NATIONAL HURRICANE OPERATIONS PLAN

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, WASHINGTON, D.C. FEDERAL COORDINATOR FOR METEOROLOGICAL SERVICES AND SUPPORTING RESEARCH

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NATIONAL HURRICANE OPERATIONS PLAN

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NATIONAL HURRICANE OPERATIONS PLAN

(ATLANTIC, EASTERN PACIFIC, AND CENTRAL PACIFIC)

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PREFACE

An Interdepartmental Plan was first issued in 1962. This is the 11th edition and presents the procedures and agreements reached at the annual Interdepartmental Hurricane Warning Conference (combined Atlantic and Pacific). This Conference is sponsored annually by the Subcommittee on Basic Meteorological Services (SC/BMS), Interdepartmental Committee for Meteorological Services (ICMS), to bring together cognizant Federal agencies to resolve problems 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 Air Weather Service (AWS) and Naval Weather Service (NWS) with the basic meteorological decisions 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.

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 National Weather Service aircraft reconnaissance observations and other special observations which are required to support the provisions of chapter 3 of this Plan.

1. The Department of Defense shall designate a Chief, Aerial Reconnaissance Coordination, Atlantic Hurricanes (CARCAH), to NHC. The CARCAH will be responsible for the coordination and final preparation of the Tropical Cyclone Plan of the Day (TCPOD) and for the scheduling of aircraft required to meet the provisions of chapter 4 of this Plan. An

Alternate CARCAH will be designated for the Alternate Hurricane Warning Office (HWO) in support of chapter 8 of this Plan.

2. The Commanding Officer, 9th Weather Reconnaissance Wing (9 WRWg), McClellan Air Force Base (AFB), Calif., as Tropical Cyclone Reconnaissance Coordinator (TCRC), will be responsible for effecting necessary coordination and liaison with MIC, EPHC San Francisco, and with MIC, CPHC Honolulu, in respect to arrangements for aircraft reconnaissance or for other special observations required to support the provisions of this Plan. The Commanding Officer, Detachment 8, 17th Weather Squadron (Det 8, 17 WSq) McClellan AFB, will provide the functions of the McClellan Weather Monitor.

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

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

RESPONSIBILITIES OF COOPERATING AGENCIES

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

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

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

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

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

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

(5) Advise the Chief, Aerial Reconnaissance Coordination, Atlantic Hurricanes (CARCAH) and Tropical Cyclone Reconnaissance Coordinator (TCRC)--Eastern and Central North Pacific--of aircraft reconnaissance and other observational requirements of the respective HWOs.

(6) Through EPHC SFO coordinate with the Fleet Weather Center (FWC) Alameda, Calif., and through CPHC HNL coordinate with the FWC Pearl Harbor, Hawaii, and the Central Pacific Forecast Center (CENPAC FC) Hickam Air Force Base (AFB), Hawaii, before issuing Tropical Cyclone Advisories in the Eastern and Central Pacific areas, respectively.

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

(1) Operate 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 for areas and times for which specific coverage is desired.

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

(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 National Data Buoy Center shall:

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

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

2. The Department of Defense shall:

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

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

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

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

3. National Weather Service 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 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 the North Atlantic and Pacific ocean stations and Ocean Weather Station HOTEL.

(2) Provide personnel, vessel, and communications support to the National Data Buoy Center 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.

CHAPTER 2

DEFINITIONS

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

1. CENTER FIX: A fix by means other than reconnaissance aircraft penetration (aircraft, ship, or land-based radar; satellite).

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

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

4. 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.

5. NEUTERCANE: A subtropical cyclone that has acquired a synoptic-scale area which has sustained winds of storm or hurricane strength, with radius of maximum winds much less than 100 miles. The thermal structure is intermediate between the typical cold-core subtropical cyclone and the warm-core tropical cyclone.

6. 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 present movement and forecast movement.)

7. SUBTROPICAL CYCLONE: A nonfrontal circular low-pressure system, initially of cold core, that originates in tropical or subtropical latitudes and has maximum surface winds generally occurring at a radius of more than 100 miles from the center. These cyclones sometimes undergo a metamorphosis of structure to become tropical storms or hurricanes.

8. TROPICAL CYCLONE: A nonfrontal cyclone of synoptic scale, developing over tropical or subtropical waters and having a definite organized circulation.

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

10. 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 maintaining 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 subsequently classified as a tropical wave, depression, storm, subtropical cyclone, neutercane, or hurricane.

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

12. 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 the middle-latitude trough.

13. VORTEX FIX: A fix made by reconnaissance aircraft penetration into the vortex of the tropical cyclone.

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 (CPHC-HNL) in their respective areas of responsibility will make available to the Department of Defense all significant tropical cyclone reports which they receive.

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

The NHC will provide this information through the Chief, Aerial Reconnaissance Coordination, Atlantic Hurricane (CARCAH). Such material provided to CARCAH will be in tape form for further relay to the Department of Defense offices. The release time of such material by CARCAH will not be earlier than 30 minutes before the scheduled warning time of the material.

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

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

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

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

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

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

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

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

(4) Amended Military Advisory.

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

(b) The National Weather Service will be permitted to make changes of 15 knots or less in the maximum sustained winds in the public bulletins, provided this does not change the category (depression/storm/hurricane) of the system. If the NHC determines an amendment to the Military Advisory is necessary because of a change only in winds, an amendment to the last Military Advisory will be issued which contains only this change in wind speed. This amendment will have the same number as the Advisory being amended and will also contain the amendment number. For example, if Military Advisory number 21 is being amended for the wind speed, it becomes the First Amendment to Military Advisory number 21. If the wind speed is changed again before the normal advisory time, it becomes the Second Amendment to Military Advisory number 21.

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

(1) Time of issue.

(2) Heading, advisory number, kind and name, and hour and day.

(3) Warnings in effect.

(4) Position, in degrees and tenths.

(5) Time of position in GMT.

(6) Accuracy and basis for position.

(7) Present movement.

(8) Present winds:

(a) Maximum sustained winds and gusts.

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

(c) Radius of 65-, 50-, and 30-knot sustained winds (Atlantic only).

(d) Radius of 100-, 50-, and 30-knot sustained winds (Pacific only).

(9) Repeat center location and time.

(10) 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.

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

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

(13) 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).

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

(15) Time of issuance for next Military Advisory.

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

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

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

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

(1) Time of issue.

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

(a) The tropical depression numbers to be furnished EPHC-SFO by the U.S. Navy at Alameda and to CPHC-HNL by the U.S. Navy at Guam.

(b) Bulletin issuances will not be numbered sequentially by NHC-MIA and EPHC-SFO.

(c) In the Central Pacific, both bulletins and advisories will be numbered sequentially, that is, Bulletin Number 1, Tropical Depression ONE; Bulletin Number 2, Tropical Depression ONE; Advisory Number 3, Tropical Storm Anita; Advisory Number 4, Hurricane Anita; Bulletin Number 5, Tropical Depression ONE; etc. WHPN1 PHNL (Tropical Depression Bulletins on WS Form

C-13) and WHPN3 PHNL (Tropical Storm or Hurricane Advisories on WS Form C-13) will be numbered sequentially as indicated. WHPN2 PHNL (issuance in public format) will contain the advisory number assigned to the concurrently issued WHPN3 PHNL or WHPN1 PHNL.

(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:

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

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

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

(10) Time of issuance for next Military Bulletin.

4. Tropical Cyclone Discussions--Atlantic. The NHC will issue Tropical Cyclone Discussions at 0300, 0900, 1500, and 2100Z daily whenever advisories are being issued. 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.

A Disaster Potential (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. The NHC will issue a Tropical Weather Outlook three times a day during the period from June 1 through November 30. These will be issued at 0930, 1530, and 2130 GMT and distributed on all Radar Report (RAREP) and Warning Coordination (RAWARC) circuits and 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 additional 1- or 2-day notice for areas where conditions are becoming unstable and favorable to tropical cyclone inception.

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

7. Marine Weather Broadcasts by Coastal Radio Stations.

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

NSS - Washington, D.C.
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 Naval Oceanographic Office Publication H.O. 118.

Time signal radio station WWV transmits two 45-second segments of warning information for the North Atlantic hourly at H+10 and H+12.

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:

WWD - LaJolla, Calif.
KPH and KFS - San Francisco, Calif.
KMI - Dixon, Calif.
KOK - Los Angeles, Calif.
NMQ - Long Beach, Calif.
KOU - San Pedro, Calif.
KHK, KQM, KBP, and NMO - Honolulu, Hawaii

Other coastal radio stations transmit warnings and forecasts for offshore and coastal waters. Complete details of these broadcasts are found in Naval Oceanographic Office Publication H.O. 118.

Radio WWVH, the time-signal radio station in Hawaii, transmits two 45-second segments of warning information for the North Pacific hourly at H+49 and H+51.

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

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

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

11. Bulletins on Subtropical Cyclones or Neutercanes. The NHC will issue six hourly marine and military bulletins in plain language format and will include a 24-hour forecast on the intensity and track of subtropical cyclone or neutercane systems. These systems will be designated by use of the phonetic alphabet. (See example in appendix B.)

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

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

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

Position accurate within_____miles.

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

WS Form C-13 (4-72)

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

or

NOAA_____PACIFIC HURRICANE CENTER

_____ _____Z _____

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

(WARNINGS)

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

_____ + [corrected / amended / relocated] upgraded to / downgraded from tropical depression / tropical storm / hurricane _____ _____

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

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

POSITION EXCELLENT/GOOD/FAIR/ACCURATE WITHIN_____MILES BASED ON DOD/RFF RECONNAISSANCE/

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

PRESENT MOVEMENT TOWARD THE_____OR_____DEGREES AT_____KT.

MAX SUSTAINED WINDS OF_____KT NEAR CENTER WITH GUSTS TO_____KT.

MAX SUSTAINED WINDS OVER INLAND AREAS_____KT WITH GUSTS TO _____KT.

* RAD OF 100 KT-WINDS_____NE_____SE_____SW_____NW QUAD.

RAD OF 65 KT-WINDS_____NE_____SE_____SW_____NW QUAD.

RAD OF 50 KT-WINDS_____NE_____SE_____SW_____NW QUAD.

RAD OF 30 KT-WINDS_____NE_____SE_____SW_____NW QUAD.

REPEAT CENTER LOCATED_____N_____W AT _____/_____Z.

12-HOUR FORECAST VALID_____/_____Z LATITUDE_____N LONGITUDE_____W.

MAX SUSTAINED WINDS OF_____KT NEAR CENTER WITH GUSTS TO_____KT.

MAX SUSTAINED WINDS OVER INLAND AREAS_____KT WITH GUSTS TO _____KT.

RADIUS OF 50-KT WINDS_____NE_____SE_____SW_____NW QUAD.

24-HOUR FORECAST VALID_____/_____Z LATITUDE_____N LONGITUDE_____W.

MAX SUSTAINED WINDS OF_____KT NEAR CENTER WITH GUSTS TO_____KT.

MAX SUSTAINED WINDS OVER INLAND AREAS_____KT WITH GUSTS TO_____KT.

RADIUS OF 50-KT WINDS_____NE_____SE_____SW_____NW QUAD.

HEAVY PRECIPITATION (Not used in Central Pacific)

(AVIATION ADVISORY ENDS HERE)

STORM-TIDE OF (Not used in Central Pacific)

(MARINE ADVISORY ENDS HERE)

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

+ RECONNAISSANCE PLANS INCLUDING SCHEDULED FIXES

NEXT ADVISORY AT_____/_____Z. (FORECASTER_____)
(*FOR USE IN PACIFIC ONLY) (# FOR USE IN ATLANTIC ONLY) (+ CENTRAL PACIFIC ONLY)
(INLAND AREAS--MORE THAN 10 MILES FROM COAST)
(GUSTS INCLUDED WHEN MAXIMUM SUSTAINED WINDS REACH 50 KNOTS.)
Note: Use of quadrants is optional in the Pacific.

CHAPTER 3
APPENDIX A

SIMPSON'S DISASTER POTENTIAL SCALE FOR ATLANTIC HURRICANES

ZERO:

(a) WINDS[#] less than 74 mph at standard anemometer elevation (F-scale[##] 0-0.9), or

(b) STORM SURGE nominally less than 4 feet.

While a broad coastal area may experience some damage to shrubbery, signs, and small structures and possibly some beach erosion, the overall scope and impact of damage would not likely require relief action by the Federal Government.

ONE:

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

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

TWO:

(a) WINDS from 96 to 110 mph at standard anemometer elevations (F-scale 1.5-1.9). Considerable damage to shrubbery and tree foliage. Some trees blown down. Extensive damage to poorly constructed signs. Some roofing material damage to buildings; some window and door damage; no major damage to building structures, or

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

[#]Definition of a sustained wind (after 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.

THREE:

(a) WINDS from 111 to 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, and some structural damage to small residences and utility buildings. Minor amount of curtainwall failures, or

(b) STORM SURGE (nominally 9 to 12 ft 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 3 to 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 from 131 to 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, and complete failure of roof structures on many small residences. Some curtainwall failure, or

(b) STORM SURGE (nominally 13 to 18 ft 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 resulting from flooding and battering action. Low-lying escape routes inland cut 3 to 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, and 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, or

(b) STORM SURGE (heights nominally greater than 18 ft 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 3 to 5 hours before center arrives. Massive evacuations of residential areas situated on low ground within 5 to 10 miles of the shoreline may be required.

EXAMPLE--SUBTROPICAL CYCLONE OR NEUTERCANE BULLETIN

NOAA NATIONAL HURRICANE CENTER BULLETIN NO. 4, SUBTROPICAL CYCLONE ALPHA, 1600Z, OCTOBER 15, 1971.

THE SUBTROPICAL CYCLONE WILL BE CENTERED NEAR LATITUDE 29.5N, LONGITUDE 57.5W AT 1600Z. THIS POSITION IS ACCURATE WITHIN 20 MILES BASED ON AIRCRAFT RECONNAISSANCE REPORTS.

THE PRESENT MOVEMENT IS TOWARD THE NORTH 10 KNOTS.

MAXIMUM SUSTAINED WINDS ARE 50 KNOTS WITH GUSTS TO 70 KNOTS. THE LOWEST CENTRAL PRESSURE IS 990 MILLIBARS. 30-KNOT WINDS EXTEND OUTWARD 200 MILES NORTH OF THE CENTER AND 50 MILES TO THE SOUTH.

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

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

DOE

AIRCRAFT RECONNAISSANCE

1. Responsibility.

a. Atlantic: The Department of Defense will have the operational reconnaissance responsibility for providing fixes and investigative flights on tropical cyclones in the Atlantic Ocean, Caribbean Sea, and Gulf of Mexico. In addition, the Research Flight Facility (RFF) of the National Oceanic and Atmospheric Administration (NOAA) will supply backup operational support in accordance with the following:

(1) Reconnaissance will be on a flight pattern coordinated and specified in the Tropical Cyclone Plan of the Day (TCPOD).

(2) When RFF is requested to fly operational missions, the specified flight pattern will be flown. When RFF research flight patterns preclude operational flights into the storm area (radius 80 n.mi. of center), the RFF will make the vortex fix and Department of Defense aircraft will provide the peripheral data.

(3) Resolution of conflicts will be made by the Chief, Aerial Reconnaissance Coordination, Atlantic Hurricanes (CARCAH).

(4) Special flights may be scheduled through CARCAH to fill specific National Hurricane Center (NHC) requirements. Priority for these special tracks will be higher than standard tracks (Gull Hotel) and lower than investigative or tropical cyclone missions. The weather mission identifier will be Gull or Navy Special.

(5) The following 500-millibar (19,000 ft) Navy Synoptic Tracks have been developed as requested by NHC to utilize better the capabilities of the WP3A aircraft:

(a) PAPA JACK

Departure Point--Jacksonville, Fla., Roosevelt Roads, P.R., or Bermuda.
Route--via 21° 05'N., 65° 11'W. and 28° 00'N., 15° 30'W.
Termination--Las Palmas, Canary Islands.

(b) PAPA CHARLIE

Departure Point--Roosevelt Roads.
Route--via 13°N., 60°W. rhumb line to 13°N., 20°W.
Termination--Dakar, Senegal, or Sal, Cape Verde Islands.

(c) PAPA PAUL

Departure Point--Roosevelt Roads.
Route--via 13°N., 60°W. to 13°N., 80°W. to 25°N., 90°W. to 29°N., 84°W.
Termination--Jacksonville.

b. Eastern and Central Pacific: The Department of Defense will be responsible for providing tropical cyclone aircraft reconnaissance in both the Eastern Pacific Hurricane Center's (EPHC) and the Central Pacific Hurricane Center's (CPHC) areas of responsibility subject to the capabilities of available aircraft.

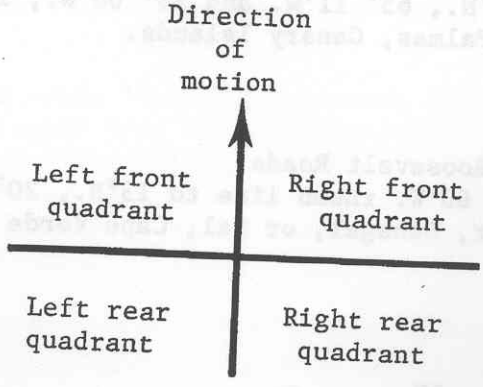
c. Investigative Reconnaissance: An investigative reconnaissance flight is a special mission to investigate the stage of development of a known tropical disturbance, specifically to determine: (a) whether a pressure center exists near the surface, and (b) the maximum low-level winds associated with the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

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

3. Reconnaissance Requirements.

a. Atlantic:

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



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

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

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

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

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

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

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

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

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

The RFF 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, NHRL, as appropriate. When more than one aircraft is in the storm, separation will be as defined in paragraph 4.a.(1)(c) of this chapter. In all cases, safety of flight is of paramount importance.

(a) The RFF 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 RFF aircraft will enter late enough and depart early enough from the storm area to insure required separation.

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

(c) The RFF may be tasked to provide vortex data, with the Department of Defense tasked to provide peripheral data. Aircraft separation will be defined in paragraph 4.a.(1)(c) of this chapter.

(d) The Department of Defense may be tasked to provide vortex and peripheral data, with RFF aircraft concurrently satisfying requirements of research pattern Zebra. Aircraft separation will be as defined in paragraph 4.a.(1)(c) of this chapter.

b. Eastern Pacific:

Center Fixes. One daily flight of up to 2,500 nautical miles, from June 1 through November 15, will be made whenever tropical cyclones are in the EPHC-SFO area of responsibility. Within the limits of operational safety, all possible efforts will be made to obtain an observed fix on the center as near 1800Z as possible; however, when a tropical cyclone is within 600 nautical miles of the west coast of the United States or within 300 nautical miles of Baja California, Mexico, the single flight will provide two center fixes at least 6 hours apart (preferably at 1500Z and 2100Z) and peripheral data as specified by the flight pattern. Operational hurricane reconnaissance flights will fly the flight pattern (as shown in appendix A) designated in the TCPOD. A plain-text message will be sent on the initial fix of the center of each flight. This message will be transmitted separately and as soon as possible in the interest of reducing time delay for delivery to EPHC-SFO. All radar fix reports will be made in plain text. The method of

obtaining the location of the center should always be included in center position reports from reconnaissance aircraft. The vortex should be located according to the priority in paragraph 9.a.(3), (a) through (d) of this chapter.

c. Atlantic and Eastern Pacific:

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

4. Reconnaissance Planning and Flight Notification.

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

(1) Preparation. Plans for aircraft reconnaissance to meet requests for data shall be prepared by CARCAH in consultation with the Director, NHC. When flights by RFF are to be made, the Chief, RFF, shall participate. Plans for reconnaissance flights will reflect the coordinated requirements as determined by the Director, NHC, with respect to flights into tropical cyclones or suspicious areas. Daily reconnaissance requirements of NHC will be provided to CARCAH as early as possible each day, and in no case later than 1630Z for use in preparation of the TCPOD. The content of the TCPOD is given in Form 6 of this chapter.

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, and depression. Reconnaissance research flights that are not requested by NHC, but require a listing in the TCPOD, will be listed with the storm, etc., to which they apply after the NHC-requested flights are listed. In preparation of the Reconnaissance TCPOD, consideration will be given to the following:

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

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

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

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

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

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

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

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

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

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

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

(g) To satisfy Department of Defense needs in the storm environment, NHC patterns may be revised with NHC concurrence on a sortie-by-sortie basis. All unclassified weather reconnaissance flights solely in support of Department of Defense requirements performed by VW-4 and the 9th Weather Reconnaissance Wing (9 WRWg) in the Atlantic area will be coordinated with CARCAH, included in the TCPOD, and specifically identified as Navy- or Air Force-required sorties.

Flight plans of reconnaissance aircraft flying in support of NHC into or through Warning Areas W-151, W-470, and W-497, controlled by Missile Test Ranges at Patrick Air Force Base (AFB), Fla. (Air Force Eastern Test Range), and Eglin AFB, Fla. (Eglin Gulf Test Range), will be coordinated by CARCAH. When these areas are designated by Notices to Airmen (NOTAMS) as being closed, CARCAH will contact the controlling agency and attempt to obtain permission for reconnaissance aircraft to enter the closed areas; however, final clearance responsibility rests with the aircraft commander and/or the agency or unit operating the aircraft. Such coordination effected by CARCAH for an

aircraft to enter a closed area constitutes permission only, and does not provide for a positive clearance. Therefore, risk caused by missile or rocket flight in the area is assumed by the aircraft commander and/or the agency operating the aircraft.

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

In the event there is a potential conflict, coordination will be effected between CARCAH and NHC to adjust the requirements by either altering fix times, routes, or alternates to provide the required margin of safety. In the event that a warning area is closed after coordination of the TCPOD or an area is closed without a NOTAM, then the respective aircraft commanders, upon being denied entry to one of these warning areas, should contact CARCAH by Autovon phone patch immediately and request assistance. Every attempt will be made by CARCAH to resolve the conflict with the appropriate controlling agency and FAA.

(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 representative at Miami will assume responsibility for notifying appropriate ARTCCs of the TCPOD immediately upon receipt.

b. Tropical Cyclone Plan of the Day (TCPOD)--Eastern Pacific:

(1) Preparation: Plans for aircraft reconnaissance to meet requests for data shall be prepared by the Tropical Cyclone Reconnaissance Coordinator (TCRC) in consultation with the EPHC-SFO. Plans for reconnaissance flights will reflect the requirements as determined by EPHC with respect to flights into tropical cyclones. The EPHC will telephone requirements for reconnaissance flights to TCRC with confirmation by message over the hurricane coordination network. The requirements will be provided TCRC as early as possible each day, but not later than 2030Z for use in preparation of the TCPOD. The format for the TCPOD is appended as Form 6 to this chapter. In preparation of the TCPOD, full consideration will be given to the following:

(a) Same consideration as listed in paragraph 4.a.(1), (a) through (e) of this chapter.

(b) The TCPOD will be prepared and disseminated daily from June 1 through November 15. In the event no reconnaissance requirements exist for a particular day, the TCPOD will merely contain a notation to that effect.

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

c. Central Pacific--Request for Reconnaissance. The CPHC-HNL will coordinate, through a conference call with responsible authorities of the U.S. Air Force, reconnaissance requirements for tropical cyclones north of the Equator between longitude 140°W. and the 180th meridian. The TCRC will levy tropical cyclone reconnaissance requirements on appropriate military units. Requests for aerial reconnaissance will be by message, but prior coordination by telephone is encouraged.

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

e. Flight Plans. The flight plans for hurricane reconnaissance flights will be filed with FAA as soon as practicable (at least 2 hours in advance is desirable) before departure time. In the interest of standardization and clarification when filing flight plans with FAA facilities, U.S. Navy reconnaissance aircraft (TCPOD-assigned flights) will use the letters NAVH followed by the last three digits of the bureau number of the aircraft. In no case will more than seven digits appear in the call sign; for example, "NAVH789". In the Atlantic, NHC will be included as an information addressee (KMIAYM).

f. Daily Synoptic Reconnaissance Flights--Atlantic:

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

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

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

(4) Dropsondes. Dropsonde release will be coordinated with the appropriate ARTCC at least 10 minutes before droptime.

5. Aircraft Reconnaissance Communications.

a. Atlantic:

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

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

(3) The A/G communications arrangements for RFF aircraft will be the same as that for U.S. Navy aircraft as shown in appendix D of this chapter. RFF aircraft may utilize U.S. Air Force Aeronautical Station facilities as shown in appendix C of this chapter when contact cannot be established with the U.S. Navy.

(4) When two or more reconnaissance aircraft are operating in the storm center, the aircraft at lower flight level will make the dropsonde to obtain the central pressure.

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

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

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

UHF Guard frequency 243.0 MHz
VHF Guard frequency 121.5 MHz.

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

b. Eastern Pacific:

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

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

(3) All hurricane aircraft reconnaissance reports received by the McClellan Monitor will be expeditiously transmitted to EPHC-SFO by means of the hurricane circuit-West Coast Hurricane Coordination Net.

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

6. Navy ATC Communications--Atlantic. The ATC A/G communications by U.S. Navy aircraft operating within the San Juan, Houston, Miami, and New York Flight Information Regions (FIR) areas of responsibility will be conducted in accordance with the following priorities:

a. U.S. Navy Single Sideband (SSB) Stations--6723 kHz (primary), 4711 kHz (secondary).

b. U.S. Air Force Aeronautical Station.

c. 6568 kHz (FAA).

d. ARINC (Aeronautical Radio, Inc.).

7. U.S. Air Force ATC Communications--Atlantic. U.S. Air Force aircraft operating within the San Juan, Houston, Miami, and New York 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.; Albrook AFB, C.Z.; and Loring AFB, Maine.

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

c. U.S. Navy SSB Stations--6723 kHz (primary), 4711 kHz (secondary).

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

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

9. Aerial Reconnaissance Weather Encoding and Reporting:

a. Atlantic and Eastern Pacific:

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

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

(b) U.S. Navy will follow RECCO and dropsonde encoding procedures as outlined in WRN4 INST. 3710.5B. The Data Acquisition and Logging System (DALS) may be employed as an additional means of providing meteorological, oceanographic, and operational position reports. Oceanographic data will be coded in accordance with Atlantic Fleet instructions as required by Fleet Weather Central (FWC) Norfolk, Va.

(c) NOAA/RFF will follow RECCO and dropsonde encoding procedures as outlined on WB Form 611-6 and World Meteorological Organization (WMO) guidelines.

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

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

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

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

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

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

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

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

The vortex should be located according to the following priority:

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

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

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

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

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

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

The storm vortex profile data to be collected are:

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

(b) Wind Profile. The flight-level wind speed profile should be obtained from 80-nautical-mile radius to the center at the designated flight-pattern altitude. The maximum radial distance from the center of the 63-, 50-, and 30-knot values should be observed in each quadrant. Surface wind-speed profile, when observed, should be included in the Remarks section of the Supplementary Vortex Data/Message (Form 4 of this chapter).

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

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

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

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

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

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

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

EXAMPLES:

First named tropical cyclone, first mission by USAF, first report--
AIR FORCE GULL ONE ANN ONE.

First named tropical cyclone, first mission by USN, fifth report--
NAVY ONE ANN FIVE.

First named tropical cyclone, second mission by USAF, tenth report--
AIR FORCE GULL TWO ANN TEN.

Second named tropical cyclone, first mission by USN, third report--
NAVY ONE BETSY THREE.

Second named tropical cyclone, first mission by NOAA/RFF, sixth report--
NOAA ONE BETSY SIX.

First investigative mission by USAF, second report--
AIR FORCE GULL ONE INVEST TWO.

Third investigative mission by USN, third report--
NAVY THREE INVEST THREE.

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

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

(8) Observation Numbering and Content:

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

EXAMPLES:

AIR FORCE GULL TEN INVEST ONE
DPTD MJEQ AT 10/2100Z ETA 31.5N 75.0W AT 11/0000Z.

NAVY FOUR ANN ONE
DPTD KNIP AT 17/1430Z ETA ANN AT 17/1800Z.

AIR FORCE GULL TWENTY SEVEN INVEST ONE
DPTD HOTEL TRACK AT 05/1438Z ETA 12.5N 45.0W AT 05/1615Z.

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

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

NAVY ONE ANN NINE
97779 TEXT TEXT.....OBS 1 THRU 8 XMTD AS NAVY SEVEN INVEST.

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

EXAMPLES:

NAVY FOUR BETSY TWENTY FIVE
ARVD KNIP 10/1730Z 22 OBS 3 DROPS OBS 1-25 KNIP.

AIR FORCE GULL THIRTY THREE INVEST SIXTEEN
ARVD KCOF 15/2300Z 14 OBS 2 DROPS 1-10 AND 14-16 KCHS OBS 11-13 KMCF.

CHAPTER 4
FORM 1

INITIAL TROPICAL CYCLONE CENTER/VORTEX REPORT

_____

_____

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

AT_____DEGREES_____MINUTES NORTH_____DEGREES_____

MINUTES WEST AT_____ _____ _____ _____ZULU

_____

*NOAA participates only in the Atlantic area.

1. The first center fix obtained on each flight will be dispatched as rapidly as possible using Form 1.
2. This form is used in the Atlantic and Eastern Pacific areas.

	DETAILED CENTER/VORTEX DATA MESSAGE	ADDRESSEE(S)
MISSION NUMBER	DATE / SCHEDULE 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.
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 (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 NEAR CENTER (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 : Z	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 GULL
NAVY
*NOAA _____97779 11304 10189 68466 -----etc.-----X

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

DEGREES _____MINUTES NORTH _____DEGREES _____ MINUTES WEST X

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

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

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

(RADAR WEATHER REMARKS) (NOTE 6)

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

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

AMPLIFYING NOTES

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

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

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

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

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

   a. Selection "POSITIVE" will be used:

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

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

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

c. Selection "FAIR" will be used:

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

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

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

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

a. Location "POSITIVE" will be used:

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

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

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

b. Location "GOOD" will be used:

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

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

c. Location "FAIR" will be used:

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

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

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

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

7. Operational information.

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

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
6 80	7 45	8 30	9 15	10 00
11 8	12 4	13 3	14 1	15 0
16 MX	17	18 63	19 50	20 30
21 RIGHT	22 FRONT	23 QUAD	24 IWALL	25
26 80	27 45	28 30	29 15	30 00
31 8	32 4	33 3	34 1	35 0
36 MX	37	38 63	39 50	40 30
41 LEFT	42 FRONT	43 QUAD	44 IWALL	45
46 80	47 45	48 30	49 15	50 00
51 8	52 4	53 3	54 1	55 0
56 MX	57	58 63	59 50	60 30
61 RIGHT	62 REAR	63 QUAD	64 IWALL	65
66 80	67 45	68 30	69 15	70 00
71 8	72 4	73 3	74 1	75 0
76 MX	77	78 63	79 50	80 30

REMARKS:

NOTES: Groups 5, 25, 45 and 65 are height of eyewall. Report to nearest 1,000 ft. in a five-digit group. ///// indicates hgt. unk.
Groups 6-10, 26-30, 46-50, and 66-70 are "D" values. Indicator is distance from center. Report in tens of feet. Add 500 for negative values. (Remarks section should be used to report changes greater than 1,000 feet in plain language.)
Groups 11-15, 31-35, 51-55, and 71-75 are temp. and dew point. Distances from center are the same as "D" values. Report to nearest degree Celsius. Add 50 for negative values.
Groups 16-20, 36-40, 56-60, and 76-80 are wind data. Indicator MX will be followed by the max. wind. Report to the nearest knot in 3 digits. Next block is radial and distance of max. wind from the center. Report as five-digit group in degrees and nautical miles. Indicator 63, 50, and 30 will be followed by three digits representing the distance of the indicated wind speed from the center.
If data unobtainable, slashes will be reported.

Monitor | TOR

1-64
(Effective January 1, 1964)

RECCO CODE

(Aerial Meteorological Reconnaissance Reporting Code)

U. S. DEPARTMENT OF COMMERCE

Section	Code	Description	See Table	See Note
Section 1 — MANDATORY	9	Group		
	xxx		1	8
	9			
	GGgg	Time (GCT) of Observation (hours and minutes)		9
	i_u	Humidity Indicator	2	
	Y	Day of Week	3	9
	Q	Octant of Globe	4	
	$L_aL_aL_a$	Latitude (In tens, units, and tenths of degrees)		10
	$L_oL_oL_o$	Longitude (In tens, units, and tenths of degrees)		10
	B	Turbulence	5	11
	f_c	Flight Conditions	6	12
	hhh	True Altitude of Aircraft (100s of ft. or decameters above m.s.l.)		13
	d_t	Type of Wind at Flight Altitude	7	14
	d_a	Reliability of Wind at Flight Altitude	8	15
	dd	Wind Direction at Altitude "hhh" (10s of degrees, true)		15
	fff	Wind Speed at Altitude "hhh" (knots)		
	TT	Temperature (In Whole Degrees Celsius)		16
	T_dT_d	Dew Point (In Whole Degrees Celsius)		17
	w	Present Weather	9	18
	m	Remarks on Present Weather	10	19
	j	Index pertaining to HHH	11	
	HHH	Altitude and Other Data		
Section 2 — OPTIONAL	I	Group Indicator		20
	k_n	Total Number of Cloud Layers Reported		21
	N_1	Cloud Amount (1st. layer)	12	22
	N_2	Cloud Amount (2nd. layer)		
	N_3	Cloud Amount (3rd. layer) (Ascending Order)		
	C	Cloud Type	13	23-25
	hh	Altitude of Base of Cloud Type Reported by C	14	
	HH	Altitude of Top of Cloud Type Reported by C		
	C	Cloud Type	13	23-25
	hh	Altitude of Base of Cloud Type Reported by C	14	
	HH	Altitude of Top of Cloud Type Reported by C		
	C	Cloud Type	13	23-25
	hh	Altitude of Base of Cloud Type Reported by C	14	
	HH	Altitude of Top of Cloud Type Reported by C		
	4	Group Indicator		26
	dd	Direction of Surface Wind (10s of degrees true)		27
	ff	Wind Speed at Surface (knots)		28
	5	Group Indicator		26
	D	Direction of Surface Wind	15	29
	F	Force of Surface Wind	16	30
	S	State of Sea	17	
	D_x	Direction of Swell	15	31
		Plain Language Remarks		

STANDARD RECONNAISSANCE CODE

CHAPTER 4
FORM 6

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

FM: OL/G HQ AWS CARCAH/RUCLEFA CORAL GABLES FL*

TO: AIG 8227 (VIA DIAL TWX TO HOMESTEAD AFB FL, TWX #305-248-0151)*
GT 22117
7072

(AMENDMENT NO._____TO THE)

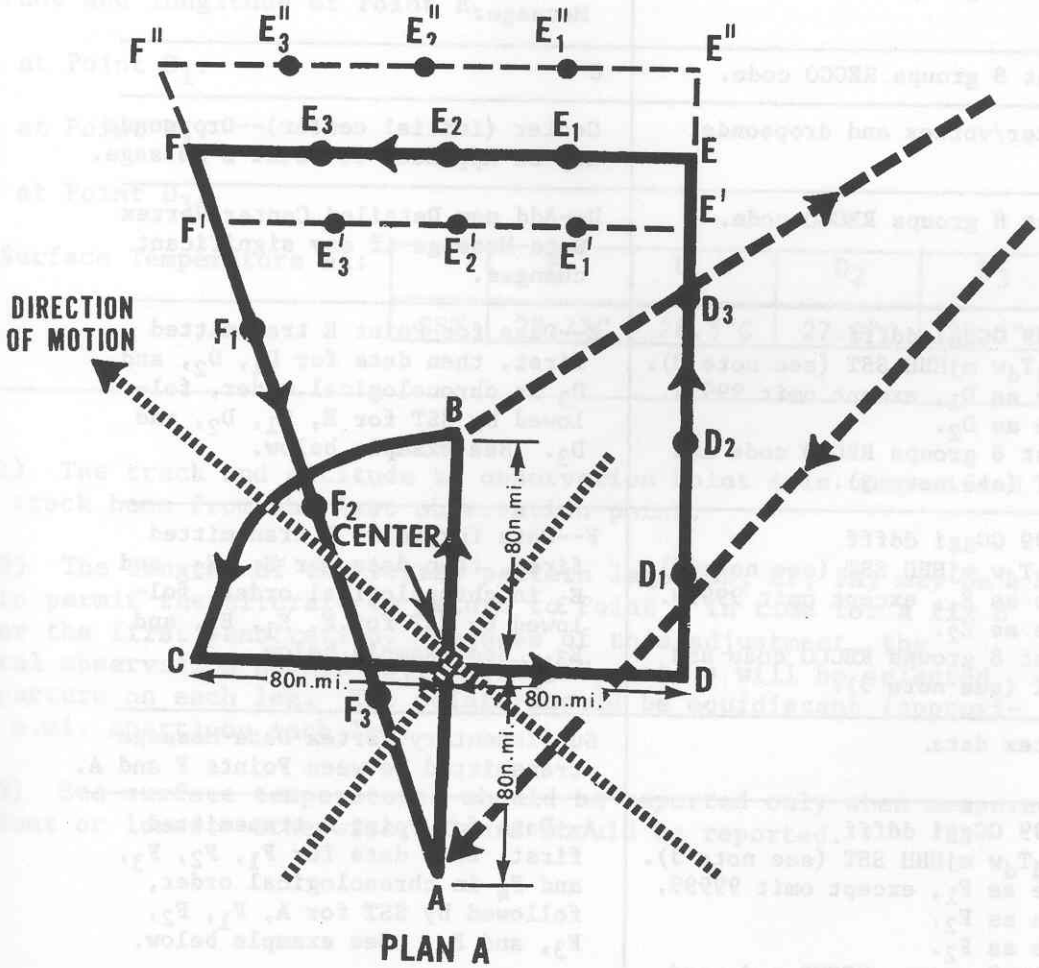
TROPICAL CYCLONE
RECON POD FROM__/____Z_____ TO__/____Z_____ FOLLOWS
mo/yr mo/yr

	1._____ (STORM NAME--TD #)	2._____ (STORM NAME--TD #)
FIX TIMES	A.__/____Z	A.__/____Z
	__/____Z	__/____Z
CALL SIGN	B._____	B._____
ETD	C.__/____Z	C.__/____Z
DEPARTURE POINT	D._____	D._____
ENROUTE ALTITUDE	E._____	E._____
STORM OR FCST PSN	F._____N_____W	F._____N_____W
DESTINATION	G._____	G._____
FLIGHT PATTERN	H._____	H._____
FCST MOVEMENT	I._____	I?_____
SUCCEEDING DAY	J._____	J._____
REMARKS	K._____	K._____

REMARKS: WARNING AREA CLEARANCES, ETC.

*For Eastern Pacific dissemination, see appendix F, paragraph 5 of this chapter.

OPERATIONAL FLIGHT PATTERN "A"



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

EXAMPLE OF RECON MESSAGE TRANSMITTED AT POINT E:

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

(1) Latitude and longitude of Point E.

(2) Time at Point D_1.

(3) Time at Point D_2.

(4) Time at Point D_3.

(5) Sea-Surface Temperature at:

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

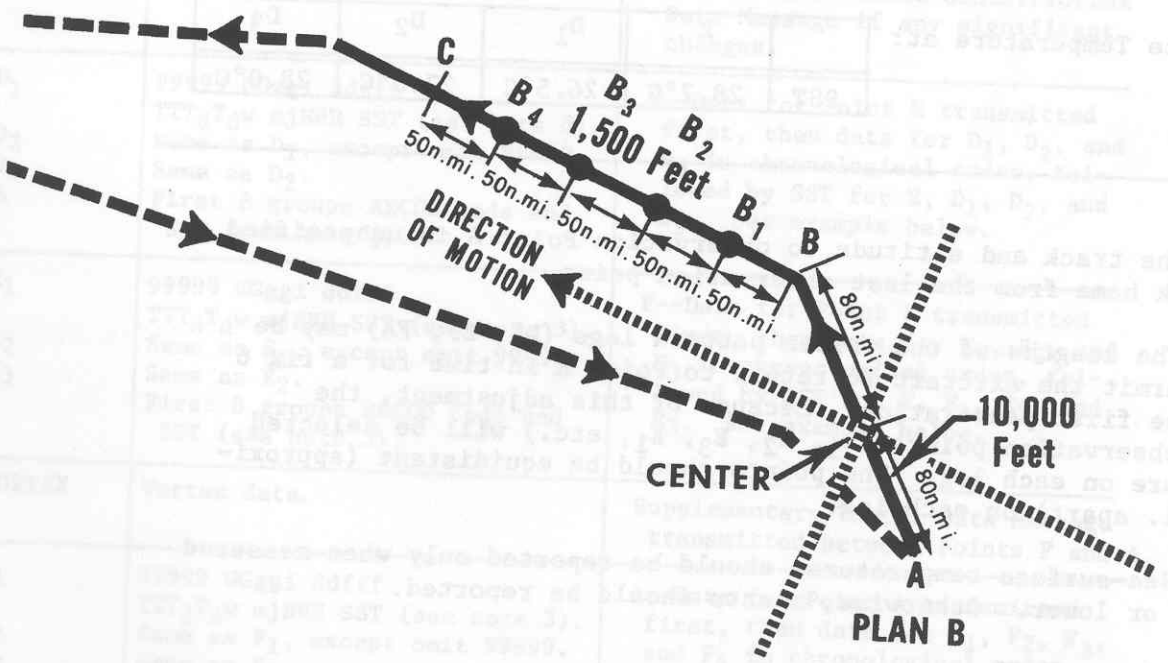
NOTES: (1) The track and altitude to observation Point A is unspecified as is the track home from the last observation point.

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

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

CHAPTER 4
APPENDIX A
ATTACHMENT 2

OPERATIONAL FLIGHT PATTERN "B"



OBSERVATION DETAILS FOR

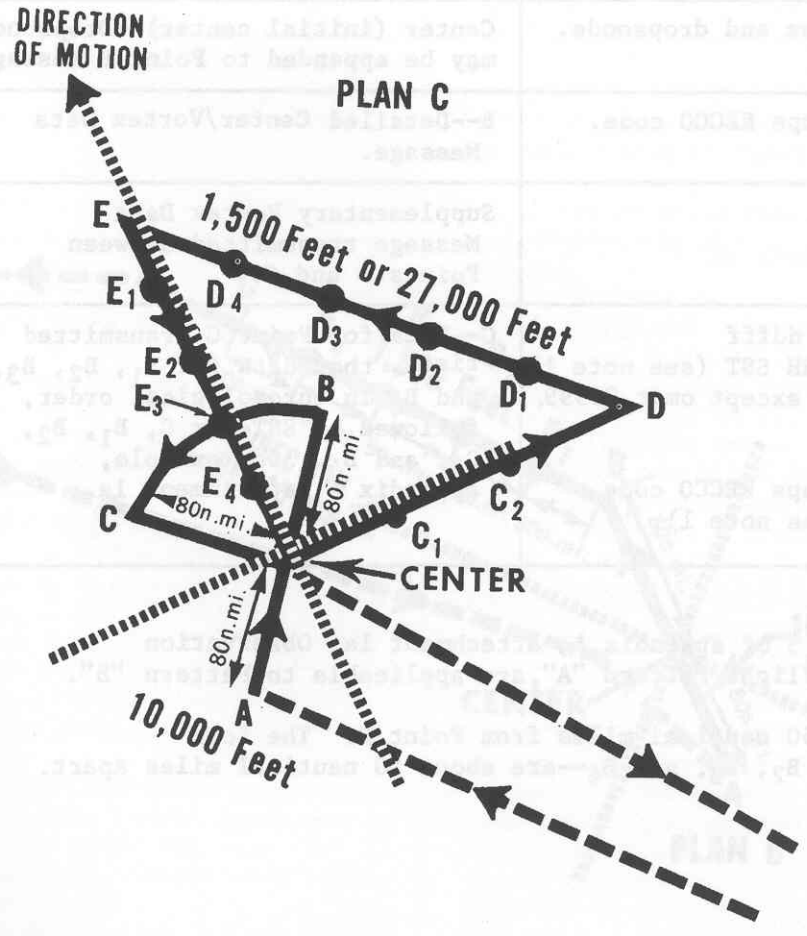
OPERATIONAL FLIGHT PATTERN "B"

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

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

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

OPERATIONAL FLIGHT PATTERN "C"



OBSERVATION DETAILS FOR
OPERATIONAL FLIGHT PATTERN "C"

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

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

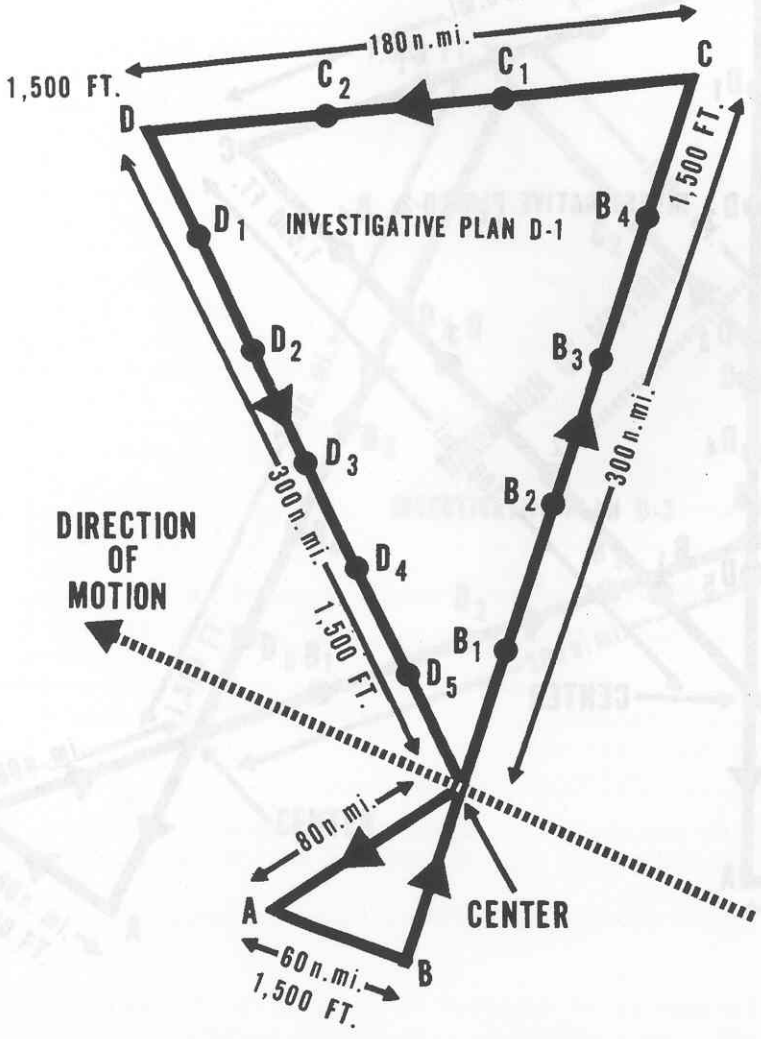
(2) Intermediate Points C_1 and C_2 are between center and Point D.

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

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

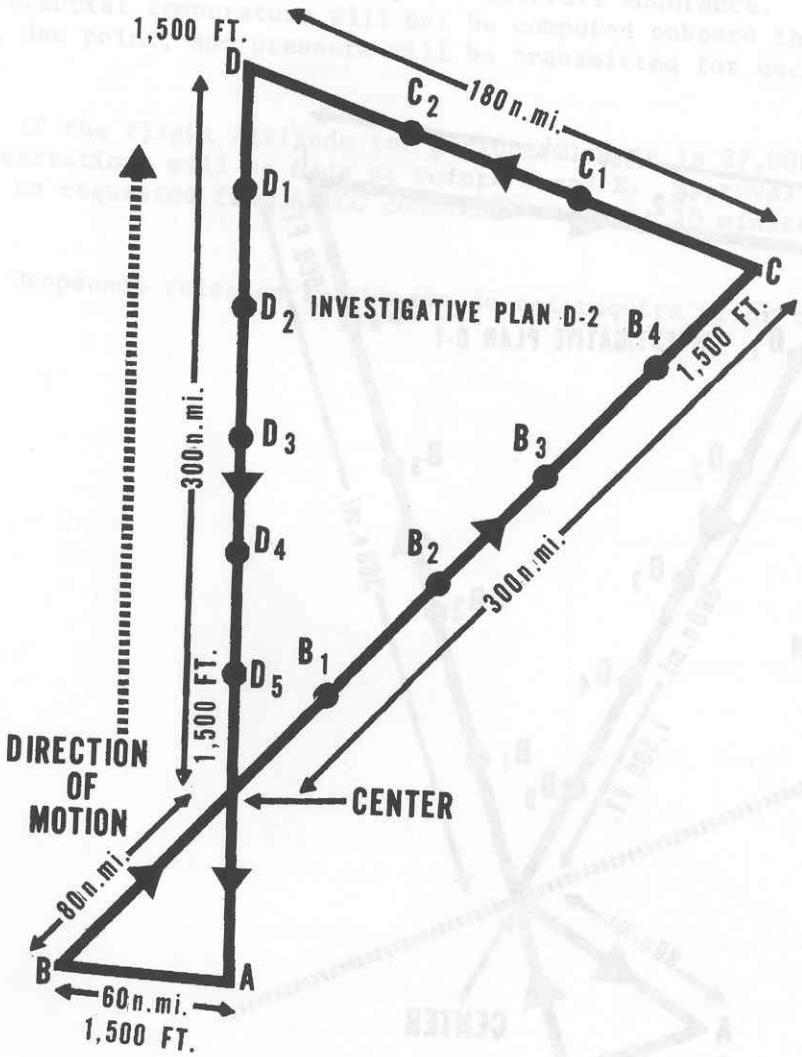
(5) Dropsonde releases in the eye do not require prior coordination with ARTCC.

OPERATIONAL FLIGHT PATTERN D-1

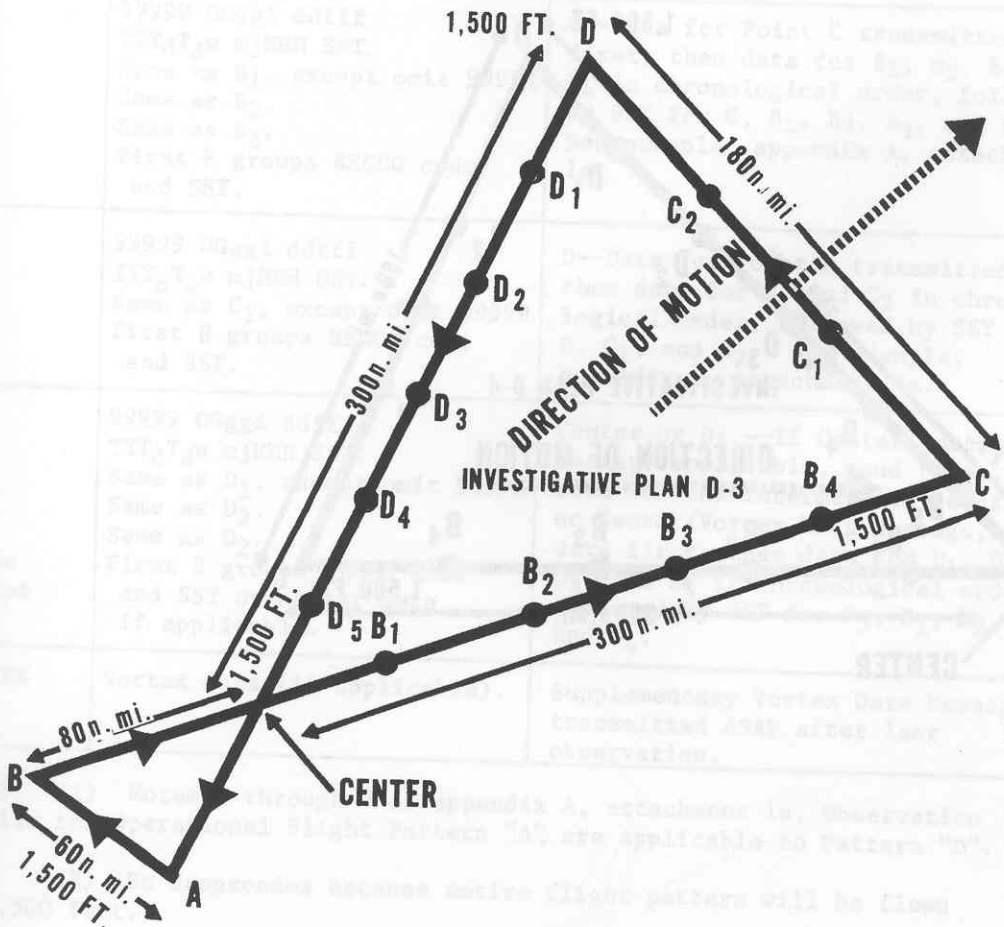


CHAPTER 4
APPENDIX A
ATTACHMENT 4
FIGURE 2

OPERATIONAL FLIGHT PATTERN D-2

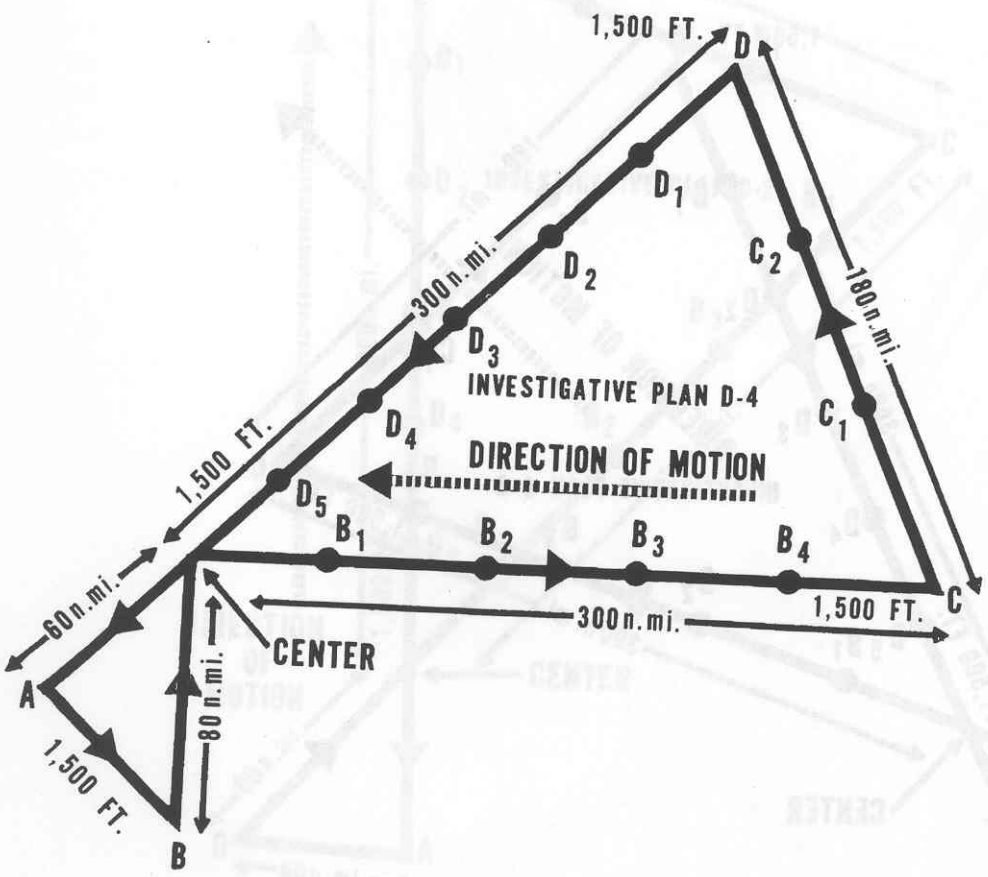


OPERATIONAL FLIGHT PATTERN D-3



CHAPTER 4
APPENDIX A
ATTACHMENT 4
FIGURE 4

OPERATIONAL FLIGHT PATTERN D-4



OBSERVATION DETAILS FOR
OPERATIONAL FLIGHT PATTERN "D"

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

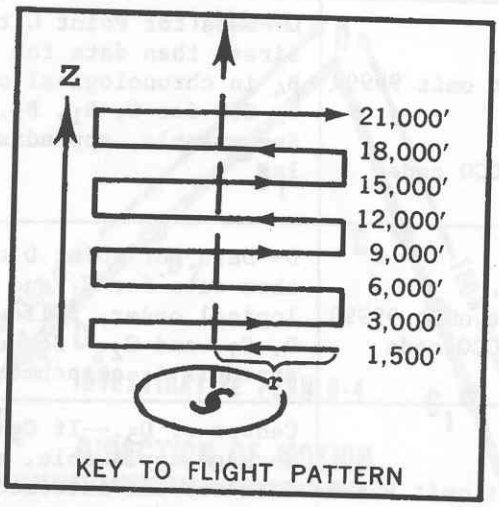
*NOTES: (1) Notes 1 through 3 of appendix A, attachment 1a, Observation Details for Operational Flight Pattern "A", are applicable to Pattern "D".

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

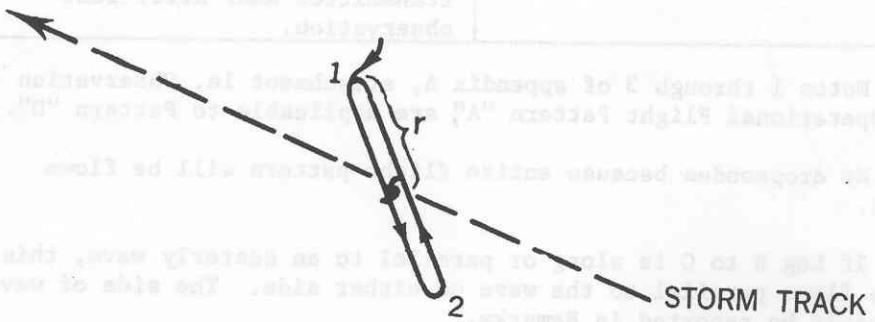
(3) If Leg B to C is along or parallel to an easterly wave, this leg should be flown parallel to the wave on either side. The side of wave (easterly) should be reported in Remarks.

RESEARCH FLIGHT FACILITY FLIGHT PATTERN

PLAN V (VICTORY) STAIRSTEP RESEARCH PATTERN



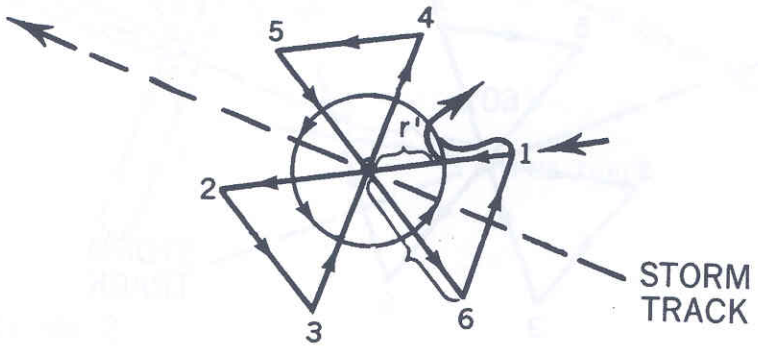
Preferred azimuth is through right front quadrant of the storm. Radial distance, r, from the eye is variable, i.e. 50 to 100 n.mi. Total pattern = 16r n.mi.



RESEARCH FLIGHT FACILITY FLIGHT PATTERN

PLAN W (WHISKEY) RESEARCH CLOVERLEAF PLUS CIRCUMNAVIGATION

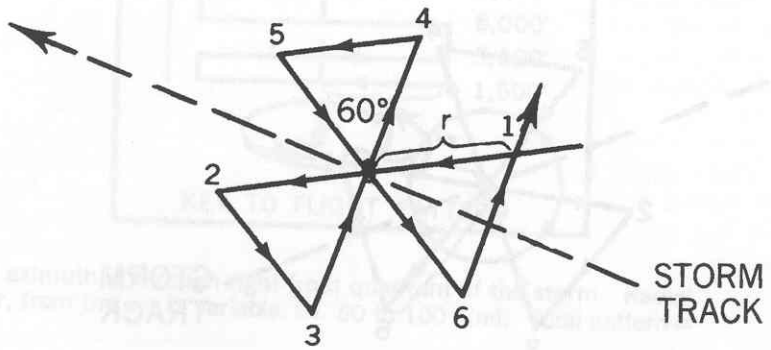
Both r, the leg of the triangle, and r', the radius of the circle, are variable. (r has been drawn for 60 n.mi. and r' for 30 n.mi. Total pattern distance $= 9r + 6.28r'$.) Preferred flight altitudes 1,500, 7,000, 13,000, 18,000 ft.



RESEARCH FLIGHT FACILITY 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.



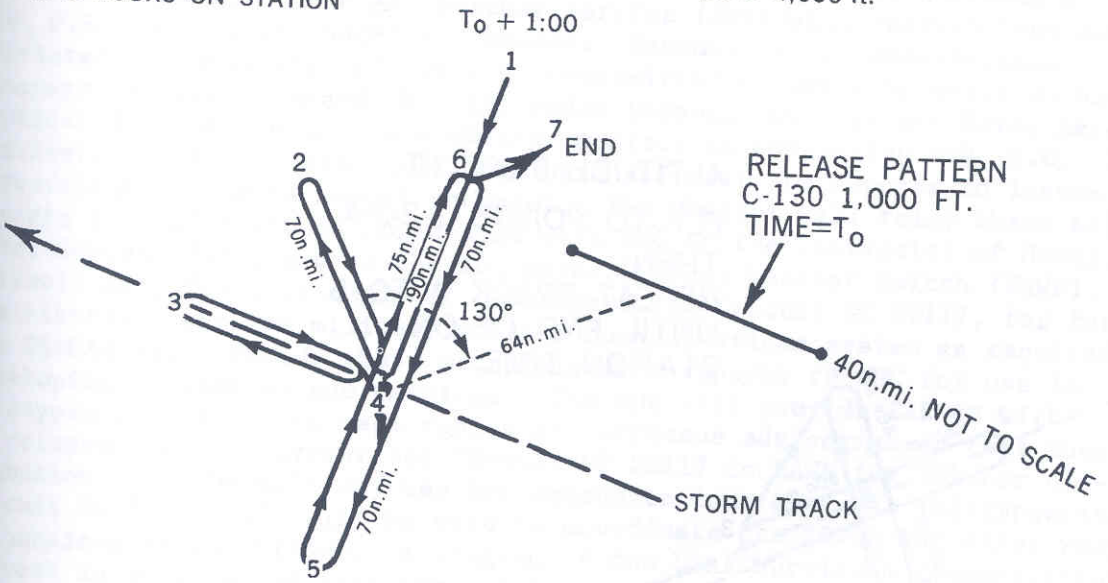
RESEARCH FLIGHT FACILITY FLIGHT PATTERN

PLAN Y (YANKEE)
TRACER EXPERIMENT (SF)

Sampling Flight No. 1

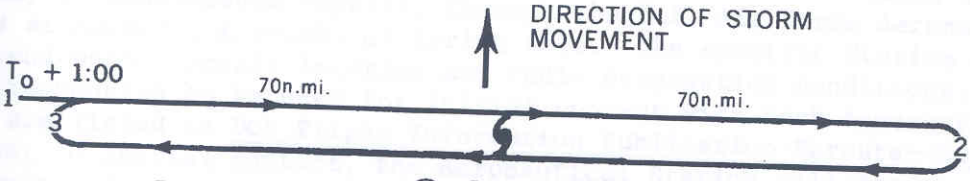
REPEAT PATTERN ⑤-⑥ FOR MINIMUM OF 5 HOURS ON STATION

DC-6 4,000 ft.



Sampling Flight No. 2

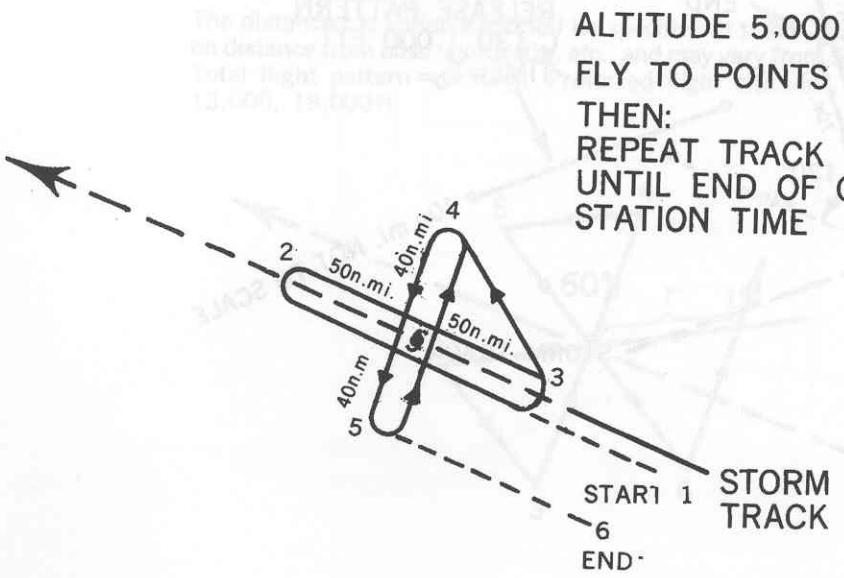
DC-6 14,000 ft.
20,000 ft.



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

RESEARCH FLIGHT FACILITY FLIGHT PATTERN

PLAN Z (ZEBRA)
WIND SPEED MONITORING



ATLANTIC

U.S. AIR FORCE COMMUNICATIONS SUPPORT PLAN

FOR

U.S. AIR FORCE HURRICANE RECONNAISSANCE

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

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

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

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

PRIMARY METHOD	FIRST ALTERNATE	SECOND ALTERNATE
	MACDILL AERONAUTICAL STATION	
Direct phone patch between recon aircraft and Charleston Weather Monitor via AUTOVON.	A/G operator copy transmission from aircraft; relay by voice to Charleston via AUTOVON.	A/G operator copy from aircraft; relay to Charleston using commercial long-distance phone or direct teletypewriter Circuit GT 22117, whichever is faster.
	ALBROOK AERONAUTICAL STATION	
Direct phone patch between recon aircraft and Charleston Weather Monitor via AUTOVON.	A/G operator copy from aircraft; relay to Charleston via AUTOVON or other available voice circuits.	A/G operator copy from aircraft; pass to MacDill via AUTOVON for further relay to Charleston by most expeditious means.
	LORING AERONAUTICAL STATION	
Direct phone patch between recon aircraft and Charleston Weather Monitor via AUTOVON.	A/G operator copy transmission from aircraft; relay to Charleston via AUTOVON.	A/G operator copy from aircraft; relay to Charleston using commercial long-distance phone or teletypewriter Circuit GT 22117, whichever is faster.

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

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

(2) GULL ONE - MACDILL - GO AHEAD.

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

(4) GULL ONE - MACDILL - STAND BY.

(5) The A/G operator conditions his console for a ground subscriber call, selects the line associated with the Station's AUTOVON line, and calls the Charleston addressee using the direct AUTOVON number. When the Charleston party answers, the operator advises:

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

(7) ROGER - STANDING BY.

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

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

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

(11) GULL ONE - CHARLESTON - ROGER - OUT.

(12) GULL ONE - OUT.

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

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

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

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

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

(6) MACDILL.

(7) The A/G operator then passes the copied message to the Coordinator for relay to Charleston Weather Monitor over AUTOVON or teletypewriter Circuit GT 22117 as appropriate.

3. Point-to-Point Teletypewriter Communications Capability.

a. Circuit GT 22117 (JQGAU 304) will be configured as shown in attachment 1, appendix E of this chapter. The NHC will have a receive-only reperforator on this Circuit to provide it with the hurricane reconnaissance reports for further relay over the FAA weather networks. The Charleston Weather Monitor will act as network control station and maintain circuit discipline. Authorized uses of this Circuit are:

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

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

(3) Aeronautical Stations to pass reports received from reconnaissance aircraft to Charleston whenever they cannot be handled by primary or first alternate means.

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

(5) In the event responsibility is transferred from NHC to the Alternate National Hurricane Center (ALT NHC), National Weather Service, Washington Hurricane Warning Office (HWO), traffic received at Charleston by means of AUTOVON will be relayed to the Alternate CARCAH over this Circuit. The Alternate CARCAH will arrange for the relay of these data to ALT NHC by the most expeditious means available. Circuit GT 22117 to Fleet Weather Facility (FWF) Suitland may be used for this purpose.

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

```
10 LTRS
AA CR 4LF
00 URXX RMCS DTG
TEXT CR 4LF
NNNN
10 LTRS.
```

(7) Command/control traffic between the 9th Weather Reconnaissance Wing Command Post (9 WRWCP) and 53 WRS.

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

b. Teletypewriter Circuit GT 22117 (JQGAU 304) is installed at CARCAH and will be used to transmit hurricane advisories to KAWN at Carswell AFB for further distribution to military customers as required. COMET II installations at CARCAH and the Charleston Monitor may be used as backup communications for the relay of hurricane advisories, warnings, and reconnaissance reports to KAWN for further distribution to military customers as required.

4. Miscellaneous Communications Services and Support.

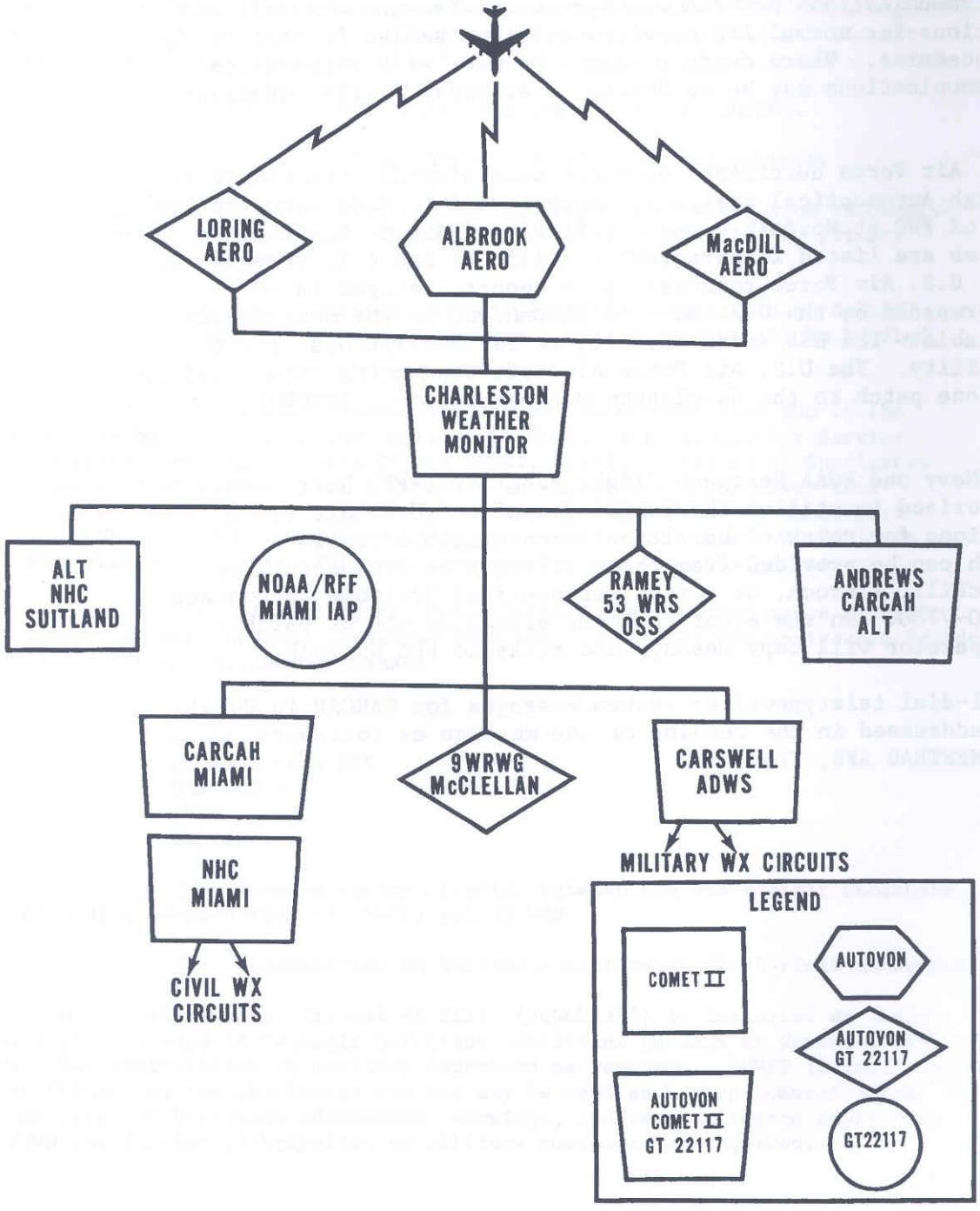
a. Routine communications between weather reconnaissance aircraft and Aeronautical Stations for normal ATC services will be handled in accordance with standard procedures. Where contact cannot be made with Aeronautical Stations, ATC communications may be conducted in accordance with paragraph 7 of this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

b. When U.S. Air Force hurricane reconnaissance aircraft are unable to communicate through Aeronautical Stations, contact will be made with the SSB radio facilities of FWC at Norfolk Naval Air Station (NAS) or Roosevelt Roads. Frequencies are listed in paragraph 2.a.(1) (b) and (c), appendix D, of this chapter. U.S. Air Force reconnaissance reports relayed in this manner will be forwarded by the U.S. Navy to CARCAH/NHC by the most expeditious means available. The SSB radio facility of FWC Norfolk has direct phone-patch capability. The U.S. Air Force aircraft contacting this facility will request a phone patch to the Charleston Weather Monitor, AUTOVON number 630-1940.

c. The U.S. Navy and NOAA Research Flight Facility (RFF) hurricane aircraft are authorized to utilize the facilities of the U.S. Air Force Aeronautical Stations for relay of hurricane reconnaissance reports. A direct voice patch can be provided from these aircraft to FWC Norfolk by requesting the MacDill, Albrook, or Loring Aeronautical Stations to contact AUTOVON number 690-7750. In the event that the signal is not of patch quality, ground operator will copy message and relay to FWC Norfolk.

d. Commercial-dial teletypewriter system messages for CARCAH in Coral Gables should be addressed in the heading of the message as follows: RUCLEFA/CARCAH HOMESTEAD AFB, FLA.

USAF ATLANTIC HURRICANE COMMUNICATION SYSTEM



ATLANTIC U.S. NAVY COMMUNICATIONS PLAN

1. General. Weather Reconnaissance Squadron Four (VW-4), an element of the Atlantic Fleet, will operate WP-3A aircraft from the Jacksonville NAS or alternate staging bases as required. The VW-4 provides reconnaissance in support of Atlantic Fleet requirements and NHC as indicated in the preceding chapters. RECCO reports are normally relayed by means of the HF/SSB circuit to FWC Norfolk. The FWC Norfolk will validate or otherwise coordinate reports with the aircraft, where possible, and will expeditiously relay reports to NHC and other intended agencies as set forth in this Plan. The NHC will provide FWC Norfolk with all hurricane warnings and advisories. The following plan outlines the communications Resources and Operations procedures for providing essential A/G communications and the subsequent relay of perishable reports. (See attachment 2 to this appendix.)

2. Resources.

a. Air-to-Ground (A/G) Communications Circuits.

(1) Primary A/G Circuit: Joint Army, Navy, Air Force Procedures (JANAP) 195 lists circuits authorized for use by primary A/G communications. VW-4 aircraft will transmit aircraft reports, weather, and other pertinent information while conducting tropical cyclone reconnaissance missions to FWC Norfolk (Net Control), FWF Suitland, Md., and NAVSTA Roosevelt Roads as follows:

(a) HF/SSB voice with alternate continuous wave (CW):

1. ALPHA, 4701.5 kHz

2. BRAVO, 9011.5 kHz

3. CHARLIE, 13222.5 kHz

4. DELTA, 15082.5 kHz

5. ECHO, 23228.5 kHz

6. LIMA, 18000.5 kHz.

(b) HF/SSB voice, radioteletypewriter, and simultaneous voice/radioteletypewriter for DALS transmission:

1. FOXTROT, 4708.5 kHz

2. GEORGE, 8973.5 kHz

3. HOTEL, 13232.5 kHz

4. INDIA, 15072.5 kHz

5. JULIET, 17980.5 kHz

6. KING, 23201.5 kHz.

(c) HF/SSB radioteletypewriter (RTTY):

1. MIKE, 3096.5 kHz

2. NOVEMBER, 11192.5 kHz

3. OBOE, 18010.5 kHz.

Note: SSB-suppressed carrier frequencies located 1.5 kHz below indicated frequency.

(2) Secondary A/G Circuit:

(a) U.S. Air Force Aeronautical Stations, using HF/SSB voice frequencies listed in latest DOD Flight Instruction Publication Enroute--Supplement, will provide secondary A/G communications. Recommended Stations listed in order of preference:

1. MacDill Aeronautical Station

2. Loring Aeronautical Station

3. Albrook Aeronautical Station.

(3) Backup and Emergency A/G Circuits:

(a) The Air Route Traffic Control Center (ARTCC) communications of FAA may be used to relay reconnaissance reports when the primary and secondary means have failed.

1. FAA Stations --6568 kHz (Miami, San Juan, New York)

(b) Navy Universal Air-to-Ground (CW) Circuit--9035 kHz

(c) Emergency and Distress Frequencies:

FREQUENCY	EMISSION	USE
500.0 kHz	CW	International Distress and Calling Frequency
2182.0 kHz	V	International Distress and Calling Frequency
2678.0 kHz	V	Coast Guard Calling and Working Frequency
5680.0 kHz	V/CW	International Search and Rescue (SAR) Control (Coast Guard)
5695.0 kHz	V/CW	SAR Control (U.S. Navy)
8364.0 kHz	CW	International Lifeboat, Liferaft, and Survival; Craft Frequency
121.5 MHz	V	Emergency and Distress for Aircraft and Ships, SAR, and VHF/DF Primary
243.0 MHz	V	Military Common Emergency, UHF

b. Point-to-Point (Surface) Relay

(1) The FWC Norfolk will use the following means of distributing hurricane traffic:

(a) Automatic Digital Network (AUTODIN). This online, encrypted, duplex teletypewriter circuit will be utilized to distribute warnings, intermediate position estimates, and Tropical Weather Summaries to military addressees and to Naval Communications Stations (NAVCOMMSTA) for transmission on Atlantic Fleet broadcasts.

(b) GT 22117 East Coast Reconnaissance Circuit. This Circuit will be the primary circuit for relaying of reconnaissance reports and coordination of TCPOD. Refer to paragraph 3 of appendix C for details concerning Circuit operation.

(c) DALS Ground Circuit, Direct-Line Teletypewriter. This circuit consists of terminals at FWC Norfolk, FWF Jacksonville, FWF Suitland, and NHC Miami. DALS information will be collected and reformatted into RECCO code by FWC Norfolk and then transmitted to NHC Miami at periodic intervals. This Circuit will be an alternate circuit for relay of reconnaissance reports received by FWC Norfolk in addition to DALS data. The NHC will be responsible for entering these reports on Hurricane Circuit 23421.

(d) COMET II. This U.S. Air Force circuit will be a backup circuit for relaying reconnaissance reports received at FWC Norfolk by SSB. Reports will be transmitted on COMET II only if GT 22117 Circuit is inoperative.

(e) 30 GP 2901, Direct-Line Telephone. This circuit connects FWC Norfolk, VW-4, FWF Jacksonville, and NHC. This Telephone is utilized to coordinate the TCPOD with CARCAH at NHC and to permit discussion of hurricane data with NHC Miami.

(f) FWC Norfolk, FWF Jacksonville, NAVSTA Roosevelt Roads, and FWF Suitland Reconnaissance Circuit (SSB). This Circuit is utilized for operational messages from and to VW-4 at Roosevelt Roads and for communications with the hurricane reconnaissance aircraft. The FWC Norfolk will use the voice call sign "NORFOLK HURRECO CONTROL" for communications on this Circuit. U.S. Navy reconnaissance aircraft will use "NAVY HURRECO," followed by the last three digits of the bureau number. Voice procedures and circuit logs will be as outlined in Allied Communication Procedures--ACP 125. Hard copies will be made of all operational and administrative messages.

3. Operations.

a. Hurricane Reconnaissance Reports.

(1) Reports:

(a) Reconnaissance reports will be encoded in the currently effective RECCO code in accordance with the National Hurricane Operations Plan. At the end of each RECCO message, the coded longitude, latitude, flight level, and surface wind groups will be repeated for confirmation.

(b) Data Acquisition and Logging System (DALS). To the maximum extent possible, DALS will be employed as a means of providing meteorological, oceanographic, and operational position reports.

(c) Oceanographic data will be coded in accordance with Atlantic Fleet instructions as required by FWC Norfolk.

(d) Radar Reports may be transmitted in plain text.

(2) Communications Procedures. In formatting messages for transmission to ground stations, all activities shall use procedures outlined in ACP 121 US Supp. 2 with respect to message headings, date-time groups, and numbering systems external to the message text. Appropriate JANAP and ACP will be used in contacting A/G stations.

(3) Precedence.

MESSAGE	PRECEDENCE
Conditions less than indicated below	- Priority (P)
RECCO reporting conditions of:	
Surface wind 33 knots or greater	- Immediate (O)
Seas 12 feet or greater	- Immediate (O)
Moderate or heavy precipitation	- Immediate (O)
Moderate or severe icing	- Immediate (O)

MESSAGE	PRECEDENCE
Moderate or severe turbulence	- Immediate (0)
Significant changes in meteorological conditions as determined by flight meteorological officer (METRO)	- Immediate (0)

(4) Classification. All meteorological and oceanographic reports shall be unclassified.

(a) Primary Guard.

1. Net Operation and Control:

a. This circuit will operate as a free net unless otherwise directed by Net Control (FWC Norfolk) and will be the primary circuit for passing reconnaissance data.

b. The FWC Norfolk shall act as the Primary Guard ground-monitoring station.

c. The FWF Suitland shall act as the secondary (backup) ground-monitoring station.

d. The FWF Jacksonville shall act as the tertiary (backup) ground-monitoring station.

e. The aircraft shall notify the ground-monitoring station before leaving the circuit, except in case of emergency.

f. The aircraft will give its call sign at the beginning of each transmission to facilitate High Frequency Direction Finding (HFDF) identification. Each radio check shall contain one full count if no other traffic is passed.

g. The aircraft and ground-monitoring station shall return to the last frequency on which contact was made if, after a frequency shift is made, no contact is made within 15 minutes.

h. The Net Control station or ground-monitoring station will request a "Test Transmission" on another frequency to determine if another circuit (frequency) will provide better communications. For example, upon the command "TEST CIRCUIT ALPHA" from the ground-monitoring station, the aircraft shall shift to Circuit ALPHA, give three long counts, and return to the circuit upon which the command was given.

i. In-flight position reports, requests for clearances, and other communications with ARTCC can be relayed on Primary Guard only if normal means of communicating with ARTCC have failed.

2. Radio Checks.

a. Periodic radio checks between Roosevelt Roads, FWF Jacksonville, and FWF Suitland will be initiated by FWC Norfolk or the station exercising ground-monitoring responsibility. The periodicity of these checks shall not exceed 1 hour.

b. Radio checks will be initiated by the aircraft before takeoff and at 30-minute intervals while airborne. Check times will be on the hour and half hour.

c. An attempt will be made on the next lower frequency if contact on a given frequency cannot be established within 15 minutes of the designated time. If this 15-minute attempt on the lower frequency is not successful, another attempt will be made on the next higher frequency. If, at this point, contact is not made, the aircraft shall return to the primary frequency.

d. DALS transmissions with channels 00, 01, 02, and 03 functional will be considered as being valid radio checks.

3. Frequency Assignments:

a. Utilization of Frequencies. Frequencies assigned in JANAP 195 ( ) will be utilized as follows:

1) FWC Norfolk will guard circuits as follows:

a) Primary: Circuit CHARLIE (13222.5 kHz).

b) Secondary: Circuit ALPHA (4701.5 kHz).

c) DALS: Authorized frequencies according to propagation conditions.

2) FWF Suitland will guard backup circuits as follows:

a) Primary: Circuit CHARLIE (13222.5 kHz).

b) Secondary: Circuit ECHO (23228.5 kHz).

c) DALS: Authorized frequencies according to propagation conditions.

3) Roosevelt Roads will guard backup circuits as follows:

a) Primary: Circuit CHARLIE (13222.5 kHz).

b) Secondary: Circuit DELTA (15082.5 kHz).

4) Other assigned frequencies may be utilized if required.

NOTE: SSB-suppressed carrier frequencies located 1.5 kHz below indicated frequency.

4. Transmission Mode:

a. Voice. A/G transmissions using frequencies ALPHA through ECHO and LIMA will serve as means to transmit plain-language reports other than DALS.

b. RTTY/DALS. Plain-language, RTTY, and DALS transmissions between the aircraft and ground-monitoring stations are primary communications modes. FWC Norfolk, FWF Jacksonville, and FWF Suitland are equipped to receive and relay A/G RTTY, including DALS.

c. CW. Radiotelegraph communications shall be used only when other communications modes fail to effect satisfactory contact.

5. Relay of Traffic:

a. The FWC Norfolk (Primary Guard station) will relay reports by means of:

1) AUTODIN to addressees indicated in aircraft message.

2) NHC (CARCAH) on East Coast Reconnaissance Circuit (GT 22117) or DALS Ground Circuit.

b. The FWF Suitland (secondary station) will relay reports by means of:

1) AUTODIN to addressees indicated in aircraft message.

2) NHC (CARCAH) on East Coast Reconnaissance Circuit (GT 22117) or DALS Ground Circuit.

3) DALS report by DALS Ground Circuit to FWC Norfolk.

c. Roosevelt Roads (backup station) will relay reports by means of:

1) AUTODIN to addressees indicated in aircraft message.

2) Ramey AFB for further relay into the COMET network.

(b) Secondary Guard.

1. A/G Voice U.S. Air Force Aeronautical Stations (HF/SSB):

a. If communications cannot be established by the aircraft and maintained on the primary circuit, the A/G voice communications, as outlined in the "Atlantic U.S. Air Force Communications Support Plan for U.S. Air Force Hurricane Reconnaissance," appendix C of this chapter, will be used.

b. Reports not phone-patched directly through the U.S. Air Force A/G stations can be further relayed (delivered) by:

1) AUTOVON/other voice circuits.

2) GT 22117.

3) AUTODIN.

(c) Backup Guard.

1. Navy Universal Air-to-Ground (CW) Circuit.

a. If communications cannot be established and maintained on circuits as outlined above, the Navy Universal Air-to-Ground (CW) Circuit will be utilized.

b. When communications cannot be established through any of the above circuits, naval reconnaissance aircraft may contact any U.S. Navy A/G station.

c. When alternate ground stations must be contacted, weather messages must be addressed with proper "Tango" instructions to ensure that ground stations will be responsible for immediate relay of such messages to FWF Suitland.

4. Miscellaneous Communications Services and Support.

a. AUTODIN messages for NHC Miami and/or CARCAH Coral Gables should be addressed in the heading of the message as follows:

RUCLEFA/NHC/MIAMI
RUCLEFA/CARCAH HOMESTEAD AFB, FLA.

DATA ACQUISITION AND LOGGING SYSTEM (DALS)

DALS data is available from Navy aircraft (100 w.p.m. HF/SSB RATT) for selected parameters at 5-second intervals or for all 30 channels at 30-second, 1-minute, 5-minute, or 10-minute intervals in the following format:

Channel	Parameter	Recorded increment	Input
00	Date	Mo., Day, Year	M
01	Time (Z)	Hr., Min., Sec.	A
02	Latitude/quadrant	Deg., Min., Quad.	A
03	Longitude	Deg., Min.	A
04	Absolute altitude	10 feet	A
05	Pressure altitude	10 feet	A
06	Ambient pressure	0.1 millibar	A
07	Ambient temperature	0.01°C.	A
08	Dew point	0.1°C.	A
09	FLT LVL wind direction	1 degree	A
10	FLT LVL wind speed	1 knot	A/M
11	Sea-surface temperature	0.1°C.	A/M
12	Sea-level pressure	0.1 millibar	A
13	Surface wind (ddfff)	Tens of deg./whole knots	M
14	True air speed	1 knot	M
15	True heading	1 degree	A
16	Ground speed	1 knot	A
17	Drift angle	1 degree	A
18	Future use for "n" or wave PD/HGT or ice accretion		A
19	Weather ($wwWBf_c$) wwW WMO Code/Bf_c = RECCO		
20	1 $K_nN_1N_2N_3$	RECCO Code	M
21	Lowest cloud	RECCO Code	M
22	Second cloud layer	RECCO Code	M
23	Third cloud layer	RECCO Code	M
24	GMT time of last Lat/Long DALS update	Tens of seconds	M
25	Navigation latitude	Quad./1 minute	M
26	Navigation longitude	1 minute	M
27	Reserved		
28	Reserved		
29	Bathythermograph	0.1°F/10 feet	A

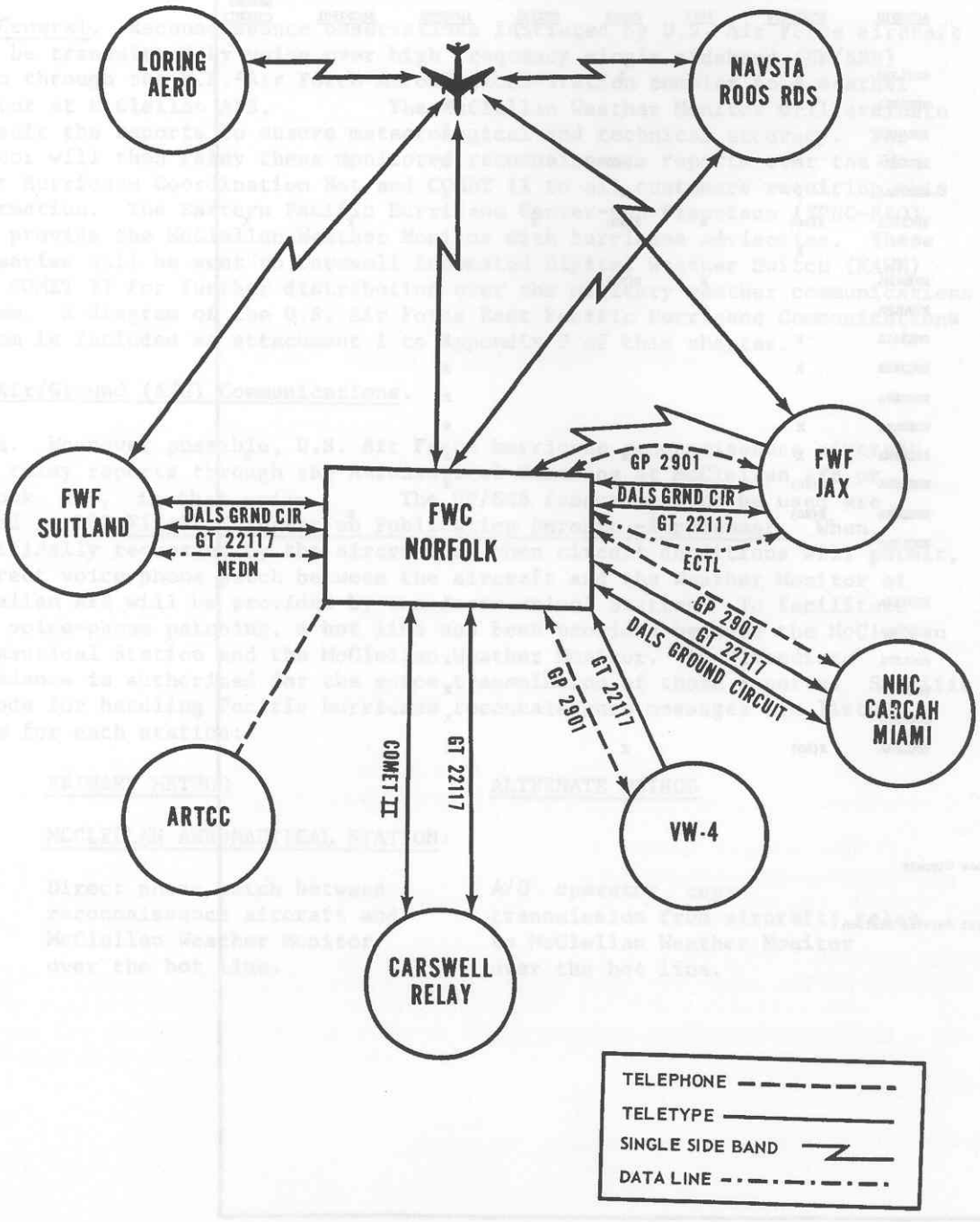
NOTE: (1) Channel 20 19999 = in clouds.
(2) Channel 21 = lowest cloud visible from aircraft.
(3) Channel 22 = first layer above channel 21.
(4) Channel 23 = first layer above channel 22.
(5) Channels 09 and 10 are normally automatic input from inertial navigation system and Doppler; however, manual input can be selected.
(6) If the Flight Meteorologist determines (from separate instruments) a specific channel is providing incorrect data, that channel will be deleted and only the channel identifier will be transmitted.
(7) Sea and swell conditions, together with other significant data including data for deleted channels, will be provided in plain language.
(8) Input - A = Automatic/M = Manual.

This page displays examples of teletypewriter copy as received from U.S. Navy reconnaissance aircraft.

Teletype display	Explanation of data
00 04051	00=Date ID, 04=April, 05=the 5th, 1=1971
01 12345	01=Time ID, 12=Hour, 34=Min , 5=50 Sec
02 30143	02=Lat/Quad ID, 30=Deg, 14=Min, 3=North of Equator between 0° and 180° Long.
03 08141	03=Long ID, 081=Deg, 41=Min
04 25140	04=Absolute altitude ID, 25140=25,140 Ft
05 24140	05=Pressure altitude ID, 24140=24,140 Ft
06 03781	06=Ambient pressure ID, 03781=378.1 Mb
07 92663	07=Ambient temp ID, 9=Minus, 2663=26.63°C.
08 9271	08=Dew point ID, 9=Minus, 271=27.1°C.
09 252	09=FL wind direction ID, 252=Wind from 252 Deg
10 046	10=FL wind speed ID, 046=46 Kt
11 0109	11=Sea-surface temp ID, 0=Positive, 109=10.9°C.
12 10278	12=Sea-level pressure ID, 10278=1027.8 Mb (99876 would = 987.6 Mb)
13 14125	13=Surface wind ID, 14=from 140 Deg, 125=125 Kt
14 315	14=True air speed ID, 315=315 Kt
15 103	15=True heading ID, 103=True heading of aircraft
16 350	16=Ground speed ID, 350=Acft ground speed 350 Kt
17 956	17=Drift angle ID, 9=Left drift, 56=4°drift (Left drift value taken from 60, 0=right drift)
18	18=Future use
19 13845	19=Weather ID, 13=Lightning, 8=Past shower, 4=Mod Turb in clouds infreq, 5=Chaotic sky
20 13438	20=Cloud amount ID, 1=Indicator, 3=Three layers, 4=5/10 lowest, 3=4/10 second, 8=10/10 third
21 65658	21=Lowest cloud ID, 6=SC, 56=Base 6000 Ft, 58=Tops 8000 Ft
22 46567	22=Second cloud layer ID, 4=AS, 65=Base 15,000 ft 67=Tops 17,000 Ft
24 18000	24=ID of time of channels 25 and 26, 18=Hours, 00=Min, 0=Tens of sec.
25 33047	25=ID for Lat of channel 24 time, 3=Quad - North of Equator between 0° and 180°, 30=30°, 47=47 Min
26 08820	26=ID for Long of channel 24 time, 088=88°, 20=20 Min
27	27=Reserved
28	28=Reserved
29 01598	29=Bathythermograph ID, 01=10 Ft, 598=59.8°F.

NOTE: (1) ID--Identifier
FL--Flight level

FWC NORFOLK HURRICANE COMMUNICATION SYSTEM



COMMON COMMUNICATIONS CAPABILITIES--ATLANTIC

STATIONS	AUTODIN	GT22117#	7072	COMET	GT2352	AUTOVON	30GP2901	DALS GROUND CIRCUIT
FWF Jacksonville	RUCLJXA	X		X		X	X	X
FWF Suitland	RUEBEGA	X				X		X
NAVSTA Roosevelt Roads	RULGANA					X		
CARCAH Miami	RUCLEFA	X		X(SO)		X	X	
ALT CARCAH Andrews	RUEBBAA	X		X		X		
NHC Miami	RUCLEFA	X(RO)	X	X(RO)	X		X	X
NOAA/RFF Miami		X						
NMC Washington	RUEOLMA		X	X(RO)				
Weather Service Washington	RUEOLMA		X					
Charleston Weather Mointor	RUEBAIA	X		X		X		
MacDill Aeronautical	RUCJBBB	X				X		
Albrook Aeronautical	RUEOEFA					X		
Loring Aeronautical	RUEDLDA	X				X		
FWC Norfolk	RUEBJNA	X		X		X		X
FWF Quonset Point	RUEDDDA	X(RO)		X		X		
VW-4 Jacksonville	RUCLBKA	X(RO)				X	X	
53 WRSMC Ramey AFB	RUCLIMA	X				X		
IFSS* Miami					X			
ARTCC Jacksonville	RUWTAIA					X		
ARTCC Washington	RUEONEA					X		
ARTCC Miami	RUCLFPA					X		
ARTCC New York	RUEDJKA					X		
ARTCC Houston	RUWTDPA					X		
Carswell ADWS	RUCLDAA	X(RO)		X		X		

#East Coast Reconnaissance Circuit

(RO) Receive only

*IFSS-International Flight Service Station

(SO) Send only

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

1. General. Reconnaissance observations initiated by U.S. Air Force aircraft will be transmitted by voice over high frequency single sideband (HF/SSB) radio through the U.S. Air Force Aeronautical Station complex to a weather monitor at McClellan AFB. The McClellan Weather Monitor will evaluate and edit the reports to ensure meteorological and technical accuracy. The Monitor will then relay these monitored reconnaissance reports over the West Coast Hurricane Coordination Net and COMET II to all customers requiring this information. The Eastern Pacific Hurricane Center-San Francisco (EPHC-SFO) will provide the McClellan Weather Monitor with hurricane advisories. These advisories will be sent to Carswell Automated Digital Weather Switch (KAWN) over COMET II for further distribution over the military weather communications system. A diagram of the U.S. Air Force East Pacific Hurricane Communications System is included as attachment 1 to appendix F of this chapter.

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

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

PRIMARY METHOD	ALTERNATE METHOD
MCCLELLAN AERONAUTICAL STATION:	
Direct phone patch between reconnaissance aircraft and McClellan Weather Monitor over the hot line.	A/G operator copy transmission from aircraft; relay to McClellan Weather Monitor over the hot line.

ALBROOK AERONAUTICAL STATION

Direct phone patch between reconnaissance aircraft and McClellan Weather Monitor over AUTOVON. McClellan Monitor phone numbers 633-6810 or 633-6755. A direct phone patch can also be provided over AUTOVON to the McClellan Aeronautical Station, extended to McClellan Weather Monitor over the hot line.	A/G operator copy transmission from aircraft and pass to McClellan over AUTOVON for relay to McClellan Weather Monitor over the hot line.

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

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

(2) LARK ONE - MCCLELLAN - GO AHEAD.

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

(4) LARK ONE - MCCLELLAN - STAND BY.

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

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

(7) ROGER - STANDING BY.

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

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

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

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

(12) LARK ONE - OUT.

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

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

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

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

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

(6) MCCLELLAN.

(7) The A/G operator then passes the copied message to the Coordinator for relay to McClellan Weather Monitor over the hot line.

3. Point-to-Point Teletypewriter Communications Capability. Teletypewriter facilities provided in support of the hurricane reconnaissance effort will be configured as follows:

a. A leased half-duplex (send/receive) 100-wpm circuit will be installed with terminations at the 9th Weather Reconnaissance Wing (9 WRWg); Tropical Cyclone Reconnaissance Coordinator (TCRC); McClellan Weather Monitor--Detachment 8, 17th Weather Squadron (Det 8, 17 WSq); FWC Alameda; and EPHC-SFO. This circuit is designated as the West Coast Hurricane Coordination Net. Authorized uses of this circuit are:

(1) Relay of aircraft hurricane traffic received by the McClellan Weather Monitor to TCRC and EPHC-SFO.

(2) Coordination of requests for reconnaissance and other related matters.

(3) Relay of hurricane advisories from EPHC-SFO for introduction into the military weather communications system.

b. A COMET II-A drop is installed at McClellan Weather Monitor and will be used to introduce hurricane reconnaissance reports and hurricane advisories into the dedicated military weather communications system for further distribution, as required.

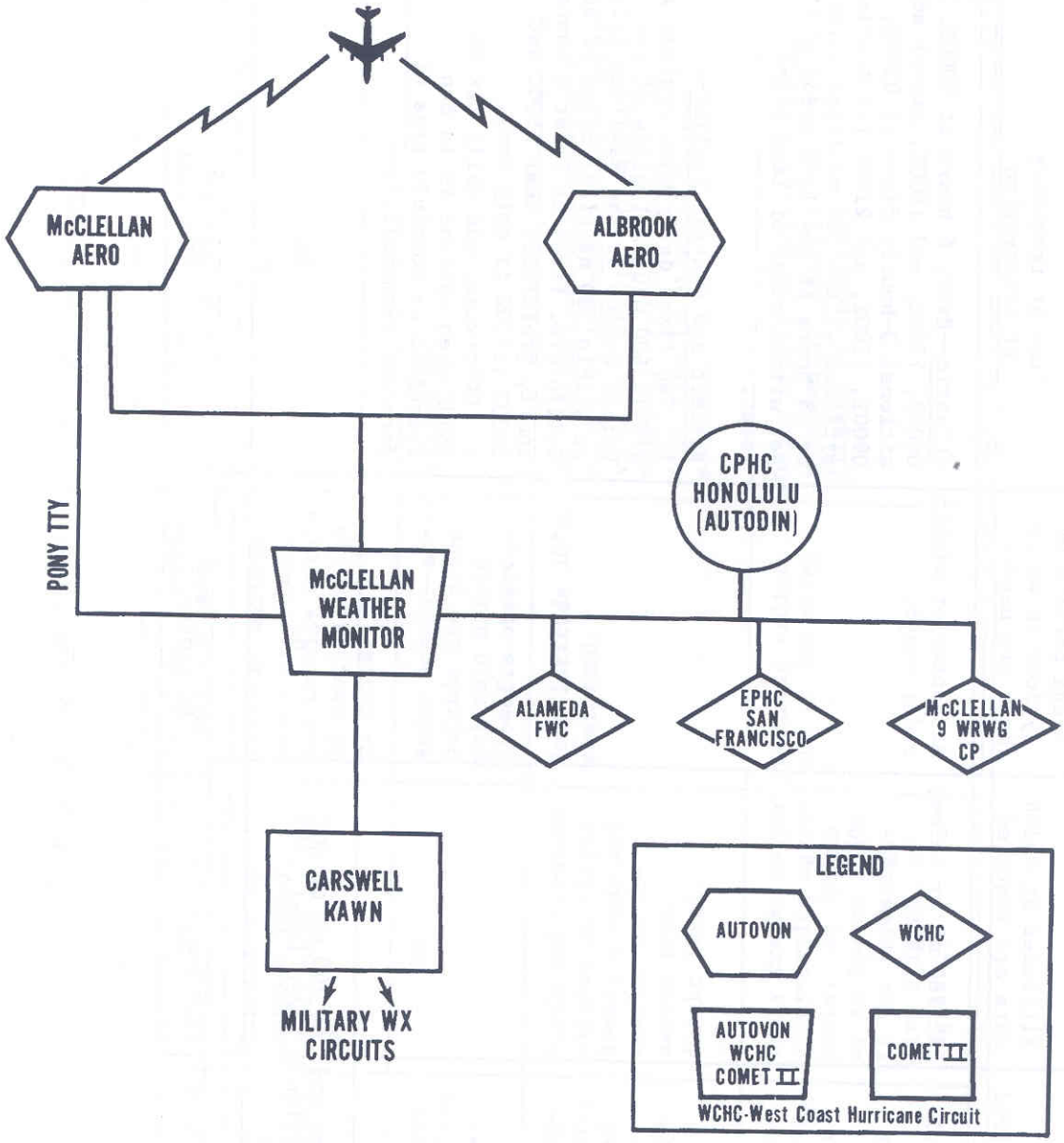
4. Miscellaneous Communications Services and Support. Routine communications between weather reconnaissance aircraft and U.S. Air Force Aeronautical Stations for normal air traffic control (ATC) services will be handled in accordance with standard procedures.

5. Dissemination of the Eastern Pacific Tropical Cyclone Plan of the Day (TCPOD). The daily TCPOD shall be disseminated on the West Coast Hurricane Coordination Net or AUTODIN to the following addressees:

FM: 9 WRWG MCCLELLAN AFB CALIF
TO: FLEWEACEN ALAMEDA CALIF (HURRICANE COORDINATION NET)
EPHC SAN FRANCISCO (HURRICANE COORDINATION NET)

Info: FLEWEAFAC SAN DIEGO (AUTODIN)
DET 8, 17 WSQ (HURRICANE COORDINATION NET)
AWS/AO SCOTT AFB ILL (AUTODIN)
AFGWC OFFUTT AFB NEB (AUTODIN)
FLEAWEACEN PEARL (AUTODIN)
CPHC HONOLULU (AUTODIN)

USAF EAST PACIFIC HURRICANE COMMUNICATION SYSTEM



JOINT REQUIREMENTS FOR AIRCRAFT RECCO DATA

Data required	Altitudes at which data are required	Areal portion of cyclone in which data are needed	Time or frequency of observation	Accuracy required
Location of center	At 700 mb or below*	At center or within radar range.	Atlantic--Every 6 hours at 0000Z, 0600Z, 1200Z, and 1800Z, except additional 3-hourly fixes at 0300Z, 0900Z, 1500Z, and 2100Z for tropical cyclones within 500 nautical miles or 48 hours of any land areas and not within range of land-based radar. Eastern and Central Pacific-- 1. Two fixes daily when cyclone is within 600 nautical miles of the United States or the Hawaiian Islands, or within 300 nautical miles of Baja California. Fixes at least 6 hours apart, preferably near 1500Z and 0000Z (1500Z if only one). 2. Otherwise, one daily fix at 1800Z when cyclone is in San Francisco or Honolulu area of forecast responsibility.	± 10 mi
Dimensions and configuration of center	At 700 mb or any lower level.	Do	Do	Indeterminate
Central pressure	Do	At center.	Do	± 2 mb

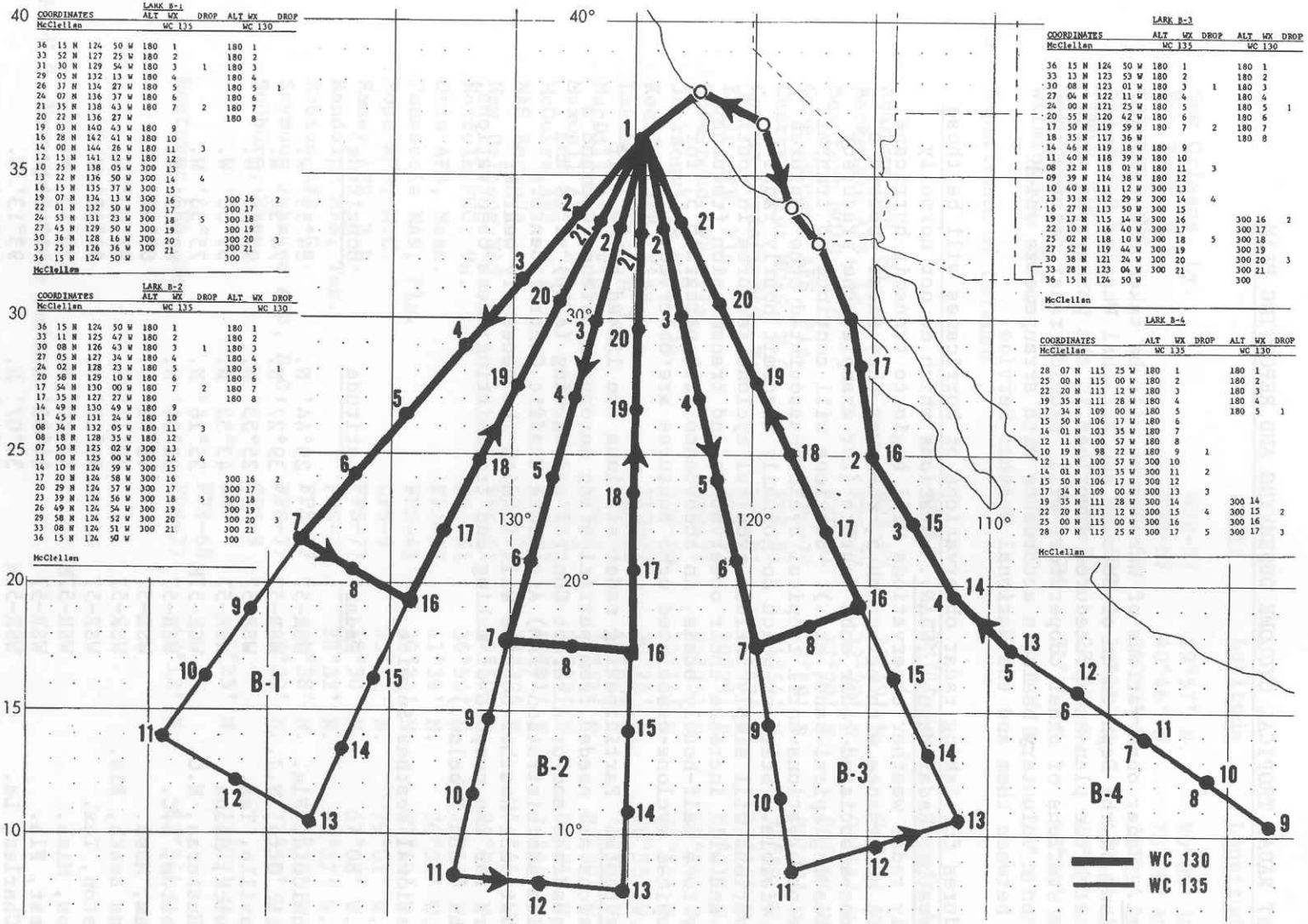
JOINT REQUIREMENTS FOR AIRCRAFT RECCO DATA--(Continued)

Data required	Altitudes at which data are required	Areal portion of cyclone in which data are needed	Time or frequency of observation	Accuracy required
Radius and strength of maximum winds	Surface or by Doppler radar, preferably at 700 mb.	Whenever maximum winds are found, but usually within 50 nautical miles of center.	Do	± 5 mi ± 5 kt
Radar echoes and direction of Cb blow-offs	Do	Radar echoes--areas outside the principal rain shield. Blowoffs observed.	Irregular.	Indeterminate
Winds, pressure heights, clouds, and weather en route to cyclone and return	Winds and pressure heights at flight level; clouds and weather as observed from flight level.	From latitude 30°N. southward.	At 180-nautical-mile intervals, except at 120-nautical-mile intervals when within 300 nautical miles of cyclone center or as indicated in Atlantic flight patterns.	Winds, ± 5 kt; Pressure heights, ± 10 meters
Winds, pressure heights, and weather in suspicious areas	Daily tracks as per interservice agreements. At 700 mb or as low as 1,500 ft for investigative flights, as required.	Variable radius 100 to 300 miles.	Daily tracks as per interservice agreements. Special investigative flights as required.	± 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 63 kt, 50 kt, and 30 kt.	± 5 mi
Temperature profile	Do	Do	Center, R = 15 n.mi., R = 30 n.mi., R = 45 n.mi., and R = 80 n.mi.	± 0.5°C
Dew-point profile	Do	Do	Do	± 0.5°C
D-value profile	Do	Do	Do	± 10 ft
Sea-surface temperature	1,500 ft.	Vortex periphery along specified operational flight pattern.	Equally spaced observations.	± 0.5°C
Equivalent# potential temperature or temperature, dew point, and pressure.	27,000 ft.	Vortex periphery along specified operational flight pattern.	Equally spaced observations.	± 0.5°C ± 1 mb

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



Department of Defense Standard Synoptic Tracks--Eastern 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 Manual (WBAN). 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 increase their observation and transmission frequency from an hourly to a half-hourly basis, in accordance with paragraph 5, for as long as tropical cyclone-associated echo features are observed.

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

a. National Weather Service

	Radar	Latitude	Longitude
Apalachicola, Fla.	WSR-57	29°44' N.	84°59' W.
Atlantic City, N.J.	WSR-57	39°27' N.	74°34' W.
Brownsville, Tex.	WSR-57	25°55' N.	97°26' W.
Brunswick, Maine	WSR-57	43°53' N.	69°56' W.
Cape Hatteras, N.C.	WSR-57M	35°16' N.	75°33' W.
Charleston, S.C.	WSR-57	32°54' N.	80°02' W.
Chatham, Mass.	WSR-57	41°41' N.	69°58' 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-57M	32°20' N.	90°13' W.
Key West, Fla.	WSR-57	24°33' N.	81°45' W.
Lake Charles, La.	WSR-57M	30°07' N.	93°13' W.
Miami, Fla.	WSR-57M	25°43' N.	80°17' W.

	Radar	Latitude	Longitude
New Orleans, La.	WSR-57	29°57' N.	90°05' W.
New York, N.Y.	WSR-57	40°46' N.	73°59' W.
Patuxent, Md.	WSR-57	38°17' N.	76°25' W.
San Juan, P.R.	FPS-67*	18°16' N.	65°46' W.
Tampa, Fla.	WSR-57	27°58' N.	82°31' W.
Waycross, Ga.	WSR-57M	31°15' N.	82°24' W.
Wilmington, N.C.	WSR-57	34°17' N.	77°55' W.

b. Department of Defense

	Radar	Latitude	Longitude
Andrews AFB, Md.	FPS-77	38°49' N.	76°51' W.
Barksdale AFB, La.	FPS-77	32°30' N.	93°41' W.
Beaufort MCAS, S.C.	FPS-41	32°29' N.	80°44' W.
Cape Kennedy AFS, Fla.	FPS-77	28°28' N.	80°33' W.
Cherry Point MCAS, N.C.	FPS-81	34°54' N.	76°53' W.
Corpus Christi NAS, Tex.	FPS-81	27°42' N.	97°16' W.
Eglin AFB, Fla.	FPS-77	30°29' N.	86°31' W.
Homestead AFB, Fla.	FPS-77	25°25' N.	80°24' W.
Jacksonville NAS, Fla.	FPS-68	30°14' N.	81°41' W.
Keesler AFB, Miss.	FPS-77	30°24' N.	88°55' W.
Lakehurst NAS, 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°21' W.
McGuire AFB, N.J.	FPS-77	40°01' N.	74°35' W.
NAS Bermuda	CPS-9	32°22' N.	64°41' W.
New Orleans NAS, La.	FPS-81	29°50' N.	90°01' W.
Norfolk FWC, Va.	FPS-81	36°56' N.	76°18' W.
Otis AFB, Mass.	FPS-77	41°39' N.	70°31' W.
Pensacola NAS, Fla.	FPS-41	30°21' N.	87°19' W.
Pope AFB, N.C.	CPS-9	35°11' N.	79°01' W.
Ramey AFB, P.R.	FPS-77	18°30' N.	67°08' W.
Randolph AFB, Tex.	FPS-77	28°32' N.	98°17' W.
Robins AFB, Ga.	FPS-77	32°38' N.	83°36' W.
Seymour Johnson AFB, N.C.	FPS-77	35°20' N.	77°58' W.
Sudbury, Mass.	CPS-9 and FPS-68	42°25' N.	71°29' W.
Westover AFB, Mass	FPS-77	42°12' N.	83°36' W.

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

ADC Sites

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

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

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

**648 Radar Sq., Benton AFS, Pa.	41°21' N.	76°18' W.
**656 Radar Sq., Saratoga Springs AFS, N.Y.	43°01' N.	73°41' W.
762 Radar Sq., North Truro AFS, Mass.	42°02' N.	70°03' W.
772 Radar Sq., Gibbsboro, NJ.	40°00' N.	74°30' 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.
Victoria, Tex. (Copano Research Foundation)	APS-20B	28°51' N.	96°55' W.
#Wallops Station, Va. (NASA)	MPS-19	37°50' N.	75°29' W.
	SPS-12	37°56' N.	75°28' W.
	FPS-16	37°50' N.	75°29' W.
	FPQ-6	37°52' N.	75°31' W.

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

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

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

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

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

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

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

a. From ADC Sites:

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

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

b. From Other Air Force Stations: Radar Reports (RAREPS) and other hurricane observation information received or observed will be transmitted every one-half hour at H+15 and H+45 on RAWARC Circuits 23420 or 23421 if send-receive capability is available on either of these Circuits. If not, hurricane observation information from those stations listed in paragraph 3.b. above will be transmitted by COMET II as an alternate.

c. From WSOs: The RAREPS and other hurricane observation information received or observed will be transmitted over either RAWARC Circuit 23420 or 23421 every one-half hour at H+15 and H+45.

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 at H+15 and H+45. 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 Meteorologist to ADC Sites to Make Hurricane Radar Observations.

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

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

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

(a) 20th NRCC--Commander, Detachment 41, 4th Weather Wing, Ft. Lee AFS, Va. Telephone, area code 703, 732-0313, Ext. 765. (For those sites from Maryland south.)

(b) 21st NRCC--Commander, Detachment 27, 4th Weather Wing, Hancock Field, Syracuse, N.Y. Telephone, area code 315, 458-5500, Ext. 620. (For those sites from Pennsylvania north.)

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

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

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

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

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

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

NAME	INVESTIGATIVE AUTHORITY	DATE
Baskerville, Robert W., Jr.	CSC*	4-11-69
Benton, Davis	CSC	8-04-60
Black, Dale A.	CSC	6-24-63
Bowser, Carl O., Jr.	CSC	4-14-69
Capo, Rafhel A.	CSC	3-14-67
Clay, Dale A.	CSC	5-15-63
Conway, Charles L.	CSC	4-16-71
Crouch, Billy J.	CSC	4-24-67
Dixon, Kenneth E.	CSC	11-10-59
Dooley, J.T.	CSC	8-18-61
Drybala, Francis J.	CSC	5-28-68
Filion, Joseph	CSC	8-08-62
Fisher, Robert E.	CSC	1-07-66
Flanders, Allen F.	CSC	11-03-60
Foster, Harrie E., Jr.	OIS**	10-26-56
Fuertsch, Francis E.	CSC	12-10-68
Gilbert, Stephen H.	OIS	5-13-63
Gray, Elwood C.	CSC	9-30-65
Hamilton, Robert E.	CSC	1-05-66
Harris, Gordon W.	OIS	1-16-63

NAME	INVESTIGATIVE AUTHORITY	DATE
Hexter, Paul L., Jr.	CSC	10-27-59
Hull, Albert J.	CSC	11-06-59
Hurlbut, Sam R.	CSC	7-13-62
Iannelli, Patrick E., Jr.	CSC	10-03-60
Johnson, Clyde C.	CSC	8-12-60
Keener, Robert W.	CSC	4-11-68
Kuhn, Ronald E.	CSC	5-07-69
Lee, John P.	OIS	3-01-63
Lockhart, William D.	CSC	1-25-71
Logan, Wendell B.	CSC	12-19-68
Lopez, Moses	OIS	7-29-69
Marier, Donald W.	CSC	11-28-62
McCaslin, Robert W.	CSC	5-26-70
Monroe, Harold	CSC	6-14-61
Oldmixon, Donald H.	CSC	7-29-60
Palmer, Cecil M.	CSC	12-01-60
Parrish, Samuel K.	CSC	11-25-60
Pauley, James N., Jr.	CSC	4-26-71
Pentecost, Joseph B.	CSC	6-05-59
Phipps, Carl L.	CSC	3-17-61
Pruett, Jeter A.	CSC	10-22-64
Robinson, John M.	CSC	4-10-68
Sadowski, Alexander F.	CSC	8-06-59
Samet, Alvin M.	CSC	5-28-68
Sarnowski, Edward	CSC	9-16-65
Schonberger, Abram	CSC	11-15-60
Schulz, Walter A., Jr.	CSC	7-05-66
Sheffield, Richard K.	CSC	5-17-65
Smith, Robert L.	OIS	4-15-54
Stewart, Eldyn L.	CSC	10-08-69
Teague, Jack L.	CSC	5-05-65
Warden, John D.	CSC	6-17-60
Wells, Fred E.	CSC	10-22-59
Williams, Milton L.	CSC	7-20-60
Wilk, Kenneth E.	CSC	12-17-62
Whitehead, Robert E.	OIS	7-21-60

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

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

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

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

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

d. Only those National Weather Service personnel listed in paragraph 6.e. are authorized to visit ARTCCs. Persons not listed in paragraph 6.e. will not be admitted.

e. Should there be a need for other cleared National Weather Service personnel to be added to the list, it will be the responsibility of the National Weather Service Regional Headquarters to coordinate names of new radar meteorologists with the responsible FAA Regional Investigation and Security Division Office. These requests will be forwarded 2 weeks in advance of the anticipated utilization of such personnel.

f. The list in paragraph 6.e. will be updated each year by the National Weather Service.

g. To expedite and assure the granting of access to ARTCCs, the following will apply:

(1) A copy of this Plan with personnel security clearance information shall be forwarded to ARTCCs.

(2) A copy of this Plan shall be forwarded to the FAA Regional Investigation and Security Division to assure visiting access is accomplished.

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

i. When National Weather Service personnel are to be detailed to ARTCCs, no prior notification of coordination is required; such personnel will present themselves at the ARTCC and, if their names are on the list given in paragraph 6.e., they will be admitted to perform the duties outlined in paragraph 7.a.

j. 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:

ARTCCs	FAA RADAR SITES	MILITARY RADAR SITES
New York ARTCC (Islip, N.Y.)	New York, N.Y. Trevose, Pa. Benton, Pa.	648 Radar Sq., Benton AFS, Pa.
Washington ARTCC (Leesburg, Va.)	Washington, D.C. Bedford, Va. Benson, N.C. Cape Charles, Va.	771 Radar Sq., Cape Charles AFS, Va. 649 Radar Sq., Bedford AFS, Va.
Boston ARTCC (Nashua, N.H.)	Boston, Mass. Bucks Harbor, Maine Saratoga Springs, N.Y.	656 Radar Sq., Saratoga Springs AFS, N.Y. 907 Radar Sq., Bucks Harbor AFS, Maine
Miami ARTCC (Miami, Fla.)	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 (Hilliard, Fla.)	Jacksonville, Fla. Charleston, S.C. Tyndall, Fla. Valdosta, Ga.	678 Radar Sq., Tyndall AFB, Fla. 679 Radar Sq., Jacksonville AFS, Fla. 792 Radar Sq., North Charleston AFS, S.C.
Houston ARTCC (Houston, Tex.)	Alexandria, La. Ellington, Tex. Lackland, Tex. New Orleans, La. Oilton, Tex.	
Oakland ARTCC (Fremont, Calif.)	Fallon, Nev. Oakland, Calif. Paso Robles, Calif. Red Bluff, Calif. Sacramento, Calif.	858 Radar Sq., Navy Aux. Air Sta., Fallon, Nev.
Los Angeles ARTCC (Palmdale, Calif.)	San Pedro, Calif. Boron, Calif. Cedar City, Utah Las Vegas, Nev. Mt. Laguna, Calif. Paso Robles, Calif.	670th Radar Sq., Ft. MacArthur AFS, 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 Manual (WBAN).

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 14 times each day. The Kansas City RADU prepares hourly SD-1 messages that include the Los Angeles ARTCC radar data each hour, entering them on all Service A circuits. Special radar overlays are prepared at more frequent intervals, when requested, and transmitted to the WSFO Los Angeles over the radar facsimile circuit. The WSFO San Francisco must rely on RAWARC, telephone calls, and the NAFAX Radar Summary Chart for radar data.

CENTRAL PACIFIC

1. There is currently no weather-dedicated radar within the Central Pacific Hurricane Center (CPHC) area of responsibility. 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, Hawaii	22°09'N.	159°39'W.
169 AC&W Sq., Mt. Kaala, Hawaii	21°31'N.	158°09'W.

2. 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.

3. The RAREPS will be provided to the Central Pacific Forecast Center (CENPAC FC), Hickam AFB, by telephone. The CENPAC FC will code reports in accordance with Weather Radar Manual (WBAN), using Honolulu VOR-TAC, geographic coordinates 21°20'N. and 158°02'W., as a reference point. Reports will be transmitted by teletypewriter to National Weather Service Honolulu and to Fleet Weather Center Pearl Harbor.

4. 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 Suitland 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 0. Reconnaissance reports and advisories will be afforded priority handling on the Service 0 system.

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

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

DESIGNATION OF TROPICAL DEPRESSIONS AND CYCLONES

1. Numbering of Tropical Depressions

a. Atlantic.

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

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

b. Pacific. Each tropical depression will be assigned a number that will be retained throughout the life cycle of the cyclone.

(1) For the area east of longitude 140°W., a list of tropical depression numbers will be maintained by the Fleet Weather Center (FWC) Alameda, Calif. Numbering will start at the beginning of each calendar 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) or the Central Pacific Hurricane Center-Honolulu (CPHC-HNL) will, respectively, request a number from FWC Alameda or JTWC Guam. When forecast responsibility is passed from one warning office to another, the number assigned will be retained.

2. Tropical Cyclone Names

a. Atlantic and Eastern Pacific:

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

b. Central North Pacific

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

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

LIST OF ATLANTIC TROPICAL CYCLONE NAMES

1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
AGNES	ALICE	ALMA	AMY	ANNA	ANITA	AMELIA	ANGIE	ABBY	ARLENE
BETTY	BRENDA	BECKY	BLANCHE	BELLE	BABE	BESS	BARBARA	BERTHA	BETH
CARRIE	CHRISTINE	CARMEN	CAROLINE	CANDICE	CLARA	CORA	CINDY	CANDY	CHLOE
DAWN	DELIA	DOLLY	DORIS	DOTTIE	DOROTHY	DEBRA	DOT	DINAH	DORIA
EDNA	ELLEN	ELAINE	ELOISE	EMMY	EVELYN	ELLA	EVE	ELSIE	EDITH
FELICE	FRAN	FIFI	FAYE	FRANCES	FRIEDA	FLOSSIE	FRANNY	FELICIA	FERN
GERDA	GILDA	GERTRUDE	GLADYS	GLORIA	GRACE	GRETA	GWYN	GEORGIA	GINGER
HARRIET	HELEN	HESTER	HALLIE	HOLLY	HANNAH	HOPE	HEDDA	HEDY	HEIDI
ILENE	IMOGENE	IVY	INGRID	INGA	IDA	IRMA	IRIS	ISABEL	IRENE
JANE	JOY	JUSTINE	JULIA	JILL	JODIE	JULIET	JUDY	JUNE	JANICE
KARA	KATE	KATHY	KITTY	KAY	KRISTINA	KENDRA	KAREN	KIM	KRISTY
LUCILLE	LORETTA	LINDA	LILLY	LILIAS	LOIS	LOUISE	LANA	LUCY	LAURA
MAE	M ADGE	MARSHA	MABEL	MARIA	MARY	MARTHA	MOLLY	MILLIE	MARGO
NADINE	NANCY	NELLY	NIKI	NOLA	NORA	NOREEN	NITA	NINA	NONA
ODETTE	ONA	OLGA	OPAL	ORPHA	ODEL	ORA	OPHELIA	OLIVE	ORCHID
POLLY	PATSY	PEARL	PEGGY	PAMELA	PENNY	PAULA	PATTY	PHYLLIS	PORTIA
RITA	ROSE	ROXANNE	RUBY	RUTH	RAQUEL	ROSALIE	ROBERTA	ROSIE	RACHEL
SARAH	SALLY	SABRINA	SHEILA	SHIRLEY	SOPHIA	SUSAN	SHERRY	SUZY	SANDRA
TINA	TAM	THELMA	TILDA	TRIXIE	TRUDY	TANYA	TESS	THEDA	TERESE
VELMA	VERA	VIOLA	VICKY	VILDA	VIRGINIA	VANESSA	VESTA	VIOLET	VERNA
WENDY	WILDA	WILMA	WINNIE	WYNNE	WILLENE	WANDA	WENDA	WILLETTE	WALLIS

CHAPTER 7
APPENDIX B

LIST OF EASTERN NORTH PACIFIC TROPICAL CYCLONE NAMES

1972	1973	1974	1975
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

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, Atlantic 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 Suitland. 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 (7072 with relay to 23421).

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

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

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

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

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

NATIONAL WEATHER SERVICE TRANSFER PLAN

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

Caribbean Sea, Gulf of Mexico, and Atlantic Ocean:

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

New Orleans : Gulf of Mexico and its coasts west of longitude 85°W. and north of latitude 25°N. (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 in the Gulf of Mexico and Caribbean Sea not assigned to HWO New Orleans or HWO San Juan, and those areas in the Atlantic Ocean not assigned to HWO Boston or HWO Washington.

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

Warning Center with primary responsibility	First alternate	Second alternate
NHC Miami	HWO Washington	HWO New Orleans
HWO New Orleans	NHC Miami	HWO Washington
HWO San Juan	NHC Miami	HWO Washington
HWO Washington	NHC Miami	HWO Boston
HWO Boston	HWO Washington	NHC Miami
EPHC San Francisco	HWO Los Angeles	CPHC Honolulu
CPHC Honolulu	EPHC San Francisco	HWO Los Angeles

CHIEF, AERIAL RECONNAISSANCE COORDINATION, ATLANTIC HURRICANES-TRANSFER PLAN

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

1. Procedures

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

(1) Current and planned reconnaissance missions of Department of Defense and Research Flight Facility (RFF) aircraft.

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

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

(4) The latest Military Hurricane Warning Advisory.

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

(6) Notification to maintain continuous contact between CARCAH and Alternate CARCAH on the U.S. Air Force hurricane teletypewriter Circuit (GT 22117/JQGCU 304) or on any other communication facilities available.

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

(1) Specific time of transfer of responsibility.

(2) Latest position of any storms.

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

(4) The current Reconnaissance TCPOD.

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

2. CARCAH Reassumption 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 RFF and will disseminate a Military Hurricane Warning Advisory to the U.S. Air Force and FWC Norfolk. If feasible, this drill will also include a flight by U.S. Air Force aircraft to test alternate routing of weather reconnaissance observations. Detailed instructions for this transfer drill will be disseminated to all concerned sufficiently in advance of the drill.

U.S. NAVY TRANSFER PLAN

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

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

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

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

d. Time permitting, FWF Suitland will be advised by classified message of the status and location of all VW-4 aircraft and 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 FWC NORFOLK
TO FWF SUITLAND
WEARECONRON FOUR
INFO CNO
CINCLANTFLT
COMNAVAIRLANT
COMNAVWEASERV
NHC MIAMI
CARCAH MIAMI
FWF JACKSONVILLE
FWF QUONSET PT

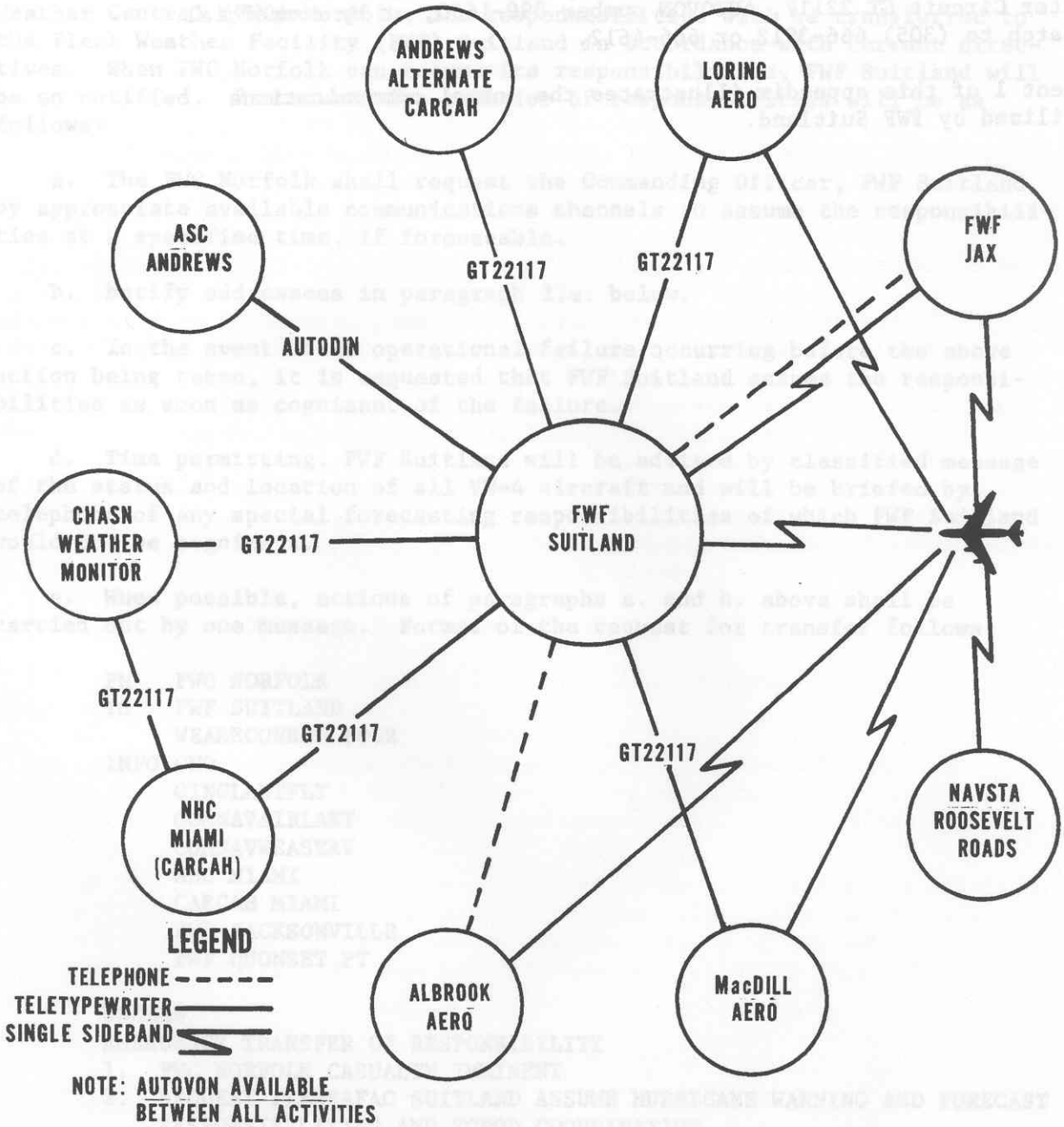
UNCLAS
EMERGENCY TRANSFER OF RESPONSIBILITY
1. FWC NORFOLK CASUALTY IMMINENT
2. REQUEST FLEWEAFAC SUITLAND ASSUME HURRICANE WARNING AND FORECAST RESPONSIBILITIES AND TCPOD COORDINATION
3. RECON FLIGHT SCHEDULE IAW TCPOD_____Z.

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 GP 2901 direct-line telephone, U.S. Air Force teletypweriter Circuit GT 22117, AUTOVON number 899-1650, or by commercial telephone patch to (305) 666-3912 or 666-4612.

3. Attachment 1 of this appendix illustrates the normal communications channels utilized by FWF Suitland.

CHAPTER 8
APPENDIX C
ATTACHMENT 1

FLEET WEATHER FACILITY
SUITLAND COMMUNICATIONS DIAGRAM



EASTERN PACIFIC

ALTERNATE HURRICANE WARNING OFFICE

Actions of the National Weather Service as the Alternate (ALT) Hurricane Warning Office Los Angeles (HWO-LAX), in case of failure of normal operations at the Eastern Pacific Hurricane Center San Francisco (EPHC-SFO) and with the Tropical Cyclone Reconnaissance Coordinator (TCRC) McClellan, are detailed below:

1. Pacific ship reports normally received at EPHC-SFO will be rerouted by communication agencies concerned to METEO Los Angeles where they will be received on Western Union tieline, TWX, or on the local Coast Guard teletypewriter circuit. The Fleet Weather Center (FWC) Alameda will telephone selected ships in the area of concern of ALT HWO-LAX.

2. Pacific ship reports received at ALT HWO-LAX will be given to FAA Flight Service Station (FSS) at Los Angeles for transmission on Service C (Circuit 35) and Service O (Circuit 8274). Military stations not on either of these Circuits will receive reports as relayed on COMET III.

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

4. The McClellan Weather Monitor will telephone hurricane reconnaissance reports to ALT HWO-LAX.

5. Coordination and liaison with TCRC will be by telephone calls.

6. Requests for hurricane reconnaissance flights will be made by telephone to TCRC.

7. After telephone coordination with TCRC, final military tropical cyclone forecasts using WS Form C-13 will be read to them for entry on military communication circuits. The McClellan 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 Center (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 EPHC-SFO will assume all CPHC-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 STORM SURVEILLANCE BY SATELLITES

1. The NOAA environmental satellites will provide coverage of the tropical areas twice a day. Local stations may receive morning Automatic Picture Transmission (APT) pictures from the direct transmission system of ESSA 8. Global midafternoon data from ESSA 9 will be centrally received and processed. Some of the data from several National Aeronautics and Space Administration (NASA) research and development satellites will be employed in the surveillance of tropical storms. The geostationary Applications Technology Satellites--ATS 3 (Atlantic) and ATS 1 (Pacific)--can provide pictures of the visible earth disc at intervals of 25 minutes. If only Northern Hemisphere coverage is desired, the interval between pictures can be reduced to 12 minutes. Data from the two ATS satellites will not be received simultaneously. These pictures will be available routinely at the National Environmental Satellite Service (NESS) and the National Hurricane Center (NHC). Movie loops prepared from a series of ATS pictures show movement and changes in character of tropical disturbances. Attachment 1 shows the expected satellite operations and data availability.

2. During storm seasons, satellite picture data (such as nephanalyses, strip pictures, and digitized mosaics) for the Pacific, Atlantic, and Indian Ocean areas of tropical cyclone activity will be provided as expeditiously as possible to those forecast centers whose forecast responsibility includes these areas.

3. Tropical disturbances observed by the satellites will be described in messages prepared by the Analysis Branch of NESS. These messages, called Satellite Weather Bulletins, will be entered on the National Weather Service and Department of Defense teletypewriter circuits for distribution to the responsible forecast centers. The Bulletins will be numbered serially, beginning January 1 for each of the five geographical subdivisions: Atlantic Ocean (including the Gulf of Mexico and Caribbean Sea); Eastern North Pacific Ocean; Western North Pacific Ocean; South Pacific Ocean; and Indian Ocean.

The Satellite Weather Bulletin is a semicoded message based upon a satellite observation of a disturbed area, described by NESS through a Tropical and Subtropical Disturbance Classification from Satellite Data Form. Attachment 2 is a graphical description of this classification system. The chart in attachment 3 may be used to estimate the maximum surface-wind speed from the banding category and the diameter of the overcast.

The message format for the Satellite Weather Bulletin is shown in attachment 4.

4. The NESS will distribute two daily messages entitled "Satellite Tropical Disturbance Summary." One message will be available daily at 0600 Greenwich Mean Time (GMT) and will summarize the tropical disturbances observed between longitude 20°E. westward to longitude 160°W. The other message, available at 1800 GMT daily, will summarize all tropical disturbances observed from longitude 160°W. westward to longitude 20°E.

These messages will:

a. List the day's Satellite Weather Bulletins.

b. Give information on disturbances for which continuity was not maintained.

c. Give locations of vorticies with tropical history observed in extra-tropical waters.

d. Describe all significant disturbed areas for which no Bulletins were sent.

A copy of the format for these messages is contained in attachment 5 of this chapter.

5. The NESS will examine on a continuing basis the current classification system for relating banding and storm diameter to surface winds, particularly to weakening or dissipating storms, and will inform all forecast agencies of new developments.

6. The NESS will inform the responsible forecast centers by the most expeditious communications available of the:

a. Discovery of a new storm.

b. Sudden change in size or apparent intensity of a storm.

c. Observed storm position in disagreement with advisory.

d. Apparent storm intensity in disagreement with advisory if in data sparse or nonreconnaissance area.

This communication is normally accomplished through the Satellite Weather Bulletin procedure or by telephone call.

7. Forecasting centers will advise the NESS Analysis Branch (telephone 301-763-5827) whenever storm characteristics, as measured by reconnaissance data, differ significantly from characteristics indicated by the appropriate NESS Satellite Weather Bulletin.

8. Guidelines for classifying tropical cyclones as named tropical storms, hurricanes, or typhoons, based solely on information from satellites, are as follows:

a. Classification will be based on the standard NESS Banding Category/ Overcast Circle Diameter/Wind Speed (BC/OCD/WS) graph; only Stage X, Category 2, 3, or 4 cyclones, may be classified as storms, hurricanes, or typhoons.

b. Stage A, B, or C may be classified as tropical disturbances, waves, or depressions.

9. Characteristics of tropical cyclone areas observed by APT receivers at Guam, Wake Island, and Oahu, Hawaii, will be described in messages prepared by appropriate authorities and transmitted to responsible forecast centers. The responsible forecast centers will notify all stations affected.

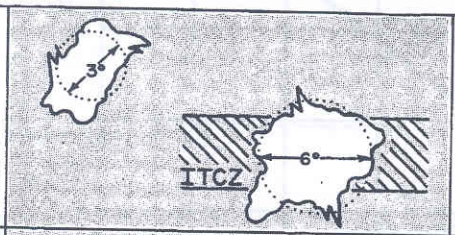
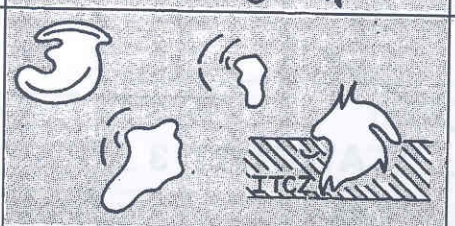
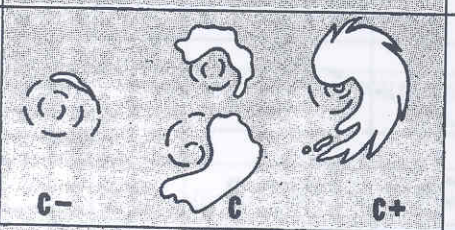
SATELLITES AND SATELLITE DATA AVAILABILITY FOR THE 1972 HURRICANE SEASON

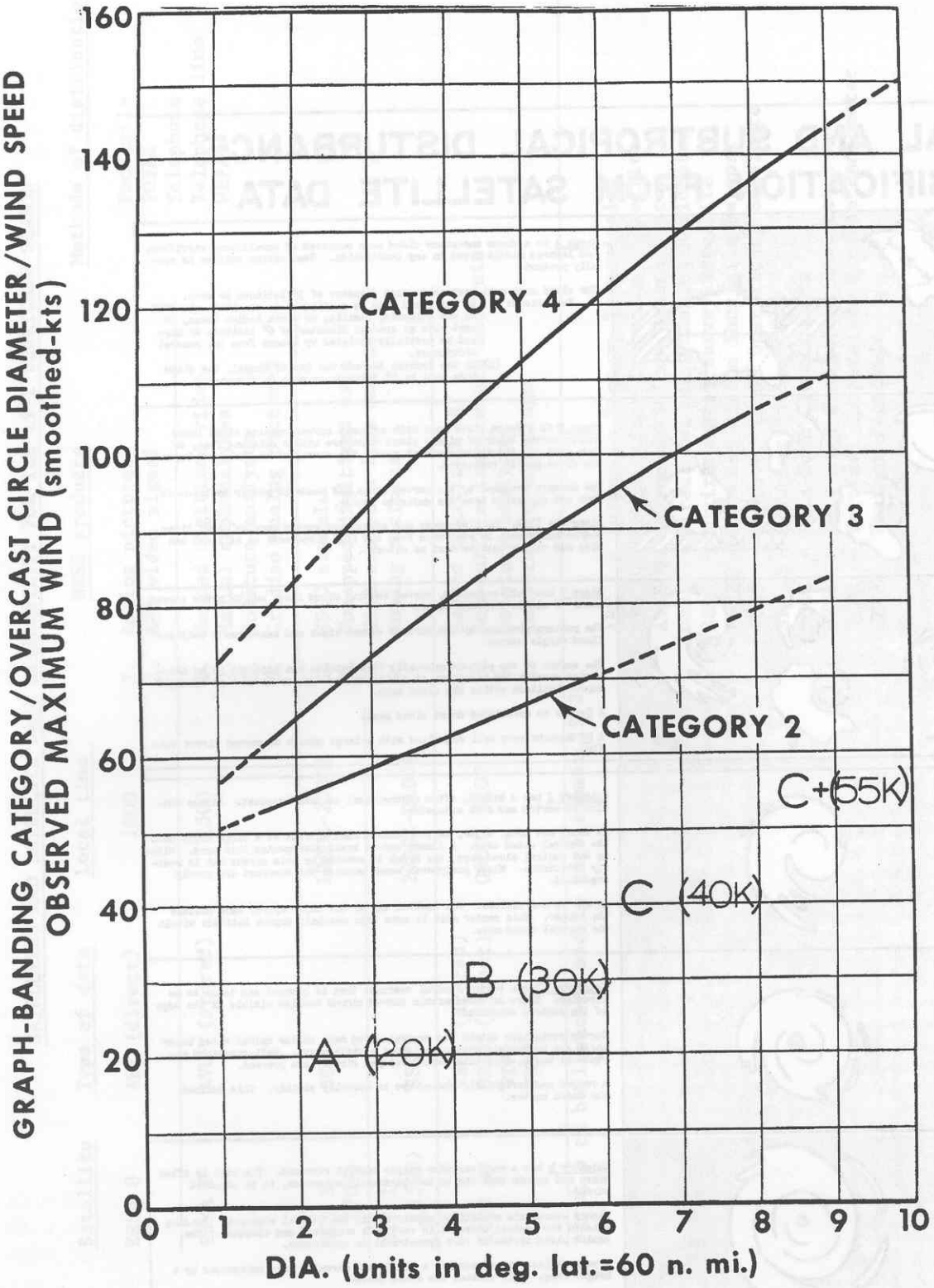
Satellite	Type of data	Local time	NESS products	Methods of distribution
ESSA 8	APT (direct)	1000	1. Analog pictures 2. APT video signal	Facsimile FOFAX Telephone Telephone line WEFAX
ESSA 9	AVCS (stored)	1500	1. Mapped digitized video 2. Manual nephanalyses 3. Moisture analyses 4. Gridded analog pictures	
ATS 3 (70W)	SSCC	1200Z-2000Z	1. SSCC signals 2. Unmapped digitized data 3. Wind analyses from movies 4. Analog pictures	
ATS 1 (150W)	SSCC	2030Z-0100Z		
ITOS D*	SR (stored) DRSR (direct) VTPR VHRR	0900, 2100	1. Mapped digitized SR 2. Sea-surface temperature analysis 3. Moisture analyses 4. Temperature soundings	

*ITOS D to be launched mid to late summer 1972.

APT - Automatic Picture Transmission
ATS - Applications Technology Satellite
AVCS - Advanced Vidicon Camera System
DRSR - Direct Readout Scanning Radiometer
ESSA - Environmental Survey Satellite
FOFAX - Forecast Office Facsimile Network
ITOS - Improved TIROS Operational Satellite
SR - Scanning Radiometer
SSCC - Spin-Scan Cloud Camera
VHRR - Very High Resolution Radiometer
VTPR - Vertical Temperature Profile Radiometer
WEFAX - Weather Facsimile

TROPICAL AND SUBTROPICAL DISTURBANCE CLASSIFICATION FROM SATELLITE DATA

A NO CURVED CLOUD LINES OR BANDS		Stage A is a dense amorphous cloud mass composed of cumuliform, cirriform, and layered middle cloud in any combination. Some cirrus outflow is usually present. The cloud mass must have an average diameter of 3° latitude or more. Exceptions: (1) If the cloud mass is contiguous to or within the ITCZ in the Atlantic, Pacific, or south Indian Ocean, it must have an average diameter of 6° latitude or more and be partially isolated by breaks from the general cloudiness. (2) In the Arabian Sea and the Bay of Bengal, the cloud mass must be 8° latitude or more in diameter.
B POORLY ORGANIZED CURVED CLOUD LINES AND BANDS ILL-DEFINED CENTER		Stage B is a dense cloud mass with adjacent curved cumulus cloud lines and/or curved bands of middle cloud which are either detached from, or form part of, the major overcast area. The curved cloud lines and bands are often poorly organized. The pattern produced by the curved lines and bands is poorly defined--it does not appear to have one definite center. Along the ITCZ, the cloud mass and associated curved cumulus cloud lines and/or bands must be separated from the ITCZ cloudiness on at least one side and cirrus outflow must be evident.
C WELL-ORGANIZED CURVED CLOUD LINES AND BANDS WELL-DEFINED CENTER OUTSIDE DENSE CLOUD MASS		Stage C has well-organized, curved cumulus cloud lines and/or broad curved bands of middle and high cloud. The pattern produced by the various curved lines and bands has a well-defined single center. The center of the pattern generally lies outside but adjacent to an associated dense cloud mass, but it can be on the edge or as much as one-half degree latitude within the cloud mass. A C- has no associated dense cloud mass. A C+ appears very well organized with a large amount of curved cirrus outflow.
X CAT. 2 WELL-ORGANIZED BANDS SPIRAL BANDS DEFINE CENTER WITHIN CENTRAL CLOUD MASS		Category 2 has a bright, often asymmetrical central overcast. Cirrus outflow is curved and more extensive. At least one long, major, well-organized band spirals at a large angle into the central cloud mass. A linear curved break accompanies this band. Within the central cloud mass, the break is covered by thin cirrus but is readily detectable. Minor peripheral bands outside the overcast are poorly organized. An eye is not visible. The central tip of the major spiral band defines the center. This center must be more than one-half degree latitude within the central cloud mass.
X CAT. 3 MODERATE DEGREE OF CONCENTRICITY TO CLOUD BANDS IRREGULARLY SHAPED EYE WITHIN CENTRAL CLOUD MASS		Category 3 has a bright central overcast that is compact and tends to be circular. There is considerable curved cirrus outflow visible at the edge of the central overcast. Curved striations within the central cloud mass define spiral cloud bands which are moderately concentric about a visible eye. Well-organized peripheral bands, some with well-developed cirrus, are present. A ragged and irregularly shaped eye is normally visible. This defines the storm center.
X CAT. 4 HIGH DEGREE OF CONCENTRICITY TO CLOUD BANDS ROUND EYE NEAR CENTER OF CENTRAL CLOUD MASS		Category 4 has a very circular bright central overcast. The edge is often sharp and smooth over one or two quadrants, otherwise, it is striated cirrus. Highly concentric striations appear within the central overcast. Banding outside the central overcast is very well organized and circular. The entire cloud system is very symmetrical in appearance. A well-defined eye appears as a small dark circular area surrounded by a bright ring. This defines the storm center.


GRAPH-BANDING CATEGORY/OVERCAST CIRCLE DIAMETER/WIND SPEED
OBSERVED MAXIMUM WIND (smoothed-kts)
160
140
120
100
80
60
40
20
0
CATEGORY 4
CATEGORY 3
CATEGORY 2
C+(55K)
C (40K)
B (30K)
A (20K)
0 1 2 3 4 5 6 7 8 9 10
DIA. (units in deg. lat.=60 n. mi.)

SATELLITE WEATHER BULLETIN

ABXX-1
ABXX-2 KWBC

SATELLITE WEATHER BULLETIN

(Satellite) (Area) (Bulletin #)

(Day) (Month) (Year) (Hour Min.) Z

(Lat. Location Long.) STAGE DIA. CAT.

(Remarks about eye) (Storm Name) *(Trend in development)

*Past Hour Movement

APPROX. TIME NEXT OBS. (Month/Day/Hour)

(Remarks)

* Not to be used in the Caribbean, Gulf of Mexico, and Atlantic. However, in these areas pertinent information, especially regarding trends as indicated by the appearance of the disturbance, will be placed in Remarks.

NOTE: A comment on the accuracy of the location of observed features will be entered in Remarks when unusual circumstances prevent determination of the accuracy to a normal accuracy of 60 nautical miles.

CHAPTER 9
ATTACHMENT 5

SATELLITE TROPICAL DISTURBANCE SUMMARY

ABXX-3 KWBC
SATELLITE TROPICAL DISTURBANCE SUMMARY

_____
(Date)

ATLANTIC (#)	(Location)	(Time)	(STAGE)	(DIA.)	(CAT.)	(Name or FIRST SIGHTED or leave blank)
BLTN. ___	_____	_____	_____	_____	_____	_____
BLTN. ___	_____	_____	_____	_____	_____	_____
BLTN. ___	_____	_____	_____	_____	_____	_____
BLTN. ___	_____	_____	_____	_____	_____	_____
BLTN. ___	_____	_____	_____	_____	_____	_____

_____
(If any Bltns. were sent yesterday on storms not reported today, state why.)

_____

_____

_____
(Give location of any vortex with tropical history observed in extrop. waters)

_____

_____

_____
(Remarks: Describe all significant disturbed areas for which no Bltn. was sent.)

EASTERN PACIFIC (#)	(Location)	(Time)	(STAGE)	(DIA.)	(CAT.)	(Name or FIRST SIGHTED or leave blank)
BLTN.___	_____	_____	_____	_____	_____	_____
BLTN.___	_____	_____	_____	_____	_____	_____
BLTN.___	_____	_____	_____	_____	_____	_____

_____

_____

_____

ABXX-4 KWBC--Satellite Tropical Disturbance Summary will include the same type of information as ABXX-3 for the Western Pacific, South Pacific, and Indian Ocean areas.

CHAPTER 10

DEPLOYMENT OF EXPERIMENTAL ENVIRONMENTAL DATA BUOYS

1. Mission

a. The principal mission of the Experimental Environmental Data Buoy (XERB-1), deployed 125 miles east of Norfolk, consists of gathering the needed engineering and environmental data to aid further development of prototype data buoys.

b. The mission objectives for the Engineering Experimental Phase (EEP) buoys, to be deployed in the Gulf of Mexico in spring to summer 1972, are similar but more comprehensive:

(1) Provision of in-situ performance data for the development of improved ocean platform systems, with special emphasis on oceanographic and meteorological sensors;

(2) Development of improved techniques for the acquisition, processing, and dissemination of environmental data; and

(3) Provision of useful data--operational, archival, and scientific--to the environmental science communities.

2. Description

a. XERB-1--A 40-foot discus buoy, experimental in nature, providing scheduled surface and limited subsurface information. The XERB-1 will be outfitted with the improved EEP data-gathering system in mid-1972.

b. EEPs--Six 40-foot discus buoys for engineering and test purposes, providing scheduled surface and subsurface information. One of the six buoys, designated as a Special Test Platform (STP), will be equipped with additional instrumentation.

3. Environmental Data

a. XERB-1--Meteorological and oceanographic parameters are measured every hour and stored on magnetic tape. Present shore interrogation is once every 3 hours, but the system is capable of more frequent interrogation. The parameters sampled and stored aboard the buoy consist of the following:

- barometric pressure
- wind direction and speed
- air temperature
- dew-point temperature
- sea-surface temperature
- global radiation
- precipitation
- wave height
- surface-current vector
- water temperature.

b. EEPs--Additional measuring capability is available with improved state-of-the-art sensors and components. Measurement of meteorological and oceanographic parameters consist of the following:

- barometric pressure
- wind speed and direction
- air temperature
- dew-point temperature
- global radiation
- wave height
- current speeds and directions
- water temperature
- water conductivity
- sound speed
- salinity.

4. Reception of Data

The U.S. Coast Guard-operated National Data Buoy Center Shore Collection Center (SCC) 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) FM21D ship code. Relay to the National Weather Service Suitland will be accomplished by means of Coast Guard Circuit GT 7990 within 1 hour of synoptic acquisition. Subsurface information will be available for relay in the Bathythermograph (BATHY) code; XERB-1 (after refit) and EEP subsurface data will be relayed in the new BATHY and TESAC (temperature, salinity, current, and other elements at different levels) code, but may be at less frequent intervals. XERB-1 surface reports presently consist of three-serial hourly synoptics in each message.

5. Special Request for Data

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

6. System Monitoring

System maintenance, calibration, and final data-quality verification are under the technical control of the National Data Buoy Center and its supporting contractors. Requests for system status and schedule information should be directed to the Test Operations Division of the National Data Buoy Center, Mississippi Test Facility, in Bay St. Louis, Mississippi, telephone (601) 688-2824.

7. Locations

a. EEP (initial)

Position No.	Location Latitude	Longitude	Buoy no.	Identification no.	Deployment order
1	27.5°N.	88.0°W.	OPS 1	EB 11	1
2	26.5°N.	90.3°W.	STP	EB 10	6
3	26.0°N.	87.0°W.	OPS 2	EB 12	2
4	24.5°N.	84.5°W.	OPS 5	EB 15	5
5	24.5°N.	89.3°W.	OPS 4	EB 14	4
6	26.0°N.	94.0°W.	OPS 3	EB 13	3

b. XERB-1

36.5°N.	73.5°W.	XERB-1	EB 01	On station

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:

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The Joint Chiefs of Staff
Washington, D.C. 20301

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Washington Navy Yard
Washington, D.C. 20390

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

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

Commandant, Marine Corps
Headquarters, U.S. Marine Corps
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