be resolved by CARCAH.

b. Eastern and Central Pacific. The DOD is responsible for providing tropical and subtropical cyclone aircraft reconnaissance in support of the Eastern Pacific Hurricane Center's (EPHC) and the Central Pacific Hurricane Center's (CPHC) areas of responsibility within the procedures outlined below:

(1) Whenever a storm is forecast* to be within 300 nautical miles of U.S. territory or DOD installations up to two consecutive 6-hourly fixes per day may be requested.

(2) Data on all storms beyond the 300 nautical mile limit will be derived primarily from satellites, ships and observations of opportunity.

(3) Special flights in the Eastern North Pacific may be requested through CARCAH to fill specific requirements for critical data needs on a tropical cyclone when satellite data are not available.

(4) Land radar, shipborne radar and meteorological satellite data will be used to supplement aircraft fixes whenever possible in East and Central Pacific areas.

(5) One investigative flight may be requested within the limits specified in (1) above.

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

*Forecast for the day of the reconnaissance flight.

4. Reconnaissance Requirements.

a. Meteorological Parameter Observational Priority. NHC data needs in priority order are:

(1) Geographical position of center

(2) Central sea level pressure (by dropsonde or low level extrapolation)

(3) Minimum 700 mb height

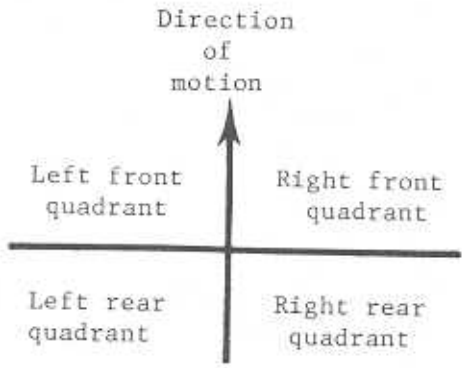
(4) Wind profile data SFC/FL

(5) Temperature

(6) Sea surface temperature

(7) Dewpoint temperature

b. 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 predicated 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 agency concerned.



(1) 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.

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

(3) 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.

(4) 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 flight meteorologist 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.

c. Vortex Center Fixes. Reconnaissance flights that are assigned operational responsibility for obtaining vortex fixes and profile data of the storm area (80 nautical miles of the center) by quadrant have the highest NHC priority. All vortex fixes are preferred at 1,500 feet or 700 millibars (10,000 feet) within aircraft safety limits. 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-hourly fix. The frequency of these fixes may be augmented as required by NHC and as specified in the TCPOD.

d. Research Facilities Center (RFC) (Atlantic Only). 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 storms on standard research patterns as shown in appendix B of this chapter. In addition, some non-standard research patterns may occasionally be flown. The research pattern or non-standard 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 5c(5) of this chapter. In all cases, safety of flight is of paramount importance.

(1) 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.

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

(3) 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 5c(5) of this chapter.

(4) 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 5c(5) of this chapter.

5. Reconnaissance Planning and Flight Notification.

a. DOC Requests for Aircraft Reconnaissance.

(1) The Director, NHC, will coordinate with EPHC-SFO to determine a list of the total NOAA Atlantic and Eastern and Central Pacific requirements for aircraft reconnaissance into subtropical cyclones and tropical cyclones or disturbances during the next 24 hours and an outlook for the succeeding 24 hours. This coordinated request will be provided to CARCAH not later than 1630 Zulu each day.

(2) CARCAH will advise the NHC of mission availability or non-availability and expected responsiveness of U.S. Air Force and RFC assets. If all requirements cannot be met, NHC will establish a priority list to be published by CARCAH in the TCPOD.

(3) CARCAH will task operational units for alert aircraft/crews or weather reconnaissance missions for the succeeding 24 hours, not later than 1800 Zulu each day. When circumstances do not permit 24-hour advance notice, the following responsiveness criteria will guide mission tasking:

(a) If an alert aircraft crew has been requested more than 12 hours previously, the levy will not be earlier than four hours plus flying time to the area of concern.

(b) If no alert aircraft crew has been requested or if an alert aircraft/crew has been requested less than 12 hours previously, the levy will be such so as to provide at least 16 hours from the time of requirement notification or from the time the alert aircraft/crew was initially requested plus enroute time.

(c) Requirements which do not meet these criteria will be levied as "resources permitting."

(d) At times a storm may develop unexpectedly and cause a serious threat to lives and property within a shorter time frame than provided for in the paragraphs above. These cases will be dealt with through emergency procedures which are not included in this plan.

b. 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.

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 pre-positioned 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.

(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 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.

(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.

c. Reconnaissance Flights:

(1) Flight Patterns. Additional tropical cyclone operational and RFC research flight patterns will be filed with FAA for information.

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

(3) Flight Levels. Reconnaissance aircraft will fly only at ARTCC assigned altitudes and will accept flight level changes when requested by FAA.

(4) Dropsonde Releases. Dropsonde instrument releases will be coordinated with the appropriate ARTCC at least 10 minutes before droptime, except for those outside of controlled airspace which do not require coordination. When two or more reconnaissance aircraft are operating in the storm center, dropsondes will not be released unless voice contact is established between aircraft and the release is coordinated among participating aircraft as well as ARTCC, if within controlled airspace.

(5) Air Traffic Control Clearances.

(a) Air Traffic Control clearances, unless otherwise coordinated prior to the flight with the responsible ATC facility, will provide ATC separation between all aircraft operating on storm missions and between these aircraft and other non-participating aircraft operating within controlled airspace. Mission commanders should be aware that non-participating aircraft may be operating over and nearby the storm area, thus adherence to ATC clearances is mandatory for safety purposes.

(b) Air Traffic Control, as a routine procedure, increases the vertical separation maintained between aircraft when reports from pilots indicate their inability to maintain assigned altitudes due to turbulence. Pilots should be aware, however, that unless such reports are received, only normal vertical separation of 1,000 feet below FL290 and 2,000 feet above FL290 will be provided by ATC to aircraft operating in the storm area. Thus, the fact that storm-mission aircraft have filed flight plans and are operating 5,000 or 10,000 feet apart, does not imply that the altitudes (flight levels) in between may not be in use by non-storm aircraft.

(c) Any procedures desired by storm-mission commanders concerning ATC separation which is outside of the above parameters must be specifically coordinated with the ATC center(s) of concern.

6. Reconnaissance Effectiveness Criteria:

a. General. Fix data must be received at the appropriate forecasting agency in a timely manner. Fix times are specified in the TCPOD to provide a sufficient interval between fixing and issuance of a warning to allow due consideration of the vortex information by hurricane forecasters. Every effort should be made to obtain fixes at TCPOD specified times. Unusual circumstances such as forecast position error, diffuse systems, and flight limitations will be considered when evaluating reconnaissance effectiveness. Requirements, when requested as "resources permitting," when unfulfilled, will not be evaluated.

b. Six-Hourly Fixes:

(1) On-Time--fix must be made not earlier than one hour before nor later than 1/2 hour after scheduled fix time.

(2) Early--fix is made within the interval from three hours to one hour prior to scheduled fix time.

(3) Late--fix is made within the interval from 1/2 hour to three hours after scheduled fix time.

c. Three-Hourly Fixes:

(1) On-Time--fix must satisfy the time criteria of paragraph b(1) above.

(2) Early--fix is made within the interval from one and one-half hours to one hour prior to scheduled fix time.

(3) Late--fix is made within the interval from 1/2 hour to one and one-half hours after scheduled fix time.

d. Investigative Missions:

(1) On-Time--missions must satisfy the following criteria:

(a) The aircraft must be within 250 n.m. of the specified point by the scheduled time.

(b) The specified flight level and track must be flown.

(c) Observations are required in all quadrants unless a concentrated investigation in one or more quadrants has been specified.

(2) Late--when the aircraft is within 250 n.m. of the specified point after the scheduled time, but prior to the scheduled time plus two hours.

e. NHC will provide CARCAH a written assessment of the reconnaissance mission anytime its timeliness or quality is outstanding or sub-standard.

7. 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 heading, 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 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 or TEALY 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 U.S. 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.

8. 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, Canal Zone.

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

9. Air-Ground Communications with Flight Service 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 Flight Service Stations will relay the data to NHC.

10. Aerial Reconnaissance Weather Encoding and Reporting:

a. 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 RECCO code except for those special formats as specified in this chapter. RECCO observations will be taken and transmitted at least hourly until the aircraft is within a 200 nautical mile radius of the center of the storm at which time observation frequency will become at least every 30 minutes.

(1) U.S. Air Force will follow RECCO and dropsonde encoding procedures as outlined by Air Force directives (RECCO National Code Form and WMO FM 36-V).

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

b. The following is a description of the minimum RECCO report content that is desired in the area of interest:

(1) Include all mandatory groups (first 8 groups of the RECCO code) plus optional groups 4ddff, and/or $5DFSD_k$ and 99999 GGggi ddfff TTT_uT_u w mjHHH as shown in appendix A of this chapter. The weather monitor will append coded latitude and longitude groups, flight level wind group and/or surface wind group following the last group of the RECCO report.

(2) 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.

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

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

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

c. Vortex Data: All observed vortex or center fix information will be included in the Detailed Center/Vortex Data message transmitted for all TCPOD scheduled fixes; it will also be included in all Detailed Center/Vortex Data messages transmitted on an "as required" basis for intermediate nonscheduled fixes. 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 of preliminary vortex information to the forecasting agency. All radar fix reports will be made in plain text and appended to the RECCO observation also taken at fix time (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:

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

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

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

(4) 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.

d. Vortex Profile Data. Penetration and collection of vortex data will normally start at 700 millibars (10,000 ft.) and in the left rear quadrant at radius of 80 nautical miles from the center as indicated by aircraft radar or determined by the flight meteorologist. Patterns will be flown and data collected as indicated in appendix A to this chapter. The storm vortex profile data to be collected are:

(1) 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.

(2) 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).

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

(4) 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.

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

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

e. 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, but it is unnecessary to return to point A following the initial vortex fix. (See Appendix A of this chapter.) Three or four intermediate observations will be made at equidistant intervals (60 to 80 n.m.) 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).

f. 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.

g. Post Flight Debrief. The flight meteorologist will telephone a short summary of the mission to the appropriate forecasting agency after landing.

h. 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 messages will include the agency indicator (AIR FORCE or NOAA) followed by the CARCAH assigned mission-system indicator and then OB followed by the numerical sequence of the report during the flight. Elements of the mission identifier are:

#1	#2	#3	#4	#5
AGENCY	NUMBER OF MISSIONS THIS SYSTEM	T.D. NUMBER OR XX IF NOT A T.D. OR GREATER	STORM NAME OR WORD CYCLONE FOR CLOSED CIRCULATION OR WORD DISTURB FOR OTHER TYPE SYSTEMS	AN OPTIONAL SUB-NUMBER TO DIFFERENTIATE SIMULTANEOUS FLIGHTS ON MORE THAN ONE DISTURBANCE OR UNNUMBERED CYCLONE

EXAMPLES:

AIR FORCE GULL 01XX DISTURB (1st mission on a system. Investigation desired as specified in item H of TCPOD).

AIR FORCE TEALY 05XX CYCLONE (5th mission on a system which is a sub-tropical or tropical cyclone. Fixes or an investigation desired as specified in item H of TCPOD).

AIR FORCE GULL 02XX CYCLONE (2nd mission on a closed system not yet a numbered T.D. Investigation desired as specified in item H of TCPOD).

AIR FORCE GULL 0401 CYCLONE (4th mission on a system now identified as T.D. #1. Fixes would normally be levied, but an investigation could be specified in item H of TCPOD if system very ill-defined).

AIR FORCE TEALY 0701 AGNES (7th mission on a system, formerly T.D. #1, which has reached T.S., or greater, strength. Fixes would be specified along with vortex pattern in TCPOD).

NOAA 0201 AGNES (2nd mission on Agnes, formerly TD#1).

i. Observation Numbering and Content.

(1) The first weather observation will have appended as remarks the ICAO four letter departure station identifier, time of departure and estimated time of arrival (ETA) at the coordinates or storm.

EXAMPLE:

AIR FORCE TEALY 0308 EMMY OB 1
97779 TEXT TEXT...DPTD KBIX AT 102100Z ETA 31.5N 75.0W at 110015Z

(2) All observations (RECCO, Center, Supplemental and Dropsonde) from the first to the last will be numbered sequentially. There is, however, one exception: When an aircraft is diverted from another mission to an NHC requested investigative or storm mission, the next observation from the diverted aircraft will be labeled OB 1, use the CARCAH assigned mission

identifier and will include remarks giving time of diversion and ETA to coordinates of interest.

EXAMPLE:

AIR FORCE TEALY 01XX DISTURB OB 1
97779 TEXT TEXT...DPTD FOXTROT TRACK AT 051438Z ETA 18N 85W AT 051615Z.

(3) If advised by CARCAH in flight that the mission identifier has been changed, the observation numbers will continue sequentially and a remark on the identifier will be made.

EXAMPLE:

AIR FORCE TEALY 0308 EMMY OB 6
97779 TEXT TEXT...OBS 1 THRU 5 XMTD AS AFTEALY0308 CYCLONE.

(4) Appended to the final weather observation will be a last report remark which will include destination, ETA, number observations, and monitor(s) that copied the observations.

EXAMPLE:

AIR FORCE GULL 0308 EMMY OB 16
97779 71717
UUAA TEXT TEXT...LAST REPORT ETA KBIX 110910Z OBS 1 THRU 10 AND 12 THRU 16 KMIA OB 11 KMHR

CHAPTER 4
FORM 1

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 SFC/FL WIND _____ _____ QUAD.

QUAD_____KTS. 700 MB HEIGHT_____METERS.

MAX SFC/FL WIND_____

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	/ NMi	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	° / NMi	J. BEARING AND RANGE FROM CENTER OF MAXIMUM SURFACE WINDS (Degrees, nautical miles).
K	DEG K	K. MAXIMUM FLIGHT LEVEL WINDS WITHIN FLIGHT PATTERN FLOWN (degrees and knots).
L	° / NMi	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 NMi, 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.

CHAPTER 4
FORM 3

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

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).

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.

CHAPTER 4
FORM 4

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 LEFT	2 REAR	3 QUAD	4 IWALL	5 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 RIGHT	22 FRONT	23 QUAD	24 IWALL	25 hhhhh
26 80ZZZ 80	27 45ZZZ 45	28 30ZZZ 30	29 15ZZZ 15	30 00ZZZ 00
31 8TTQQ 8	32 4TTQQ 4	33 3TTQQ 3	34 1TTQQ 1	35 0TTQQ 0
36 MXFFF MX	37 000RR	38 64RRR 64	39 50RRR 50	40 34RRR 34
41 LEFT	42 FRONT	43 QUAD	44 IWALL	45 hhhhh
46 80ZZZ 80	47 45ZZZ 45	48 30ZZZ 30	49 15ZZZ 15	50 00ZZZ 00
51 8TTQQ 8	52 4TTQQ 4	53 3TTQQ 3	54 1TTQQ 1	55 0TTQQ 0
56 MXFFF MX	57 000RR	58 64RRR 64	59 50RRR 50	60 34RRR 34
61 RIGHT	62 REAR	63 QUAD	64 IWALL	65 hhhhh
66 80ZZZ 80	67 45ZZZ 45	68 30ZZZ 30	69 15ZZZ 15	70 00ZZZ 00
71 8TTQQ 8	72 4TTQQ 4	73 3TTQQ 3	74 1TTQQ 1	75 0TTQQ 0
76 MXFFF MX	77 000RR	78 64RRR 64	79 50RRR 50	80 34RRR 34

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.

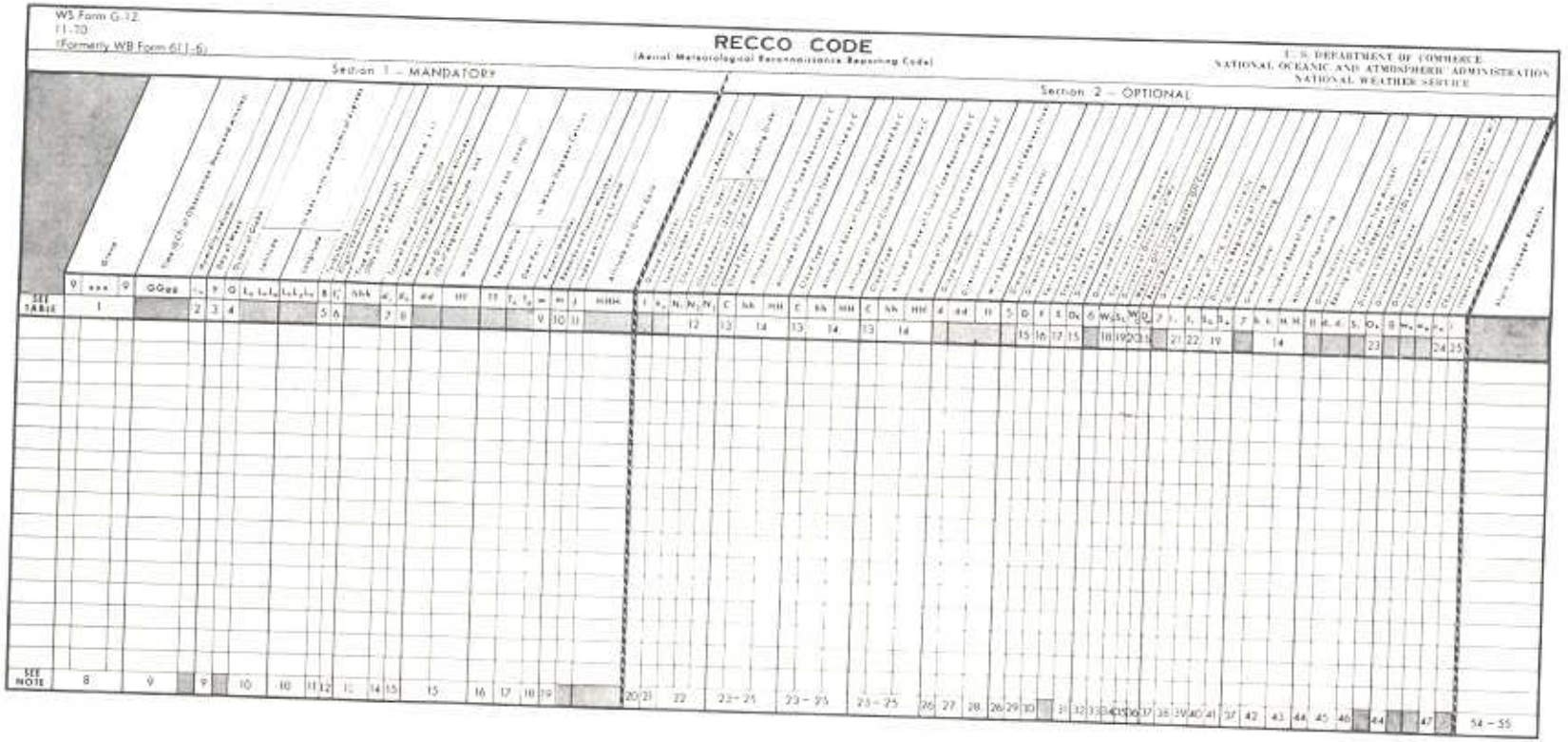
FFF - Maximum wind speed (kts.).

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

RRR - Radial distance (nautical miles of the 64kt, 50kt and 34kt isotachs from the center.

// - Data are unknown or unobtainable

MONITOR TOR



STANDARD RECONNAISSANCE CODE

CHAPTER 4
FORM 6

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

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

TO (MAC APPROVED ADDRESSEES) /GT7072/PHNLYM, KSFOYM, MJSJYM

- -

SUBJECT TROPICAL CYCLONE
RECON POD FROM_____Z (month)(year) TO _____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 IDENTIFIER

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)

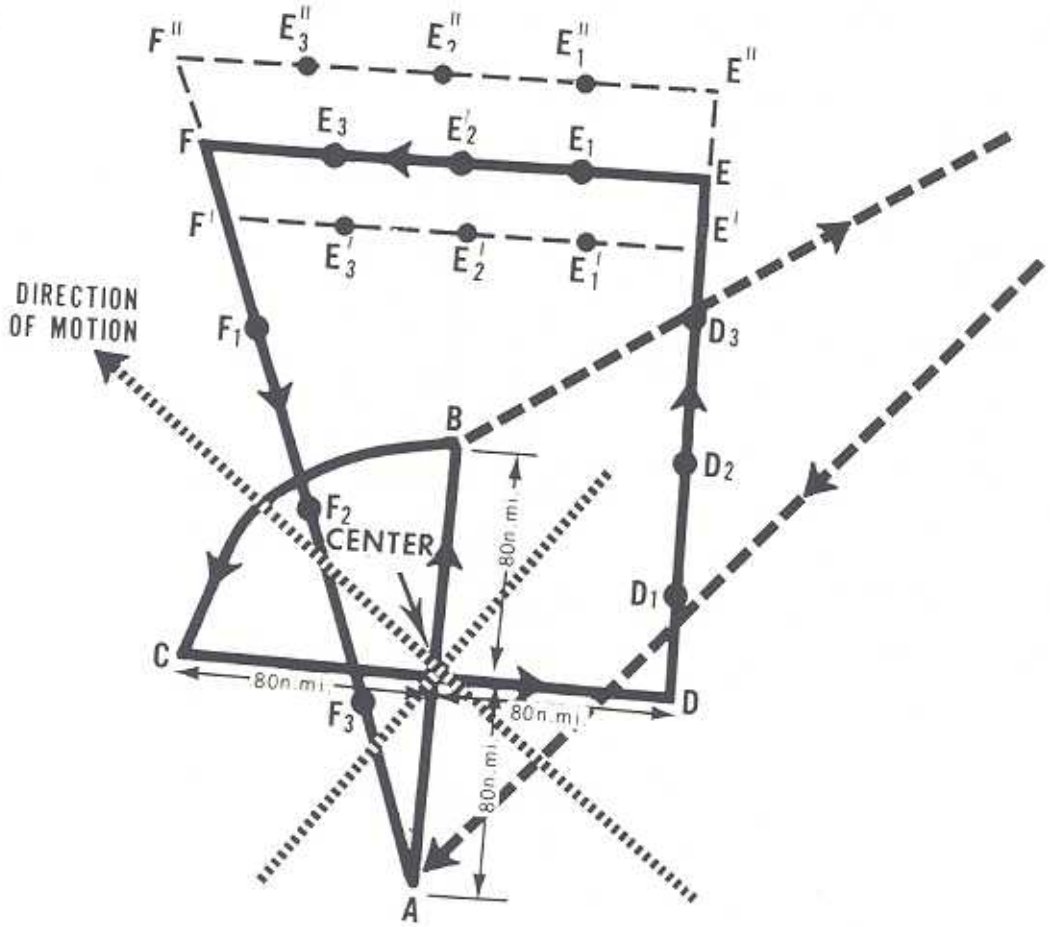
2. (SECOND SYSTEM, if applicable, same as in 1. above or if Atlantic requirements negative, then outlook for succeeding day.)

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

CHAPTER 4
APPENDIX A
ATTACHMENT 1A

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_uT_uw 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_uT_uw 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 profile data.	Supplementary Vortex Data Message transmitted between Points F and A.
F_1	99999 GGggi ddfff TTT_uT_uw 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 profile data for last penetration. (See note 5.)	B

EXAMPLE OF RECON MESSAGE TRANSMITTED AT POINT E:

9xxx9 GGggi YQLaLaLa(1) LoLoLoBf(1) hhhdtda ddfff TTT_uT_uw mjHHH 99999 GGggi(2) ddfff TTT_uT_uw mjHHH GGggi(3) ddfff TTT_uT_uw mjHHH GGggi(4) ddfff TTT_uT_uw mjHHH SST(5) 28.5 26.5 27.0 28.0

(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	28.5°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.

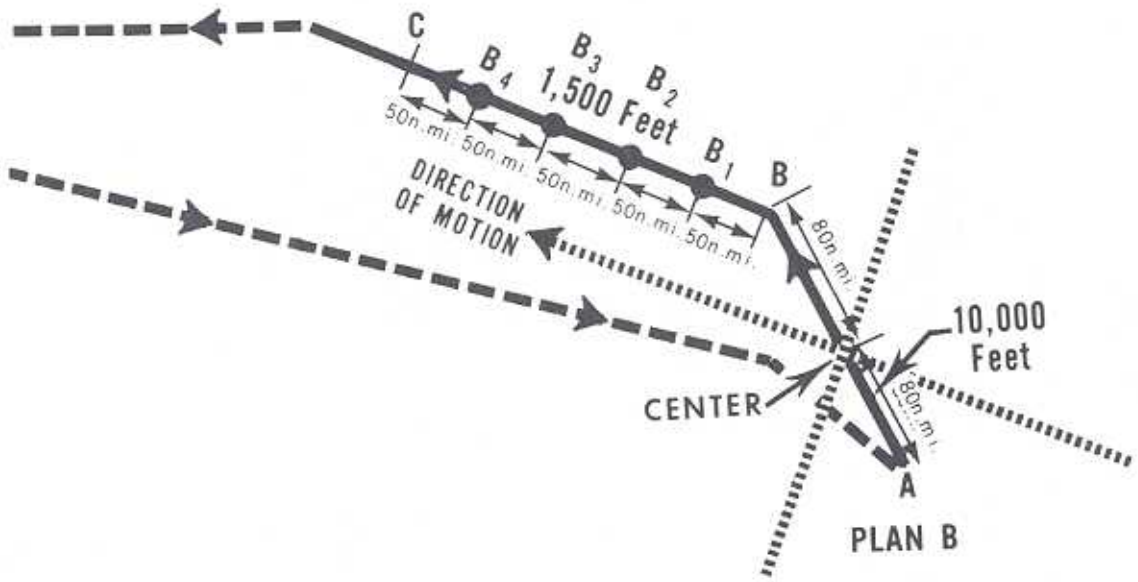
(3) Sea-surface temperatures should be reported only when measured at 1,500 feet or lower. Otherwise, no report will be made.

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

(5) The vortex profile 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 profile 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 profile data.	Supplementary Vortex Data Message transmitted between Points B and C.
B_1	99999 GGggi ddfff TTT_uT_uw 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).	

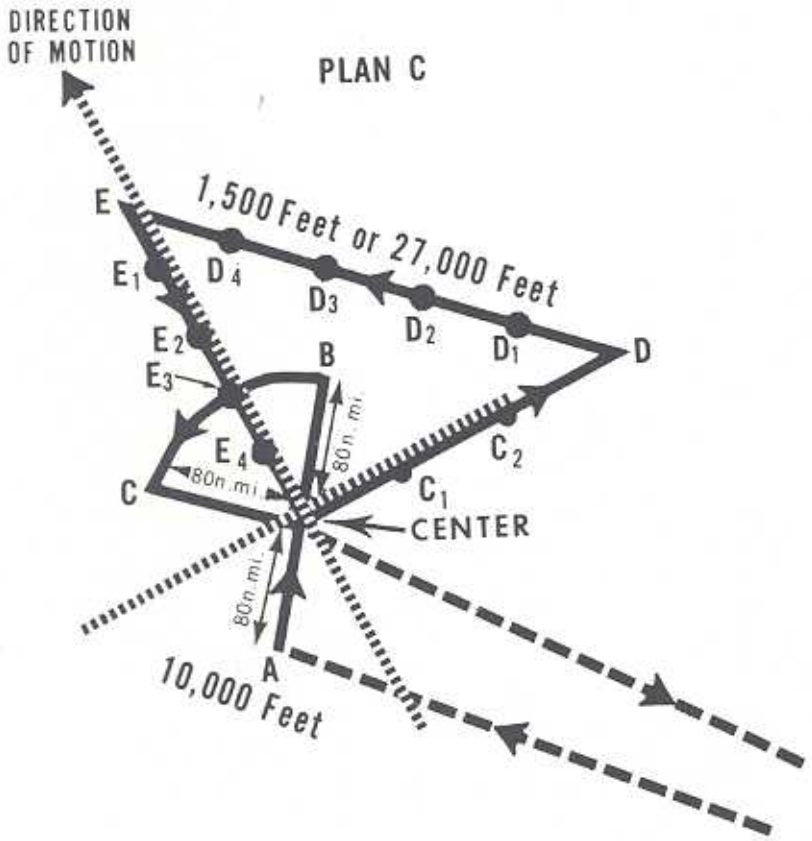
NOTES: (1) Notes 1 and 3 of appendix A, attachment 1a, Observation Details for Operational Flight Pattern "A", are applicable to Pattern "B".

(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.

CHAPTER 4
APPENDIX A
ATTACHMENT 3

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_uT_u'v 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_uT_uw 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 profile data.	Supplementary Vortex Data Message transmitted between Point E and Center.
E_1	99999 GGggi ddfff TTT_uT_uw 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 profile 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.

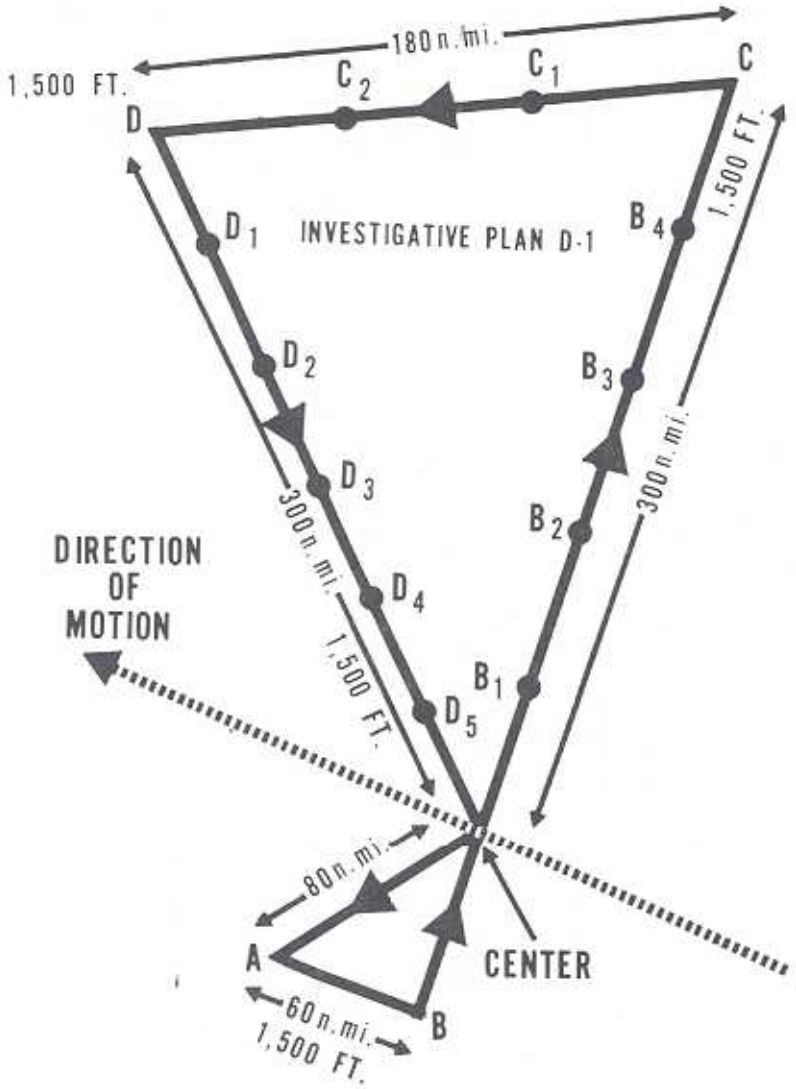
(4) If the flight altitude for peripheral data is 27,000 feet, dropsonde observations will be made at Points D and E.

(5) 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

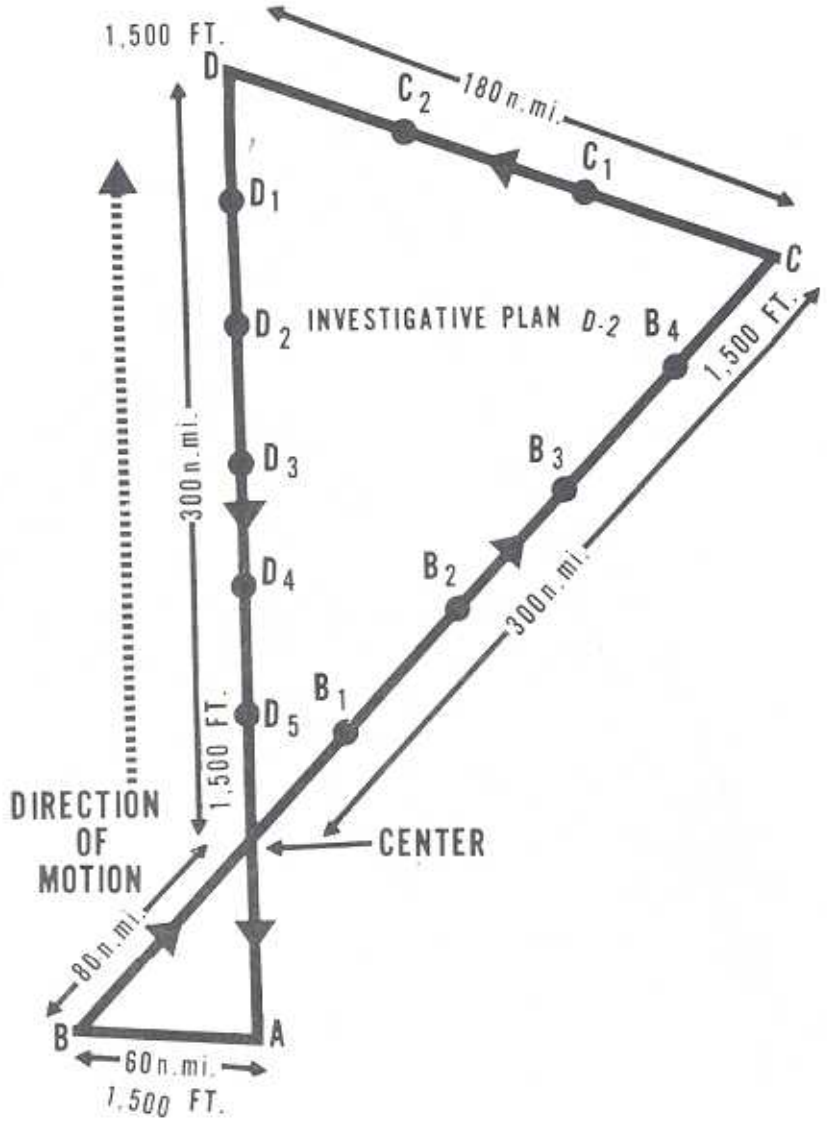
OPERATIONAL FLIGHT PATTERN D-1

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



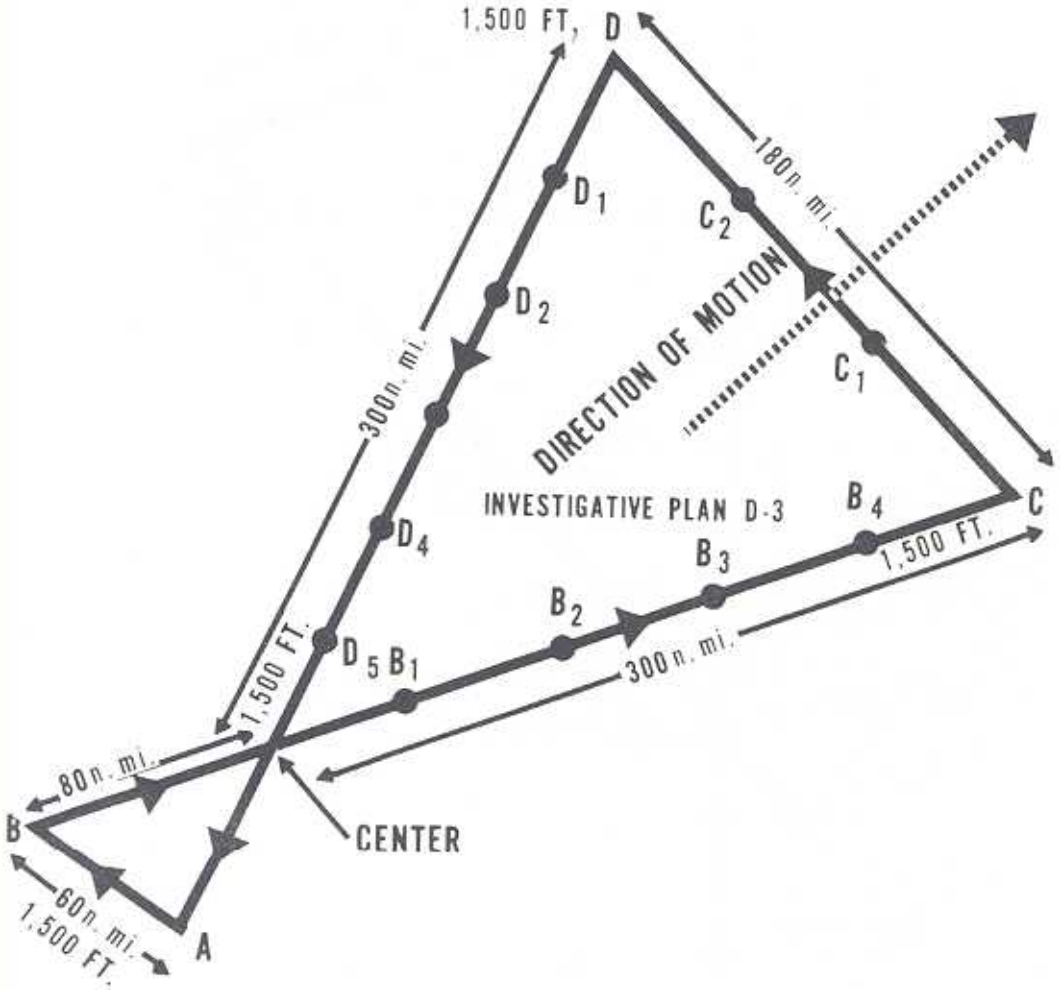
CHAPTER 4
APPENDIX A
ATTACHMENT 4
FIGURE 2

OPERATIONAL FLIGHT PATTERN D-2



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

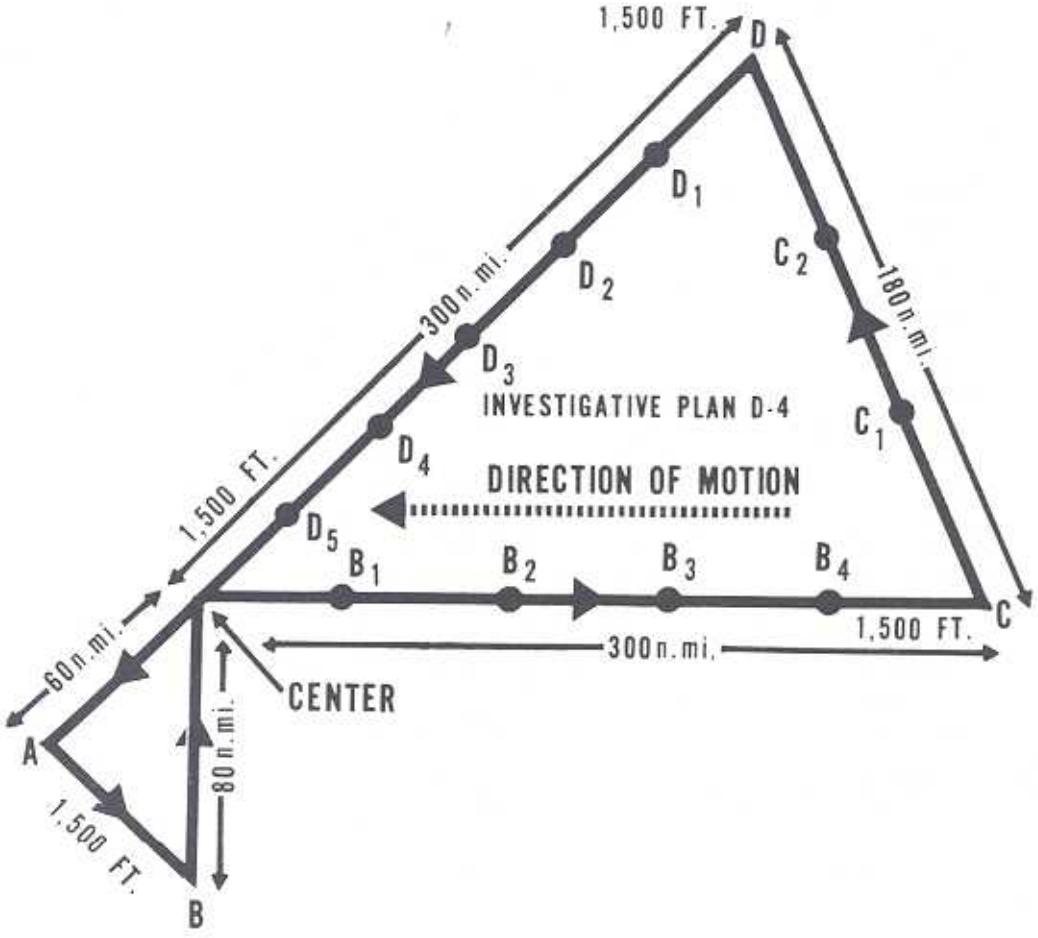
OPERATIONAL FLIGHT PATTERN D-3



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

CHAPTER 4
APPENDIX A
ATTACHMENT 4
FIGURE 4

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_uT_uw 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_uT_uw 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_uT_uw 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 profile 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".

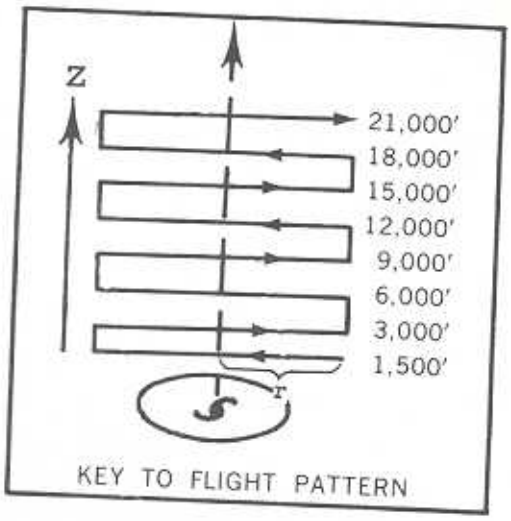
(2) No dropsondes because entire flight pattern will be flown at 1,500 feet.

(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.

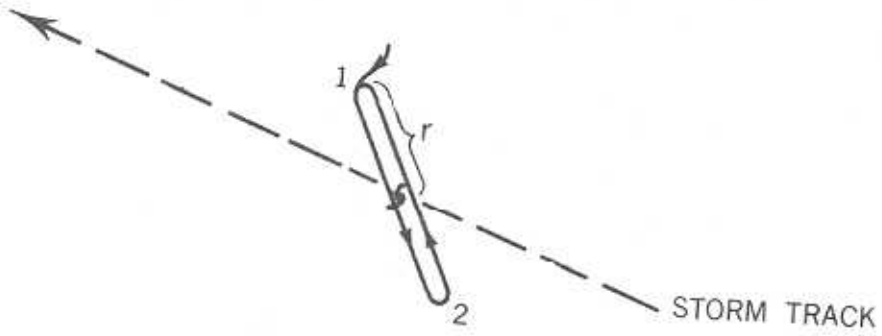
(4) The Maximum Flight Level Wind in the outbound leg will be appended to Point C Message.

RESEARCH FACILITIES CENTER FLIGHT PATTERN

PLAN V (VICTORY) STAIRSTEP RESEARCH PATTERN



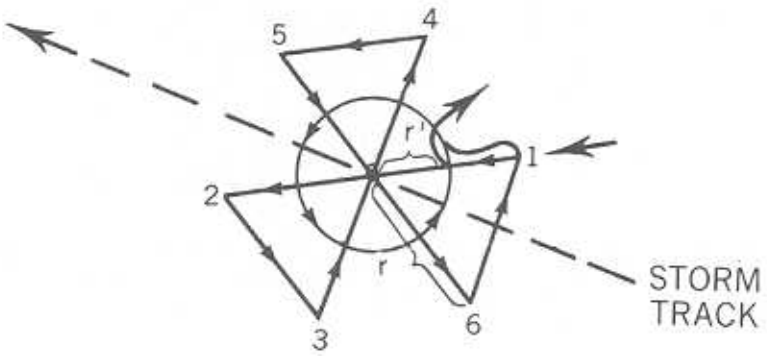
Preferred azimuth is through right front quadrant of the storm. Radial distance, r, from the eye is variable, i.e. 50 to 100 n.mi. Total pattern = 16r n.mi.



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.

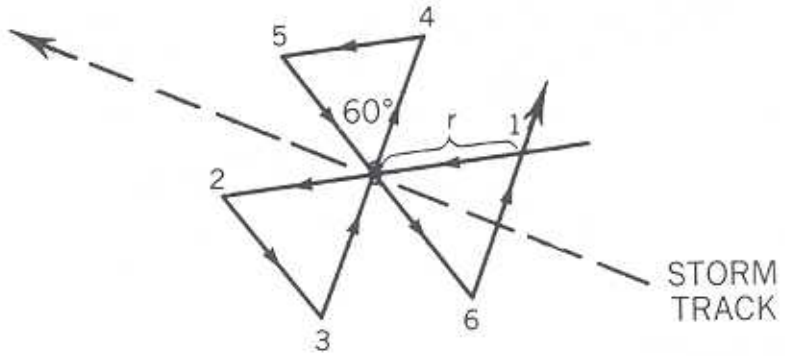


CHAPTER 4
APPENDIX B
ATTACHMENT 3

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.

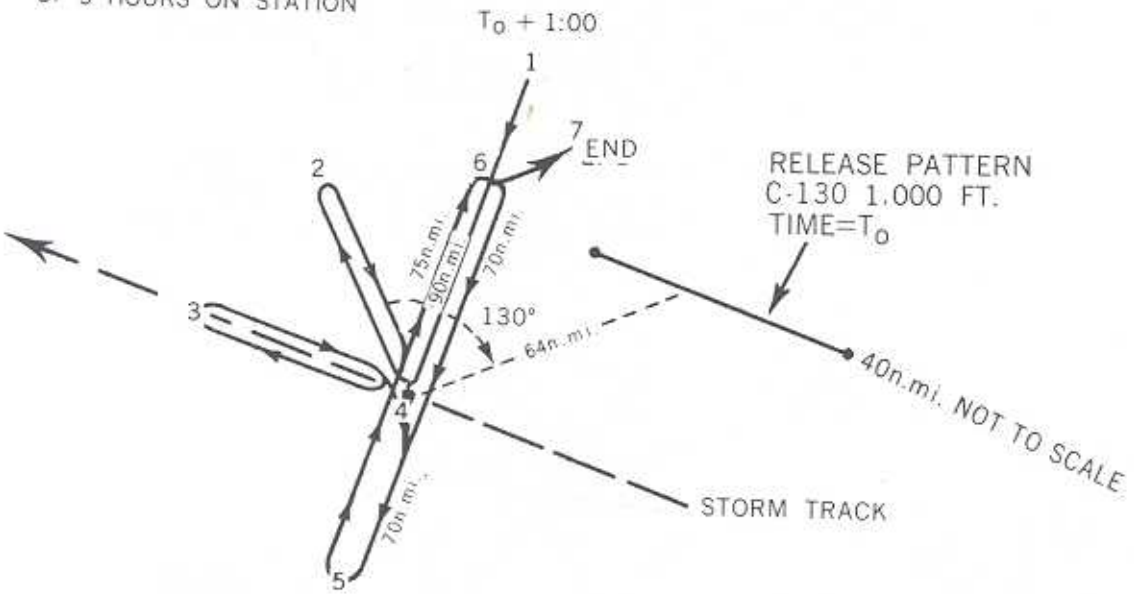


RESEARCH FACILITIES CENTER FLIGHT PATTERN

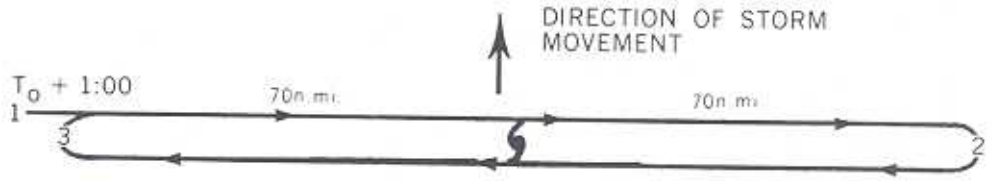
PLAN Y (YANKEE) TRACER EXPERIMENT (SF)

Sampling Flight No. 1

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



Sampling Flight No. 2



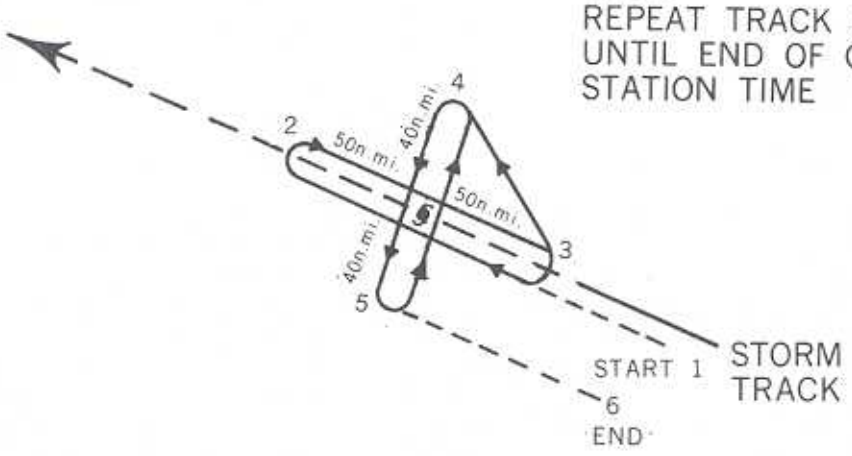
REPEAT PATTERN (3)-(2) FOR MINIMUM OF 5 HOURS ON STATION AT 14,000 FT. FOR LAST PASS, CLIMB TO MAXIMUM POSSIBLE ALTITUDE (~20,000 FT.)

CHAPTER 4
APPENDIX B
ATTACHMENT 5

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 USAF will operate from Keesler AFB, Miss., and other forward operating locations (FOL). Reconnaissance observations will be transmitted from these aircraft by voice using high frequency single sideband radio through the USAF Aeronautical Station complex to a weather reconnaissance data monitor (Gull Weather Monitor) located at the National Hurricane Center, Coral Gables, Fla. The Gull Weather Monitor will evaluate these reports for technical accuracy and disseminate them to the Automatic Digital Weather Switch (ADWS) Carswell, AFB, Tex., through the Suitland computer facility using National Weather Service Cathode Ray Tube (CRT) equipment. In the event of a CRT failure, the Gull Weather Monitor will disseminate reconnaissance traffic to ADWS through the Suitland computer facility using NWS RAWARC equipment. A diagram of the USAF Atlantic hurricane communications network is included as attachment 1 to this appendix.

2. Air/Ground Communications.

a. USAF hurricane reconnaissance aircraft will normally relay reconnaissance reports through the USAF Aeronautical stations at MacDill, Albrook, or Scott AFBs. The specific station contacted will depend upon aircraft location and radio propagation conditions. Radio frequencies to be used for initial contact with aero stations are as published in the DOD Flight Information Publication-Enroute Supplement. During initial contact the aircraft will request a discreet frequency for mission use. If able, the aero station will honor the request (Contact delays inherent with use of published or common-user frequencies can adversely impact NHC forecast efforts.). Aircrews attempting to relay weather data will specifically request a direct phone-patch to the Gull Weather Monitor upon contact with an aero station.

Backup monitoring service is provided by the Mather Weather Monitor at Mather AFB, Calif. Specific radio procedures and terminology will be as described in Allied Communications Publication (ACP) 125. USAF has authorized the use of "Immediate" precedence for transmission of hurricane reconnaissance reports. Handling of hurricane reconnaissance messages will be as follows:

PRIMARY	SECONDARY	BACKUP
Direct phone-patch between aircraft and Gull Weather Monitor (AV 894-1150) through any aero station.	Aircraft transmit message to any A/G operator. A/G operator copy and relay message by voice to Gull Weather Monitor (AV 894-1150 or other available voice circuits)	Direct phone-patch between aircraft and Mather Weather Monitor (AV 828-4377) through any aero station.

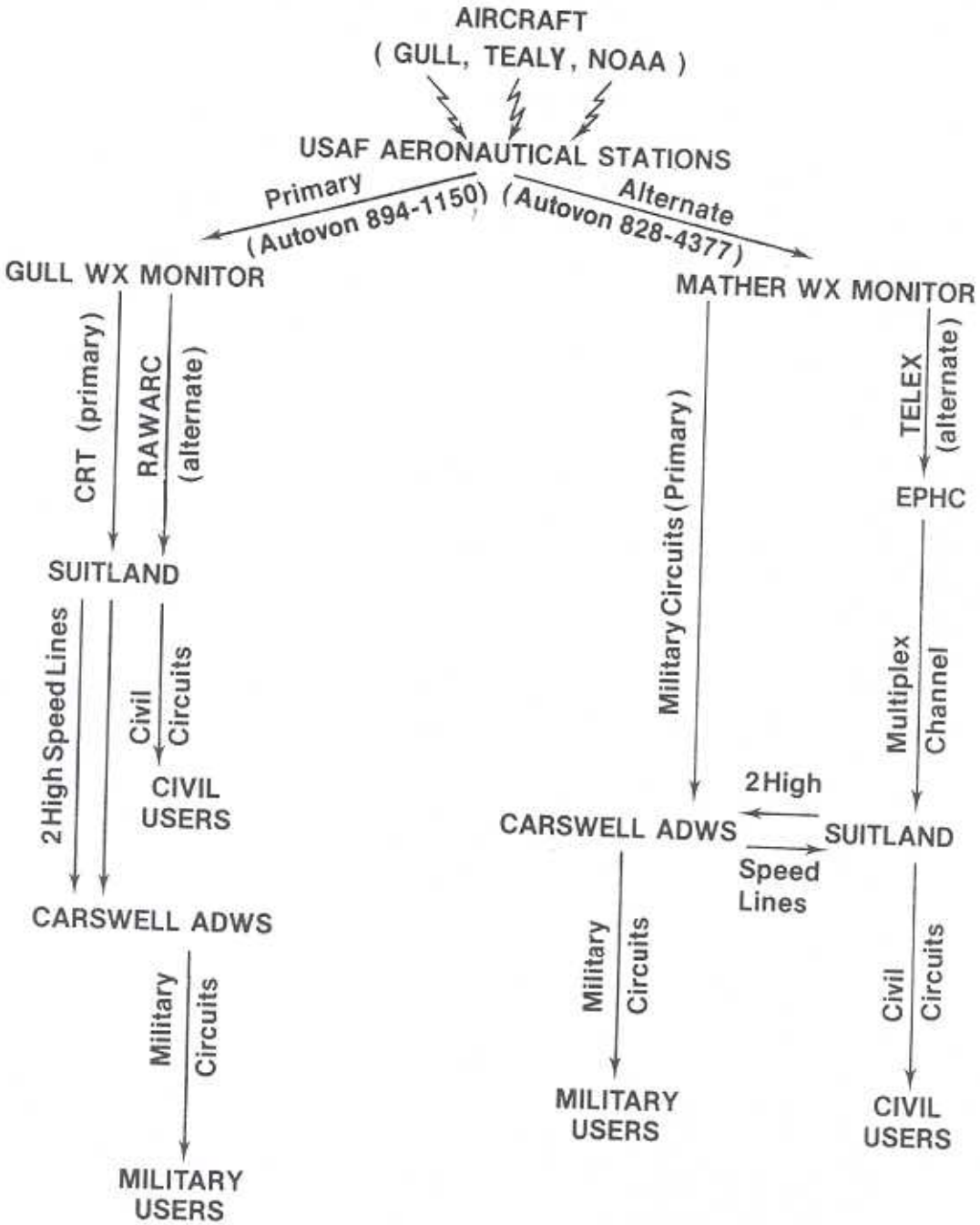
3. Miscellaneous Communications Services and Support.

a. The NOAA Research Facilities Center (RFC) aircraft are authorized to use USAF Aeronautical stations for phone patch or relay of reconnaissance reports to the Gull Weather Monitor or Mather Weather Monitor.

b. Messages to CARCAH/Gull Weather Monitor should be addressed as follows:

OL G, HQ AWS, CORAL GABLES, FL

Atlantic
Hurricane Reconnaissance Communications Flow Diagram



ATLANTIC
ORGANIZATIONAL COMMUNICATION CAPABILITIES

STATION	AUTODIN ADDRESS	TELETYPE	PHONE #
CARCAH	OL G, HQ AWS, CORAL GABLES, FL	A, B	COMM 305-666-3912
ALT CARCAH	DET 2, 2WS, ANDREWS AFB, MD	B	AV 858-7413
GULL WX MONITOR	OL G, HQ AWS, CORAL GABLES, FL	A, B	AV 894-1150
ALT GULL WX MONITOR	DET 7, 24WS, MATHER AFB, CA	B	AV 828-4377
NATIONAL HURRICANE CNTR	NAT HURR CNTR, CORAL GABLES, FL	A, B	COMM 305-667-3108
ALT NHC	WSFO, WASHINGTON, D.C.	A, B	COMM 301-899-3152
MACDILL AERO STATION	MACDILL AERO STA, MACDILL AFB, FL		AV 434-1750
ALBROOK AERO STATION	ALBROOK AERO STA, ALBROOK AFB, CZ		AV 313-286-3273
SCOTT AERO STATION	SCOTT AERO STA, SCOTT AFB, IL		AV 631-3980
CAPE RADIO	CAPE RADIO, CAPE CANAVERAL AFB, FL		AV 467-2144
CINCLANTFLT OAC	CINCLANTFLT OCEANIC AIRSPACE COORDINATOR, NY, NY		AV 456-2718
ARTCC MIAMI	ARTCC, MIAMI, FL		AV 894-1910
53WRS	53WRS, KEESLER AFB, MS		AV 868-4540
815WRS	815WRS, KEESLER AFB, MS		AV 868-2409
RFC	RFC, MIAMI, FL	A	COMM 305-526-2936
FWC NORFOLK	FLEWEACEN, NORFOLK, VA	B	AV 690-7750
ADWS	DET 7, 6WW, CARSWELL AFB, TX	A, B	AV 739-5559
AFGWC	AFGWC, OFFUTT AFB, NB	B	AV 271-2586
EPHC	WSFO, SAN FRANCISCO, CA		COMM 415-368-4339
CPHC	WSFO, HONOLULU, HA		COMM 808-845-2102

LEGEND

A - GT 7072

B - COMET TYPE EQUIPMENT (COMEDS)

CHAPTER 4
APPENDIX D

EASTERN AND CENTRAL PACIFIC

U.S. AIR FORCE COMMUNICATIONS SUPPORT PLAN

FOR

U.S. AIR FORCE HURRICANE RECONNAISSANCE

1. General. Communications for Eastern and Central Pacific Hurricane Reconnaissance will be as published for the Atlantic (appendix C) with the following exceptions:

a. USAF Aeronautical stations normally contacted include those at McClellan, Albrook, Hickam, Andersen, and Elmendorf AFBs.

b. The primary reconnaissance monitor is the Mather Weather Monitor. The Eastern Pacific backup monitor is Gull Weather Monitor. The Central Pacific backup monitors are Hickam Weather Monitor, Hickam AFB, Hawaii and Swan Weather Monitor, Andersen AFB, Guam.

c. The Eastern Pacific Hurricane Center (EPHC) located in Redwood City, Calif., and the Central Pacific Hurricane Center (CPHC), located in Honolulu, Hawaii, will provide tropical cyclone advisories to ADWS through the Suitland facility. USAF Eastern Pacific hurricane communications are identical to those indicated in the Atlantic diagram (attachment 1 appendix C) except that the Mather Weather Monitor is primary.

2. Air/Ground Communications. Handling of Eastern and Central Pacific Hurricane reports is as follows:

PRIMARY	SECONDARY	BACKUP
Direct phone patch between aircraft and Mather Wx Monitor (828-4377) through any Aero station.	Aircraft transmit message to any A/G operator. A/G operator copy and relay message by voice to Mather Wx Monitor (828-4377).	Direct phone patch between aircraft and any Monitor through any Aero station.

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 or at 1500 feet.	Whenever maximum winds are found, but usually within 50 nautical miles of center.	Do	± 5 mi ± 5 kt
Radar echoes	Do	Radar echoes--areas outside the principal rain shield.	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.	All areas.	At least hourly until within 200 nm of center of storm; then every 30 minutes.	Winds, ± 5 kt; Pressure heights, ± 10 meters
Winds, pressure heights, and weather in suspicious areas	At 700 mb or as low as 1,500 ft for investigative flights, as required.	Variable radius 100 to 300 miles.	Every 30 minutes.	± 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 meters
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.

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.

#If the central region of a storm is defined by an identifiable wall cloud, the radar fix is reported as an EYE. If a center of circulation is recognizable but not well-defined by a wall cloud, it is reported as a CNTR. When the eye or center is only occasionally recognizable, or there is some other reason to suspect an uncertain central organization, it is reported as a PSBL EYE or PSBL CNTR.

#Remarks are included with eye fixes to indicate the degree of confidence in the fix. Qualifying remarks will not, ordinarily, be applied to center (CNTR) fixes. If the wall cloud is closed, or almost closed, and the resultant eye is symmetrical, it is classified as a GOOD FIX. If the derived fix is believed to be useful although ambiguous due to lack of completeness of the wall cloud, e.g., less than 50% or because of lack of symmetry of the eye configuration, it is classified as a POOR FIX. The phrase FAIR FIX is used to express an intermediate degree of confidence.

3. Participants. Participating radar stations are listed below. If radar observations are needed from participating Aerosapce Defense Command's (ADCOM) 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	WSR057	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.
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

Andrews AFB, Md.	FPS-77	38°48'N.	76°53'W.
Barksdale AFB, La.	FPS-77	32°30'N.	93°40'W.
Bermuda NAS	FPS-106	32°22'N.	64°41'W.
Cape Kennedy AFS, Fla.	FPS-77	28°28'N.	80°33'W.
Chase Field NAS, Beeville, Tex.	FPS-106	28°22'N.	97°40'W.
Cherry Point MCAS, N.C.	FPS-106	34°54'N.	76°53'W.
Corpus Christi NAS, Tex.	FPS-106	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.
New Orleans NAS, La.	FPS-81	29°50'N.	90°01'W.
Norfolk FWC, Va.	FPS-106	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 & FPS-68	42°25'N.	71°29'W.

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

ADCOM 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.

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

**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 ADCOM radar unit or other more powerful units, the ADCOM 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 ADCOM 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 COMEDS 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 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 ADCOM Sites to Make Hurricane Radar Observations.

a. The Director of the National Weather Service has been authorized to send radar meteorologists to ADCOM 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 Public Services 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 must be on file at the ADCOM radar sites listed in paragraph 3.b above. It will be the responsibility of the Public Services Branch, Meteorological Services Division (MSD), National Weather Service Headquarters in Silver Spring to coordinate additions, changes, and/or deletions in this list with Headquarters, ADCOM, at least 2 weeks in advance of the effective date of the change. The coordinating correspondence from the National Weather Service Headquarters to ADCOM 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. ADCOM (DORO)
Ent AFB, Colo. 80912

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

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

a. The National Weather Service has been authorized by the 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 the 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 Public Services 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 must be on file at the FAA facilities included in paragraph 7.e. It will be the responsibility of the Public Services 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 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 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

FAA--ARTCCs	FAA RADAR SITES	MILITARY RADAR SITES
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.	
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. At hourly intervals throughout the day and night this composite is also communicated over the Western Region radar facsimile circuit (RAFAX) where it is received by WSFO, Los Angeles and WSFO, San Francisco. Special radar overlays from Palmdale ARTCC may be prepared at more frequent intervals when requested and transmitted over RAFAX to WSFO San Francisco. Requests for special observations will be made to WSO (Radar), Salt Lake City, FTS 588-4004, who will coordinate with WSO (Radar), Palmdale, and other offices necessary to accomplish relay of the information.

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 Detachment 4, 1st Weather Wing (Det4, 1WW), 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. Kaala, 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.

CHAPTER 6

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.

CHAPTER 7

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 appendix 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

1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
ANNA	ANITA	AMELIA	ANGIE	ABBY	ARLENE	AGNES	ALICE	ALMA	AMY
BELLE	BABE	BESS	BARBARA	BERTHA	BETH	BETTY	BRENDA	BECKY	BLANCHE
CANDICE	CLARA	CORA	CINDY	CANDY	CHLOE	CARRIE	CHRISTINE	CARMEN	CAROLINE
DOTTIE	DOROTHY	DEBRA	DOT	DINAH	DORIA	DAWN	DELIA	DOLLY	DORIS
EMMY	EVELYN	ELLA	EVE	ELSIE	EDITH	EDNA	ELLEN	ELAINE	ELOISE
FRANCES	FRIEDA	FLOSSIE	FRANNY	FELICIA	FERN	FELICE	FRAN	FIFI	FAYE
GLORIA	GRACE	GRETA	GWYN	GEORGIA	GINGER	GERDA	GILDA	GERTRUDE	GLADYS
HOLLY	HANNAH	HOPE	HEDDA	HEDY	HEIDI	HARRIET	HELEN	HESTER	HALLIE
INGA	IDA	IRMA	IRIS	ISABEL	IRENE	ILENE	IMOGENE	IVY	INGRID
JILL	JODIE	JULIET	JUDY	JUNE	JANICE	JANE	JOY	JUSTINE	JULIA
KAY	KRISTINA	KENDRA	KAREN	KIM	KRISTY	KARA	KATE	KATHY	KITTY
LILIAS	LOIS	LOUISE	LANA	LUCY	LAURA	LUCILLE	LORETTA	LINDA	LILLY
MARIA	MARY	MARTHA	MOLLY	MILLIE	MARGO	MAE	MADGE	MARSHA	MABEL
NOLA	NORA	NOREEN	NITA	NINA	NONA	NADINE	NANCY	NELLY	NIKI
ORPHA	ODEL	ORA	OPHELIA	OLIVE	ORCHID	ODETTE	ONA	OLGA	OPAL
PAMELA	PENNY	PAULA	PATTY	PHYLLIS	PORTIA	POLLY	PATSY	PEARL	PEGGY
RUTH	RAQUEL	ROSALIE	ROBERTA	ROSIE	RACHEL	RITA	ROSE	ROXANNE	RUBY
SHIRLEY	SOPHIA	SUSAN	SHERRY	SUZY	SANDRA	SARAH	SALLY	SABRINA	SHEILA
TRIXIE	TRUDY	TANYA	TESS	THEDA	TERESE	TINA	TAM	THELMA	TILDA
VILDA	VIRGINIA	VANESSA	VESTA	VIOLET	VERNA	VELMA	VERA	VIOLA	VICKY
WYNNE	WILLENE	WANDA	WENDA	WILLETTE	WALLIS	WENDY	WILDA	WILMA	WINNIE

CHAPTER 7
APPENDIX B

LIST OF EASTERN NORTH PACIFIC TROPICAL CYCLONE NAMES

1976	1977	1978	1979
Annette	Ava	Aletta	Agatha
Bonny	Bernice	Blanca	Bridget
Celeste	Claudia	Connie	Carlotta
Diana	Doreen	Dolores	Denise
Estelle	Emily	Eileen	Eleanor
Fernanda	Florence	Francesco	Francene
Gwen	Glenda	Gretchen	Georgette
Hyacinth	Heather	Helga	Hilary
Iva	Irah	Ione	Ilsa
Joanne	Jennifer	Joyce	Jewel
Kathleen	Katherine	Kristen	Katrina
Liza	Lillian	Lorraine	Lily
Madeline	Mona	Maggie	Monica
Naomi	Natalie	Norma	Nanette
Orla	Odessa	Orlene	Olivia
Pauline	Prudence	Patricia	Priscilla
Rebecca	Roslyn	Rosalie	Ramona
Simone	Sylvia	Selma	Sharon
Tara	Tillie	Toni	Terry
Valerie	Victoria	Vivian	Veronica
Willa	Wallie	Winona	Winifred

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

CHAPTER 8

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);

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 not assigned to HWO San Juan, 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 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

CHAPTER 8
APPENDIX B

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, 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 by any 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.

CHAPTER 8
APPENDIX C

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. FWC Norfolk shall request 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
DIRNAVOCEANMET 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 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.

CHAPTER 8
APPENDIX E

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.

#TROPICAL CYCLONE SURVEILLANCE BY SATELLITES

1. Geostationary Operational Environmental Satellite (GOES). The GOES system presently consists of two operational and one "stand-by" satellites. GOES-1, launched on October 16, 1975, is located at 75°W; SMS-2 (Synchronous Meteorological Satellite), launched February 16, 1975, is located at 135°W; SMS-1, launched in May 1974, is located at 105°W (in stand-by mode). The principal GOES products are pictures produced at 30-minute intervals. During the daylight hours, 1/2-mile, 1-mile and 2-mile resolution fixed, standard sectors are produced. During the nighttime, equivalent 1-mile and 2-mile IR standard sectors are produced. Implanted grids are automatically applied, both day and night, to all sectors. Also, at specified times each day, certain IR pictures will be enhanced to emphasize various features. All products will be delivered in near real-time to the Satellite Field Service Stations (SFSSs), WSFOs and to the NESS Analysis and Evaluation Branch (AEB). 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 polar orbiting satellites provide coverage of the U.S. twice a day (at approximately 9:00 a.m. and 9:00 p.m. local time). Global visible and infrared data (8 km resolution) are centrally received, processed and disseminated to appropriate SFSSs and WSFOs via FOFAX and in some instances, via the GOES distribution system. Photographic copies are available to the AEB from the NESS Photo Lab. Vertical Temperature Profile Radiometer (VTPR) 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 Service Station support concept, GOES imagery will be distributed by the Central Data Distribution Facility (CDDF) at the World Weather Building in Marlow Heights, Md., to the SFSSs in Miami, San Francisco, Honolulu, Kansas City, Washington, Anchorage and to the NESS 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 the National Hurricane Center (NHC), the San Francisco SFSS for the support provided the Eastern Pacific Hurricane Center (EPHC), and the Honolulu SFSS is responsible for providing support to the Central Pacific Hurricane Center (CPHC). (The GOES operational data flow is depicted in Attachment 1 to this chapter.)

All SFSSs operate 24 hours per day. Satellite Meteorologists can be contacted as follows:

a. At the Miami SFSS, between the hours of 0630-1630 EDST and 2000-0400 EDST at (305) 350-4310.

b. At the San Francisco SFSS through FTS at 470-9122-9123.

c. At the Honolulu SFSS at (808) 847-2776.

4. NESS Analysis and Evaluation Branch (NESS/AEB). The NESS Analysis and Evaluation Branch provides support to the NMC with data from the polar orbiting NOAA satellites as well as with that from GOES. The AEB is collocated with the NMC in the World Weather Building in Marlow Heights, Md. It has access to NOAA data processed at the NESS Photo Lab and to GOES data processed at the Central Data Distribution Facility.

a. The AEB operates 24 hours per day. Satellite Meteorologists can be contacted at (301) 763-8444.

b. The Synoptic Analysis Section of the AEB will distribute 2 daily teletype messages entitled "Satellite Tropical Disturbance Summary" (attachment 2 to this chapter). These messages describe areas of significant weather in the tropical regions of the Central, Western, and Southern Pacific Oceans observed by the visible (day) and infrared (night) data received from the NOAA satellites. An 0800Z Summary describes the visible data taken from 1900Z-0200Z. The 2000Z Summary describes the infrared data taken from 0700Z-1400Z. These summaries are available on the following teletype circuits:

(1) 8383, 8285, 8273 (Service 0)
(2) GF 10211 (Honolulu)
(3) GD 60159 (Tokyo)
(4) GDA 60146 (Bracknell)
(5) GD 20300 (Carswell AFB)
(6) GD 90488 (Kansas City)

c. The Satellite Winds Section of the AEB derives winds from the motions of clouds observed in successive GOES images. These winds are derived over the broad areas of the Tropics observed by GOES 1 and SMS 2. The winds are input to the NMC operational analyses, transmitted on WMO teletype circuits, and stored in the NOAA central computer at Suitland for access by other computer centers.

5. Confidence Factors used in the location and maximum wind speed estimates of tropical cyclones determined from satellite imagery (using the Dvorak or Hebert-Poteat techniques) are as follows:

a. Wind speed estimates from satellite imagery are assigned a confidence factor according the following number key:

1 = analyst confident of wind speed estimate.
2 = analyst tempted to vary estimate by as much as plus or minus 12 knots.
3 = analyst uncertain of estimate by more than 12 knots.

b. Vortex locations from satellite imagery are assigned a confidence factor according to the following number key:

1 = well defined eye with good picture registration.
2 = well defined eye with uncertain picture registration.
3 = well defined circulation center with good picture registration.
4 = well defined circulation center with uncertain picture registration.
5 = poorly defined circulation center with good picture registration.
6 = poorly defined circulation center with uncertain picture registration.

6. The Defense Meteorological Satellite Program (DMSP) will normally provide coverage of tropical areas four times a day. Visual and infrared data will be available from two operational satellites in the early morning, near noon, late evening, and near midnight time frames. 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 Patrick AFB, Fla. When named storms are observed in these DMSP readouts, and the NHC determines that coverage from available NESS satellite should be supplemented, teletype bulletins describing the location and intensity classification of the storm will be transmitted to the NHC upon request by CARCAH 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 Patrick direct readout covers basically the Caribbean area south of 30 degrees north and west of 60 degrees west; teletype bulletins (paragraph d, below) will be provided to NHC.

b. AFGWC will provide teletype bulletins (paragraph d, below) for those areas not covered by the Hickam and Patrick direct readouts; specifically, for named storms located north of 30 degrees north and/or east of 60 degrees west (NHC 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 additional receipt delays of one and one-half to three hours. Processing after data receipt at AFGWC and transmission of the teletype bulletin will require about two hours.

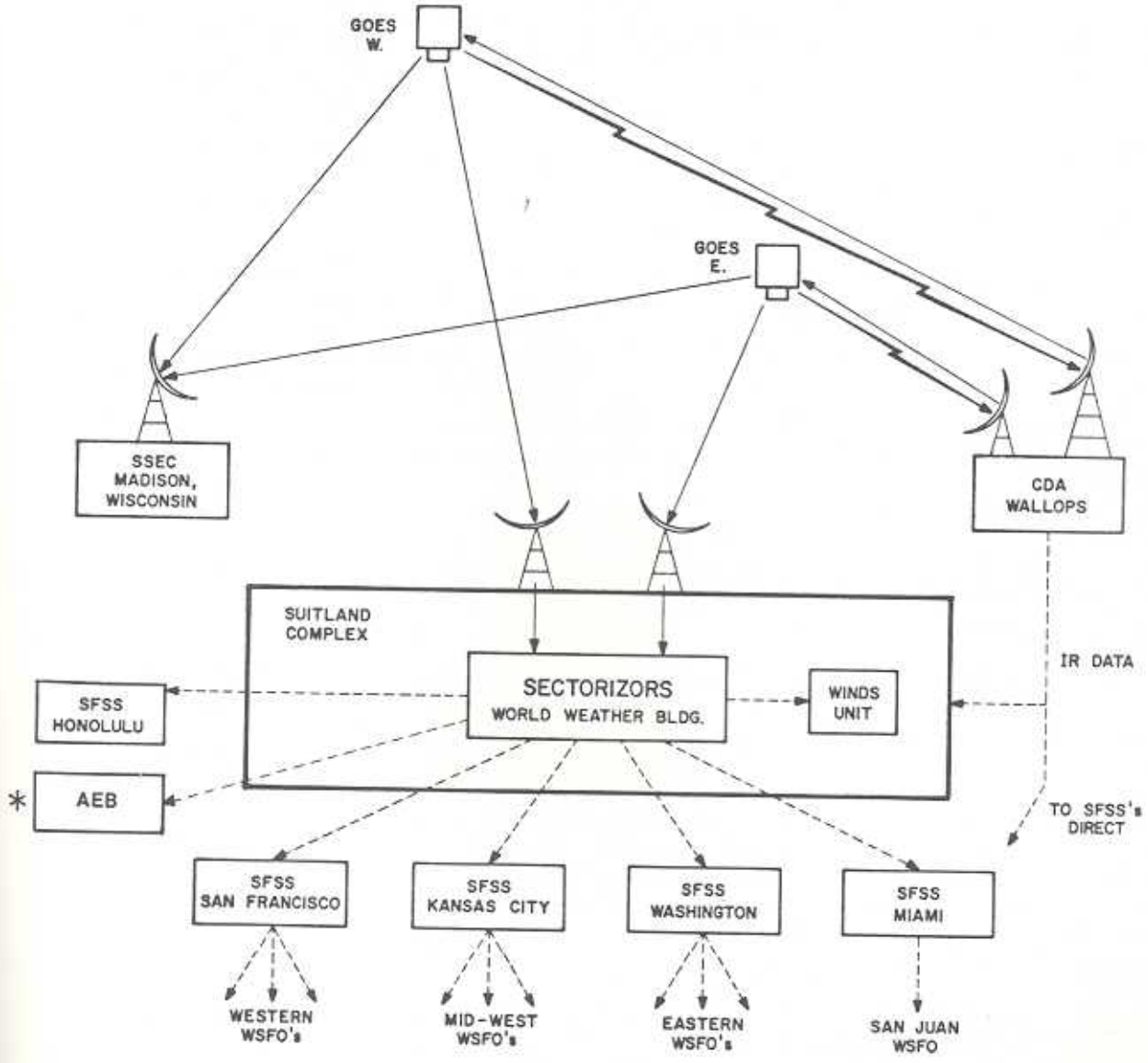
c. When suspicious areas are present which have not been classified as named storms and NHC requires additional satellite analysis of the area, CARCAH will call the appropriate DMSP location to receive telecon information on the suspicious area.

d. Teletype bulletins originated by Offutt and Patrick will be in SAREP code form (WMO FM 85-VI Part A) with the following additional specifications:

(1) $A_tS_tW_fa_tt_m$ 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.)

(2) Remarks: Include check sums, Latitude (LT/X) and Longitude (LG/X) for cyclone position and specify whether ephemeris or geographic gridding was used. Also include, as appropriate, information on eye characteristics, spiral rainbands, unexpected changes in storm movement, etc.

GOES
OPERATIONAL DATA FLOW



* Analysis and Evaluation Branch

NOTE: Anchorage SFSS is in the GOES Operational Data Flow but primarily utilizes the NOAA Polar Orbiting Satellite data.

CHAPTER 9
ATTACHMENT 2

*ABXX(#) KWBC

SATELLITE TROPICAL DISTURBANCE SUMMARY

ALL MOVEMENTS AND TRENDS 24 HRS UNLESS OTHERWISE STATED

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

(Remarks)

(Oceanic Area)	(Satellite(s) & Sensor(s))		(Times)
(Location w/CONF)	(Time)	(Code w/CONF)	(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 1976 HURRICANE SEASON

Satellite	Type of Data	Local Time	NESS Products
GOES-1 (East) 75.0°W SMS-2/GOES (West) 135.0°W SMS-1/GOES (Standby) 105.0°W	VISSR	#Every 30 minutes (24 hrs/day) (Limited scan for short interval viewing available)	1. 1/2, 1 and 2 mi. resolution visible standard sectors covering Western U.S., Mid-West and Eastern U.S. (daylight hours). 2. 1 and 2 mi. equivalent IR standard sectors for the entire U.S. (nighttime hours). 3. Equivalent IR enhanced imagery. 4. Floating sectors at 1/2, 1 and 2 mi. resolution (visible and equivalent IR). 5. Full disc IR (day and night). 6. Movie Loops 7. Wind Analysis
ITOS (NOAA series)	SR (stored) APT (direct) VTPR VHRR	0900/2100	1. Mapped digitized SR (cloud cover imagery) 2. Sea-surface Temperature Analysis 3. Moisture Analysis 4. Soundings
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

#Except for scheduled interrupts for preventive maintenance (PM), i.e., 3-hour period for each satellite on alternating days: GOES-1 PM 0500 through 0730 GMT and SMS-2 PM, 0515 through 0745 GMT. Full disc IR will be provided during these periods.

VTPR - Vertical Temperature Profile Radiometer
APT - Automatic Picture Transmission
SMS - Synchronous Meteorological Satellite
GOES - Geostationary Operational Environmental Satellite
ESSA - Environmental Survey Satellite
FOFAX - Forecast Office Facsimile Network
SR - Scanning Radiometer
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)
IR - Infrared
ITOS - Improved TIROS Operational Satellite

CHAPTER 10

ENVIRONMENTAL DATA BUOYS

1. Mission. The mission of the environmental data buoys deployed in the Gulf of Mexico and off the east and west coasts 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. Environmental data buoys (EBs) are deployed in the following locations of interest to the National Hurricane Operations Plan.

IDENT.	LAT.	LONG.	LOCATION	HULL TYPE
EB-01*	35.0N	72.0W	230 n.m. SE of Norfolk, Va.	12.2 meter discus
EB-04	26.0N	90.0W	275 n.m. SSW of Gulfport, Miss.	"
EB-15	32.3N	75.3W	250 n.m. ESE of Charleston, S.C.	"
EB-16	42.5N	130.0W	344 n.m. SW of Astoria, Ore.	10 meter discus
EB-20**	41.0N	138.0W	600 n.m. West of Crescent City, Calif.	12.2 meter discus
EB-21**	46.0N	131.0W	270 n.m. West of Astoria, Ore.	"
EB-34	40.1N	73.0W	59 n.m. SE of New York, N.Y.	6.1 meter NOMAD
EB-41	38.7N	73.6W	67 n.m. ESE of Cape May, N.J.	4.9 meter discus

*Scheduled for April 1976 deployment
**Scheduled for August 1976 deployment

3. Environmental Data. Meteorological and oceanographic parameters can be measured every hour and stored on the buoy for 24 hours. Normally, synoptic data are reported once every three hours, but the system is capable of hourly interrogation. The parameters sampled, stored aboard the buoy, and transmitted to shore for dissemination to operational users include the following:

- Sea Level Pressure
- Wind Direction and Speed
- Air Temperature
- Dew Point Temperature (EB-04 only)
- Sea Surface Temperature
- Sea Surface Salinity (EB-04 only)
- Wave Height Spectral Data (all except EB-34)

The data are sampled several times per second and averaged over a 10- to 15-minute period. EB-34 and -41 are special purpose buoys and their capabilities are not as extensive (e.g., they are set to report every hour but cannot store data for more than 1 hour).

4. Data Availability. These buoys provide scheduled meteorological and limited oceanographic data from improved data acquisition systems. In addition 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 (see address and telephone number in paragraph six below).

5. Reception of Data. The U.S. Coast Guard-operated Shore Collection Station (SCS) at Miami will routinely collect surface synoptic information from the buoys eight times daily. These data are converted into physical units and then translated into World Meteorological Organization (WMO) FM 21-E ship code. Relay to the National Weather Service at Suitland, Md., is by means of NWS Circuit 7072 well within one (1) hour of synoptic acquisition.

6. 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 Director, NOAA Data Buoy Office, National Space Technology Laboratories, Bay St. Louis, Miss. 39520; telephone (601) 688-2800.

7. Potential Interruptions in Data. Since there are some experimental data buoys in the list given above which are being used to fill an operational need, the potential exists for occasional breaks or interruptions in the data from these buoys. Only buoys EB-01, -15, -16, -20, -21 have a pure operational configurations.

8. Planning for Additional Environmental Data Buoys. Future plans for employment of data buoys are given in the Federal Plan for Environmental Data Buoys published in November 1974.

CHAPTER 11

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

Director, Naval Oceanography and Meteorology
Building 200
Washington Navy Yard
Washington, D.C. 20374

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

Headquarters, Air Force Reserve
Robins Air Force Base, Georgia 31093

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

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

*U.S. GOVERNMENT PRINTING OFFICE: 1976 210-801/242 1-3

NOAA--S/T 76-2252