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

FEDERAL COORDINATOR FOR METEOROLOGICAL SERVICES AND SUPPORTING RESEARCH

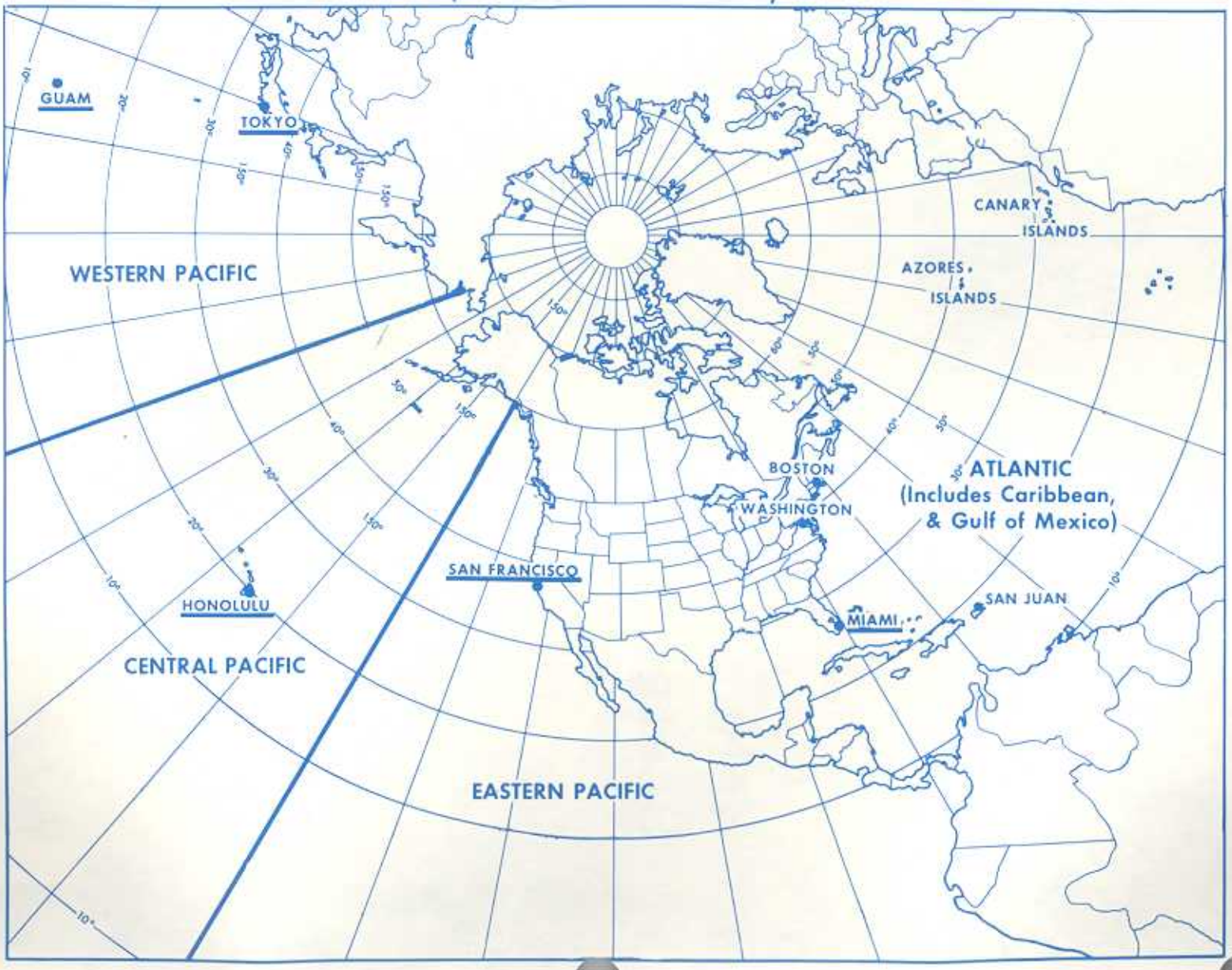
National Hurricane Operations Plan

FCM 78-2

Washington, D.C.
May 1978

NATIONAL HURRICANE OPERATIONS PLAN

(AREA OF RESPONSIBILITY)



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SERVICES AND SUPPORTING RESEARCH

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FOREWORD

An Interdepartmental Plan was first issued in 1962. This document is the 16th edition and presents procedures and agreements reached at the annual Interdepartmental Hurricane Warning Conference. This edition of the Plan is a major revision of the previous edition. The 32d annual Conference was held at the USAF Keesler Technical Training Center at Keesler Air Force Base, MS, 24-26 January 1978.

The Conference is sponsored by the Subcommittee on Basic Meteorological Services, Interdepartmental Committee for Meteorological Services and brings together cognizant Federal agencies to achieve agreement on items of mutual concern related to hurricane warning services. Joint hosts this year for the conference were the Aerospace Rescue and Recovery Service and the Air Weather Service.

R. E. Hallgren

Richard E. Hallgren
Federal Coordinator for
Meteorological Services and
Supporting Research

NATIONAL HURRICANE OPERATIONS PLAN

(ATLANTIC, EASTERN PACIFIC, AND CENTRAL PACIFIC)

CONTENTS

CONTENTS

INTRODUCTION

1. Introduction. The Hurricane Warning Service is an interdepartmental effort to provide the Nation and designated international recipients with environmental data, forecasts, and assessments concerning tropical and subtropical weather systems. Interdepartmental cooperation achieves economy and efficiency in the operation of the Hurricane Warning Service. This plan provides the basis for implementing the agreements of the Department of Commerce (DOC), Department of Defense (DOD), and the Department of Transportation (DOT) reached at the annual Interdepartmental Hurricane Warning Conference (combined Atlantic and Pacific). It is the 16th edition of the original, first issued in 1962, and represents a major revision. The Hurricane Conference is sponsored by the Subcommittee on Basic Meteorological Services, Interdepartmental Committee for Meteorological Services, to bring together cognizant Federal agencies and achieve agreement on items of mutual concern related to the Atlantic and Pacific hurricane warning services.

2. Terms used in this Plan.

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

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

c. Eye - the relatively calm center of a tropical cyclone which is more than 1/2 surrounded by wall cloud.

d. 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 1 June through 30 November; in the Eastern Pacific, from 1 June through 15 November; and in the Central Pacific, from 1 June through 31 October. Hurricanes can of course occur during any month of the year.

e. Mission Identifier - the nomenclature assigned to tropical and subtropical cyclone aircraft reconnaissance missions for weather data identification. It comprises an agency - aircraft indicator followed by a Chief, Aerial Reconnaissance Coordination, All Hurricanes (CARCAH) assigned mission-system indicator.

f. Present Movement - the best estimate of the movement of the center of a tropical cyclone at a given time and at a given position.

g. Relocated - a term used on an advisory to indicate that a vector drawn from the preceding advisory position to the latest known position is not necessarily a reasonable representation of the cyclone's movement.

h. Subtropical Cyclones - nonfrontal, low-pressure systems comprising initially baroclinic circulations developing over subtropical waters. There are two types: (1) A cold low with circulation extending to the surface layer and maximum sustained winds generally occurring at a radius of about 100 miles or more from the pressure center. These cyclones sometimes metamorphose and become tropical storms or hurricanes. (2) A mesoscale cyclone originating in or near a frontolyzing zone of horizontal wind shear, with radius of maximum sustained winds generally less than 30 miles. The entire circulation sometimes encompasses an area initially no more than 100 miles in diameter. These marine cyclones may change in structure from cold to warm core. While generally short-lived, they may ultimately evolve into major hurricanes or into extratropical wave cyclones. Subtropical cyclones are classed according to intensity as follows:

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

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

i. Tropical Cyclone Plan of the Day - a coordinated mission plan which describes operational weather reconnaissance flights on the next 05Z to 05Z day committed to satisfy the data requirements for that day's coordinated DOC tropical and subtropical cyclone reconnaissance. Additionally, it identifies possible requirements in the succeeding 24-hour period.

j. Tropical Weather Systems -

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

(2) Tropical Wave. A trough or cyclonic curvature maximum in the trade-wind easterlies. The wave may reach maximum amplitude in the lower middle troposphere or may be the reflection of an upper troposphere cold-low or Equatorward extension of a middle-latitude trough.

(3) Tropical Cyclone. A nonfrontal low-pressure system of synoptic scale developing over tropical or subtropical waters and having definite organized circulation.

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

(b) Tropical Storm. A warm-core tropical cyclone in which the maximum sustained surface wind (1-minute mean) is 34 knots or greater, but less than 64 knots.

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

k. Vortex Fix - the location of the surface and/or flight level center of a tropical or subtropical cyclone obtained by reconnaissance aircraft penetration.

l. Wall Cloud - an organized band of cumuliform clouds immediately surrounding the center of a tropical cyclone.

CHAPTER 2

RESPONSIBILITIES OF COOPERATING AGENCIES

1. Department of Commerce (DOC) Responsibilities.

a. Provide timely dissemination of all significant information regarding tropical and subtropical cyclones to appropriate agencies, general public, and marine and aviation interests.

b. Through NWS - consult as necessary with Department of Defense (DOD) regarding day-to-day DOD requirements for cyclone assessments and attempt to meet these requirements within the capabilities of the Hurricane Warning Service; prepare through National Hurricane Center (NHC) and distribute to DOD the coordinated DOC reconnaissance and other meteorological data requirements to be provided by DOD on tropical/subtropical cyclones and disturbances; provide facility and administration support to OL-G, Air Weather Service (AWS) as agreed to by DOC and DOD; provide DOD basic meteorological information, warnings, forecasts, and associated prognostic reasoning concerning location, intensity, and forecast movement of tropical and subtropical cyclones in the following maritime areas and adjacent States and possessions of the United States:

(1) Atlantic Ocean (north of Equator including Caribbean Sea and Gulf of Mexico) - advices are the responsibility of the Director, NHC, Miami, FL. (NHC will consult with Fleet Weather Central (FWC), Norfolk, VA, prior to issuance of an initial advisory.)

(2) Eastern Pacific Ocean (north of the Equator and east of 140°W) - advices are the responsibility of the Meteorologist-in-Charge (MIC), Eastern Pacific Hurricane Center (EPHC), Redwood City, CA. (EPHC will consult with FWC, Pearl Harbor, HI, before issuance of an initial advisory.)

(3) Central Pacific Ocean (north of the Equator between 140°W and 180°) - advices are the responsibility of MIC, Central Pacific Hurricane Center (CPHC), Honolulu, HI. (CPHC will consult with FWC, Pearl Harbor, HI, and Detachment 4, 1 Weather Wing, Hickam AFB, HI, before issuance of an initial advisory.)

(4) Relating to (1), (2), (3) above, exchange of information is encouraged on subsequent warnings when significant changes are made, or as otherwise required.

c. Through the National Environmental Satellite Service (NESS) - operate DOC environmental satellite systems capable of providing coverage of meteorological conditions in the Tropics during the tropical cyclone season, and monitor and interpret DOC satellite imagery; obtain as necessary, National Aeronautic and Space Administration (NASA) research/development satellite data for NWS operational use; comply with NHC, EPHC, and CPHC satellite data requirements.

d. Through the National Data Buoy Office (NDBO) - develop, deploy, and operate environmental data buoy systems to support data requirements of NHC, EPHC, and CPHC.

e. Through the Environmental Research Laboratory (ERL)/Research Facilities Center (RFC) - provide weather reconnaissance flights as specified in Chapter 4, unless relieved of these responsibilities by the Administrator of the National Oceanic and Atmospheric Administration (NOAA) in order to participate in project STORMFURY.

2. DOD Responsibilities.

a. Provide NWS with timely dissemination of significant information received regarding tropical and subtropical cyclones.

b. Provide NHC, EPHC, and CPHC current DOD requirements for tropical cyclone advices.

c. Meet DOC requirements for aircraft reconnaissance and other special observations as agreed to by DOD and DOC.

d. Provide a 24-hour aircraft operation interface (Chief, Aerial Reconnaissance Coordination, All Hurricanes--CARCAH) at the National Hurricane Center.

e. Designate OL-G, AWS as the liaison to NHC and the military point of contact for NHC to request special DOD observations in support of this Plan, i.e., Defense Meteorological Satellite Program (DMSP) fixes, additional upper air observations, etc.

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

g. Provide access to Aerospace Defense Command (ADCOM) radar sites. (See Chapter 6.)

3. Department of Transportation (DOT) Responsibilities.

a. Provide NWS with timely dissemination of significant information received regarding tropical and subtropical cyclones.

b. Through the Federal Aviation Administration (FAA) - provide air traffic control, communication, and flight assistance services. In addition, FAA will provide access to Air Route Traffic Control Center (ARTCC) communication and radar facilities (see Chapter 6) and provide communication circuits for relay of weather information as required.

c. Through the U.S. Coast Guard (USCG) - provide personnel, vessel, and communication support to NDBO for development, deployment, and operation of environmental data buoy systems; provide surface observations to NWS from its coastal facilities and vessels; provide communication circuits for relay of weather observations to NWS in selected areas; and provide coastal broadcast facilities at selected locations for tropical storm/hurricane forecasts and warnings.

4. DOD, DOC, and DOT will cooperate in arranging an annual trip to the Caribbean and the Gulf of Mexico area to carry out a continuing and effective liaison of the warning service with the Directors of Meteorological Services, Air Traffic Control Agencies, and Disaster Preparedness Agencies of nations in those areas.

OBSERVATIONS, FORECASTS, AND RELATED INFORMATION TO BE FURNISHED BY NWS TO DOD

1. Observations - The National Hurricane Center (NHC), Eastern Pacific Hurricane Center (EPHC), and Central Pacific Hurricane Center (CPHC) will make available to Department of Defense (DOD) all significant tropical/subtropical cyclone observations that they receive.

2. Military Advisories.

a. General - NHC, EPHC, and CPHC will provide DOD with forecasts and related information for tropical and subtropical weather disturbances of depression intensity or greater. Forecasts will include advice as to location, movement, intensity, and dimension of these disturbances. Advisories will be disseminated through the NWS Weather Communications facility at Suitland, MD, to the Automated Weather Network (AWN) at Carswell AFB, TX, for further relay to DOD agencies. Military advisories will not be disseminated to the public. DOD forecasters who must give advice concerning an imminent operational decision may contact the appropriate Hurricane Center forecaster (see Chapter 1) when published military advisories require elaboration. Phone numbers for the NHC/EPHC/CPHC are published in Appendix D to Chapter 4.

b. Military Advisory Issue Frequency - The first military advisory will normally be issued when meteorological data indicate that a tropical or subtropical cyclone has formed. Subsequent advisories will be issued at 0400Z, 1000Z, 1600Z, and 2200Z (0300Z, 0900Z, 1500Z, 2100Z in the Eastern and Central Pacific). Advisories will continue to be issued until the system degenerates below depression level. At times, scheduled military advisories will be supplemented or updated to reflect new information showing important changes in position, movement, and intensity. Such advisories will be issued under the following circumstances and termed Special Advisories:

(1) When conditions require a hurricane watch or warning.

(2) When tropical storms change to hurricane or vice versa.

(3) When conditions require change or cancellation of an existing coastal warning.

(4) A tornado threat develops.

(5) When the forecaster believes other significant changes have occurred.

c. Military Advisory Content - Military advisories will contain appropriate information as shown in Form 1 of this chapter, Appendix A. Depending on the circulation intensity, advisories will contain when appropriate 12- and 24-hour forecasts with 48- and 72-hour outlooks valid from times based on the latest 6 hourly synoptic time.

d. Numbering of Advisories. All advisories will be numbered sequentially in the Eastern and Central Pacific, i.e., Advisory Number 1 on tropical depression (TD) 1, Advisory Number 2 on TD 1, Advisory Number 3 on Tropical Storm Anita, Advisory Number 4 on Hurricane Anita, Advisory Number 5 on TD 1, etc. Once the system is named in the Atlantic, that name will be retained on military advisories until no further advisories are issued on that system; advisory numbering will continue sequentially.

3. Other Information Provided to DOD.

a. Tropical Cyclone Discussion. Issued by NHC on named Atlantic storms at 0300Z, 0900Z, 1500Z, and 2100Z. Discussion will be disseminated for intragovernmental use only and will contain preliminary prognostic positions up to 72 hours; will describe objective techniques, synoptic features, and climatology used; will provide reasons for track changes; and will include plans for warning display. Additionally, the Saffir/Simpson Hurricane Scale (SSH) as described in Appendix C to this chapter will be included whenever the tropical cyclone is within 72 hours of landfall on the U.S. coast or a military installation.

b. Tropical Weather Outlook. Issued by NHC three times a day from 1 June to 30 November at 0530, 1130, and 1730 Eastern Local Time (ELT). The outlook will briefly describe both stable and potentially unstable areas out to 48 hours. A monthly summary of Atlantic tropical cyclone activity will be added to the Tropical Weather Outlook at the end of each month during the hurricane season.

c. Public Advisories. Issued by the appropriate Hurricane Warning Office (HWO) for any tropical cyclone threatening land in the Gulf of Mexico, Caribbean, or Western North Atlantic areas. In the Pacific, public advisories are issued for storms and hurricanes that are expected to affect the United States within 48 hours. Scheduled public advisories are issued at the same time scheduled military advisories are issued. When no coastal warnings are included, the 0400Z public advisory may be issued at 0230Z by NHC only. (Note: Public Advisories use statute miles for distance and miles per hour for speed.)

d. Atlantic and Gulf of Mexico Tropical Cyclone Position Estimates. The NWS HWO that issues the public advisory may also issue hourly Tropical Cyclone Position Estimates when the tropical cyclone is under effective surveillance and within 200 nautical miles of land-based radar. These estimates when issued will be prepared a short time before each hour except at hours when advisories are issued. Position estimates will be disseminated to the public, DOD, and other Federal agencies and will provide geographical positions in latitude and longitude, and also by distance and direction from a well-known point.

e. Storm Summaries. Storm summaries are written by storm coordination centers after subtropical and tropical cyclones have moved inland and public advisories have been discontinued. These summaries will reference the former storm name and be issued as long as the storm remnants pose a serious flooding threat. Storm summaries will be transmitted at 0500Z, 1100Z, 1700Z, and 2300Z. Format and content will follow that of Winter Storm Summaries (WSOM (Weather Service Operations Manual) C-42).

f. Marine Advisories. Issued by NHC, EPHC, and CPHC with the same frequency and at the same times as the Military Advisories. The content and format of these advisories are identical to those of the Military Advisories, but will not include a 48- and 72-hour extended outlook. Marine Advisories will be transmitted to high-seas shipping according to the details found in Worldwide Marine Weather Broadcasts, jointly published by U.S. Navy (USN) and NWS.

4. Abbreviated Headings. Abbreviated communications headings will be assigned to advisories on tropical and subtropical cyclones and other advices based on depression number (or storm name) and standard communication procedures. Details are found in appropriate communications manuals.

5. Designation of Tropical and Subtropical Cyclones.

a. Numbering of Depressions. Each depression will be assigned a number that will be retained throughout the life cycle of the cyclone; this number will not, however, be disseminated for depressions after they become storms or hurricanes. For each hurricane center's area, numbering will begin with 01 at the start of each calendar year. When forecast responsibility is passed from one warning center to another, the assigned number will be retained.

(1) For the Atlantic, Caribbean, and Gulf of Mexico, depression numbers will be assigned by NHC after advising the Fleet Weather Central (FWC) Norfolk.

(2) For the Pacific area east of longitude 140°W, depression numbers will be assigned by EPHC after advising the FWC Pearl Harbor.

(3) For the Pacific area west of longitude 140° W, depression numbers are assigned by the Joint Typhoon Warning Center (JTWC), Guam. CPHC will request numbers from JTWC.

*b. Naming of Tropical Storms and Hurricanes.

(1) 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 of Appendix B of this chapter will be used for identifying tropical storms and hurricanes in the Atlantic Ocean, Caribbean Sea, and Gulf of Mexico. After the sets have been used, the same sets

will be used again. The list of names in Appendix C of this chapter will be used for identifying tropical storms and hurricanes 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.

(2) Central Pacific.

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

(b) For tropical storms and hurricanes originating east of longitude 140°W, names will be assigned by EPHC. Tropical storms and hurricanes that cross longitude 140°W from either west or east will retain their original assigned name.

c. Numbering of Subtropical Storms. When a system becomes a subtropical storm, it will be assigned a storm number to indicate its sequence of occurrence among subtropical storms for that area. Numbering will begin with 1 and be consecutive, returning to 1 each new year.

*Note: The list of names included in this plan was adopted by the 32d Interdepartmental Hurricane Conference and will be implemented pending concurrence by the countries involved and the appropriate WMO Regional Associations.

WS Form C-13

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

*UPGRADED FROM
*DOWNGRADED TO

*SUBTROPICAL DEPRESSION
*TROPICAL DEPRESSION
*TROPICAL STORM

_____ (NAME/NUMBER) _____ MILITARY ADVISORY NUMBER SPECIAL/CORRECTED

NATIONAL WEATHER SERVICE _____ CITY _____ STATE

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

_____ (WARNINGS)

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

POSITION EXCELLENT / GOOD / FAIR / ACCURATE WITHIN _____ NM

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

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

FORECAST VALID _____ Z _____ N _____ W.
MAX SUSTAINED WINDS _____ KT WITH GUSTS TO _____ KT.
MAX SUSTAINED WINDS OVER INLAND AREAS _____ KT WITH GUSTS TO _____ KT.
RADIUS OF 50-KT WINDS _____ NE _____ SE _____ SW _____ NW QUAD.
FORECAST VALID _____ Z _____ N _____ W.
MAX SUSTAINED WINDS OF _____ KT WITH GUSTS TO _____ KT.
#MAX SUSTAINED WINDS OVER INLAND AREAS _____ KT WITH GUSTS TO _____ KT.
+RADIUS OF 34-KT WINDS _____ NE _____ SE _____ SW _____ NW QUAD.
RADIUS OF 50-KT WINDS _____ NE _____ SE _____ SW _____ NW QUAD.

(12 hr. forecast not included for Atlantic Depressions or Subtropical Storms)

(AVIATION ADVISORY ENDS HERE)

STORM-TIDE OF (Not used in Central Pacific)
HEAVY PRECIPITATION (Not used in Central Pacific)
(Marine and Depression Advisories end here)

EXTENDED OUTLOOK FOR INTRAGOVERNMENTAL USE ONLY

OUTLOOK VALID _____ Z _____ N _____ W.
MAX SUSTAINED WINDS _____ KT WITH GUSTS TO _____ KT.
#MAX SUSTAINED WINDS OVER INLAND AREAS _____ KT WITH GUSTS TO _____ KT.
RADIUS OF 50-KT WINDS _____ NE _____ SE _____ SW _____ NW QUAD.
OUTLOOK VALID _____ Z _____ N _____ W.
MAX SUSTAINED WINDS _____ KT WITH GUSTS TO _____ KT.
#MAX SUSTAINED WINDS OVER INLAND AREAS _____ KT WITH GUSTS TO _____ KT.
RADIUS OF 50-KT WINDS _____ NE _____ SE _____ SW _____ NW QUAD.

(Extended Outlook not included for Subtropical Storms)

+RECONNAISSANCE PLANS INCLUDING SCHEDULED FIXES _____

NEXT ADVISORY AT _____ Z. (FORECASTER _____)
(@ FOR USE IN ATLANTIC ONLY) (+ CENTRAL PACIFIC ONLY) (* 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.

Excellent--pos accurate within 10 nm
Good--within 20 nm
Fair--within 40 nm

ATLANTIC NAMES

1978	1979	1980	1981	1982	1983
AMELIA	ANA	ALLEN	ARLENE	ALBERTO	ALICIA
BESS	BOB	BONNIE	BRET	BERYL	BARRY
CORA	CLAUDETTE	CHARLEY	CARLA	CHRIS	CHANTAL
DEBRA	DAVID	DANIELLE	DENNIS	DEBBY	DEAN
ELLA	ELENA	EARL	EMILY	ERNESTO	ERIN
FLOSSIE	FREDERIC	FRANCES	FLOYD	FLORENCE	FELIX
GRETA	GLORIA	GEORGES	GERT	GILBERT	GABRIELLE
HOPE	HENRI	HERMINE	HARVEY	HELENE	HUGO
IRMA	ISABEL	IVAN	IRENE	ISAAC	IRIS
JULIET	JUAN	JEANNE	JOSE	JOAN	JERRY
KENDRA	KATE	KARL	KATRINA	KEITH	KAREN
LOUISE	LARRY	LISA	LENNY	LESLIE	LUIS
MARTHA	MINDY	MITCH	MARIA	MICHAEL	MARILYN
NOREEN	NICOLAS	NICOLE	NATE	NADINE	NOEL
ORA	ODETTE	OTTO	OPHELIA	OSCAR	OPAL
PAULA	PETER	PAULA	PHILIPPE	PATTY	PABLO
ROSALIE	ROSE	RICHARD	RITA	RAFAEL	ROXANNE
SUSAN	SAM	SHARY	STAN	SANDY	SEBASTIEN
TANYA	TERESA	TOMAS	TAMMY	TONY	TANYA
VANESSA	VICTOR	VIRGINIE	VINCE	VALERIE	VAN
WANDA	WANDA	WALTER	WILMA	WILLIAM	WENDY

EASTERN PACIFIC NAMES

1978	1979	1980	1981
ALETTA	ANDRES	AGATHA	ADRIAN
BUD	BLANCA	BLAS	BEATRIZ
CARLOTTA	CARLOS	CELIA	CALVIN
DANIEL	DOLORES	DARBY	DORA
EMILIA	ENRIQUE	ESTELLE	EUGENE
FICO	FEFA	FRANK	FERNANDA
GILMA	GUILLERMO	GEORGETTE	GREG
HECTOR	HILDA	HOWARD	HILARY
IVA	IGNACIO	ISIS	IRWIN
JOHN	JIMENA	JAVIER	JOVA
KRISTY	KEVIN	KAY	KNUT
LANE	LINDA	LESTER	LIDIA
MIRIAM	MARTY	MADELINE	MAX
NORMAN	NORA	NEWTON	NORMA
OLIVIA	OLAF	ORLENE	OTIS
PAUL	PAULINE	PAINE	PILAR
ROSA	RICK	ROSLYN	RAMON
SERGIO	SANDRA	SEYMOUR	SELMA
TARA	TERRY	TINA	TODD
VICENTE	VIVIAN	VIRGIL	VERONICA
WILLA	WALDO	WINIFRED	WILEY

CENTRAL & WESTERN PACIFIC NAMES

Column 1	Column 2	Column 3	Column 4
ANDY	ABBY	ALEX	AGNES
BESS	BEN	BETTY	BILL
CECIL	CARMEN	CARY	CLARA
DOT	DOM	DINAH	DOYLE
ELLIS	ELLEN	ED	ELSIE
FAYE	FORREST	FREDA	FABIAN
GORDON	GEORGIA	GERALD	GAY
HOPE	HERBERT	HOLLY	HAZEN
IRVING	IDA	IKE	IRMA
JUDY	JOE	JUNE	JEFF
KEN	KIM	KELLY	KIT
LOLA	LEX	LYNN	LEE
MAC	MARGE	MAURY	MAMIE
NANCY	NORRIS	NINA	NELSON
OWEN	ORCHID	OGDEN	ODESSA
PAMELA	PERCY	PHYLLIS	PAT
ROGER	RUTH	ROY	RUBY
SARAH	SPERRY	SUSAN	SKIP
TIP	THELMA	THAD	TESS
VERA	VERNON	VANESSA	VAL
WAYNE	WYNNE	WARREN	WINONA

SAFFIR/SIMPSON'S HURRICANE (SSH) SCALE

ONE

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

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

TWO

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

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

THREE

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

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

FOUR

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

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

FIVE

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

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

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* Definition of a sustained wind (from Fujita and Simpson 1972) - A sustained wind is one that 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.

CHAPTER 4

AIRCRAFT RECONNAISSANCE

1. General. All Department of Commerce (DOC) tropical and subtropical cyclone aircraft reconnaissance needs will be requested and provided in accordance with the procedures of this chapter. Department of Defense (DOD) will attempt to fulfill all DOC requirements; however, based on stated DOC needs, DOD will normally be prepared to generate up to five reconnaissance aircraft sorties per day. Requirements exceeding this capability will be executed on a "resources permitting" basis. Research aircraft of the Research Facilities Center (RFC) may be diverted to fulfill urgent operational requirements.

2. Responsibilities.

a. DOD has operational reconnaissance responsibility for providing vortex fixes/data and investigative flights in response to DOC needs.

b. RFC may be requested to:

(1) Provide augmentation to the U.S. Air Force (USAF) for operational aircraft reconnaissance with high-density/accuracy data, when storms are within 24 hours of landfall of the continental United States.

(2) Provide augmentation capabilities for USAF aircraft reconnaissance when DOC needs exceed the capabilities of DOD resources.

(3) Assume responsibility for hurricane reconnaissance over foreign airspace that may be restricted for military operations.

c. Additionally, RFC may conduct research flights which assume an operational responsibility to the hurricane centers.

3. Control of Aircraft. Operational control of aircraft engaged in tropical or subtropical cyclone reconnaissance will be exercised by the operating agencies.

4. Joint Reconnaissance Requirements.

a. Meteorological Parameter Requirements. Data needs in priority order are:

(1) Geographical position of vortex center (surface center if known).

(2) Central sea-level pressure (by dropsonde or extrapolation from within 1,500 feet of sea surface).

(3) Minimum 700-millibar height (if available).

(4) Wind profile data (surface and flight level).

(5) Temperature (flight level).

(6) Sea-surface temperature.

(7) Dewpoint temperature (flight level).

(8) Height of eye wall.

b. Meteorological Instrument Capabilities. Required aircraft reconnaissance data instrument capabilities are as follows:

(1) Data positions - within 10 nautical miles.

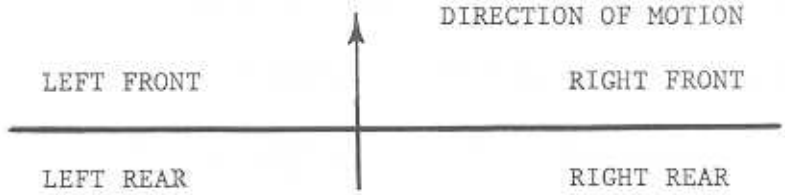
(2) Sea-level pressures - plus or minus 2 millibars.

(3) Pressure heights - plus or minus 10 meters.

(4) Temperatures (including dewpoint and sea-surface temperature (SST) plus or minus 0.5° C.

(5) Winds - speed plus or minus 5 knots; direction plus or minus 10°.

c. Standard Flight Patterns. Operational hurricane reconnaissance flights will fly designated flight patterns (Appendix A of this chapter) that use a quadrant system based upon the predicted direction of motion of the cyclone center. (See following diagram.) A tasked pattern may be adjusted by the flight meteorologist to best fulfill data requirements within operational capabilities of the aircraft or agency concerned.



d. High-Density Accuracy Requirements. DOC requires rapid acquisition of high-density/accuracy data. Only a limited number of aircraft now have the capability to meet these requirements. DOC requests for aircraft reconnaissance should include the requirements for these resources to be committed to a particular system(s).

5. Reconnaissance Planning and Flight Notification.

a. DOC Requests for Aircraft Reconnaissance Data.

(1) National Hurricane Center (NHC) will coordinate with Eastern Pacific Hurricane Center (EPHC) and Central Pacific Hurricane Center (CPHC) to determine a list of the total DOC requirements for data on tropical and subtropical cyclones or disturbances for the next 24-hour period

(0500Z - 0500Z) and an outlook for the succeeding 24-hour period. This coordinated request will be provided to Chief, Aerial Reconnaissance Coordination, All Hurricanes (CARCAH) as soon as possible,but not later than (NLT) 1630Z each day (in the format of Form 1, this chapter). Amendments will be provided as required.

(2) From this coordinated DOC request, CARCAH will task reconnaissance missions to meet the DOC requirements. When DOC needs exceed DOD and RFC resources, CARCAH will coordinate with NHC to establish priorities of accomplishment.

(3) The following requests can be anticipated for a forecast or actual storm location:

(a) Atlantic, Gulf of Mexico, and Caribbean - up to four 6-hourly fixes per day when a storm is within 500 nautical miles of landfall west of 55°W and north of 8°N, and up to eight 3-hourly fixes per day when a storm is forecast to be within 300 nautical miles of the U.S. coast, Puerto Rico, Virgin Islands, or a DOD installation.

(b) Eastern and Central Pacific - up to two consecutive 6-hourly fixes per day when a storm is within 300 nautical miles of landfall or a DOD installation.

(c) Investigative flights may be requested as required for disturbances in areas defined in paragraphs (a) and (b) above (i.e., one or two flights per day dependent upon proximity of landfall and upon known or suspected stage of development).

(d) Exceptions may be made when additional reconnaissance is essential to carry out warning responsibilities.

b. DOD Aircraft Reconnaissance Responsiveness.

(1) Notification of requirements must occur early enough to allow 16 hours plus en-route flying time to the area of concern.

(2) The "Succeeding Day Outlook" portion of the Tropical Cyclone Plan of the Day (TCPOD) provides advance notification of requirements and authorizes units to pre-position aircraft.

(3) When circumstances do not allow the appropriate notification lead time, the mission will be levied as "resources permitting."

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

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

(1) Preparation. CARCAH will prepare the DCPOD daily during the period from 1 June through 30 November and at other times during the year as required. CARCAH will coordinate the TCPOD with NHC, Keesler Weather Reconnaissance Coordination Center (KWRCC) and RFC before publication.

(a) TCPOD will list all DOC-required tropical/subtropical reconnaissance operational missions. The Remarks section of the TCPOD will include appropriate comments whenever research and operational flights overlap.

(b) DOD-required tropical or subtropical cyclone reconnaissance missions in the Atlantic or the Pacific west to 180° will also be listed in the TCPOD and identified as Navy or USAF requirements.

(c) Amendments to the TCPOD will be prepared only when requirements change.

(2) Dissemination. The TCPOD will be made available to all appropriate agencies that provide support to or exercise control of reconnaissance missions or that are a part of the hurricane warning service. The TCPOD will be disseminated by 1800Z each day. Amendments will be disseminated as required.

d. Air Traffic Control (ATC) Clearances.

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

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

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

(4) Dropsonde Releases. Dropsonde releases will be coordinated with the appropriate Air Route Traffic Control Center (ARTCC) and participating aircraft if within controlled airspace, and with participating aircraft only, if outside controlled airspace. Contact with participating aircraft may be made on 123.05 MHz, 304.8 MHz, or 4701 KHz.

6. Reconnaissance Effectiveness Criteria.

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

(1) ON-TIME - Fix is made not earlier than 1 hour before nor later than 1/2 hour after scheduled fix time. Investigative aircraft are within 250 nautical miles of the specified coordinates by the scheduled time.

(2) EARLY - Fix is made from 1 hour before scheduled fix time to half of the time interval to the preceding scheduled fix (not to exceed 3 hours).

(3) LATE - Fix is made within the interval from 1/2 hour after scheduled fix time (not to exceed 3 hours). Investigative aircraft are within 250 nautical miles of specified coordinates no later than 2 hours after scheduled time.

(4) MISSED - Data are not obtained within the parameters specified for on-time, early, or late.

b. NHC will provide CARCAH a written assessment of the reconnaissance mission anytime its timeliness or quality is outstanding or substandard. Unusual circumstances such as forecast position error, diffuse systems, and flight limitations will be considered. Requirements levied as "resources permitting" will not be assessed.

7. Aerial Reconnaissance Weather Encoding and Reporting.

a. Horizontal and Vertical. Horizontal meteorological observations and vertical observations will be coded and transmitted in RECCO code and TEMP DROP Code, respectively. En-route RECCO observations will be taken and transmitted at least hourly until the aircraft is within 200 nautical miles of the center of the storm at which time observation frequency will become at least every 30 minutes.

b. Vortex Data. The detailed Vortex Data Message (Form 3 of this chapter) will be prepared with all observed vortex fix information for all scheduled fixes. For intermediate fixes, either an abbreviated or detailed Vortex Data Message may be transmitted, depending upon availability of information and forecaster requirements.

c. Center Fix Data. All radar fix reports and other type aircraft center fixes will be made in plain text and appended to the RECCO observation also taken at fix time. Remarks stating the degree of confidence should be included for radar fixes in the same manner as in Chapter 6, paragraph 2.b.

d. Supplementary Vortex Data. Penetration and collection of supplementary vortex data on operational flight patterns A and B will normally start at 700 millibars at a radius of 80 nautical miles from the center as determined by the flight meteorologist. The supplementary vortex data required are as shown in Form 4 of this chapter. Note: Present weather reconnaissance equipment is marginal in satisfying these requirements; data will be collected as close to stated requirements as possible and within the capabilities of the flight crew.

e. Postflight Debriefing. At the forecaster's request, the flight meteorologist will provide either an airborne or postflight debriefing to the appropriate hurricane center.

f. Mission Identifier. Each reconnaissance report will include the mission identifier as the opening text of the message. Regular weather and hurricane reconnaissance messages will include the 5-digit agency/aircraft indicator followed by the CARCAH-assigned mission-system indicator. Elements of the mission identifier are:

Agency - Aircraft Indicator -- Mission System Indicator

Agency - Aircraft Number	# of missions this system (2 digits)	Depression # or XX if not a depression or greater (2 digits)	Storm name or words CYCLONE or DISTURB
AF plus last 3 digits of tail number			
NOAA plus last digit of reg. number			

EXAMPLES:

AF985	01XX	DISTURB	(Air Force aircraft 985 on the first mission to investigate a disturbance.)
AF987	0503	CYCLONE	(Air Force aircraft 987 on the fifth mission on depression #3. Invest or fix as specified in TCPOD.)
NOAA2	0701	AGNES	(NOAA aircraft 42RF on the seventh mission to fix depression #1,which has acquired the name AGNES.)

g. Observation Numbering and Content.

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

EXAMPLE:

AF966 0308 EMMY OB 1
97779 TEXT TEXT...DPTD KBIX AT 102100Z ETA 31.5N 75.0W
at 110015Z

(2) All observations (RECCO, Vortex, Supplemental, and Dropsonde) from the first to the last will be numbered sequentially. There is, however, one exception: When an aircraft is diverted from another mission to an NHC-requested investigative or storm mission, the next observation from the diverted aircraft will be labeled OB 1, use the CARCAH assigned mission identifier, and will include remarks giving time of diversion and ETA to coordinates of interest.

EXAMPLE:

AF968 01XX DISTURB OB 1
97779 TEXT TEXT...DPTD FOXTROT TRACK AT 051438Z ETA 18N
85W AT 051630Z

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

EXAMPLE:

AF987 0308 EMMY OB 6
97779 TEXT TEXT...OBS 1 THRU 5 XMTD AS AF987 0308 CYCLONE.

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

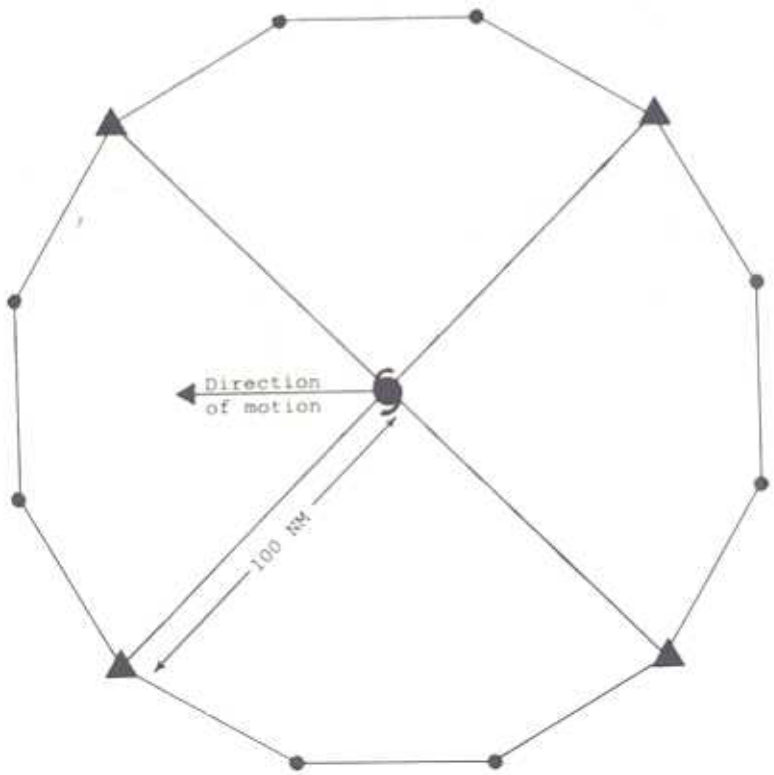
EXAMPLE:

AF553 0308 EMMY OB 16
XXAA TEXT TEXT...LAST REPORT ETA KBIX 110910Z OBS 1
THRU 10 and 12 THRU 16 KMIA OB 11 KMHR

OPERATIONAL FLIGHT PATTERN "A"

Provides vortex and peripheral data on tropical and subtropical cyclones including two 6-hourly and intermediate fixes.

DATA REQUIREMENTS



OBSERVATION DETAILS

1. Flight level - normally 700 millibars, but may be low level if requested.

2. RECCO (Section 1 plus 4ddff and 9ViTwTwTw) is required for each transit of a triangle position. Transmit immediately, RECCO (Section 3 plus 9ViTwTwTw) is required for each transit of a circle position. Section 3 data are appended to next RECCO (Section 1) observation. Groups with indicator 4 or 9 are included in observations only when surface winds are discernable or flight is at low level.

3. Supplementary Vortex data are required for each radial flown inbound or outbound. Message is normally prepared and transmitted after completion of radial legs in each quadrant.

4. On each transit of the center a fix will be made and a Vortex Data Message completed. If it is scheduled fix, the Detailed Vortex Data Message will be completed using data gathered since the previous fix and will be transmitted immediately. If it is an intermediate (nonscheduled) fix, an Abbreviated Vortex Data Message using data gathered since the previous fix may be prepared in lieu of the detailed message and transmitted immediately. Center dropsonde data will also be provided for scheduled fixes made at 700 millibars or above.

5. Dropsonde data are required in each quadrant at triangle positions once per mission.

6. Entry and exit headings are 45° off cyclone direction of motion as specified, or its reciprocal (ZZZ + 45) or (ZZZ + 180) +45)). These radial headings should be maintained with $\pm 20^{\circ}$.

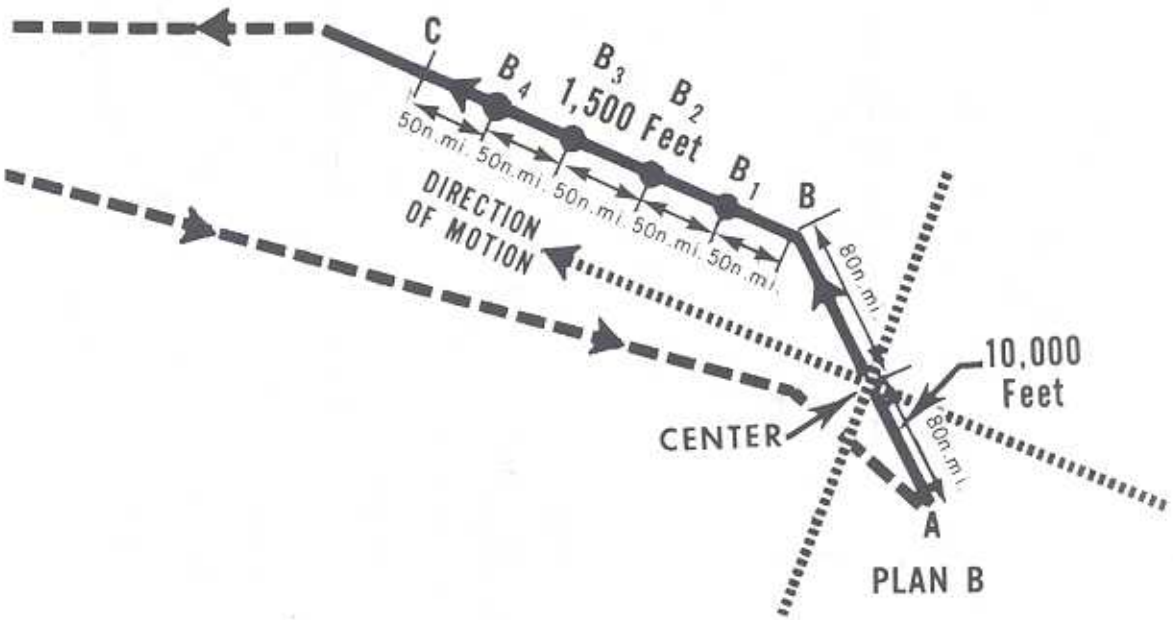
7. Current weather reconnaissance capability may preclude complete and timely satisfaction of these requirements; peripheral dropsonde soundings will be attempted whenever deemed feasible by flight meteorologist.

RECOMMENDED PATTERN "A" EXECUTION

CHAPTER 4
APPENDIX A
ATTACHMENT 2

OPERATIONAL FLIGHT PATTERN "B"

Provides vortex data on tropical and subtropical cyclones too distant for more than one vortex fix.



OBSERVATION DETAILS

1. RECCO (Section 1 plus 4ddff and 9ViTwTwTw) is required for each transit of a triangle position. Transmit immediately. RECCO (Section 3 plus 9ViTwTwTw) is required for each transmit of a circle position. Section 3 data are appended to next RECCO (Section 1) observation. Groups with indicator 4 or 9 are included in observations only when surface winds are discernable or flight is at low level.

2. Supplementary Vortex Data are required for inbound and outbound radials.

3. Detailed Vortex Data message and center dropsonde report are required.

OPERATIONAL PATTERNS C-1 THROUGH C-4 PROVIDE VORTEX AND PERIPHERAL DATA ON DIFFUSE TROPICAL OR SUBTROPICAL CYCLONES

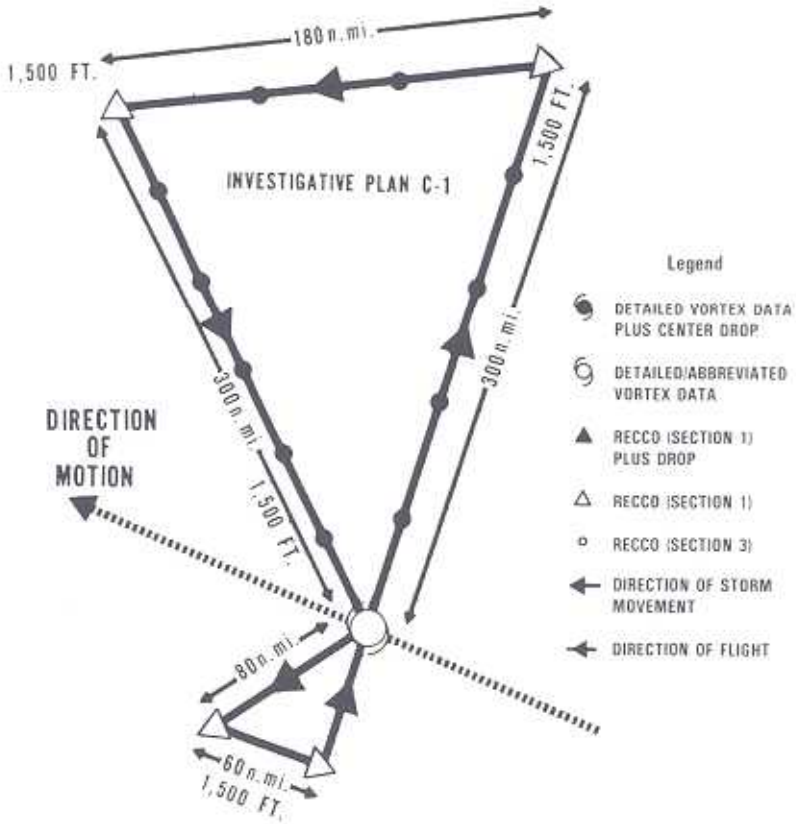
OBSERVATION DETAILS

1. RECCO (Section 1 plus 4ddff and 9ViTwTwTw) is required for each transit of a triangle. RECCO (Section 3 plus 9ViTwTwTw) is required for each transit of a circle position. Section 3 data are appended to next RECCO (Section 1) observation or Abbreviated/Detailed Vortex Message. Group 4 is included in observations only when surface winds are discernable.

2. Abbreviated/Detailed Vortex Data Message is required for each transit of the center when applicable.

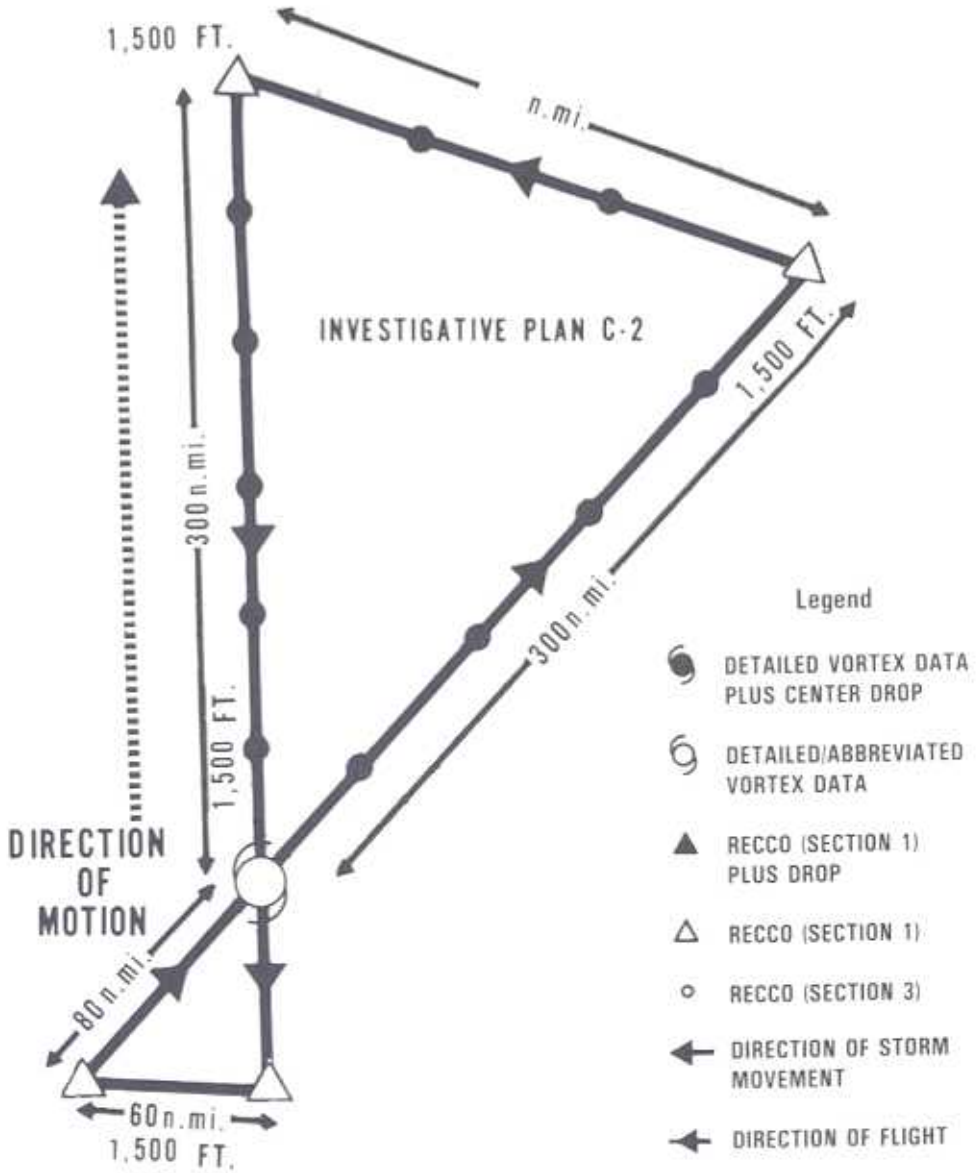
3. The maximum flight level wind observed on an outbound radial will be appended to the next RECCO observation.

OPERATIONAL FLIGHT PATTERN C-1

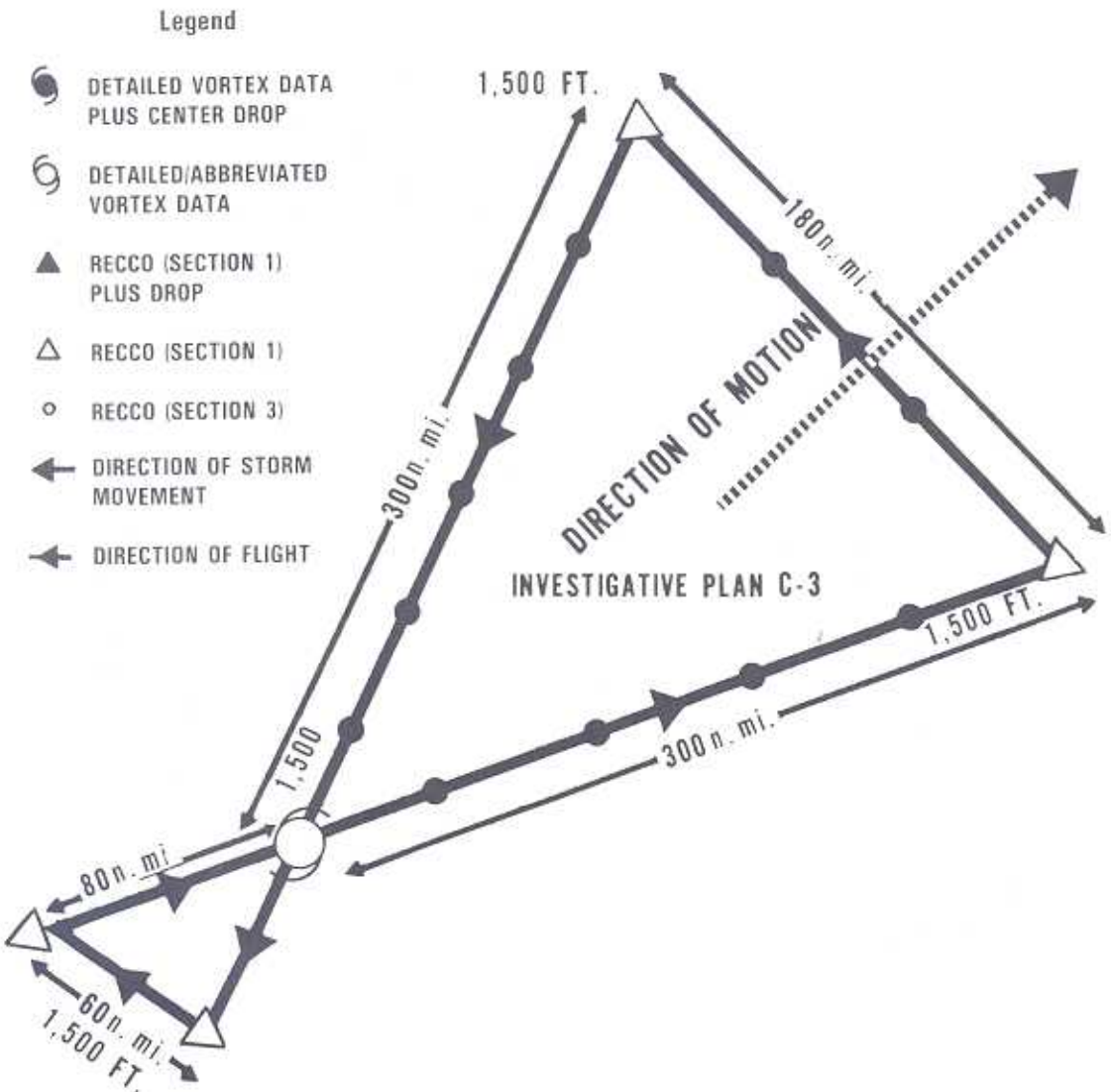


CHAPTER 4
APPENDIX A
ATTACHMENT 3
FIGURE 2

OPERATIONAL FLIGHT PATTERN C-2

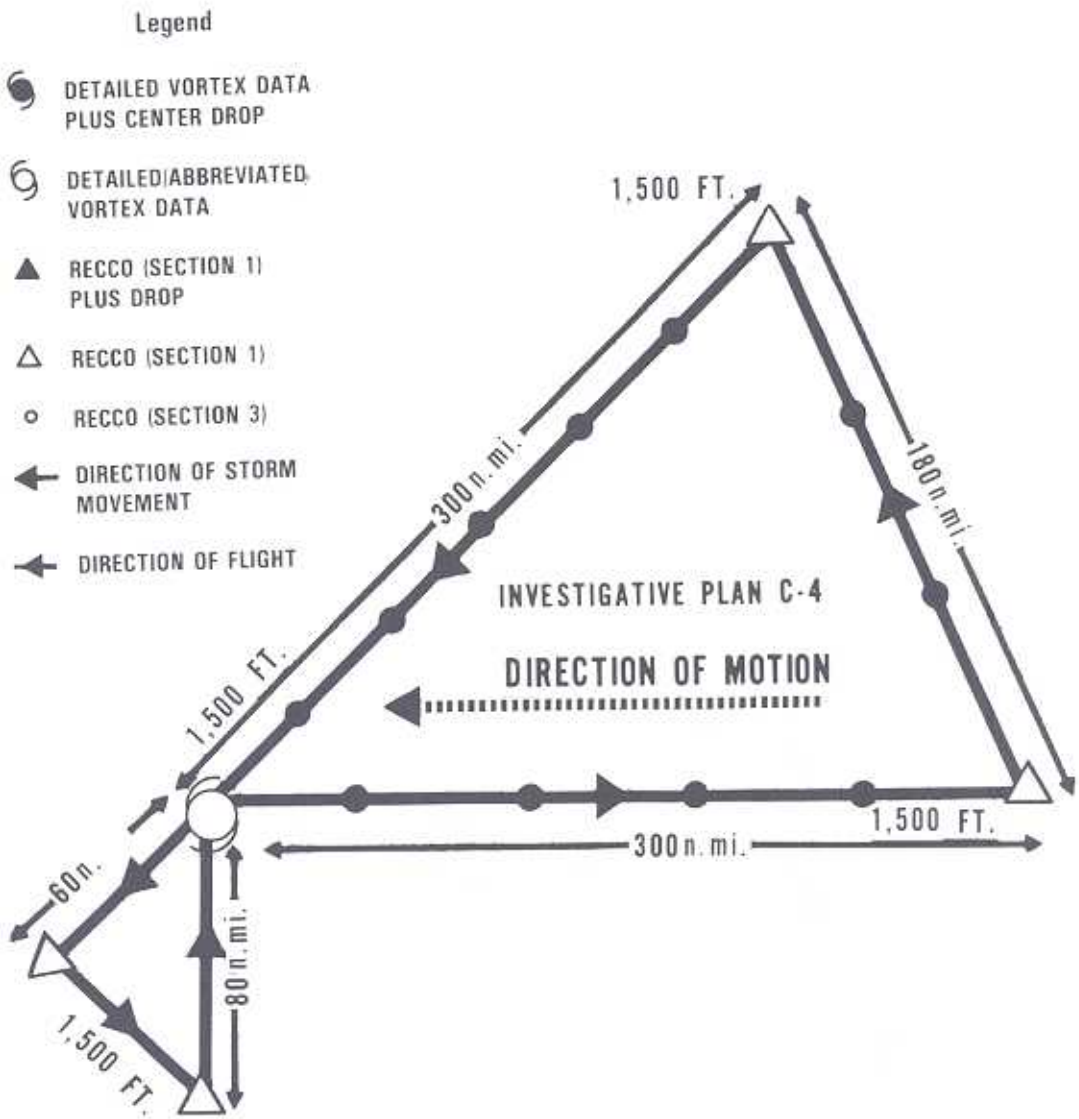


OPERATIONAL FLIGHT PATTERN C-3



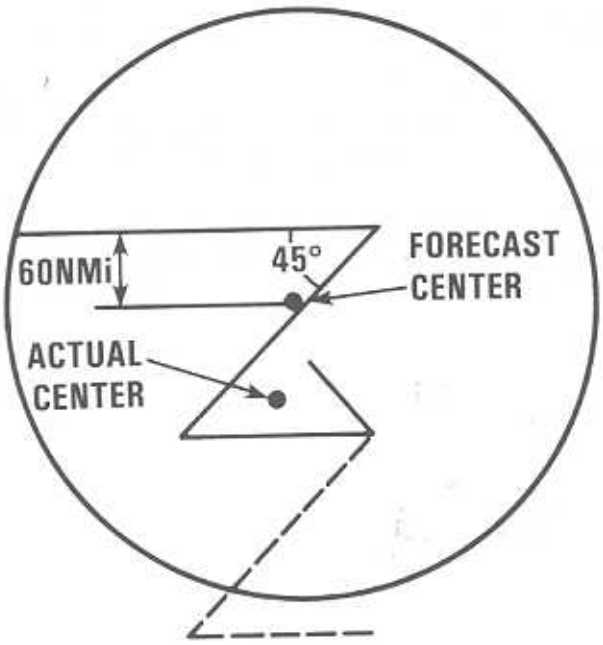
CHAPTER 4
APPENDIX A
ATTACHMENT 3
FIGURE 4

OPERATIONAL FLIGHT PATTERN C-4



OPERATIONAL FLIGHT PATTERN DELTA

Provides a suggested approach to the investigation of a disturbance to ascertain the existence or nonexistence of a closed circulation, supply RECCO observations in required areas and locate the vortex center.



1. Flight altitude - normally 1,500 feet, but may be adjusted as required.

2. Section 1 RECCO observations plus 4ddff and 9ViTwTwTw required every 30 minutes with section 3 RECCO plus 9ViTwTwTw; Section 1 or Section 3 RECCO required at turn points.

3. Detailed Vortex Data Message required if vortex fix is made.

DISCUSSION:

The Delta pattern is designed to provide the flexibility required in the investigation of a disturbance as follows:

1. The pattern is converted west-east to a mirror image if entry is to be made from the east.

2. The length of the legs are to be adjusted during the pattern to coincide with cyclonic circulation wind shifts, i.e., turn points are selected by the flight meteorologist after observing appropriate sustained wind shifts.

3. If observed data indicate that the aircraft is on the southern side of the circulation, the pattern is converted south-north to a mirror image pattern to enable investigation in the proper areas.

4. If data indicate to the flight meteorologist that the aircraft is far north of any existing circulation, the pattern is extended (as shown by dashed lines) to allow further investigation.

5. If the location of the center becomes obvious, the pattern may be broken off to accomplish a vortex fix. Forecast agencies may request changes in the pattern as dictated by their data requirements.

NHOP COORDINATED REQUEST FOR AIRCRAFT RECONNAISSANCE

___ Original
___ Amendment
(Check One)

I. ATLANTIC REQUIREMENTS

STORM NAME DEPRESSION # SUSPECT AREA	FIX OR ON STAT-ION TIME	COORD-INATES	FLIGHT PATTERN	FCST MVMT	HIGH DENS ACCY REQT	PRIO RITY

SUCCEEDING DAY OUTLOOK _____

_____

_____

REMARKS _____

_____

II. EASTERN AND CENTRAL PACIFIC

STORM NAME DEPRESSION # SUSPECT AREA	FIX OR ON STAT-ION TIME	COORD-INATES	FLIGHT PATTERN	FCST MVMT	HIGH DENS ACCY REQT	PRIO RITY

SUCCEEDING DAY OUTLOOK _____

_____

REMARKS _____

_____

III. DISTRIBUTION 124

A. TO CARCAH BY 1630Z OR AMEND AT ANY TIME

B. DATE _____ TIME _____ FCSTR INIT _____

CHAPTER 4
APPENDIX B
FORM 2

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

FM OL-G HQ AWS CORAL GABLES FL/CARCAH

TO (MAC-APPROVED ADDRESSEES) /(NOAA-APPROVED ADDRESSEES)

- -

SUBJECT TROPICAL CYCLONE
RECON POD FROM _____Z (MONTH)(YEAR) TO _____Z (MONTH)(YEAR) FOLLOWS

I. ATLANTIC

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

FLIGHT ONE (NHC PRIORITY, if applicable)

A. _____Z — FIX TIMES/ON STATION TIMES (Resources Permitting if Applicable)
_____Z

B. _____ — MISSION IDENTIFIER

C. _____Z — ETD

D. _____ — DEPARTURE STATION

E. _____ — FORECAST POSITION/STORM NAME

F. _____ — DESTINATION STATION

G. _____ — FLIGHT PATTERN

H. _____ — FORECAST MOVEMENT

I. _____ — REMARKS

FLIGHT TWO (if applicable, same as FLIGHT ONE)

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

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

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

II. EASTERN AND CENTRAL PACIFIC (Same as in ATLANTIC)

BT
NNNN

DATE	SCHEDULED FIX TIME	AIRCRAFT NUMBER	FLIGHT METEOROLOGIST

MANOP HEADING (PRECEDENCE IMMEDIATE)

MISSION IDENTIFIER AND OBSERVATION NUMBER

(ABBREVIATED) (DETAILED) VORTEX DATA MESSAGE

A		Z	DATE AND TIME OF FIX
B	DEG	MIN N S	LATITUDE OF VORTEX FIX
	DEG	MIN E W	LONGITUDE OF VORTEX FIX
C	MB	M	MINIMUM HEIGHT AT STANDARD LEVEL
D		KT	ESTIMATE OF MAXIMUM SURFACE WIND OBSERVED
E	DEG	NM	BEARING AND RANGE FROM CENTER OF MAXIMUM SURFACE WIND
F	DEG	KT	MAXIMUM FLIGHT LEVEL WIND NEAR CENTER
G	DEG	NM	BEARING AND RANGE FROM CENTER OF MAXIMUM FLIGHT LEVEL WIND
H		MB	MINIMUM SEA LEVEL PRESSURE COMPUTED FROM DROPSONDE OR EXTRAPOLATED FROM WITHIN 1500 FT OF SEA SURFACE
I	C/	M	MAXIMUM FLIGHT LEVEL TEMP/PRESSURE ALTITUDE OUTSIDE EYE
J	C/	M	MAXIMUM FLIGHT LEVEL TEMP/PRESSURE ALTITUDE INSIDE EYE
K	C/	C	DEWPOINT TEMP/SEA SURFACE TEMP INSIDE EYE
L			EYE CHARACTER: Closed wall, poorly defined, open SW, etc.
M			EYE SHAPE/ORIENTATION/DIAMETER. Code eye shape as: C – Circular, CO – Concentric; E – Elliptical. Transmit orientation of major axis in tens of 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 NM, length of minor axis 5NM. CO8–14 – Concentric eye, diameter inner eye 8 NM, outer eye 14 NM.
N	DEG	MIN N S	CONFIRMATION OF FIX: Coordinates and Time
	DEG	MIN E W	
		Z	
O	/		FIX DETERMINED BY/FIX LEVEL FIX DETERMINED BY: 1 – Penetration; 2 – Radar; 3 – Wind; 4 – Pressure; 5 – Temperature. FIX LEVEL (Indicate surface center if visible; indicate both surface and flight level centers only when same): 0 – Surface; 1 – 1500 ft; 8 – 850 mb; 7 – 700 mb; 5 – 500 mb; 4 – 400 mb; 3 – 300 mb; 2 – 200 mb; 9 – Other.
P	/	NM	NAVIGATION FIX ACCURACY/METEOROLOGICAL ACCURACY
Q			REMARKS

INSTRUCTIONS: Items A through G (and H when extrapolated) are transmitted from the aircraft immediately following the fix. The remainder of the message is transmitted as soon as available for scheduled fixes and at the ARWO's discretion for unscheduled (intermediate) fixes.

DATE	AIRCRAFT NUMBER	FLIGHT METEOROLOGIST
MANOP HEADING (PRECEDENCE IMMEDIATE)		
MISSION IDENTIFIER AND OBSERVATION NUMBER		

SUPPLEMENTARY VORTEX DATA MESSAGE

1 AZIMUTH	2 ddDEG DEG	3 FLZZZ FL					
4 LEFT RIGHT	5 FRONT REAR	6 QUAD					
7 DjHHH 8	8 DTTQQ 8	9 DjHHH 4	10 DTTQQ 4	11 DjHHH 3	12 DTTQQ 3	13 DjHHH 1	14 DTTQQ 1
15 DjHHH Ø	16 DTTQQ Ø	17 64RRR 64	18 50RRR 50	19 34RRR 34	20 MXFFF MX	21 BBBRR	22 hhhhh
23 LEFT RIGHT	24 FRONT REAR	25 QUAD					
26 DjHHH 8	27 DTTQQ 8	28 DjHHH 4	29 DTTQQ 4	30 DjHHH 3	31 DTTQQ 3	32 DjHHH 1	33 DTTQQ 1
34 DjHHH Ø	35 DTTQQ Ø	36 64RRR 64	37 50RRR 50	38 34RRR 34	39 MXFFF MX	40 BBBRR	41 hhhhh
42 LEFT RIGHT	43 FRONT REAR	44 QUAD					
45 DjHHH 8	46 DTTQQ 8	47 DjHHH 4	48 DTTQQ 4	49 DjHHH 3	50 DTTQQ 3	51 DjHHH 1	52 DTTQQ 1
53 DjHHH Ø	54 DTTQQ Ø	55 64RRR 64	56 50RRR 50	57 34RRR 34	58 MXFFF MX	59 BBBRR	60 hhhhh
61 LEFT RIGHT	62 FRONT REAR	63 QUAD					
64 DjHHH 8	65 DTTQQ 8	66 DjHHH 4	67 DTTQQ 4	68 DjHHH 3	69 DTTQQ 3	70 DjHHH 1	71 DTTQQ 1
72 DjHHH Ø	73 DTTQQ Ø	74 64RRR 64	75 50RRR 50	76 34RRR 34	77 MXFFF MX	78 BBBRR	79 hhhhh
Remarks							

CODE FIGURES	
dd	– True direction in tens of degrees (pattern orientation based on direction of storm motion).
zzz	– Flight level in hundreds of feet (absolute altitude below 5500 feet).
D	– Group indicator designating the distance from the center in nautical miles (8–80, 4–45, 3–30, 1–15, Ø–center).
hhhhh	– Height of the eyewall in feet.
jHHH	– Pressure height data in RECCO format.
TTQQ	– Temperature/dewpoint in degrees Celsius. Add 50 for negative values.
FFF	– Maximum observed wind speed in knots.
BBBRR	– Bearing and range from the center of MXFFF.
RRR	– Radial extent of 64 kt, 50 kt, and 34 kt winds from the center in nautical miles.
//	– Data are unknown or unobtainable.

HURRICANE AIRCRAFT RECONNAISSANCE COMMUNICATIONS

1. General. USAF and NOAA aircraft will transmit reconnaissance observations using HF single side band radio through the USAF Aeronautical Station complex to the appropriate weather reconnaissance data monitor. Weather monitors will evaluate these reports and disseminate them to either the AWN at Carswell AFB, TX, or the weather communications facility at Suitland, MD.

2. Air Ground Communications. The USAF aeronautical station contacted will depend upon aircraft location and radio propogation conditions. Initial contact radio frequencies are as published in appropriate en-route flight publications. After initial contact, aeronautical stations will provide a discrete frequency for mission use if possible. Aircrew relay of weather reconnaissance data will be by direct phone-patch to the weather monitor. Specific radio procedures and terminology will be described in Allied Communications Publication (ACP) 125. USAF has authorized the use of "Immediate" precedence for transmission of hurricane reconnaissance reports as follows:

PRIMARY	SECONDARY
Direct phone-patch between aircraft and Miami Monitor (Atlantic and Eastern Pacific) or Hickam Weather Monitor (Central Pacific) through any aero station.	Direct phone-patch between aircraft and weather monitor through any aero station.

3. Aircraft Satellite Data Link (ASDL) equipped aircraft. USAF and NOAA aircraft equipped with ASDL (NOAA 41C, NOAA 42RF, NOAA 43RF, and USAF 623492) have the option to utilize the ASDL system using the following procedures:

a. Data Format - This format will be used for transmission of reconnaissance data by the ASDL System.

One-Minute Observation

(Message Header)	(Date/Time)
URNT40 KMIA	23/233
(Platform Identifier)	(Date Time - Supplied by NESS)
15C9419C	23012 3220

NOAA1 0100 Test 2 or OB2

(TIME)	(LATITUDE)	(LONGITUDE)	(PRESS-ALT)	(D-VALUE)	(WIND)	(TEMP)	(DEWPT)
1233	2803	08037	06173	+0436	213010	+138	± 096

.
.
NNNN

(For Data From Atlantic, Caribbean, and Gulf of Mexico)
ZCZC
URNT10 KMIA 231233
  TEXT (Standard Recco Code)
NNNN

NOTE: URNT10 - Routine Recco Observations
URNT11 - Routine Tropical Cyclone Observations
URNT12 - Detailed Vortex Messages, Supplementary Vortex Messages, Abbreviated Vortex Messages

(For Data from the Pacific 180° W.)
ZCZC
URPN10 KMIA 231233
  TEXT (Standard Recco Code)

NOTE: URPN10 - Routine Recco Observations
URPN11 - Routine Tropical Cyclone Observations
URPN12 - Detailed Vortex Messages, Supplementary Vortex Messages, Abbreviated Vortex Messages

b. Data Transmission Schedule - To facilitate the transmission of data from several aircraft through one circuit, each aircraft will be assigned a specific block of time within the 30-minute interval for transmission of its data using the following schedule:

0—— +5 RFC 41C C130	+5—— +10 RFC 42RF P-3(A)	+10—— +15 RFC 43RF P-3(B)	+15—— +20 DOD 492 AWRS
+20—— +25 RADAR	+25—— +30 RADAR	+30—— +35 RFC 41C C130	+35—— +40 RFC 42RF P-3(A)
+40—— +45 RFC 43RF P-3(B)	+45—— +50 DOD 492 AWRS	+50—— +55 RADAR	+55 —— +60 RADAR

Because only 4 minutes and 28 seconds of each 5-minute time block can be used for data transmission, roughly 1/2 minute is left in each transmission block. This schedule is designed to eliminate diagnostic statements that would appear at the NESS computer if data from specific sources arrived at the computer at unscheduled times.

RECONNAISSANCE ORGANIZATION COMMUNICATION CAPABILITIES

STATION	AUTODIN ADDRESS	TELETYPE	PHONE
CARCAH/MIAMI Monitor	OL-G, AWS, Coral Gables, FL	A B C	AV 894-3430 CO 305-666-4612 FT 350-5547 AV 894-1150 (phone patch only)
Mather Weather Monitor	Det 7, 24 WS, Mather AFB, CA	B	AV 828-4377
Hickam Weather Monitor	Det 4, 1 WW, Hickam AFB, HI	B	AV 315-449-1279
National Hurricane Center	Nat'l Hurricane Center Coral Gables, FL	A B C	CO 305-667-3108 FT 350-5547
Alternate National Hurricane Center	WSFO, Washington, DC	A C	CO 301-899-3152 FT 763-8300
Eastern Pacific Hurricane Center	WSFO, Redwood City, CA	C	CO 415-368-4339 FT 470-9462
Central Pacific Hurricane Center	WSFO, Honolulu, HI	C	CO 808-845-2102
FWC Norfolk	FLEWEACEN, Norfolk, VA	B	AV 690-7750
FWC Pearl Harbor	FLEWEACEN, Pearl Harbor, HI	B	AV 315-430-0111 ask for 471-004
FWF Suitland	FLEWEAFAC, Suitland, MD	B	AV 293-7310
Det 5, AWS	Det 5, AWS, Keesler AFB, MS		AV 868-2544
AF Global Weather Central	AFGWC, Offutt AFB, NE	B	AV 271-2586
CINCLANTFLT OAC	CINCLANTFLT OAC, Ronkonkoma, NY	C	AV 938-1694
ARTCC Miami	ARTCC, Miami, FL	C	AV 894-1910
53 WRS	53 WRS, Keesler AFB, MS		AV 868-4540 CO 601-377-4540
920 WRG	920 WRG, Keesler AFB, MS		AV 868-4318 CO 601-377-4318
KWRCC	920 WRG, Keesler AFB, MS/KWRCC		AV 868-2409 CO 601-377-2409

A - GT7072
B - COMEDS
C - AFTN

CHAPTER 5

SATELLITE SURVEILLANCE OF TROPICAL AND SUBTROPICAL CYCLONES

1. Satellite.

a. Geostationary Operational Environmental Satellite (GOES). The GOES system consists of four satellites, two operational and two standby. The principal GOES products are 1/2 hourly pictures with implanted grids automatically applied to all sectors. During daylight, 1/2-mile, 1-mile, and 2-mile resolution fixed standard sectors are produced, and during the night equivalent 1-mile and 2-mile IR (infrared) standard sectors are produced. Additionally, certain IR pictures will be enhanced at specified times to emphasize various features, and floating sectors at 1/2-, 1-, and 2-mile resolution may be produced as desired to augment standard sector coverage. All products are delivered in near real time to Satellite Field Service Stations (SFSSs), to the National Environmental Satellite Service (NESS) Analysis and Evaluation Branch, and to Weather Service Forecast Offices (WSFOs). (See GOES Operational Data Flow, Appendix 1 to this chapter.)

b. NOAA Polar-Orbiting Satellites. Twice a day, the NOAA (National Oceanic and Atmospheric Administration) polar-orbiting satellite provides global visible and infrared (IR) pictures (1- and/or 8-kilometer resolution) that are centrally received, processed, and disseminated to appropriate SFSSs and WSFOs via FOFAX (Forecast Facsimile Circuit) and, in some instances, the GOES distribution system.

2. Satellite Field Service Stations (SFSS).

a. Support Concept. Under the NESS SFSS support concept, GOES imagery in support of the hurricane warning services is distributed by the Central Data Distribution Facility at Marlow Heights, MD, to the SFSSs in Miami, San Francisco, Honolulu, and Washington. These SFSSs are collocated with NWS hurricane forecasting units and are responsible for providing support to them.

b. Station Contact. SFSS satellite meteorologist can be contacted as follows:

(1) Miami - between 0630 - 1630 EDST and 2000 - 0400 EDST at (305) 350-4310 and 4460.

(2) San Francisco - 24 hours a day at 470-9122/9123 FTS.

(3) Honolulu - 24 hours a day at (808) 847-2776.

(4) Washington - 24 hours a day at (305) 763-8239.

3. NESS Analysis and Evaluation Branch (AEB). AEB operates 24 hours a day to provide GOES and NOAA satellite data support to National Meteorological Center (NMC). Additionally, the Synoptic Analysis Section of AEB twice daily at 0800Z and 2000Z distributes a "Satellite Tropical Disturbance Summary" (Appendix 1 to this chapter) that describes areas of significant weather in the tropical regions of the Central, Western, and Southern Pacific Oceans. AEB may be contacted at (301) 763-8444.

4. The Defense Meteorological Satellite Program (DMSP). DMSP will provide coverage of tropical/subtropical cyclones whenever possible. Data covering the National Hurricane Operations Plan (NHOP) areas of interest will be received centrally at the Air Force Global Weather Center (AFGWC) at Offutt AFB, NE; and locally at direct readout sites at Hickam AFB, HI, and Patrick AFB, FL.

a. Named Storm Observation. When named storms are observed in these DMSP readouts, and the National Hurricane Center (NHC) determines that coverage from available NESS satellites should be supplemented, teletype bulletins, describing the location and intensity classification of the storm, will be transmitted in SAREP code form (WMO Form 85-VI, Part A), with the additions shown in Appendix 2 of this chapter. Units will respond to OL-G, AWS (Air Weather Service) telephonic requests (confirmation messages will be transmitted). Procedures are:

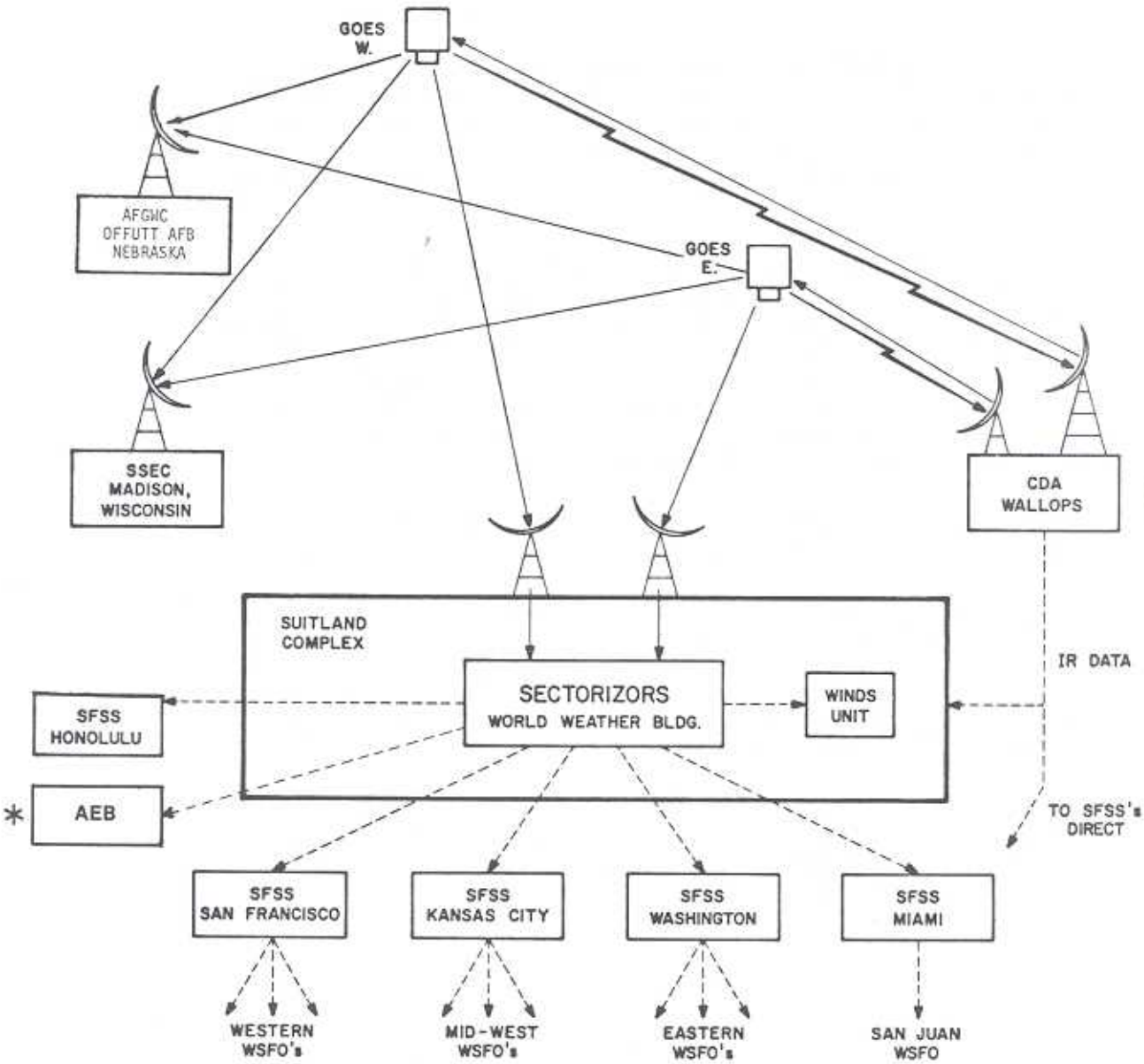
(1) Hickam readout will provide data directly to the Central Pacific Hurricane Center (CPHC).

(2) Patrick readout will provide data in its area of the Caribbean south of 30°N and west of 60°W.

(3) AFGWC will provide data in the NHOP area of responsibility not covered by the Hickam or Patrick readouts, specifically, the area north of 30°N and/or east of 60°W to the European continent.

b. Disturbances. When disturbances are present that have not been classified as named storms and Department of Commerce (DOC) requires additional satellite analysis of the area, OL-G AWS will call the appropriate DMSP location to receive telcon information on the disturbance.

GOES
OPERATIONAL DATA FLOW



* Analysis and Evaluation Branch

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

SATELLITES AND SATELLITE DATA AVAILABILITY FOR 1978 HURRICANE SEASON

Satellite	Type of Data	Local Time	
GOES-2 (East) 75.0°W SMS-2/GOES (West) 135.0°W SMS-1/GOES (Standby) 105.0°W GOES-1 (Standby) 105°W	VISSR	# Every 30 minutes (24 hr/day) (Limited scan for short-interval viewing available)	1. 1/2-, 1- and 2-mi resolution visible standard sectors covering Western United States, Midwest and Eastern United States (daylight). 2. 1 and 2 mi. equivalent IR standard sectors for the entire United States (night). 3. Equivalent IR-enhanced imagery. 4. Floating sectors at 1/2-, 1- and 2-mi resolution (visible and equivalent IR) 5. Full disc IR (day and night). 6. Movie loops 7. Wind analysis
ITOS (NOAA series)	SR (stored) APT (direct) VTPR VHRR	0900/2100	1. Mapped digitalized SR (cloud cover imagery) 2. Sea-surface temperature analysis 3. Moisture analysis 4. Soundings
DMSP	LF/TF LS/TS	0700/1900	1. Unmapped imagery (all data types)
	LF/TF LS/TS	1133/2333	2. Mapped imagery (LS/TS data only)

#Except for scheduled interrupts for preventive maintenance (PM), i.e., 2 1/2-hour period for each satellite on alternating days: GOES-1 PM 0450 through 0720 GMT and SMS-2 PM, 0505 through 0735 GMT. Full disc IR will be provided during these periods.

VTPR	-	Vertical Temperature Profile Radiometer
APT	-	Automatic Picture Transmission
SR	-	Scanning Radiometer
VHRR	-	Very High Resolution Radiometer
VISSR	-	Visible-Infrared Spin Scan Radiometer
LF	-	Light Fine (Visual Scanning Radiometer 0.3nmi)
TF	-	Thermal Fine (Infrared Scanning Radiometer 0.3 nmi)
LS	-	Light Smooth (Visual Scanning Radiometer 1.5nmi)
TS	-	Thermal Smooth (Infrared Scanning Radiometer 1.5nmi)
ITOS	-	Improved TIROS Operational Satellite

CHAPTER 5
APPENDIX B
FORM 1

*ABXX(#) KWBC

SATELLITE TROPICAL DISTURBANCE SUMMARY

ALL MOVEMENTS AND TRENDS 24 HRS UNLESS OTHERWISE STATED

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

(Remarks)

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

(Remarks)

Date prepared (Z)_____Time Prepared (Z)_____Shift_____

*(HEADING)	(OCEANIC AREA)	(TYPE DATA)
ABXX11	Atlantic, East and Central Pacific (to 140W)	VIS/IR DAY
ABXX12	Indian Ocean	
ABXX13	West and South Pacific	VIS/IR DAY
ABXX14	Indian Ocean	
ABXX15	Atlantic, East and Central Pacific (to 140W)	IR NITE
ABXX16	West and South Pacific	IR NITE

ADDITIONAL SPECIFICATIONS TO SAREP CODE FORM FOR TRANSMISSION OF DMSP DATA

(1) $A_t S_t W_f a_t t_m$ Accuracy of the position A_t (Code 0252) report as: 1 - Visible Eye
2 - Well defined C.C.
3 - Poorly defined C.C.
Intensity (S_t) based on the Dvorak Classification (Code 3752). Mean width or diameter of the CDO (W_f - Code 4536). Apparent 24-hr. change in intensity (a_t - code 0252). Report t_m as not included (Code 4044). (Note: $S_t W_f a_t$ values are only reported when visible data available; report as undermined when infrared data is used to determine A_t.)

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

CHAPTER 6

SURFACE RADAR REPORTING

1. General - Radar observations of tropical cyclones will be made at Department of Defense (DOD), National Weather Service (NWS), and Federal Aviation Administration (FAA) radar facilities and at other cooperating radar facilities according to established agreements with NWS.

2. Procedures

a. Radar observations of tropical cyclones will be made in accordance with the Federal Meteorological Handbook (FMH) #7, Part A, Weather Radar Observations. Stations that do not normally transmit hourly radar weather observations will make and transmit radar observations when they first observe a tropical cyclone type echo feature and will continue to take and transmit radar observations until these features are no longer observed. Stations that normally transmit hourly radar observations will include tropical cyclone features in routine reports and will make and transmit half-hourly special observations as long as tropical cyclone echo features are observed.

b. If the central region of a storm is defined by an identifiable wall cloud, the radar fix is reported as an EYE. If the central region is recognizable, but not well defined by a wall cloud, it is reported as a CENTER. When the EYE or CENTER is only occasionally recognizable or some other central region uncertainty exists, the EYE or CENTER is reported as PSBL EYE or PSBL CENTER. Remarks stating degree of confidence will be included with EYE fixes only and will be classified as either GOOD, FAIR, or POOR. A GOOD fix is reported when the EYE is symmetrical - virtually surrounded by wall cloud; a POOR fix is reported when the EYE is asymmetrical - less than 50% surrounded by wall cloud; a FAIR fix is reported to express a degree of confidence between GOOD and POOR.

c. Timely transmission of tropical cyclone radar reports is essential. Normally, radar reports are transmitted on Radar Report and Warning Coordination Circuit (RAWARC), GT 7072, or Conus Meteorological Data System (COMEDS) circuit equipment. Those radar facilities not having weather transmission capability may call the nearest Weather Service Office (WSO) collect.

3. Special Provisions

a. If NWS Weather Surveillance Radar (WSR) 57 and DOD weather radar facilities are collocated (within 25 nautical miles), the NWS radar will have the primary responsibility for making and transmitting tropical cyclone radar reports - DOD will provide backup service. If a radar facility is less powerful than the WSR 57 and is collocated with an Aerospace Defense Command (ADCOM) radar facility, the ADCOM radar facility will have the primary responsibility for making and transmitting tropical cyclone radar reports provided it is manned by a qualified weather radar operator, the less powerful radar facility will provide backup service. Any backup radar facility, however, may transmit radar reports as desired.

b. If radar reports are needed from ADCOM facilities or Air Route Traffic Control Centers (ARTCCs), NWS will dispatch weather radar specialists to these facilities to make and transmit tropical cyclone radar observations. DOD and FAA have authorized the Director NWS to dispatch NWS radar specialists to ARTCCs and ADCOM sites during critical hurricane threat situations to make and transmit hurricane radar observations. Specific procedures regarding notification, access to sites, clearances, etc., as agreed to by DOD and NWS will be the responsibility of the Public Services Branch, Meteorological Services Division, NWS headquarters, and will be strictly adhered to.

c. Staff weather officers providing support to ADCOM units act as coordinators for visits. These coordinators are: 20th North American Air Defense Command Regional Control Center (NRCC), Commander Det. 41, 12 Weather Sq., Ft. Lee, AFS, VA (703-732-2256, ext. 765); 21 NRC,Commander Det. 27, 12 Weather Sq., Hancock Field, Syracuse, NY (315-458-5500, ext. 535); 326 Air Division, OL-AG, Det. 6, AWS, Hickam AFB , HI (AV 433-0111, ext. 449-2271). Sites are listed in Appendix I.

d. Appendix A lists FAA ARTCCs that may be visited.

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

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

b. Owing to the limited facilities at ARTCCs, NWS agreed that no more than two persons will visit a Center 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.

(1) NWS must notify the appropriate FAA facility coordinator by wire of the intent of weather service personnel to visit such a facility. This may be done by telephone in an emergency. Notification will normally be handled by the responsible NWS Regional Office or the Public Services Branch, Silver Spring, MD. This notification will include the name of the individuals, site to be visited, and inclusive date(s) of visit.

(2) The permission to visit must be on file at the FAA facilities included in Appendix 2. It will be the responsibility of the Public Services Branch Meteorological Services Division (MSD), NWS Headquarters, Silver Spring, MD, to coordinate additions, changes, and/or deletions in the list of their personnel with the FAA facilities to be visited 2 weeks in advance of effective date of change. Coordinating correspondence should refer to this document.

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

(4) Only those personnel who have been identified by wire will be admitted to FAA facilities.

(5) NWS annually will update the list of personnel

(6) Copies of this plan shall be forwarded to appropriate ARTCCs.

PARTICIPATING RADAR STATIONS

National Weather Service

	Radar	Latitude	Longitude
Apalachicola, FL	WSR-57	29°44'N.	84°59'W.
Atlantic City, NJ	WSR-57	39°27'N.	74°35'W.
Baton Rouge, LA	WR-100-5	30°32'N.	91°09'W.
Brownsville, TX	WSR-57	25°54'N.	97°26'W.
Brunswick, ME	WSR057	43°54'N.	69°56'W.
Cape Hatteras, NC	WSR-57	35°16'N.	75°33'W.
Charleston, SC	WSR-57	32°54'N.	80°02'W.
Chatham, MA	WSR-57	41°39'N.	69°57'W.
Daytona Beach, FL	WSR-57	29°11'N.	81°03'W.
Galveston, TX	WSR-57	29°18'N.	94°48'W.
Jackson, MS	WSR-57	32°19'N.	90°05'W.
Key West, FL	WSR-57	24°33'N.	81°45'W.
Lake Charles, LA	WSR-57	30°07'N.	93°13'W.
Miami, FL	WSR-57	25°43'N.	80°17'W.
New York, NY	WSR-57	40°46'N.	73°59'W.
Patuxent, MD	WSR-57	38°17'N.	76°25'W.
Pensacola, FL	WSR-57	30°21'N.	87°15'W.
San Juan, PR	FPS-67*	18°16'N.	65°46'W.
Slidell, LA	WSR-57	30°17'N.	89°46'W.
Tampa, FL	WSR-57	27°42'N.	82°24'W.
Victoria, TX	WR-100-5	28°51'N.	96°55'W.
Volens, VA	WSR-74S	36°57'N.	79°00'W.
Waycross, GA	WSR-57	31°15'N.	82°24'W.
Wilmington, NC	WSR-57	34°16'N.	77°55'W.

Department of Defense

Andrews AFB, MD	FPS-77	38°48'N.	76°53'W.
Barksdale AFB,	FPS-77	32°30'N.	93°40'W.
Bermuda NAS	FPS-106	32°22'N.	64°41'W.
Cape Canaveral AFS, FL	FPS-77	28°28'N.	80°33'W.
Chase Field NAS, Beeville, TX	FPS-106	28°22'N.	97°40'W.
Cherry Point MCAS, NC	FPS-106	34°54'N.	76°53'W.
Corpus Christi NAS, TX	FPS-106	27°42'N.	97°16'W.
Craig AFB, AL	FPS-77	32°21'N.	86°59'W.
Eglin AFB, FL	FPS-77	30°29'N.	86°31'W.
Homestead AFB, FL	FPS-77	25°29'N.	80°23'W.
Howard AFB, CZ	FPS-77	08°77'N.	79°36'W.
Jacksonville NAS, FL	FPS-106	30°14'N.	81°41'W.
Keesler AFB, MS	FPS-77	30°24'N.	88°55'W.
Key West NAS, FL	FPS-67B/20M	24°35'N.	81°41'W.
Lakehurst NATTC, NJ	FPS-81	40°02'N.	74°20'W.
MacDill AFB, FL	FPS-77	27°51'N.	82°30'W.
McGuire AFB, NJ	FPS-77	40°00'N.	74°36'W.
New Orleans NAS, LA	FPS-81	29°50'N.	90°01'W.
Norfolk FWC, VA	FPS-106	36°56'N.	76°18'W.
Pope AFB, NC	CPS-9	35°12'N.	79°01'W.
Randolph AFB, TX	FPS-77	29°32'N.	98°17'W.
Robins AFB, GA	FPS-77	32°38'N.	83°36'W.
Seymour Johnson AFB, NC	FPS-77	35°20'N.	77°58'W.
Sudbury, MA	CPS-9 & FPS-68	42°25'N.	71°29'W.

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

ADCOM Sites

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

	Latitude	Longitude
632 Radar Sq., Roanoke Rapids AFS, NC	36°27' N.	77°44' W.
**645 Radar Sq., Patrick AFB, FL	28°13' N.	80°36' W.
**660 Radar Sq., MacDill AFB, FL	27°50' N.	82°28' W.
671 Radar Sq., Key West AFS, FL	24°35' N.	81°41' W.
**678 Radar Sq., Tyndall AFB, FL	30°05' N.	85°37' W.
**679 Radar Sq., Jacksonville AFS, FL	30°13' N.	81°41' W.
701 Radar Sq., Ft. Fischer AFS, NC	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, SC	32°54' N.	80°01' W.

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

**656 Radar Sq., Saratoga Springs AFS, NY	43°01' N.	73°41' W.
762 Radar Sq., North Truro AFS, MA	42°02' N.	70°03' W.
772 Radar Sq., Gibbsboro, NJ	39°49' N.	74°57' W.
773 Radar Sq., Montauk AFS, NY	41°04' N.	71°52' W.
**907 Radar Sq., Bucks Harbor AFS, ME	44°38' N.	67°24' W.

** Remoted in the FAA ARTCC

c. Cooperating Sites

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

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

ADCOM and FAA Sites Remoted to ARTCC's

FAA--ARTCCs	FAA Radar Sites	Military Radar Sites
New York ARTCC (Islip NY) Long Island MacArthur Aprt. Ronkonkoma, LI NY 11779 COM: 516-663-3401 FTS: 8-737-3401	New York, NY Trevose, PA Benton, PA	648 Radar Sq., Benton AFS PA
Boston ARTCC Federal Aviation Administration Air Route Traffic Control Center Northeastern Blvd. & Harris Rd. Nashua, NH 03060 COM: 603-889-1171 x633 FTS: 8-834-6633	Boston MA Bucks Harbor ME Saratoga Springs NY	656 Radar Sq., Saratoga Springs AFS NY 907 Radar Sq., Bucks Harbor AFS ME
Miami ARTCC 7500 NW. 58th St. Miami FL 33166 COM: 305-592-9770 FTS: 8-350-2678	MacDill FL Patrick FL Richmond FL	644 Radar Sq., Richmond AFS FL 645 Radar Sq., Patrick AFB FL 660 Radar Sq., MacDill AFB FL
Jacksonville ARTCC P.O. Box 98 Hilliard FL 32046 COM: 904-845-3311 (Hilliard) 904-791-2581 (Jacksonville) FTS: 8-946-2581	Jacksonville FL Charleston SC Tyndall FL Valdosta GA Jedburg SC	678 Radar Sq., Tyndall AFB FL 679 Radar Sq., Jacksonville AFS FL 861 Radar Sq., Aiken AFS SC
Houston ARTCC P.O. Box 60308 Houston TX 77205 COM: 713-443-8545 FTS: 8-521-3070	Alexandria LA Ellington TX Lackland TX New Orleans LA Oilton TX	
Oakland ARTCC 5125 Central Ave. Fremont CA 94536 COM: 415-797-3200 FTS: 8-449-6200	Fallon NV Oakland CA Paso Robles CA Red Bluff CA Sacramento CA	858 Radar Sq., Navy Aux. Air Sta., Fallon NV

CHAPTER 6
APPENDIX B
(Continued)

FAA--ARTCCs	FAA Radar Sites	Military Radar Sites
Los Angeles ARTCC 2555 E Ave. P Palmdale CA 93550 COM: 805-947-4101 x201 FTS: 8-799-1011	San Pedro CA Boron CA Cedar City UT Las Vegas NV Mt. Laguna CA Paso Robles CA	670 Radar Sq., Ft. MacArthur CA 750 Radar Sq., Boron AFS CA 751 Radar Sq., Mt. Laguna AFS CA

ENVIRONMENTAL DATA BUOY REPORTING

1. General. Environmental data buoys in the Gulf of Mexico and off the U.S. east and west coasts obtain data on meteorological and oceanographic parameters for operational and research purposes. Data buoy location and configuration are given in Attachment 1. The status and capability of data buoys can be obtained from the Director, NOAA Data Buoy Office (NDBO), NSTL Station, MS 39529, telephone (601) 688-2800, FTS 494-2800.

2. Procedures. Environmental data buoys routinely measure, store, and transmit data once every 3 hours. Data obtained operationally include sea-level pressure, wind direction and speed, air temperature, sea-surface temperature, and wave height spectral data. During critical storm periods, data collection and reporting can be increased to once per hour by contacting the U.S. Coast Guard (USCG) Shore Collection Station in Miami, FL, telephone (305) 233-3062, FTS 350-4750.

3. Communications. Buoy data normally are received at the USCG Shore Collection Station in Miami or through the NESS DCS system. Data are converted to physical units, translated into WMO FM24V marine synoptic code (see Attachment 2), and transmitted to NWS Suitland on NWS circuit GT 7072. The conversion of buoy data transmission from HF to UHF communications via the Geostationary Operational Environmental Satellite (GOES) system is now in progress. Buoy data relayed via satellite will be routed to NESS and on to NMC/NWS, Suitland, MD, for processing and dissemination. All buoys are scheduled to be converted to satellite communications by the fall of 1978. As of 1 October 1978, requests for hourly data should be made by contacting NESS Operations, Suitland, MD, telephone (301) 763-8351, FTS 763-8351.

CHAPTER 7
ATTACHMENT 1

ENVIRONMENTAL DATA BUOY LOCATION AND CONFIGURATION

STA. I.D.	BUOY CONF.	LOCATION
41001	BG	35.0/72.0
41002	BG	32.3/75.3
42001	DF	26.0/90.0
42002	BF	26.0/93.5
42003	DF	26.0/86.0
44001	CE	38.7/73.6
44002	DE	40.1/73.0
44003	DF	40.8/68.5
44004	BG	39.0/70.0

BUOY HULL & PAYLOAD TYPES

A. 10-m discus hull
B. 12-m discus hull
C. 5-m discus hull
D. 6-m boat-shaped hull
E. MVX I Payload (HF only)
F. MVX II Payload (HF & UHF)
G. PEB (General Dynamics) Payload (HF & UHF)
H. PEB (General Dynamics) Payload (UHF only)

CODE FORM FM 24-V

Report of synoptic surface observation
from a sea station (AUTOMATIC weather station)

$M_i M_i M_j M_j$

$YYGGi_u \quad D_s v_s L_a L_a L_a \quad Q_c L_o L_o L_o L_o \quad s_t i_R NV^+ h$

$0ddff \quad 1w^+w^+WW \quad 2s_n TTT \quad (3s_n T_d T_d T_d)$

$5PPPP \quad (6a^+ p_v p_v p_v) \quad (7RRRt_R) \quad (8N_h C_L C_M C_H)$

$(9I_s E_s E_s R_s^+) \quad (s_n T_w T_w T_w n_w \quad P_w P_w H_w H_w P_w \quad P_w H_w H_w d_w d_w$

$(P_w P_w H_w d_w d_w)) \quad A_1 b_w n_b n_b n_b$

This is the entire code form, including groups not included in U.S. EDB reports. The numbers of the code tables are the numbers given in the WMO Manual On Codes.

CHAPTER 8

MARINE WEATHER BROADCASTS

1. General. The Department of Defense (DOD) and Department of Transportation (DOT) are responsible for broadcasting marine tropical cyclone advisories issued by the National Hurricane Center. Appendix A of this chapter lists the stations involved.

The broadcasts are for the purpose of providing warnings to meet U.S. international obligations in DOC (Department of Commerce) areas of forecast responsibility given in Chapter 2.

2. Broadcast Procedures. DOT and DOD will arrange for broadcast of all marine tropical cyclone advices immediately upon receipt. The latest tropical cyclone forecast will be transmitted according to the schedule and on the frequencies given in Worldwide Marine Weather Broadcasts. The latest position estimate will be used by DOT and DOD along with the latest forecast for storms on which position estimates are being issued. These broadcasts will be made in both voice and cw mode.

List of Marine Tropical Cyclone Forecast Broadcast Stations

Station Call Letters	Location
NMW	Astoria, OR
NMF	Boston, MA
NMO	Honolulu, HI
NMQ	Long Beach, CA
NMA	Miami, FL
NMG	New Orleans, LA
NAM	Norfolk, VA
NMN	Portsmouth, VA
NMC	San Francisco, CA
NMR	San Juan, PR

CHAPTER 9

WARNING TRANSFER POLICIES

1. Transfer of Warning Responsibility.

a. When a tropical/subtropical cyclone approaches longitude 140°W, the coordinated transfer of warning responsibility from Eastern Pacific Hurricane Center (EPHC) to Central Pacific Hurricane Center (CPHC) will be made and appropriate advice issued.

b. When a tropical/subtropical cyclone crosses the 180° meridian from east to west, the coordinated transfer of warning responsibility from CPHC to Joint Typhoon Warning Center (JTWC) will be made and appropriate advice issued.

c. When a tropical/subtropical cyclone crosses the 180° meridian from west to east, the coordinated transfer of warning responsibility from JTWC to CPHC will be made. JTWC will append the statement "Next warning by CPHC-HNL" to their last warning.

2. Alternate Responsibilities.

a. In the event of impending or actual operational failure of a hurricane forecast center, responsibilities will be transferred to the appropriate alternate facility in accordance with existing directives and retained there until resumption of responsibility is made. Fleet Weather Central (FWC) Norfolk will be advised of impending or actual National Hurricane Center (NHC) and Chief, Aerial Reconnaissance Coordination, All Hurricanes (CARCAH) transfer of responsibility by the most rapid means available.

b. Alternate facilities are as follows:

PRIMARY	ALTERNATE
(1) NHC	HWO (Hurricane Warning Office) Washington
(2) EPHC	NHC
(3) CPHC	FWC Pearl Harbor
(4) FWC Norfolk	FWF Suitland
(5) JTWC	AJTWC, FWC Pearl Harbor
(6) HWO	NHC
(7) HWO Washington	NHC
(8) HWO Boston	HWO Washington

c. In the event of the operational failure of CARCAH, direct communicatio is authorized between DET. 5, AWS, and the forecast facility. Contact Detachment 5, AWS, through the KWRCC at AV 868-2409/CO 601-377-2409.

PUBLICITY

News media releases, other than warnings and/or advisories for the purpose of informing the public of the operational and research activities of DOD and NWS, 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:

Director, Naval Oceanography and Meteorology
NSTL Station
Bay St. Louis, MS 39529

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

Headquarters Air Force Reserve
Robins Air Force Base, GA 31093

NOAA, Office of Public Affairs
6010 Executive Boulevard
Rockville,MD 20852

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

CHAPTER 10
APPENDIX A

ABBREVIATIONS AS USED IN THIS PLAN

A/G	Air/Ground
ACP	Allied Communications Publication
ADCOM	Aerospace Defense Command
AEB	Analysis and Evaluation Branch
AFB	Air Force Base
AFGWC	Air Force Global Weather Central
AFTN	Aeronautical Fixed Telecommunications Network
AJTWC	Alternate Joint Typhoon Warning Center
APT	Automatic Picture Transmission
ASDL	Aircraft Satellite Data Link
ATC	Air Traffic Control
AWN	Automated Weather Network
AWS	Air Weather Service
CARCAH	Chief, Aerial Reconnaissance Coordination, All Hurricanes
COMEDS	Continental U.S. Meteorological Data System
CONF	Confidence Factor
CPHC	Central Pacific Hurricane Center
CW	Continuous Wave
DCS	Data Collection System
DMSP	Defense Meteorological Satellite Program
DOC	Department of Commerce
DOD	Department of Defense
DOT	Department of Transportation
EDB	Environmental Data Buoy
ELT	Eastern Local Time
EPHC	Eastern Pacific Hurricane Center
ERL	Environmental Research Laboratories
ETA	Estimated Time of Arrival
ETD	Estimated Time of Departure
FAA	Federal Aviation Administration
FMH	Federal Meteorological Handbook
FOFAX	Forecast Office Facsimile
FWC	Fleet Weather Central
FWF	Fleet Weather Facility
GOES	Geostationary Operational Environmental Satellite
GMT	Greenwich Mean Time
HF	High Frequency
HWO	Hurricane Warning Office
ICAO	International Civil Aviation Organization
IR	Infrared
ITOS	Improved TIROS Operational Satellite
JTWC	Joint Typhoon Warning Center
KWRCC	Keesler Weather Reconnaissance Coordination Center
LF	Light Fine (Visual Scanning Radiometer 0.3 n. mi.)
LS	Light Smooth (Visual Scanning Radiometer 1.5 n. mi.)
MAC	Military Airlift Command
MIC	Meteorologist in Charge
MSD	Meteorological Services Division
NASA	National Aeronautics and Space Administration

NDBO	National Data Buoy Office
NESS	National Environmental Satellite Service
NHC	National Hurricane Center
NHOP	National Hurricane Operations Plan
NLT	Not Later Than
NMC	National Meteorological Center
NOAA	National Oceanic and Atmospheric Administration
NRCC	North American Air Defense Command Regional Control Center
NWS	National Weather Service
OL-G	Operating Location G
PM	Preventive Maintenance
RAWARC	Radar Report and Warning Coordination
RECCO	Reconnaissance Code
RFC	Research Facilities Center
SAREP	Report of synoptic interpretation of cloud data obtained by a meteorological satellite
SFSS	Satellite Field Services Station
SMS	Synchronous Meteorological Satellite
SR	Scanning Radiometer
SSH	Saffir/Simpson Hurricane
SST	Sea Surface Temperature
TCPOD	Tropical Cyclone Plan of the Day
TD	Tropical Depression
TF	Thermal Fine (Infrared Scanning Radiometer 0.3 n. mi.)
TS	Thermal Smooth (Infrared Scanning Radiometer 1.5 n. mi.)
UHF	Ultra High Frequency
US	United States
USAF	United States Air Force
USCG	United States Coast Guard
USN	United States Navy
VHRR	Very High Resolution Radiometer
VIS	Visible
VISSR	Visible - Infrared Spin Scan Radiometer
VTPR	Vertical Temperature Profile Radiometer
WMO	World Meteorological Organization
WRG	Weather Reconnaissance Group
WRS	Weather Reconnaissance Squadron
WSFO	Weather Service Forecast Office
WSO	Weather Service Office
WSOM	Weather Service Operations Manual
WSR	Weather Surveillance Radar
Z	Zulu (Coordinated Universal Time)

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