



***1985
ANNUAL TROPICAL
CYCLONE REPORT***

***JOINT TYPHOON
WARNING CENTER
GUAM, MARIANA ISLANDS***

FRONT COVER: Typhoon Odessa (above right) as viewed through the cargo bay of the NASA Space Shuttle. The cloudiness at the lower right is associated with Typhoon Pat. Odessa and Pat, along with Skip, Ruby and Tess, became part of the single most active tropical cyclone day during the the 1985 northwestern Pacific season, when all five systems existed at the same time. At picture time, 282220Z August 1985, the Shuttle was passing eastward across the position 24.1N latitude 143.4E longitude (NASA slide #35-078 provided by CDR D.A. Mautner, OIC NAVPOLAROCEANCEN Detachment, Johnson Space Center, Texas).

U.S. NAVAL OCEANOGRAPHY COMMAND CENTER
JOINT TYPHOON WARNING CENTER
COMNAVMARIANAS BOX 17
FPO SAN FRANCISCO 96630

CHARLES G. STEINBRUCK

Captain, United States Navy

COMMANDING

*** DAVID W. MCLAWHORN**

Lieutenant Colonel, United States Air Force

VERNON G. PATTERSON

Lieutenant Colonel, United States Air Force
DIRECTOR, JOINT TYPHOON WARNING CENTER
COMMANDER, DETACHMENT 1, 1ST WEATHER WING



*** TRANSFERRED DURING 1985**

STAFF

*LCDR Scott A. Sandgathe, USN
*MAJ Mark E. Older III, USAF
LCDR George M. Dunnavan, USN
*LCDR Brett T. Sherman, USN
CAPT Boyce R. Columbus, USAF
CAPT Anita F. Dye, USAF
LT John L. Shoemake, USN
CAPT Michael T. Gilford, USAF
LT Brian J. Williams, USN
LT Mark J. Gunzelman, USN
LT Harry S. Gatani, USN
TSGT Marguritta H. Smith, USAF
AG2 Kevin L. Cobb, USN
*AG2 Teddy R. George, USN
AG2 Kristopher W. Buttermore, USN
SGT Donna M. Curtis, USAF
*SGT Margaret E. Gray, USAF
AG3 Shirley A. Murdock, USN
*SGT Thomas L. Parra, USAF
*AG3 Randall J. McKillip, USN
AG3 Erika L. Sauer, USN
*SRA James Kelly III, USAF
SRA Ronald W. Jones, USAF
SRA Donald L. Novak, Jr, USAF
SRA Angelia Gavin, USAF
AGAN James P. Gallagher, Jr, USN
AGAN Steven M. Deola, USN

EDITORS: LT William P. Wirfel, USN
MR Frank H. Wells, CIV

CONTRIBUTER: Detachment 1,1WW - USAF
(Satellite Operations)
CAPT Frederick J. Svez, USAF
CAPT Donna P. McNamara, USAF
TSGT William H. Taylor, USAF
SSGT Fabrice F. Clark, USAF
*SSGT Charles B. Siniff, Jr, USAF
*SSGT Patti A. Ashby, USAF
SSGT Paul F. Schirle, USAF
SSGT Jerome P. Koch, Jr, USAF

*Transferred during 1985

FOREWORD

The Annual Tropical Cyclone Report is prepared by the staff of the Joint Typhoon Warning Center (JTWC), a combined USAF/USN organization operating under the command of the Commanding Officer, U.S. Naval Oceanography Command Center/Joint Typhoon Warning Center, Guam. JTWC was established in April 1959 when USCINCPAC directed USCINCPACFLT to provide a single tropical cyclone warning center for the western North Pacific region. The operations of JTWC are guided by CINCPACINST 3140.1 (series).

The mission of the Joint Typhoon Warning Center is multi-faceted and includes:

1. Continuous monitoring of all tropical weather activity in the Northern and Southern Hemispheres, from 180 degrees longitude westward to the east coast of Africa, and the prompt issuance of appropriate advisories and alerts when tropical cyclone development is anticipated.

2. Issuing warnings on all significant tropical cyclones in the above area of responsibility.

3. Determination of reconnaissance requirements for tropical cyclone surveillance and assignment of appropriate priorities.

4. Post-storm analysis of all significant tropical cyclones occurring within the western North Pacific and North Indian Oceans, which includes an in-depth analysis of tropical cyclones of note and all typhoons. Also for the first time a summary of the South Pacific and South Indian Ocean significant tropical cyclones for the period 1 July 1984 through 30 June 1985 are included.

5. Cooperation with the Naval Environmental Prediction Research Facility, Monterey, California, on the operational evaluation of tropical cyclone models and forecast aids, and the development of new techniques to support operational forecast scenarios.

Satellite imagery used throughout this report represents data obtained by the tropical cyclone satellite surveillance network. The personnel of Detachment 1, 1WW, collocated with JTWC at Nimitz

Hill, Guam, coordinate the satellite acquisitions and tropical cyclone surveillance with the following units:

Det 4, 20WS, Hickam AFB, Hawaii

Det 5, 20WS, Clark AB, RP

Det 8, 20WS, Kadena AB, Japan

Det 15, 30WS, Osan AB, Korea

Air Force Global Weather Central,
Offutt AFB, Nebraska

In addition, the Naval Oceanography Command Detachment, Diego Garcia, and DMSP equipped U.S. Navy aircraft carriers have been instrumental in providing vital satellite position fixes of tropical cyclones in the Indian Ocean.

Should JTWC become incapacitated, the Alternate Joint Typhoon Warning Center (AJTWC) located at the U.S. Naval Western Oceanography Center, Pearl Harbor, Hawaii, assumes warning responsibilities. Assistance in determining satellite reconnaissance requirements, and in obtaining the resultant data, is provided by Det 4, 20WS Hickam AFB, Hawaii.

A special thanks is extended to the men and women of: 27th Information Systems Squadron, Operating Location C, for their continuing support by providing high quality real-time satellite imagery; the Pacific Fleet Audio-Visual Center, Guam, for their assistance in the reproduction of satellite and graphics data for this report; to the Navy Publications and Printing Service Branch Office, Guam, for their efforts to meet deadlines; and to AG3 S. A. Murdock for typing the many drafts and assistance with the final manuscript of this report. Thanks is also extended to Lt. G. H. Carpenter and Lt. R. A. Wimmer for submitting Tropical Cyclone write-ups on Typhoon Tess and Typhoon Kit respectively. A special thanks to TSGT W. H. Taylor for gridding the numerous satellite images for this report and to Mrs. Leah M. Foster of the Xerox Corporation, Guam for her assistance with the preparation of the script font portions of this document.

Note: Appendix IV contains information on how to obtain past issues of the Annual Tropical Cyclone Report (titled Annual Typhoon Report prior to 1980).

CHAPTER IV	SUMMARY OF SOUTH PACIFIC AND SOUTH INDIAN OCEAN TROPICAL CYCLONES	
	1. General - - - - -	138
	2. South Pacific and South Indian Ocean Tropical Cyclones	-139
CHAPTER V	SUMMARY OF FORECAST VERIFICATION	
	1. Annual Forecast Verification - - - - -	-148
	2. Comparison of Objective Techniques - - - - -	-155
CHAPTER VI	APPLIED TROPICAL CYCLONE RESEARCH SUMMARY FROM NAVENVPREDRSCHFAC	-161
ANNEX A	TROPICAL CYCLONE TRACK AND FIX DATA	
	1. Western North Pacific Data - - - - -	-163
	2. North Indian Ocean Data - - - - -	-230
	3. South Pacific and South Indian Ocean Data - - - - -	-235
APPENDICES	I. Definitions - - - - -	-270
	II. Names of Tropical Cyclones - - - - -	-271
	III. References - - - - -	-272
	IV. Past Annual Tropical Cyclone Reports - - - - -	-273
DISTRIBUTION	- - - - -	-274

CONTRACTIONS

ACCRY	Accuracy	EL	Elongated
ACFT	Aircraft	ELEV	Elevation
ADP	Automated Data Processing	EXP	Exposed
AFGWC	Air Force Global Weather Central	FI	Forecast Intensity (Dvorak)
AIREP	Aircraft Weather Report(s) (Commercial and Military)	FLF	Flight
ANT	Antenna	FNOC	Fleet Numerical Oceanography Center
AOR	Area of Responsibility	FT	Feet
APRNT	Apparent	GMT	Greenwich Mean Time
APT	Automatic Picture Transmission	GOES	Geostationary Operational Environmental Satellite
ARWO	Aircraft Reconnaissance Weather Officer	HATRACK	Hurricane and Typhoon Tracking (Steering) Program
ATT	Attenuated	HGT	Height
AVG	Average	HPAC	Mean of XTRP and CLIM Techniques (Half Persistence and Climatology)
AWN	Automated Weather Network	HR(s)	Hour(s)
BPAC	Blended Persistence and Climatology	HVY	Heavy
BRG	Bearing	ICAO	International Civil Aviation Organization
CDO	Central Dense Overcast	INIT	Initial
CI	Cirriiform Cloud or Cirrus also Current Intensity (Dvorak)	INJAH	North Indian Ocean Component of TYAN
CINCPAC	Commander-in-Chief Pacific AF - Air Force, FLT - Fleet (Navy)	INST	Instruction
CLD	Cloud	IR	Infrared
CLIM	Climatology	KM	Kilometer(s)
CLSD	Closed	KT	Knot(s)
CM	Centimeter	LLCC	Low-Level Circulation Center
CNTR	Center	LVL	Level
CPA	Closest Point to Approach	M	Meter(s)
CSC	Cloud System Center	M/S	Meter(s) per Second
CYCLOPS	Tropical Cyclone Steering Program (HATRACK and MOHATT)	MAX	Maximum
DEG	Degree	MB	Millibar(s)
DIAM	Diameter	MET	Meteorological
DIR	Direction	MIN	Minimum
DMSP	Defense Meteorological Satellite Program	MOHATT	Modified HATRACK
DST	Distance	MOVG	Moving

MSLP	Minimum Sea-Level Pressure	STNRY	Stationary
MSN	Mission	SST	Sea Surface Temperature
NAV	Navigational	ST	Subtropical
NEDN	Naval Environmental Data Network	STR	Subtropical Ridge
NEDS	Naval Environmental Display Station	STY	Super Typhoon
NEPRF	Naval Environmental Prediction Research Facility	TAPT	Typhoon Acceleration Prediction Technique
NESDIS	National Environmental Satellite, Data, and Information Service	TC	Tropical Cyclone
NET	Near Equatorial Trough	TCARC	Tropical Cyclone Aircraft Reconnaissance Coordinator
NM	Nautical Mile(s)	TCFA	Tropical Cyclone Formation Alert
N/O	Not Observed	TCM	Tropical Cyclone Model
NOAA	National Oceanic and Atmospheric Administration	TD	Tropical Depression
NOCC	Naval Oceanography Command Center	TDO	Typhoon Duty Officer
NOGAPS	Navy Operational Global Atmospheric Prediction System	TIROS	Television Infrared Observational Satellite
NTCM	Nested Tropical Cyclone Model	TPAC	Extrapolation and Climatology Blend
NWOC	Naval Western Oceanography Center	TS	Tropical Storm
NR	Number	TY	Typhoon
NRL	Naval Research Laboratory	TYAN	Typhoon Analog Program
OBS	Observations	TYFN	Western North Pacific Component (Revised) of TYAN
OTCM	One Way (Interactive) Tropical Cyclone Model	TUTT	Tropical Upper-Tropospheric Trough
PACOM	Pacific Command	ULAC	Upper-Level Anticyclone
PCN	Position Code Number	ULCC	Upper-Level Circulation Center
PSBL	Possible	VEL	Velocity
PTLY	Partly	VIS	Visual
QUAD	Quadrant	VMNT	Vector Movement (ddff)
RADOB	Radar Observations	WESTPAC	Western (North) Pacific
RECON	Reconnaissance	WMO	World Meteorology Organization
RNG	Range	WND	Wind
RT	Right	WRNG(s)	Warning(s)
SAT	Satellite	WRS	Weather Reconnaissance Squadron
SFC	Surface	XTRP	Extrapolation
SLP	Sea-Level Pressure	Z	Zulu Time (Greenwich Mean Time)
SRP	Selective Reconnaissance Program		