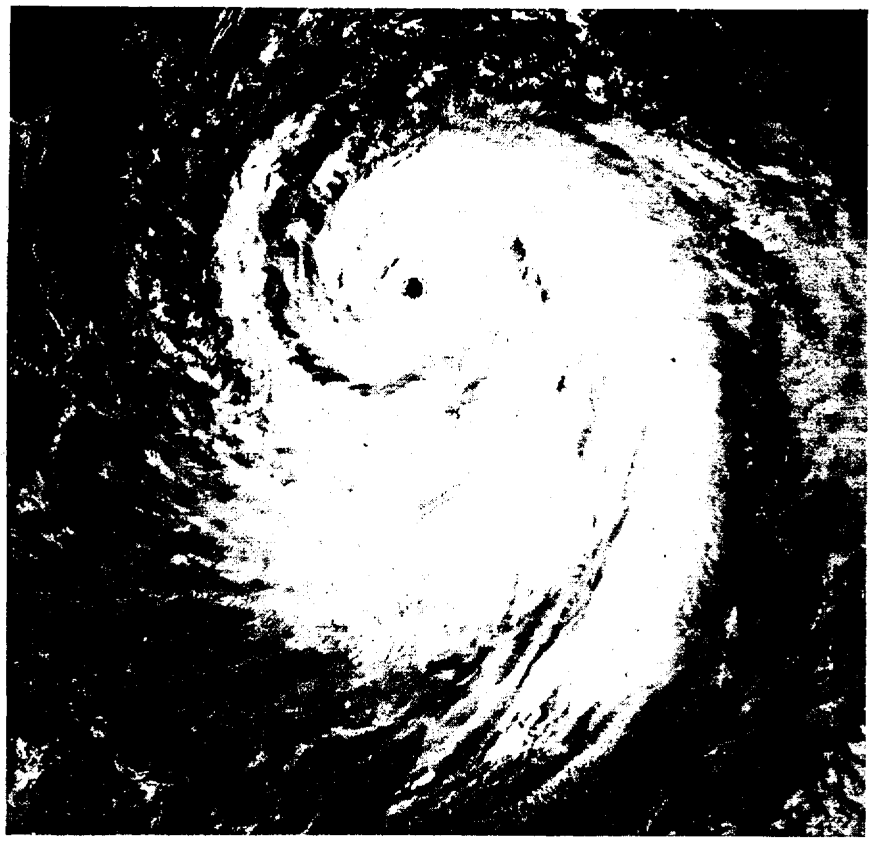
JTWC OPS

ANNUAL TYPHOON Report



1972

FLEET WEATHER CENTRAL/JOINT TYPHOON WARNING CENTER

Guam, Mariana Islands

SEE EDGE INDEX
ON BACK COVER

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The body of this annual report summarizes Western North Pacific Tropical Cyclones. Annex A summarizes tropical cyclones from 180 degrees eastward to the North American Coast, and Annex B summarizes tropical cyclones in the Bay of Bengal east of 90 degrees.

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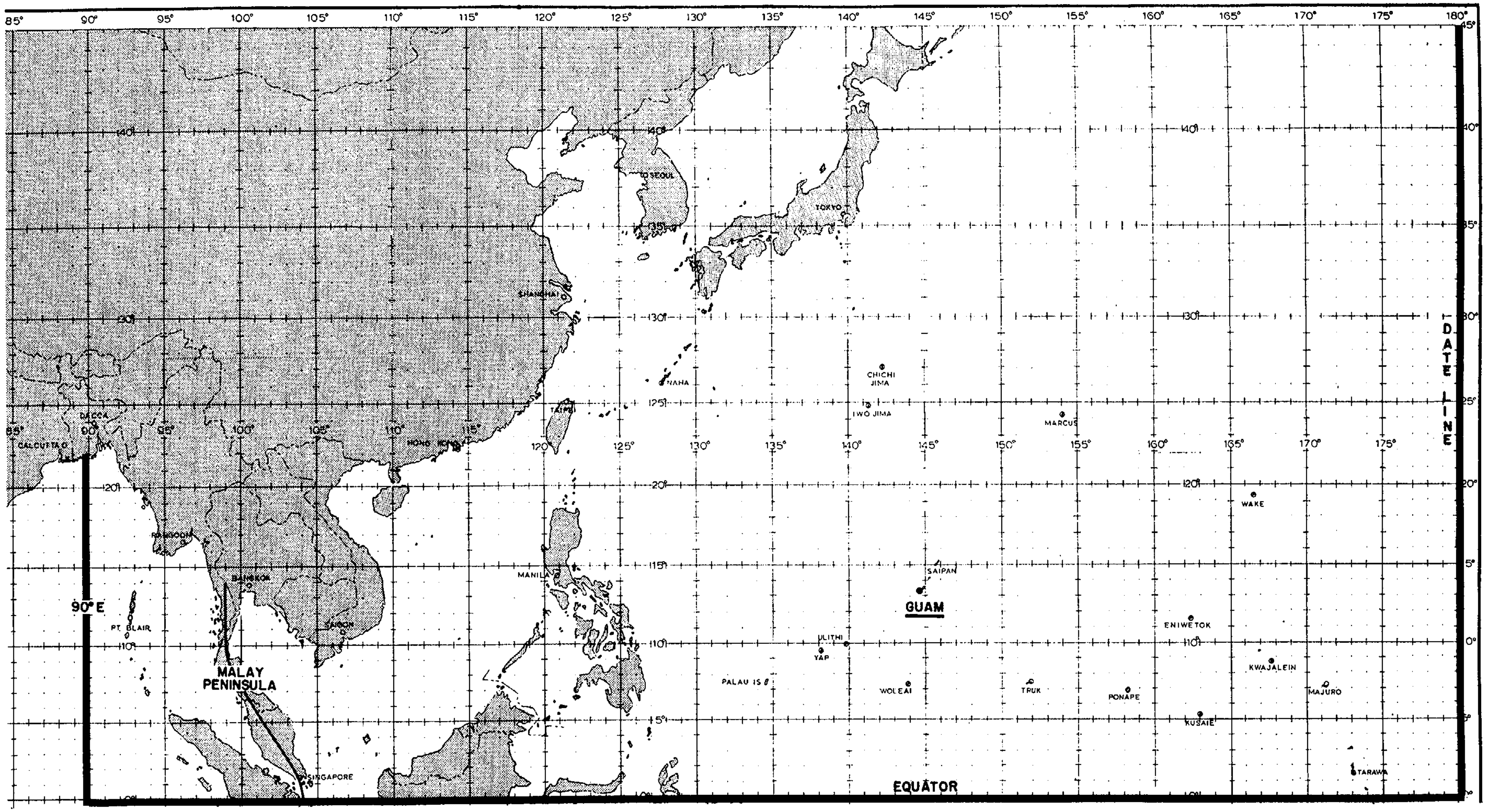

Area of Responsibility - Joint Typhoon Warning Center, Guam

Primary (180° West to Malay Peninsula)   Secondary (Malay Peninsula West to 90°E)

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1972
ANNUAL TYPHOON REPORT

FORWARD

The body of this annual report summarizes western North Pacific tropical cyclones. Annex A summarizes tropical cyclones from 180° eastward to the North American coast, and Annex B summarizes tropical cyclones in the Bay of Bengal east of 90°E.

Fleet Weather Central/Joint Typhoon Warning Center (FWC/JTWC), Guam has the responsibility to:

1. Provide warnings to U.S. Government agencies for all tropical cyclones north of the equator and west of 180° longitude to the coast of Asia and the Malay Peninsula;

2. Provide warnings for the area from the Malay Peninsula west to 90°E;

3. Determine tropical cyclone reconnaissance requirements and assign priorities;

4. Conduct investigative and post-analysis programs including preparation of the Annual Typhoon Report; and

5. Conduct tropical cyclone forecasting and detection research.

Asian Tactical Forecast Center, Fuchu (formerly Air Force Asian Weather Central), coordinating with the Naval Weather Service Environmental Detachment, Yokosuka, is designated as the alternate JTWC in case of the incapacitation of FWC/JTWC Guam.

The JTWC is an integral part of FLEWEACEN Guam and is manned by four officers and five enlisted men each from the Navy and Air Force. The senior Air Force officer is designated as Director, JTWC.

The Western Pacific Tropical Cyclone Warning System consists of the Joint Typhoon Warning Center and the U.S. Air Force 54th Weather Reconnaissance Squadron stationed at Andersen Air Force Base, Guam.

The Central Pacific Hurricane Center, Honolulu, is responsible for the area from 180° eastward to 140°W and north of the equator. Warnings are issued in coordination with FLEWEACEN Pearl Harbor and the Air Force Central Pacific Forecast Center, Hickam Air Force Base, Hawaii.

The Eastern Pacific Hurricane Center, San Francisco, is responsible for the area east of 140°W and north of the equator. Warnings are issued in coordination with FLEWEAFAC Alameda and the Air Force Hurricane Liaison Officer, McClellan Air Force Base, California. FLEWEACEN Pearl Harbor replaced FLEWEAFAC Alameda in this coordinating role on 1 November 1972.

The coordinating agencies under CINCPACFLT and CINCPACAF are responsible for further dissemination and, if necessary, local modification of tropical cyclone warnings to U.S. military agencies.

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CHAPTER I – OPERATIONAL PROCEDURES

1. GENERAL

Services provided by the Joint Typhoon Warning Center (JTWC) include forecasts of tropical cyclone formation, intensity, direction and speed of movement, and extent of damaging winds. This information was disseminated in 1972 by: (1) the Tropical Cyclone Formation Alert issued when formation of a tropical cyclone was suspected; (2) tropical cyclone warnings issued four times daily whenever a significant tropical cyclone was observed in the JTWC primary area; and (3) tropical cyclone warnings issued twice daily whenever a significant tropical cyclone was observed in the JTWC secondary area.

FLEWEACEN Guam provides computer and meteorological/oceanographic analyses for the JTWC. Communications support is furnished by the Nimitz Hill Message Center of the Naval Communications Station, Guam.

2. ANALYSES AND DATA SOURCES

a. FLEWEACEN GUAM ANALYSES:

(1) Surface mercator analysis, Northern Hemisphere, Western Pacific area; 0000Z, 0600Z, 1200Z, and 1800Z.

(2) Surface micro-analysis of South China Sea region; 0000Z, 0600Z, 1200Z, and 1800Z.

(3) Surface mercator analysis, Northern and Southern Hemispheres, Western Pacific and Indian Ocean area; 0600Z and 1800Z.

(4) Sea surface temperature charts; daily.

b. JTWC ANALYSES:

(1) Gradient level (3,000 feet) streamline analysis (south of 20°N) and isobaric analysis (north of 20°N); 0000Z and 1200Z.

(2) 700-mb, 500-mb, and 200-mb contour and streamline analysis; 0000Z and 1200Z.

(3) Reconnaissance data. Observations from weather reconnaissance aircraft are plotted on large-scale sectional charts.

(4) Time cross sections of selected tropical stations.

(5) Time sections of surface reports for selected tropical stations.

(6) Additional and more frequent analyses similar to those above during periods of tropical cyclone activity.

c. SATELLITE DATA:

Satellite data played a major role in the early detection of tropical cyclones in 1972. This aspect, as well as applications of satellite data to tropical cyclone tracking, is discussed in Chapter II, Reconnaissance and Communications.

d. RADAR:

Land radar reports, when available, were used for tracking tropical cyclones during the 1972 typhoon season. Once a storm moved within range of a land radar site, reports were usually received hourly. Use of radar during 1972 is treated in Chapter II, Reconnaissance and Communications.

e. COMPUTER PRODUCTS:

During 1971 the FLEWEACEN Guam computer was equipped with a varian plotter. This device eliminated a significant portion of the former hand plotting effort. Varian charts are produced routinely at synoptic times for the surface, 700-mb, and 500-mb levels. Additionally, a chart which approximates the 200-mb level is also produced. This chart uses rawinsonde data at 200 mb and aireps above 33,000 feet and within six hours of the 0000Z and 1200Z synoptic times. Data not in the proper format for use by the computer are hand plotted on the charts. These include pibal gradient level winds, low cloud movement, and missing or late synoptic reports necessary for a detailed analysis.

In addition, the standard array of synoptic-scale computer analyses and prognostic charts is produced.

JTWC extensively utilizes the computer center for objective typhoon forecasts and for statistical post analysis.

3. FORECAST AIDS

a. CLIMATOLOGY:

The following climatological publications were utilized:

(1) Tropical Cyclones in the Western Pacific and China Sea Area (Royal Observatory, Hong Kong), covering 70 years of typhoon tracks.

(2) Intensity Changes of Tropical Storms and Typhoons of the Western North Pacific Ocean (Brand and Gaya, 1971) NAVWEARSCHFAC Tech Paper No. 5-71.

(3) Climatological 24-Hour Typhoon Movement (McCabe, J. T., 1961).

(4) Western Pacific Typhoon Tracks, 1950-1959 and 1959-1968 (FWC/JTWC).

(5) Far East Climate Atlas (1st Weather Wing, February 1963).

(6) Annual Typhoon Reports, 1959-1971 (FWC/JTWC).

(7) A Climatology of Tropical Cyclones and Disturbances of the Western Pacific with a Suggested Theory for Their Genesis/Maintenance (Gray, Wm., 1970) NAVWEARSCHFAC Tech Paper No. 19-70.

(8) Changes in the Characteristics of Typhoons Crossing the Philippines (Brand and Blelloch, 1972) ENVPREDRSCHFAC Tech Paper No. 6-72.

(9) Speed of Tropical Storms and Typhoons After Recurvature in the Western North Pacific Ocean (Burroughs and Brand, 1972) ENVPREDRSCHFAC Tech Paper No. 7-72.

(10) The Typhoon Analog Computer Program (TYFOON).

b. PERSISTENCE:

Extrapolation of storm movement using 12-hour mean speed and direction was the most reliable objective method for 24-hour forecasts.

c. OBJECTIVE TECHNIQUES:

During 1972 the following objective forecasting methods were employed:

(1) ARAKAWA - surface pressure grid model.

(2) TYRACK - based on program-selected best steering level from FLEWEACEN Pearl tropical fields.

(3) TSGLOB - modification of TYRACK using global band upper air fields (GBUA) from FLENUMWEACEN Monterey. It replaced TYRACK on 23 September 1972 when FLEWEACEN Pearl tropical fields were replaced by the GBUA's from FLENUMWEACEN Monterey.

(4) TYFOON - analog weighted mean track.

(See Chapter V for technique evaluation.)

4. FORECASTING PROCEDURES

a. TRACK FORECASTING:

An initial track based on persistence blended subjectively with climatology is developed for a 3-day period. This initial track is subjectively modified by the following:

(1) Recent steering is evaluated by considering the latest upper air analyses as representative of the average upper air flow over the past 24 hours. (The latest upper air analyses are about 12 hours old, thus roughly representing the mid-point of the last 24-hour time interval.) By this technique actual past 24-hour movement serves to indicate the best steering level as well as the effectiveness of steering.

(2) Objective techniques are considered, with the techniques being ranked according to their past performance on similar storms.

(3) Twenty-four hour height-change analyses are evaluated for forecast track/speed changes (Hoover, Devices for Forecasting Movement of Hurricanes, Manuscript of the U.S. Weather Bureau, 1957).

(4) The prospects of recurvature are evaluated for all westward moving storms. The basic requisites for this evaluation are accurate continuity on mid-latitude troughs and numerical progs to indicate changes in amplitude or movement. Relative position and strength of the subtropical ridge and northward tendency due to internal forces are also important considerations.

(5) Finally, a check is made against climatology to ascertain the likelihood of the forecast. If the forecast track is climatologically unusual, a reappraisal of the forecast rationale is conducted and adjustments made if warranted.

b. INTENSITY FORECASTING:

Intensity forecasts are extrapolated linearly and modified by climatology where necessary. This modification is made after considering upper tropospheric evacuation, 850 mb-700 mb temperatures, sea surface temperatures, and possible terrain influence.

5. WARNINGS

Tropical cyclone warnings are numbered sequentially. If warnings are discontinued and the storm reintensifies, as Tropical Storm Grace did this year, warnings are numbered consecutively from the last warning issued. Amended or corrected warnings are given the same number as the warnings they modify. Forecast positions are issued at 0000Z, 0600Z, 1200Z, and 1800Z as follows:

Tropical Depressions	12 hr and 24 hr
Typhoons and Tropical Storms	12 hr, 24 hr, 48 hr, and 72 hr

Forecast periods are stated with respect to warning time. Thus a 24-hour forecast verifies 26-1/2 hours after the aircraft fix data, 30 hours after the latest surface synoptic chart and 30 or 36 hours after the latest upper air charts.

Warning forecast positions are verified against the corresponding post analysis "best track" positions. A summary of results from 1972 is presented in Chapter V.

6. PROGNOSTIC REASONING MESSAGE

Whenever warnings on typhoons and tropical storms are being issued, a prognostic reasoning message is released at 0000Z and 1200Z. This message is intended to provide the reasoning behind the latest JTWC forecasts.

7. TROPICAL WEATHER SUMMARY

This message is issued daily from 1 May through 31 December and otherwise when tropical cyclogenesis is forecast or observed. It is issued at 0600Z and describes the location, intensity and likelihood of development of all tropical low pressure areas and significant cloud masses detected by satellite.

8. TROPICAL CYCLONE FORMATION ALERT

Alerts are issued when the formation of a tropical cyclone is considered possible or probable. These messages are issued as required and are valid for up to 24 hours unless cancelled, superseded or extended.

1. GENERAL

During the 1972 typhoon season there were three primary methods--satellite, radar, and aircraft--utilized to accomplish reconnaissance. Aircraft reconnaissance remained the primary means for cyclone reconnaissance; however, greater emphasis was placed on the use of satellite-derived information due to a reduction of reconnaissance resources in November 1971.

2. RECONNAISSANCE RESPONSIBILITY AND SCHEDULING

Aircraft weather reconnaissance is performed in the JTWC area by the 54th Weather Reconnaissance Squadron (54 WRS). The squadron, composed of nine WC-130 aircraft, is located at Andersen Air Force Base, Guam.

The JTWC reconnaissance schedule is sent daily to the Tropical Cyclone Reconnaissance Coordinator. This schedule includes areas to be investigated, forecast positions of cyclones to be fixed and standard synoptic tracks to be flown.

Four fixes per day, at six-hour intervals, are required on all significant tropical cyclones in the JTWC primary area of responsibility (see inside front cover). Two fixes per day are required in the secondary area. Additional fixes and other information may be requested by operational commanders through the JTWC (CINCPAC-INST 3140.1K, 1971).

3. AIRCRAFT RECONNAISSANCE SUMMARY

Beginning with Typhoon Lola in May, the JTWC employed satellite and radar, on a selective basis, to position tropical cyclones in order to conserve aircraft and crews. Of 713 required fixes, 15% were obtained by satellite or radar. By selecting the mode of fixing, 109 fixes were eliminated from the aircraft levy. Of the 127 investigative missions required, 38% were performed by satellite, conserving 48 aircraft sorties. Whenever observing conditions permitted, satellite and radar were utilized, except in instances where aircraft fixes were required by operational commanders.

Table 2-1 summarizes aircraft reconnaissance fixes. 624 fixes were levied of which 538 or 86.2% were 6-hourly. The intermediate fixes (3-hourly) accounted for 12.5% and there were three 1-hourly fixes levied. Five fixes were levied for the Bay of Bengal area representing 0.8% of the total.

The aircraft missions for 1972 included 17 synoptic tracks, 81 investigatives and 624 fixes. The lower half of Table 2-1 compares the total of 705 fixes and investigatives levied with the annual average of 706 compiled over a 10-year period. The coverage provided by SRP reduced this total from 862 required fixes and investigatives. This is a total savings of 19% from May. Reconnaissance effectiveness, the top of Table 2-2, separates the fixes into 6-hourly, 3-hourly, and 1-hourly categories. Of a total of 624 fixes levied, 126 were missed. This represents a 20.2% missed rate as compared to the 1971 average of 7.6%. These statistics were developed by the same system of crediting fixes as was used in 1971 (FWC/JTWC, 1971).

In addition to the fixes missed, 2.1% and 8.5% of the fixes were too early or too late respectively. This is a 5% increase from the previous year. Early and late fixes are considered together as each degrades the quality of warnings.

The bottom half of Table 2-2 compares fixes levied with fixes missed. During the

TABLE 2-1. FIX SUMMARY

538	6-HRLY FIXES LEVIED (WESTPAC)	86.2%
78	INTERMEDIATE (3-HRLY FIXES)	12.5%
3	1-HRLY FIXES	0.5%
5	FIXES IN SECONDARY AREA (BAY OF BENGAL)	0.8%
624		

COMPARISON OF FIXES AND INVESTIGATIVES LEVIED IN 1972 TO LONG TERM AVERAGE

LEVIED FIXES	624
LEVIED INVESTIGATIVES	81
	705

ANNUAL AVERAGE LEVIED FIXES/INVESTIGATIVES (1962 - 1971): 706

TABLE 2-2. RECONNAISSANCE EFFECTIVENESS

	ALL	6 HRLY	3 HRLY	1 HRLY
COMPLETED ON TIME	433	370	60	3
EARLY	13	10	3	0
LATE	52	46	6	0
MISSED	126	117	9	0
TOTAL	624	543	78	3

LEVIED VS. MISSED FIXES

	LEVIED	MISSED	PERCENT
AVERAGE 1965-1970	507	10	2.0%
1971	802 (620 6HR, 182 3HR)	61 (44 6HR, 17 3HR)	7.6%
1972	624 (543 6HR, 78 3HR, 3 1HR)	126 (117 6HR, 9 3HR)	20.2%

period from 1965-1970, when a different crediting criteria was used, an average of 2% of all fixes were missed. In 1971 a more rigid system of scoring reconnaissance was adopted, resulting in an increase in the missed-fix ratio. This season, continuing with the 1971 criteria, a large increase was noted, especially in the 6-hourly rate. The combined 6-hourly and 3-hourly missed-fix percentage rate was 2-1/2 times the 1971 rate.

Figure 2-1 compares fixes missed to the monthly fix requirements and multiple-storm days. The 174 fixes levied in July account for about 28% of all fixes levied in 1972. July also included 44% of the multiple-storm days (20) and 40% of the fixes missed (50).

Figure 2-2 compares the percentage of fixes and investigatives missed/late versus the number of storms per day. Thirty-two percent of the annual total of levied fixes and investigatives were missed on four-storm days. This illustrates the load that is placed on the aircraft reconnaissance assets during periods of multiple-storm days. Despite the 48 sorties and 109 fixes obtained by satellite and radar, the percentage of fixes missed/late on single-storm days was twice as large as the average for 1971.

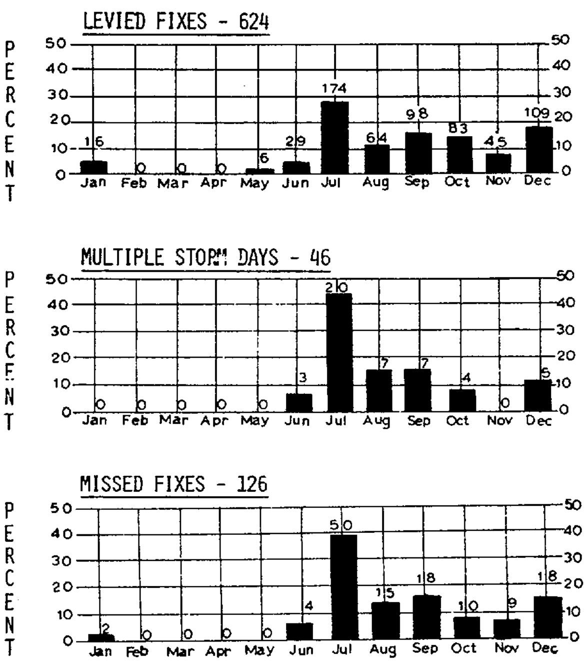

FIGURE 2-1. *Missed fixes for 1972 compared to monthly fix requirements and multiple storm days.*

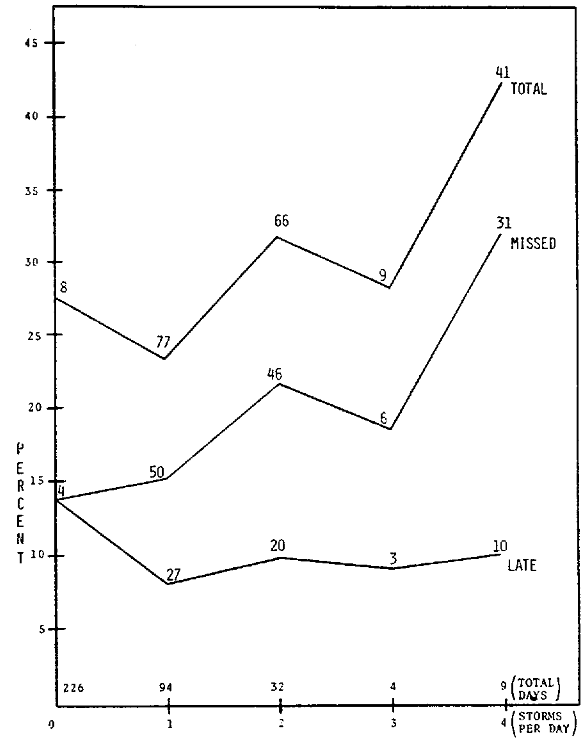

FIGURE 2-2. *Percentage of fixes and investigatives missed/late vs. storms per day.*

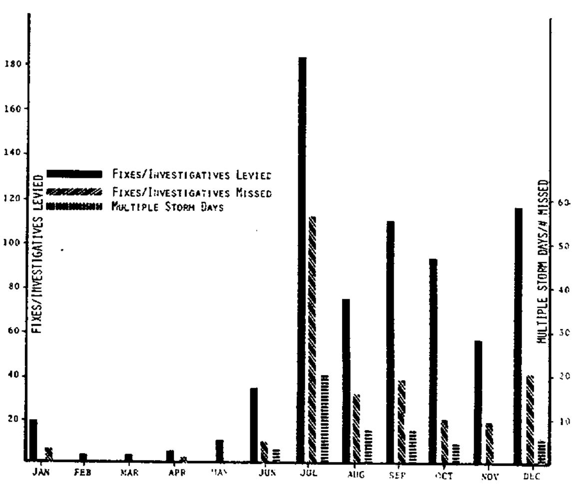

FIGURE 2-3. *Levied requirements vs. missed fixes/investigatives as related to multiple storm days.*

Figure 2-3 relates levied requirements to multiple-storm days and missed fixes/investigatives by month. The major peaks occurred in July and September when four tropical cyclones were active concurrently. The peak in October was a result of almost continuous storm activity. The peak in December resulted from a period of two concurrent storms.

4. RADAR RECONNAISSANCE SUMMARY

Over 700 land and ship radar reports were received during the 1972 season. These reports are normally received hourly whenever a storm is within the envelope of radar coverage. The majority of the reports from land stations were from Japan, including the Ryukyus and Taiwan. Radar reports from ships were received almost exclusively from the South China Sea.

Since the radar is normally remote from the storm, ability to position a cyclone is a function of signal attenuation, range, organization of the cyclone and operator skill (NAVAIR 50-1P-2, 1967). The mean deviation, from the best track, for all radar reports on cyclones was 17 nm. The mean deviation for radar reports on cyclones of typhoon strength was 16 nm.

Positioning errors occurred when the wall cloud was weak or open, creating false impressions of the actual storm movement. During Typhoon Betty, for example, land radars reported her stationary from 160800Z until 161100Z at which time they showed her tracking southeast. During this time Betty was actually moving north-northwest at 13 kt. Positioning errors also generate unrealistic speed movements. Radar fix-to-fix computations produced some speeds in excess of 200 kt.

Another source of positioning error is present when a storm is near the maximum radar range. In these cases the radar paints only the tops of clouds near the wall and a complete presentation of the eye, if defined, is not possible.

Despite these errors and limitations, radar was used very effectively to track cyclones. Typhoon Lorna provided an excellent example of the efficacy of radar for tracking a well-developed tropical cyclone. Lorna was tracked solely by radar from 1240Z on the 1st of October through 0540Z on the 5th. Due to geographic flight restrictions, aircraft were unable to penetrate during this period.

5. COMMUNICATIONS

a. AIR TO GROUND:

Current air-to-ground communications procedures were implemented five years ago and functioned effectively in 1972. Reconnaissance information is normally received from the aircraft by JTWC via voice phone patch through Andersen, and occasionally from Clark aeronautical station. If the transmission from the aircraft is not of patch quality, data can be relayed over the telephone by the weather monitor in the aeronautical station. If the weather monitor can not complete a direct phone patch or relay, he places the message on a teletype circuit but this usually results in excessive delay.

Figure 2-4 compares the 33.8 minute average delay in receipt of center data messages in 1972 with recent years. Under ideal circumstances the weather observer transmits the complete message 20 to 25 minutes after fixing the center of the storm. The small rise in delay times noted in 1971 and 1972 is attributed to the number of multiple-cyclone situations in those years and the system's inability to handle more than one voice report at a time.

Table 2-3 shows that the percent of fix messages received over one hour after fix time remained nearly constant in recent years, but the percent of fix messages received after warning time rose significantly in 1971 and again in 1972.

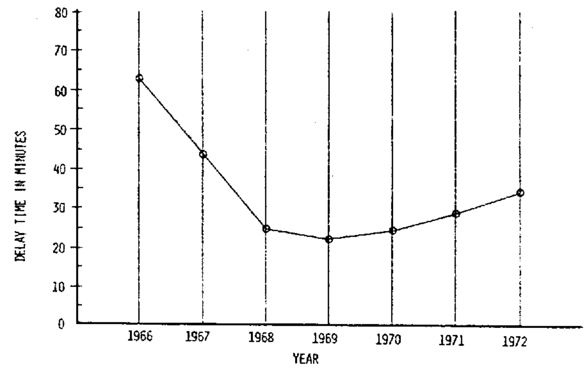

FIGURE 2-4. *Comparison of 1972 average delay times with those of previous years.*

The preliminary eye data message was instituted in 1972 as a means of reducing the delay in receipt of position and intensity information. These preliminary messages are much shorter than the complete report and reduce the time required for preparation and transmission. Figure 2-5 illustrates that the delay in receipt of this information is nearly halved by the use of the preliminary messages. The solid bars represent the delay of the complete center data message and hatched bars portray preliminary message delays. The number of reports considered are in parentheses.

TABLE 2-3. 1972 AIR/GROUND DELAY STATISTICS COMPARED WITH PREVIOUS YEARS

	1967	1968	1969	1970	1971	1972
% FIX MESSAGES DELAYED OVER ONE HOUR	16%	4%	3%	5%	6%	6%
% FIX MESSAGES RECEIVED AFTER WARNING TIME	3.1%	0.7%	0.6%	0.9%	2.1%	5.5%

Figure 2-5 also illustrates the difference in delay times between the various means of delivery; phone patch and relay being the most expeditious while the infrequently-used teletype relay resulted in delays of over 55 minutes. Most fix reports from the Bay of Bengal had to be relayed due to weak signal strength or inability of the aircraft to raise Clark Airways. This resulted in considerable delay in receipt of the data.

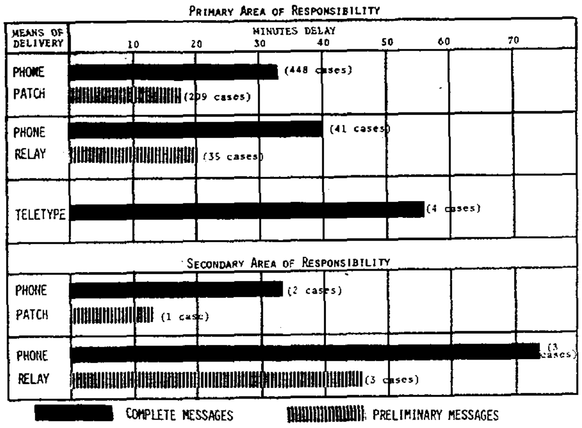

FIGURE 2-5. *1972 eye message delay statistics.*

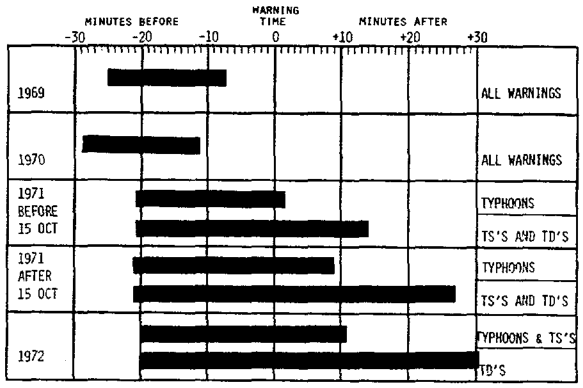

FIGURE 2-6. *AUTODIN message handling times.*

b. OUTGOING COMMUNICATIONS:

The present warning handling procedure was initiated in October 1971. By agreement with the Nimitz Hill Message Center, a special content indicator causes warnings to be placed in the communications system before other IMMEDIATE but after FLASH traffic awaiting transmission. Typhoon and tropical storm warnings are handled in this manner while tropical depression warnings are treated as normal IMMEDIATE messages.

Figure 2-6 shows a comparison of the delays encountered in transmission of warning messages in 1972 with the years through 1969. In 1972, warnings were delivered to the Nimitz Hill Message Center an average of 20 minutes before warning time (represented by the left-hand limit of the bar) and transmitted on AUTODIN an average of 30.7 minutes later (represented by the right-hand limit of the bar). This closely parallels the delays realized in 1971 after the use of the special content indicator was initiated. These statistics represent the average time required to enter the warnings into the communications system. Actual time of receipt at a station depends on factors beyond the control of JTWC or its servicing communications center.

REFERENCES:

CINCPACINST 3140.1K, "Tropical Cyclone Operations Manual," III-2, Sect 3.3.1, November 1971.

FWC/JTWC, Annual Typhoon Report, Guam, Marianas Islands, p 2-13, 1971.

NAVAIR 50-1P-2, Weather Radar Manual, Ch. 3, August 1967.

CHAPTER III - TECHNICAL NOTES

1. VERIFICATION OF THE 48-HOUR FORECAST SECTOR OF 75 PERCENT PROBABILITY

a. INTRODUCTION:

At the 1971 CINCPAC Tropical Cyclone Conference the COMSEVENTHFLT Staff Meteorologist introduced an agenda item requesting that a statement of estimated error for the 48-hour outlook position be included in warnings issued by the Joint Typhoon Warning Center (JTWC). The Conference agreed that an estimated error was of value, however, it noted that no objective procedure had as yet been developed that could adequately depict what the estimated error would be for a particular forecast. The JTWC was therefore tasked to develop and test a means for estimating the error associated with a particular 48-hour outlook.

b. DEVELOPMENT AND TESTING:

During the 1971 tropical cyclone season, two methods of assigning confidence limits to 48-hour outlooks were developed and tested.

The first method consisted of constructing a segment of an annulus with the origin at the warning position and the segment centered about the 48-hour outlook position. The mean width was determined by striking a 240-mile arc (mean track error) centered at the 48-hour outlook position. The mean length was determined by moving 180 miles toward and away from the 48-hour outlook position. The 362 cases evaluated yielded a verification rate of 55%.

The second method used the 48-hour 50% climatology ellipse (obtained from the TYFOON analog computer program) as the confidence limit. Of 102 cases tested during 1971, 42% verified.

A combination of these two methods was then tested. This method consisted of a sector originating at the warning position, but limited by the larger of lines tangent to:

(1) The 50% climatological ellipse; or

(2) 120 miles across track and 180 miles along track from the 48-hour outlook position.

In no case would the resulting sector be smaller than either of the sectors derived using the first or second methods. Of the 94 cases tested using this third method, 79% verified.

Shortcomings were known to be inherent in all three of the methods tested. The first method failed in areas where climatological tracks diverge and in cases where recurvature occurred. The method based on the 50% climatological ellipse handled poorly those cases where there was a well-established westward track or climatologically unusual storms. The combination method demonstrated little skill when an abrupt course change occurred or during short-term accelerations or decelerations.

Although all three methods exhibited weaknesses, the combination method was chosen for operational use based upon its 79% verification during the 1971 test period.

c. UTILIZATION:

The 48-hour forecast sector of 75% probability was first issued on Typhoon Ora in June 1972.

The actual procedure used in its construction is depicted in Figure 3-1. First, the 48-hour 50% probability ellipse from the TYFOON analog program was plotted as shown in 1.a. Next, the forecast track was constructed. In 1.b. the forecast track and 48-hour outlook position lie within the 48-hour 50% TYFOON probability ellipse, although this is not a requirement. Third, using the 48-hour outlook position and track, 120-mile perpendiculars were drawn across track and 180-mile points were laid along track. Utilizing these points, tangents and arcs were drawn from

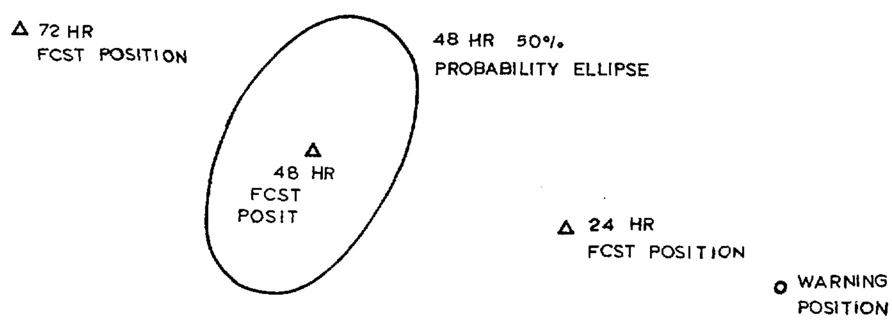

FIGURE 3-1.a. *Forecast positions based on TYFOON analog computer program.*

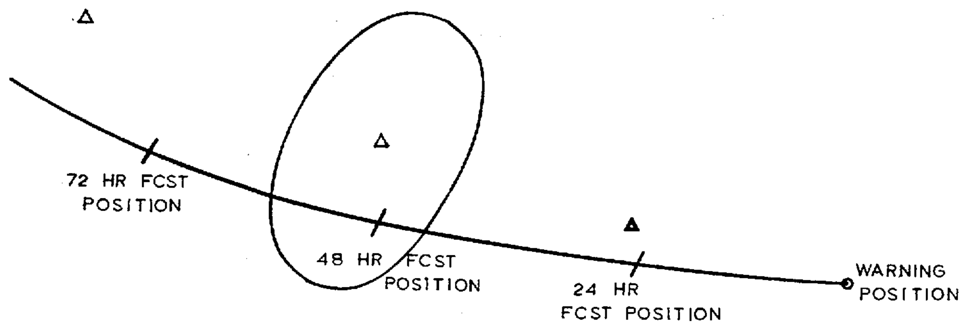

FIGURE 3-1.b. *Actual forecast track.*

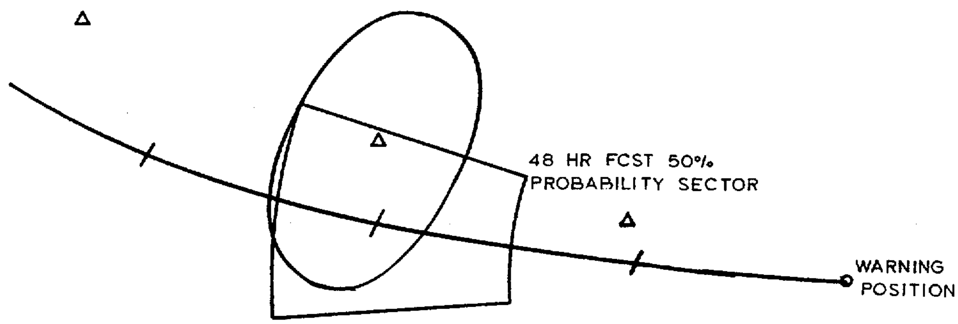

FIGURE 3-1.c. *48-hr forecast 50% probability sector centered on 48-hr forecast position.*

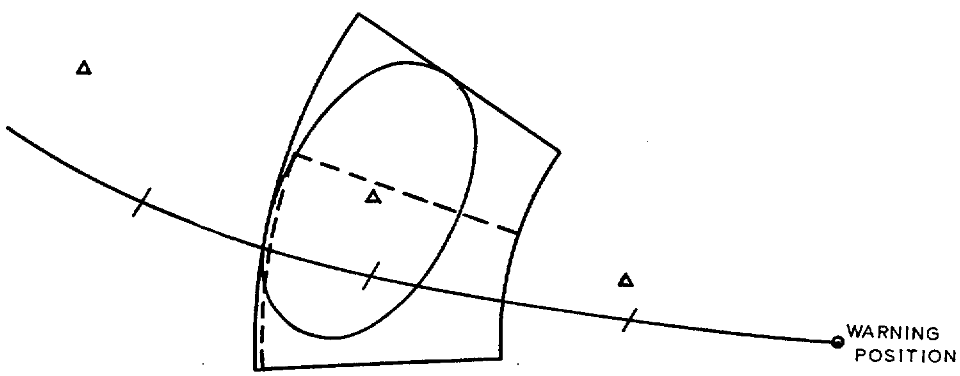

FIGURE 3-1.d. *The 48-hr forecast sector of 75% probability.*

the warning position, resulting in a wedge-shaped sector centered on the 48-hour outlook position as depicted in 1.c. Finally, taking the extreme positions of the 4x6 degree wedge-shaped sector and the 50% probability ellipse, tangents and arcs were drawn from the warning position resulting in the 48-hour forecast sector of 75% probability as shown in 1.d.

During the 1972 tropical cyclone season 48-hour 75% probability forecast sectors were included in 307 warnings. An individual storm and cumulative breakdown is provided in Table 3-1. As can be seen from Table 3-1, 27 of the forecasts were not verified. This was due to the tropical cyclone having dissipated or become extratropical by verification time. Of the 280 48-hour sector of 75% probability forecasts verified, only 153 or 54.6% of the actual 48-hour positions fell within the sector.

d. VERIFICATION PROCEDURES:

To determine if a bias existed in the method of constructing the sector, it was divided into four internal and four external parts for verification purposes as shown in Figure 3-2. All directions shown in Figure 3-2 and subsequent figures are relative to the storm tracks. The hypothesis on which the verification sector was based was that if no bias existed, then a

TABLE 3-1. INDIVIDUAL AND CUMULATIVE VERIFICATION STATISTICS FOR THE 48-HOUR FORECAST SECTOR OF 75% PROBABILITY

STORM NAME	INDIVIDUAL STORM FORECASTS ISSUED	WITHIN SECTOR	OUTSIDE SECTOR	NOT VERIFIED	CUMULATIVE TOTAL FORECASTS ISSUED	WITHIN SECTOR	OUTSIDE SECTOR	NOT VERIFIED
ORA	9	4	3	2	9	4	3	2
PHYLLIS	33	4	24	5	42	8	27	7
RITA	50	23	27	0	92	31	54	7
SUSAN	1	0	1	0	93	31	55	7
TESS	25	11	10	4	118	42	65	11
ALICE	16	11	5	0	134	53	70	11
BETTY	24	20	4	0	158	73	74	11
CORA	10	6	1	3	168	79	75	14
ELSIE	4	1	3	0	172	80	78	14
FLOSSIE	11	9	2	0	183	89	80	14
GRACE	5	0	5	0	188	89	85	14
HELEN	7	3	2	2	195	92	87	16
IDA	18	12	3	3	213	104	90	19
KATHY	12	7	5	0	225	111	95	19
MARIE	18	11	4	3	243	122	99	22
NANCY	14	3	11	0	257	125	110	22
OLGA	16	9	4	3	273	134	114	25
PAMELA	12	6	4	2	285	140	118	27
RUBY	1	1	0	0	286	141	118	27
THERESE	21	12	9	0	307	153	127	27

normal distribution should be present both in and out of the sector.

Figure 3-3 shows the breakdown of the 280 forecasts verified. The distribution within the sector could be described as fairly normal. However, of the 127 forecasts that fell outside the sector, 59 or 46.5% were outside to the east of the storm tracks while only 15 or 11.8% were outside to the west of the storm tracks. Thus, the original hypothesis of no bias in the construction of the sectors was invalid.

Based upon the results contained in Figure 3-3, a new hypothesis was formulated, i.e., that a westerly bias existed in the construction of the sectors. To determine if this hypothesis was valid it was necessary to divide the storms for which 48-hour sector forecasts were issued into two categories:

(1) Northerly/recurving storms - those storms whose primary direction of movement was either to the right of 315°(T) or which recurved; and

(2) Westerly moving storms those storms whose primary direction of movement was to the left of 315°(T).

In making this division, the difference in the number of storms was quite small--11 classified as northerly/recurving and 9 classified as westerly moving. A major difference existed, however, in the number of sector forecasts issued--190 for northerly/recurving versus 90 for the westerly moving storms. This significant difference resulted from the climatologically disproportionate number of northerly moving systems experienced during the 1972 season that originated to the east of Guam where historical data was minimal.

If the new hypothesis of a westerly bias was correct, then the majority of cases verified for the northerly/recurving storms should fall to the right of the sector center. Similarly, for the westerly moving storms, the majority of cases should fall to the left of the sector center. Figures 3-4, northerly/recurving storms, and 3-5, westerly moving storms, confirm this hypothesis. In fact, a southwesterly bias was actually present, i.e.,:

(1) For northerly/recurving storms 63.7% of the predictions fell to the right of center and 55.8% fell above the center; and

(2) For westerly moving storms 60.6% of the forecasts fell to the left of center and 57.8% fell below the center.

Thus, the center of the average 48-hour forecast sector of 75% probability issued during 1972 was to the left and behind the actual average storm track.

e. RESULTS AND CONCLUSIONS:

A verification rate of only 54.6%, plus the presence of a southwesterly bias, indicated the need for a complete reanalysis of the procedures used in constructing the 48-hour forecast sector of 75% probability.

The southwesterly bias was attributed to two factors:

(1) The regression and correlation coefficients for TYFOON were recomputed after the 1971 season utilizing data from that year. The 1971 season had a preponderance of westerly moving storms. The result was a limited biasing of TYFOON toward westerly moving storms.

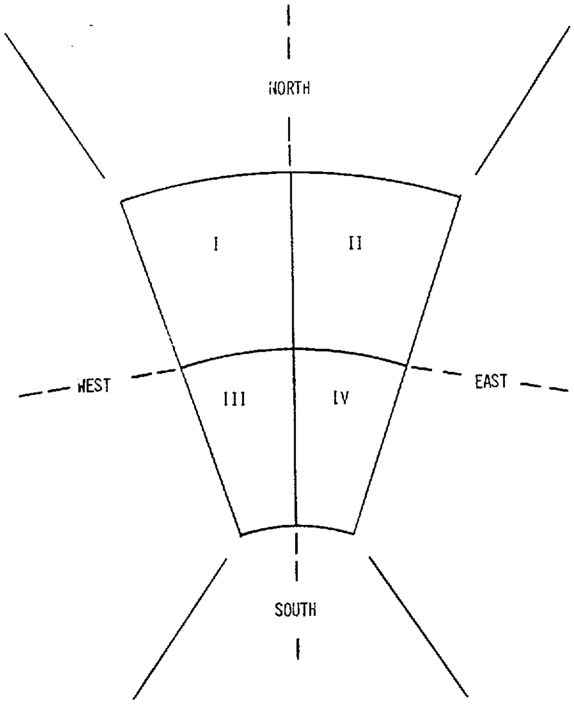

FIGURE 3-2. *Verification sector.*

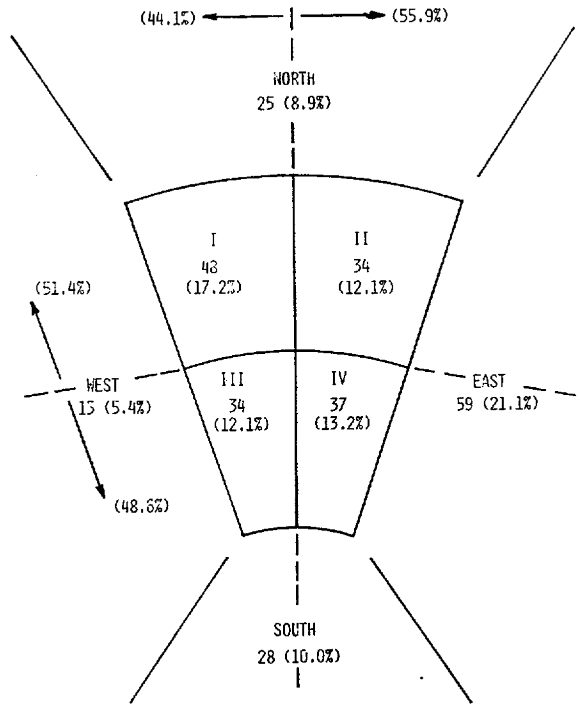

FIGURE 3-3. *Verification of sector forecasts issued during 1972.*

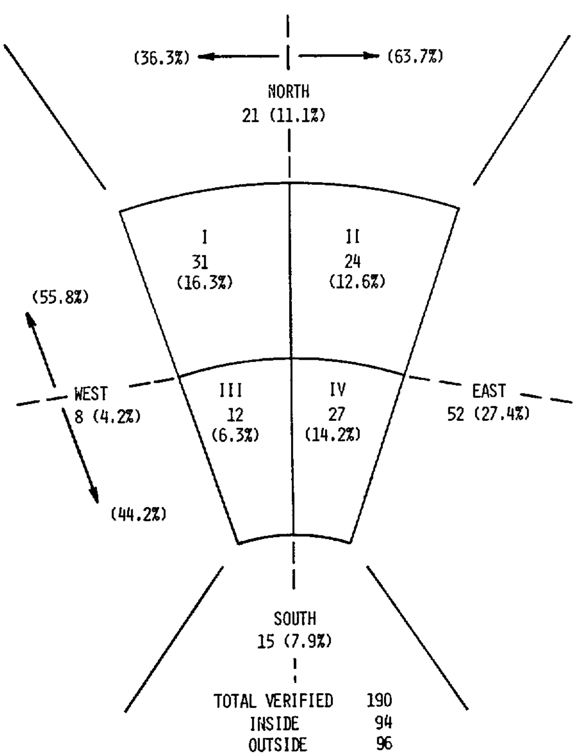

FIGURE 3-4. *Verification of sector forecasts for northerly/recurving tropical cyclones.*

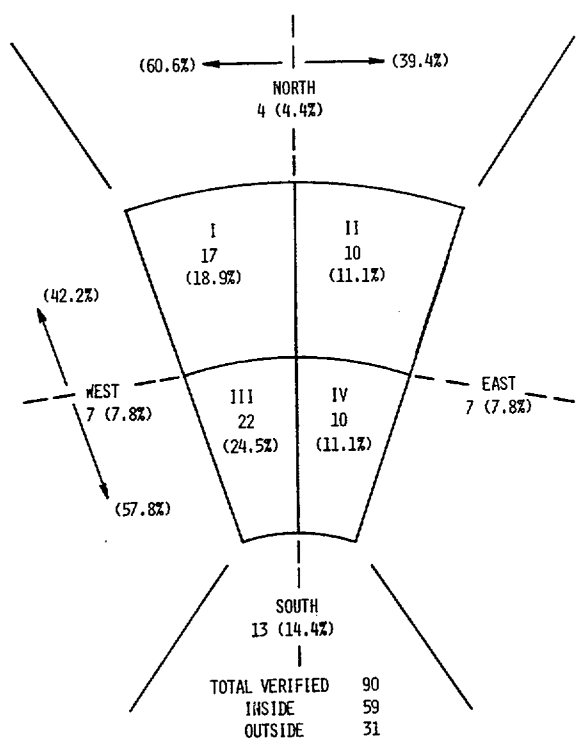

FIGURE 3-5. *Verification of sector forecasts for westerly moving tropical cyclones.*

(2) The JTWC has historically been slow to forecast recurvature by an average of one to two warnings.

These two factors contributed markedly to the center of the 48-hour forecast sector being to the left and behind the actual storm tracks.

When the sector was originally developed, it was assumed that the 48-hour 50% TYFOON ellipse and the 4x6 degree wedge-shaped sector were independent, thus establishing a 75% degree of confidence. Both subjective and mathematical investigation indicated that the original assumption was invalid. The 4x6 degree wedge-shaped sector was dependent upon the 48-hour outlook position and the forecast track. The forecast track, in turn, was derived from many inputs, one of which was the 50% TYFOON ellipses for 24, 48, and 72 hours. Therefore, true independence between the two did not exist. Utilizing this fact, it was mathematically determined that the optimum degree of confidence that could be expected using the present method would be about 65%. This equates with the actual verification statistics for westerly moving systems in 1972 of 65.5%.

During the 1972 season the average sector was approximately 270,000 nm^2. To insure that future sectors actually verified 75% of the time would require a minimum increase of 37% in the average sector size over the 1972 average. The result would be a sector of such dimension as to be of dubious value.

Although well received, on the average, by the users of Typhoon Warning WestPac, the 48-hour forecast sector of 75% probability has proven to be not only unreliable but even misleading. The JTWC sees no means of readily improving the present sector forecast system. An entirely new method must be developed and tested.

2. A RE-EVALUATION OF THREE-HOURLY FIXES

a. INTRODUCTION:

A JTWC presentation made to the 1972 CINCPAC Tropical Cyclone Conference contributed significantly to a recommendation for the deletion of mandatory 3-hourly fixes whenever a tropical cyclone was within 300 nm of a Department of Defense (DOD) installation. However, operational commanders retained the authority to request supplementary fixes if required for operational decisions or to safeguard DOD interests and lives.

The rationale behind the JTWC presentation in 1972, reproduced in the 1971 Annual Typhoon Report, was:

(1) Increased reconnaissance fixes would improve the accuracy of the warning position when based on interpolation but not extrapolation. Extrapolation would improve only until the distance between fixes became so small that inaccuracies in measurements were of the same order of magnitude as likely changes in the parameters measured; and

(2) The addition of 3-hourly fixes would increase the reconnaissance burden and be accompanied by a proportional increase in the missed-fix frequency.

The statistics presented, based on the evaluation of 1971 data, tended to support the rationale listed above.

TABLE 3-2. THREE-HOURLY FIXES VERSUS SEASON'S AVERAGE

	THREE HOURLY FIXES	SEASON'S AVERAGE	SEASON'S AVERAGE LESS THREE-HOURLY FIXES
MISS RATE	11.5%	19.7%	20.7%
LATE RATE	7.7%	9.2%	9.4%
EARLY RATE	3.8%	1.9%	1.6%
MADE RATE	76.9%	69.2%	68.3%

b. RESULTS DURING 1972:

During the 1972 season the JTWC levied 78 3-hourly fixes, primarily in the South China Sea (SCS). These supplementary fixes were levied at the request of operational commanders, in anticipation of such requests, or to fulfill requirements for warnings.

Aircraft on two-fix sorties can get the intermediate fix as a bonus. Thus, during 1972, the 3-hourly fixes had a better miss/late rate than the overall statistics for the year as depicted in Table 3-2. This enabled the JTWC to obtain a more comprehensive evaluation of the tropical cyclone. More importantly, the average 24-hour forecast error for warnings based on consecutive 3-hourly fixes was less than for any other fix interval. A comparison of average 24-hour forecast errors for three separate fix interval categories and all warnings issued is shown in Table 3-3. This comparison shows that warnings based on two or more consecutive 3-hourly fixes are superior, on the average, to all other categories.

TABLE 3-3. COMPARISON OF 1972 AVERAGE 24-HOUR FORECAST ERRORS

	AVERAGE 24-HOUR FORECAST ERROR
A. WARNINGS BASED ON:	
Consecutive three-hourly fixes	94 nm
Consecutive six-hourly fixes	111 nm
Missed aircraft recon fixes	134 nm
B. ALL WARNINGS ISSUED FOR:	
SCS tropical cyclones	105 nm
SCS tropical cyclones without three-hourly fixes	110 nm
All tropical cyclones	117 nm

c. CONCLUSIONS:

Although 1972 found a reversal in the results obtained in 1971, a two-year sampling of data is considered to be insufficient to arrive at valid conclusions. The majority of 3-hourly fixes in 1971 were levied as a system approached land. In 1972 most 3-hourly fixes were levied on cyclones moving over the SCS and undergoing reorganization and intensification. Also, tropical cyclones over the SCS are normally smaller than those in other parts of the western North Pacific.

In general, continuous 6-hourly fixes are sufficient for warning purposes only so long as the tropical cyclones are following a smooth path at nearly constant speed. However, for erratically moving or accelerating circulations, 3-hourly fixes are essential to the issuance of competent warnings.

3. AN AUTOMATED OBJECTIVE TECHNIQUE FOR CONSTRUCTING TROPICAL CYCLONE BEST TRACKS

a. INTRODUCTION:

The accuracy of tropical cyclone best tracks depends heavily on the techniques used in their construction (position/intensity histories). Due to changes in personnel, reconnaissance platforms, and procedures, these techniques have varied greatly over the years. Since reliable data are essential for progress in tropical cyclone research it is desirable that inconsistency be eliminated. It was with this goal that an objective analysis technique was developed.

b. GENERAL PROCEDURE:

The computer program takes cyclone fix information from punched cards, weighs and groups these data based on preassigned weighting factors and calculates latitude, longitude, intensity, and accuracy functions using linear and second order smoothing routines. The program incorporates both a position history routine to develop the actual storm track and an intensity history routine to derive the storm's maximum surface wind speed at each synoptic time.

(1) THE POSITION HISTORY ROUTINE - The program initially divides the time domain into 3-hourly intervals, or integral multiples of 3 hours, so that each interval contains at least one fix. To eliminate unwanted short-term movements, a group point is derived from a weighted combination of the fixes contained in each time interval. This group point is assigned a time, position, and accuracy values, all weighted by the accuracies of the fixes used to produce the group point. The set of group points then undergoes four linear smoothing/accuracy adjustments where each group point is adjusted in relation to adjacent group points. After linear smoothing, five group points at a time (i, $i + 1$, $i + 2$, $i + 3$, and $i + 4$) are considered in a second order smoothing routine. During this process, points $i + 1$ and $i + 3$ are adjusted in reference to a second order polynomial drawn through points i, $i + 2$, and $i + 4$. After completion of two second order smoothings, the position history, as defined by the collection of group points, is adjusted to correct any corner cutting that may have been introduced during the smoothing cycles. The program then calculates latitude, longitude, and position accuracy values corresponding to the set of desired best track times using second order interpolation.

(2) THE INTENSITY HISTORY ROUTINE - This portion of the program closely parallels the position history routine. Differences exist in that, unlike position information, much of the intensity information cannot be read directly from fix data cards but must be constructed from other measured parameters. In addition, some fixes lack intensity estimates altogether. In these cases intensity data from neighboring group points are used.

c. FUTURE DEVELOPMENT:

All fixes used in the procedure are assigned an accuracy weighting factor which determines how much influence they will have on the final best track positions of the storm. The merit of an objective best track routine depends on the goodness of the weighting factors used. The factors are assigned based on the probable errors of the fix method utilized and modified if better information as to the accuracy of the fix is available. The values assigned to various fix methods are based on limited data and will be refined as the data base enlarges. Results gained in testing the program with 1972 data are very encouraging, indicating that the objective best track program represents a significant advance in post-seasonal tropical cyclone track analysis.

CHAPTER IV — SUMMARY OF TROPICAL CYCLONES

1. GENERAL RESUME

Thirty named tropical cyclones, of which twenty-two attained typhoon intensity, developed over western North Pacific waters during 1972 (Table 4-1). Typhoons Olga and Ruby had their origin in the central Pacific. Elsie and Flossie retained their identity while crossing the Indo-China peninsula and regenerated into tropical cyclones of typhoon strength over the Bay of Bengal.

The 1972 typhoon frequency was higher than the yearly average of 19 since the beginning of the JTWC in 1959. During this period, only 1962, 1964, and 1971 experienced more typhoons (Table 4-2). Typhoon days numbered 121, which is 21 more than average (Table 4-3). This figure surpasses all years since 1959, indicating the several multiple-storm situations and longer track lifetimes of 1972.

Multiple-storm activity was quite pronounced in July. Four tropical cyclones, Phyllis, Rita, Susan, and Tess, signaled the greatest simultaneous outbreak in JTWC records in over a decade. The record for multiple storms was August 1960, when five appeared on synoptic charts during the same day. However, in July 1972 four named tropical cyclones co-existed for seven consecutive days, producing a longevity record (Figure 4-1). Typhoon days for July exceeded the high for any month since 1959, as a record 222 warnings were issued by the JTWC. This compares with a total of 739 warnings issued during the year (Table 4-4).

The equatorial trough was quite pronounced during the summer and fall of 1972. Low-level monsoon westerlies extended from Southeast Asia across equatorial latitudes into the central Pacific. Sadler[1] indicated this anomalous circulation pattern to be associated with large-scale ocean

TABLE 4-1. FREQUENCY OF TROPICAL STORMS (INCLUDING TYPHOONS) BY MONTHS AND YEARS

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1945	0	0	0	1	1	2	5	7	6	1	3	0	26
1946	0	0	1	0	1	2	3	2	3	1	2	0	15
1947	0	0	1	0	1	1	3	3	5	6	6	1	27
1948	1	0	0	0	2	2	2	5	5	4	3	2	26
1949	1	0	0	0	0	1	5	3	6	1	3	2	22
1950	0	0	0	0	1	2	3	2	3	3	3	1	18
1951	0	0	1	2	1	1	1	2	2	4	1	2	17
1952	0	0	0	0	0	3	3	4	5	6	3	4	28
1953	0	1	0	0	1	2	2	6	3	4	3	1	23
1954	0	0	1	0	1	0	1	6	4	3	3	0	19
1955	1	0	1	1	0	1	6	3	3	4	1	1	22
1956	0	0	1	2	0	1	2	5	5	2	3	1	22
1957	2	0	0	1	1	1	1	3	5	4	3	0	21
1958	1	0	0	0	1	3	5	3	3	3	2	1	22
1959	0	1	1	1	0	0	3	6	6	4	2	2	26
1960	0	0	0	1	1	3	3	10	3	4	1	1	27
1961	1	1	1	1	3	2	5	4	6	5	1	1	31
1962	0	1	0	1	2	0	6	7	3	5	3	2	30
1963	0	0	0	1	1	3	4	3	5	5	0	3	25
1964	0	0	0	0	2	2	7	9	7	6	6	1	40
1965	2	2	1	1	2	3	5	6	7	2	2	1	34
1966	0	0	0	1	2	1	5	8	7	3	2	1	30
1967	1	0	2	1	1	1	6	8	7	4	3	1	35
1968	0	0	0	1	1	1	3	8	3	6	4	0	27
1969	1	0	1	1	0	0	3	4	3	3	2	1	19
1970	0	1	0	0	0	2	2	6	4	5	4	0	24
1971	1	0	1	3	4	2	8	4	6	4	2	0	35
1972	1	0	0	0	1	3	6	5	4	5	2	3	30
Totals	13	7	13	20	31	45	110	142	129	107	73	33	721
Avg.	.46	.25	.46	.71	1.11	1.61	3.93	5.07	4.61	3.82	2.61	1.18	25.75

TABLE 4-2. FREQUENCY OF TROPICAL STORMS REACHING TYPHOON INTENSITY BY MONTHS AND YEARS

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1945	0	0	0	0	0	1	2	5	3	1	1	0	13
1946	0	0	1	0	1	1	3	1	3	1	2	0	13
1947	0	0	0	0	1	1	0	3	4	5	4	1	19
1948	1	0	0	0	2	0	2	2	4	1	2	1	15
1949	1	0	0	0	0	1	3	3	3	1	1	1	14
1950	0	0	0	0	1	1	1	2	1	3	2	1	12
1951	0	0	1	2	1	1	1	2	2	3	1	2	16
1952	0	0	0	0	0	3	1	3	3	4	3	2	19
1953	0	1	0	0	1	1	2	4	2	4	1	1	17
1954	0	0	0	0	1	0	1	4	4	2	3	0	15
1955	1	0	1	1	0	1	5	3	3	2	1	1	19
1956	0	0	1	1	0	0	2	4	5	1	3	1	18
1957	1	0	0	1	1	1	1	2	5	3	3	0	18
1958	1	0	0	0	1	3	4	3	3	3	1	1	20
1959	0	0	0	1	0	0	1	5	3	3	2	2	17
1960	0	0	0	1	0	2	2	8	0	4	1	1	19
1961	0	0	1	0	2	1	3	3	5	3	1	1	20
1962	0	0	0	1	2	0	5	7	2	4	3	0	24
1963	0	0	0	1	1	2	3	3	3	4	0	2	19
1964	0	0	0	0	2	2	6	3	5	3	4	1	26
1965	1	0	0	1	2	2	4	3	5	2	1	0	21
1966	0	0	0	1	2	1	3	6	4	2	0	1	20
1967	0	0	1	1	0	1	3	4	4	3	3	0	20
1968	0	0	0	1	1	1	1	4	3	5	4	0	20
1969	1	0	0	1	0	0	2	3	2	3	1	0	13
1970	0	1	0	0	0	1	0	4	2	3	1	0	12
1971	0	0	0	3	1	2	6	3	5	3	1	0	24
1972	1	0	0	0	1	1	4	4	3	4	2	2	22
Totals	8	2	6	17	24	31	71	101	92	80	52	22	505
Avg.	.29	.07	.21	.61	.86	1.11	2.54	3.61	3.29	2.86	1.86	.79	18.04

TABLE 4-3. TYPHOON DAYS 1959-1972

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL PER YEAR
1959	---	---	---	8	---	---	3	18	19	18*	10	18	94
1960	---	---	---	2	---	10	13	36*	---	23*	2*	12	98
1961	---	---	8	---	8	2	10*	15	23*	17*	6	6	95
1962	---	---	---	7	4	---	14*	37*	8	30*	19*	---	119
1963	---	---	---	4	5	15	11	23*	14*	24*	---	11	107
1964	---	---	---	---	7	5*	22*	18*	28*	14	11*	6	111
1965	2	---	---	2	5	12*	19*	23*	25*	14	6	---	108
1966	---	---	---	5	11	6	7*	16*	23*	11	4	3	86
1967	---	---	2	7	---	4	14*	10	32*	21*	21*	---	111
1968	---	---	---	6	1	7	6	8	32*	19	18*	---	97
1969	5	---	---	5	---	---	8	6	10	18	10*	---	62
1970	---	5	---	---	---	2	5	24*	16	21*	6	---	79
1971	---	---	---	4	13*	8	20*	27*	21*	11*	7	---	111
1972	2	---	---	---	1	6	39*	16	16*	21	9	11	121
TOTAL	9	5	10	50	55	77	191	277	267	262	129	67	1399
MEAN	.6	.4	.7	3.6	3.9	5.5	13.6	19.8	19.1	18.7	9.2	4.8	99.9

*Two typhoons occurring on the same day are counted as two typhoon days.

TABLE 4-4. SUMMARY OF JTWC WARNINGS 1969-1972

	1960-1971 (AVG)	1969	1970	1971	1972
TOTAL NUMBER OF WARNINGS	731	430	533	747	739
CALENDAR DAYS OF WARNING	151	108	127	163	139
NUMBER OF WARNING DAYS WITH TWO OR MORE CYCLONES	54	15	29	54	46
NUMBER OF WARNING DAYS WITH THREE OR MORE CYCLONES	12	1	0	6	13

[1]Consultant visit to JTWC in October 1972 by Prof. James C. Sadler, University of Hawaii.

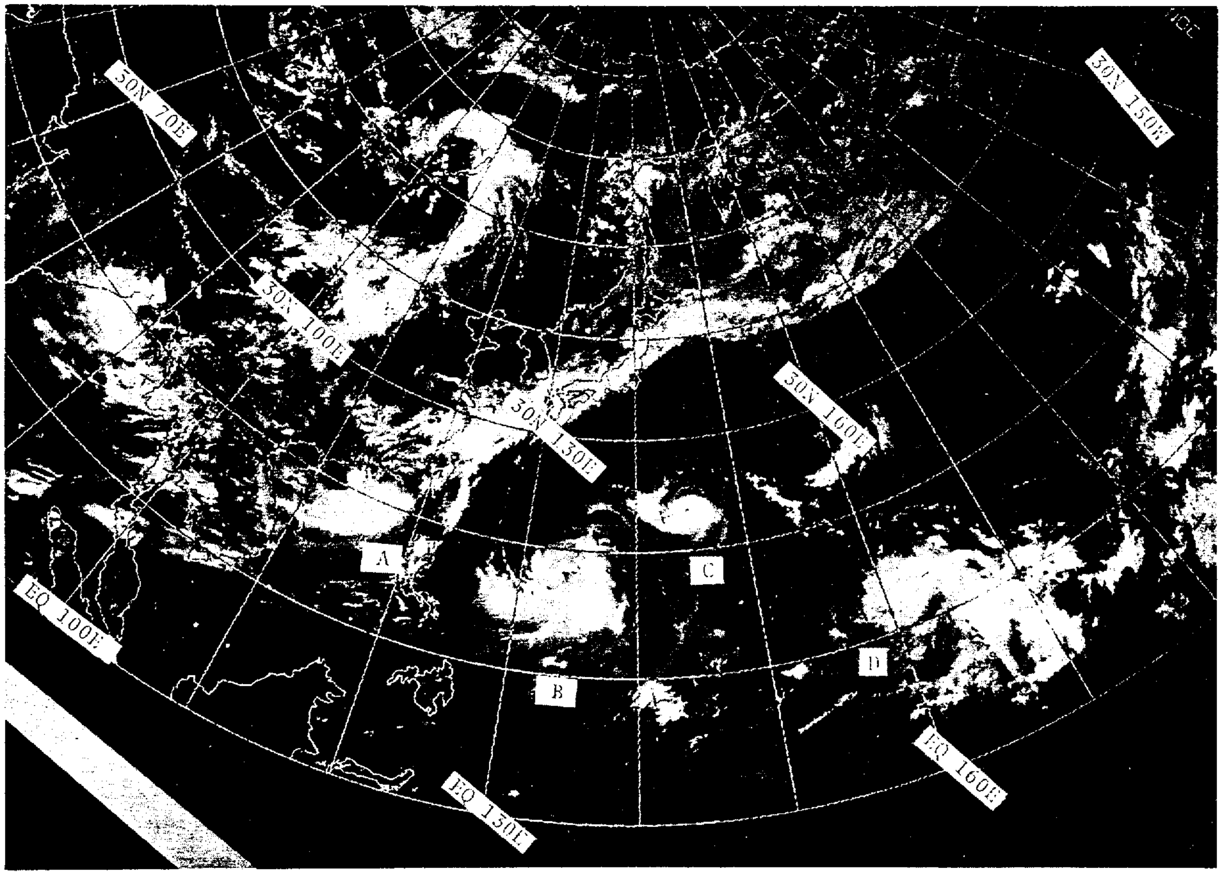

FIGURE 4-1. *ESSA-9 satellite mosaic for 13 July 1972 showing multiple tropical cyclones--Tropical Storm Susan (A), typhoons Rita (B), Phyllis (C), and Tess (D)--in the northwest Pacific Ocean.*

warming and the early beginning of a strong "El Nino."

This anomalous circulation pattern gave rise to an unusual number of tropical cyclones (nine) forming east of 160°E. Of these, Lola and Olga each developed as members of a cyclone pair with southern hemisphere tropical cyclones. The anomalous monsoonal flow also acted to prolong the typhoon season. This was evidenced by Tropical Storm Violet's presence in the Marshall Island area during mid-December.

Atypically, only one tropical cyclone (Tropical Storm Doris) developed in the trade wind easterlies, during the summer and fall, from disturbances created by upper tropospheric cyclonic cells. However, on several occasions, such cells, embedded in the semi-permanent mid-Pacific trough, enhanced the outflow from disturbances in the equatorial trough and aided their development.

Only Rita and Betty reached super typhoon intensity (130 kt). This equals 1960 and 1969 for the lowest annual frequency of super typhoons in JTWC history. The 14-year (1959-1972) average for super typhoons is six.

Rita established a new longevity record (22 days) for a tropical cyclone in the western North Pacific.[2] She dominated the synoptic circulation features of the East China and Philippine Seas for most of the period. Typhoons Phyllis, Susan, and Tess developed and dissipated during Rita's lifetime. Tess traveled over 3100 nm from the vicinity of the Marshall Islands, engaged in a Fujiwhara interaction with Rita, and dissipated over the Sea of Japan. All of this occurred while Rita maintained typhoon intensity.

Several typhoons dealt destruction to the Far East during 1972. The Republic of the Phillipines was especially hard hit as Kit, Ora, Rita, and Therese brought a combined death toll of approximately 640 to the archipelago (Table 4-5). Rita, although never crossing the coastline, had a critical impact on the economy of the country by enhancing the southwest monsoonal flow. This resulted in torrential rains of record proportions that caused widespread destruction and flooding throughout Luzon.

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[2]Longest-lived (31 days) tropical cyclone on record is Hurricane Ginger, September 1971, in the North Atlantic.

Helen inflicted the heaviest damage on Japan in several years as she moved through the Ise Bay area, grounding many ships, causing numerous landslides inland, and capsizing several fishing vessels.

Much of the pertinent meteorological data and typhoon damage statistics in this chapter were based on information received from the following sources: Weather Bureau of the Republic of China; Royal Observatory of Hong Kong; Office of the High Commissioner, Trust Territory of the Pacific Islands; Casualty Returns, Liverpool Underwriters Association; Director of Meteorology, Republic of Vietnam; Japan Meteorological Agency; Weather Bureau of the Republic of the Philippines; and the Environmental Data Service, National Oceanic and Atmospheric Administration.

TABLE 4-5. LIST OF ESTIMATED CASUALTIES FOR THE 1972 SEASON

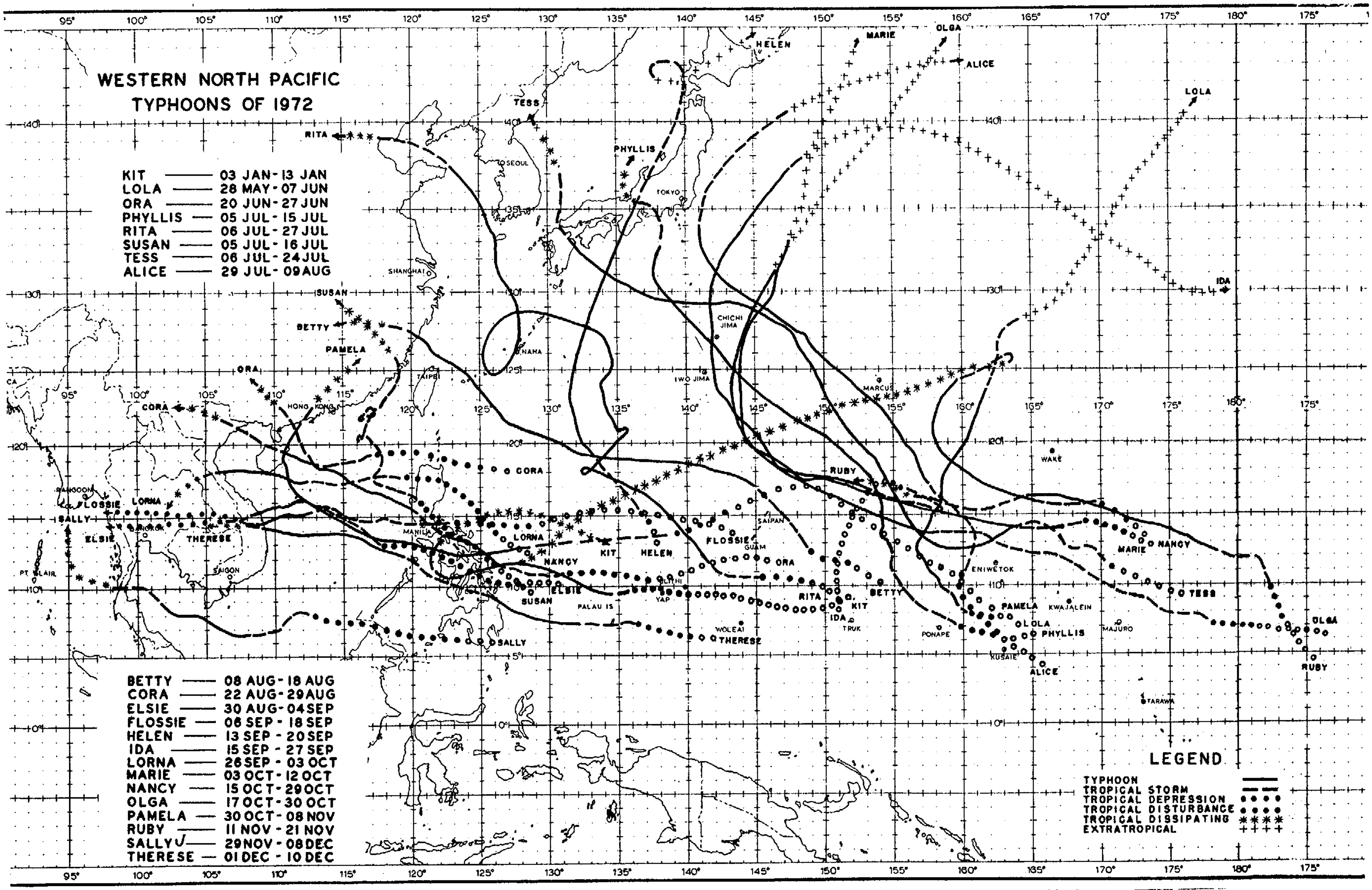
TYPHOON	DEATHS	MISSING
KIT	204	--
LOLA	---	2
ORA	134	--
PHYLLIS	3	--
RITA	229	--
SUSAN	4	--
TESS	29	20
BETTY	25	4
ELSIE	---	--
FLOSSIE	---	--
HELEN	72	2
MARIE	19	--
PAMELA	4	5
RUBY	---	--
SALLY	11	5
THERESE	90	--
	824	36

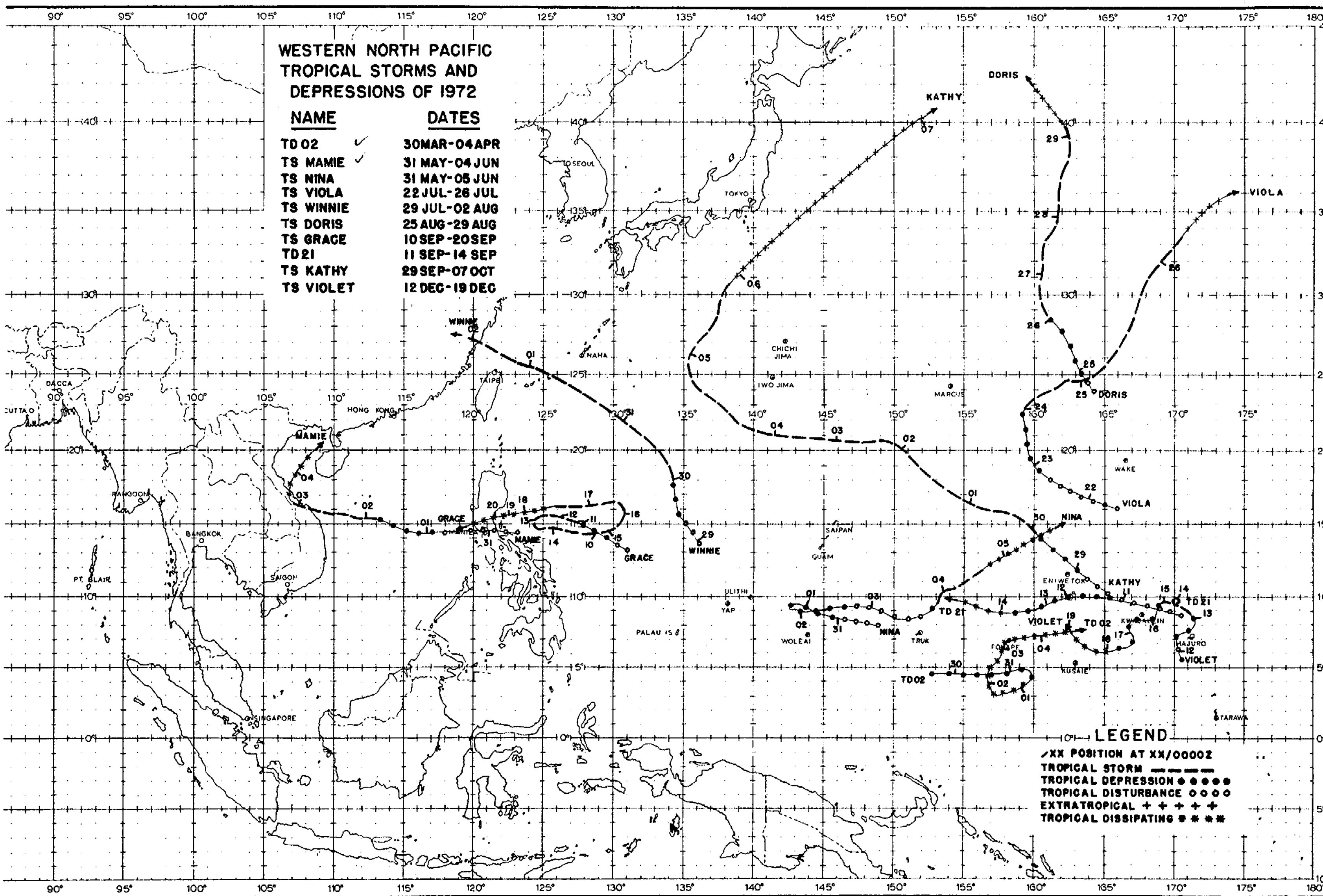
TABLE 4-6. 1972 TROPICAL CYCLONES

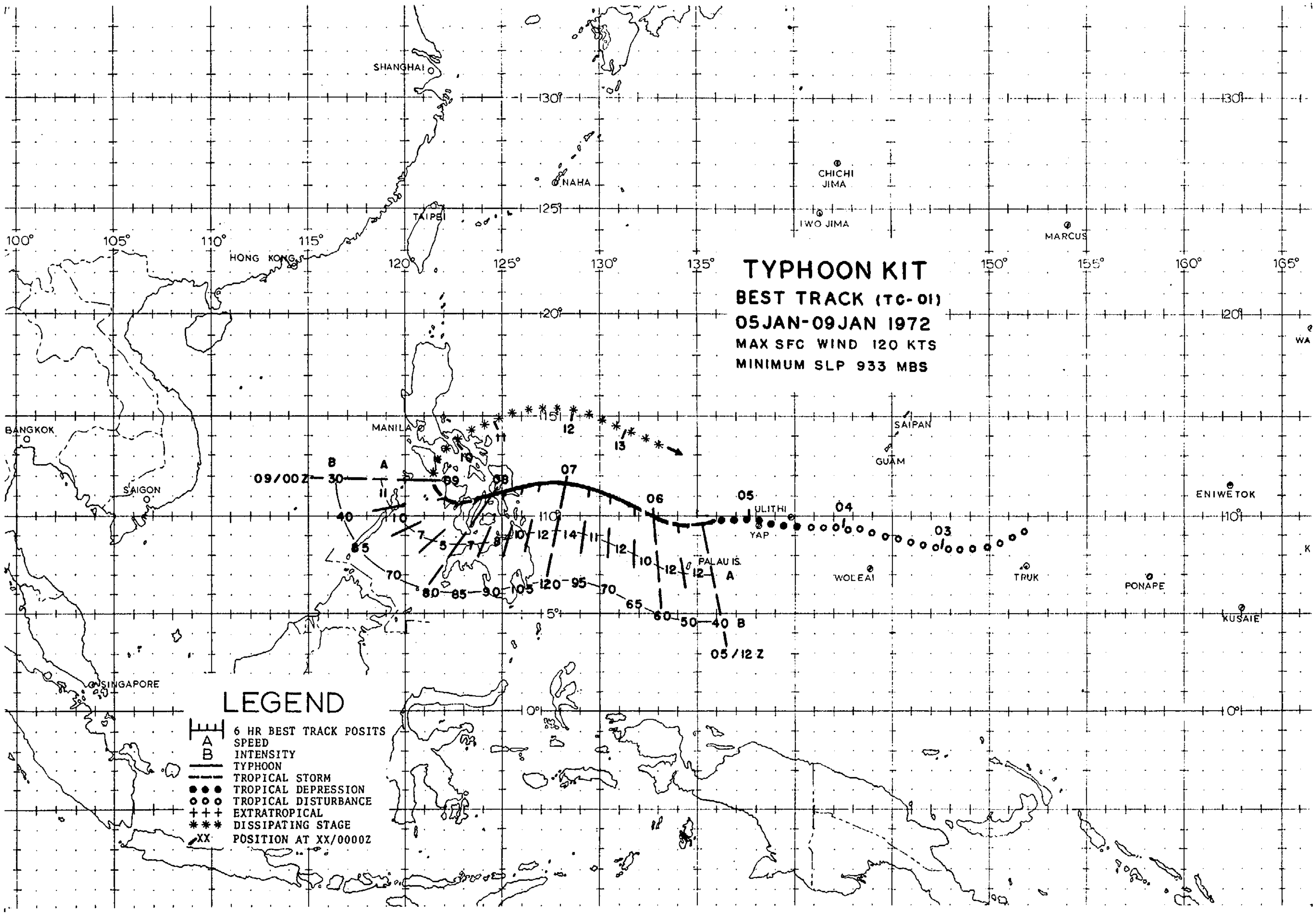
CYCLONE	TYPE	NAME	DATE (PRD OF WRNG)	CALENDAR DAYS OF WARNING	MAX SFC WIND	MIN OBS SLP	WARNINGS ISSUED TOTAL	NO. AS TYPHOONS	DISTANCE TRAVELED
01	T	KIT	05 JAN-09 JAN	4	120	933	15	5	840
02	TD	TD 02	31 MAR-01 APR	2	30	1001	5	--	185
03	T	LOLA	30 MAY-05 JUN	7	105	956	26	13	1370
04	TS	MAMIE	02 JUN-03 JUN	2	50	989	5	--	260
05	TS	NINA	04 JUN-04 JUN	1	45	N/A	3	--	120
06	T	ORA	23 JUN-27 JUN	5	80	971	19	12	1450
07	T	PHYLLIS	06 JUL-15 JUL	10	120	944	38	22	2325
08	T	RITA	07 JUL-26 JUL	20	145	911	79	72	3330
09	T	SUSAN	07 JUL-14 JUL	8	65	980	29	4	800
10	T	TESS	08 JUL-24 JUL	17	125	940	66	44	3165
11	TS	VIOLA	24 JUL-26 JUL	3	60	980	8	--	890
12	TS	WINNIE	31 JUL-02 AUG	3	60	971	7	--	440
13	T	ALICE	01 AUG-08 AUG	8	90	964	30	20	2040
14	T	BETTY	09 AUG-17 AUG	9	135	910	35	27	2075
16	T	CORA	25 AUG-29 AUG	5	65	976	16	4	630
15	TS	DORIS	25 AUG-29 AUG	5	55	986	17	--	1045
17	T	ELSIE	31 AUG-04 SEP	5	75	974	16	12	580
18	T	FLOSSIE	10 SEP-16 SEP	7	75	975	25	7	795
19	TS	GRACE	*12 SEP-18 SEP	5	50	989	12	--	495
20	T	HELEN	13 SEP-16 SEP	4	100	957	15	13	1325
21	TD	TD 21	13 SEP-15 SEP	3	30	N/A	8	--	550
22	T	IDA	17 SEP-24 SEP	8	110	930	31	24	2315
23	TS	JUNE	(TS JUNE PICKED UP BY CENTRAL PACIFIC HURRICANE CENTER, HONOLULU)						
24	TS	KATHY	01 OCT-05 OCT	5	60	976	19	--	1560
25	T	LORNA	01 OCT-03 OCT	3	75	990	8	6	475
26	T	MARIE	05 OCT-12 OCT	8	115	936	29	24	2545
27	T	NANCY	16 OCT-21 OCT	6	105	945	22	19	1200
28	T	OLGA	22 OCT-29 OCT	8	105	939	31	24	2765
29	T	PAMELA	04 NOV-08 NOV	5	110	942	19	15	1575
30	T	RUBY	14 NOV-20 NOV	7	110	941	24	16	1555
31	T	SALLY	01 DEC-05 DEC	5	80	984	16	10	645
32	T	THERESE	01 DEC-10 DEC	10	105	944	36	20	1805
33	TS	VIOLET	11 DEC-19 DEC	9	55	995	30	--	960
		1972 TOTALS		139**			739	413	

*12/00Z - 14/06Z and 17/06Z - 18/00Z
**Overlapping days included only once in sum

DATA TAKEN FROM BEST TRACK


WESTERN NORTH PACIFIC
TYPHOONS OF 1972
KIT — 03 JAN - 13 JAN
LOLA — 28 MAY - 07 JUN
ORA — 20 JUN - 27 JUN
PHYLLIS — 05 JUL - 15 JUL
RITA — 06 JUL - 27 JUL
SUSAN — 05 JUL - 16 JUL
TESS — 06 JUL - 24 JUL
ALICE — 29 JUL - 09 AUG
BETTY — 08 AUG - 18 AUG
CORA — 22 AUG - 29 AUG
ELSIE — 30 AUG - 04 SEP
FLOSSIE — 06 SEP - 18 SEP
HELEN — 13 SEP - 20 SEP
IDA — 15 SEP - 27 SEP
LORNA — 26 SEP - 03 OCT
MARIE — 03 OCT - 12 OCT
NANCY — 15 OCT - 29 OCT
OLGA — 17 OCT - 30 OCT
PAMELA — 30 OCT - 08 NOV
RUBY — 11 NOV - 21 NOV
SALLY — 29 NOV - 08 DEC
THERESE — 01 DEC - 10 DEC
LEGEND
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
TROPICAL DISSIPATING
EXTRATROPICAL
SEOUL
TOKYO
SHANGHAI
NAHA
TAIPEI
HONG KONG
MANILA
SAIGON
BANGKOK
RANGOON
PT. BLAIR
CHICHI JIMA
IWO JIMA
MARCUS
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
PONAPE
KUSAIE
ENIWETOK
KWAJALEIN
MAJURO
TARAWA
WAKE


WESTERN NORTH PACIFIC
TROPICAL STORMS AND
DEPRESSIONS OF 1972
NAME
DATES
TD 02
30MAR-04APR
TS MAMIE
31 MAY-04 JUN
TS NINA
31 MAY-05 JUN
TS VIOLA
22 JUL-26 JUL
TS WINNIE
29 JUL-02 AUG
TS DORIS
25 AUG-29 AUG
TS GRACE
10 SEP-20 SEP
TD 21
11 SEP-14 SEP
TS KATHY
29 SEP-07 OCT
TS VIOLET
12 DEC-19 DEC
LEGEND
XX POSITION AT XX/0000Z
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
TROPICAL DISSIPATING
SEOUL
TOKYO
NAHA
TAIPEI
HONG KONG
CHICHI JIMA
IWO JIMA
MARCUS
WAKE
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
PONAPE
KUSAIE
ENIWETOK
KWAJALEIN
MAJURO
TARAWA
DACCA
RANGOON
BANGKOK
SAIGON
PT. BLAIR
SINGAPORE


TYPHOON KIT
BEST TRACK (TC-01)
05JAN-09JAN 1972
MAX SFC WIND 120 KTS
MINIMUM SLP 933 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
XX POSITION AT XX/0000Z
09/00Z
05/12Z
SHANGHAI
NAHA
CHICHI JIMA
IWO JIMA
TAIPEI
MARCUS
HONG KONG
MANILA
SAIPAN
GUAM
BANGKOK
SAIGON
ULITHI
YAP
PALAU IS.
WOLEAI
TRUK
PONAPE
ENIWETOK
KUSAIE
SINGAPORE

KIT

The season's first typhoon developed from a disturbance generated by an upper tropospheric low in the mid-Pacific trough in the eastern Carolines. The disturbance moved west-northwest for the next four days with a surface circulation becoming apparent on 4 January in the western Carolines. The depression passed just south of Yap and Ulithi on the evening of the 4th with Ulithi reporting 35-kt winds for a short period and surface pressure of 1001 mb.

On the 6th, reconnaissance aircraft located Tropical Storm Kit with 50-kt winds and a central pressure of 992 mb. For a 14-hour period, from the night of the 6th to mid-day on the 7th, Kit deepened 44 mb (3.1 mb/hr) to an unseasonably low 933 mb and winds of 120 kt (Figure 4-2).

January typhoons are unusual. Since 1945 only seven other tropical cyclones reached typhoon intensity, the latest being Phyllis in 1969.

As Kit moved toward the central Philippines, she turned to the west-southwest as heights began to build to the north over eastern China. Subsequent to moving over Leyte Gulf, Kit decelerated and weakened, crossing the mountainous terrain of the Visayan Island group on the 8th. Kit further weakened to tropical storm strength by the time she reached Panay Island on the morning of the 9th. As westerlies eroded the ridge over eastern China, Kit drifted north. During the next several days, Kit followed an unusual track, dissipating back over the Philippine Sea.

In her wake, Kit left a death toll at 204 persons and property damage of approximately 23 million dollars (U.S.). Torrential rains caused rampaging floodwaters which washed away bridges, devastated crops, and heavily damaged property. Newspapers indicate floodwaters of up to nine feet occurred in the towns of Abuyog and Baybay on Leyte.

Kit, being an unexpected event for January, played havoc with shipping. Early on the 7th a British vessel, HALCYON DAYS, passed through the eye, experiencing winds of force 11 and recording a minimum pressure of 964 mb. A tug, the USS SIOUX, pulling a large tow, was caught in the southern part of the eye that night. She encountered estimated winds in excess of 75 kt and recorded a minimum pressure of 952 mb.

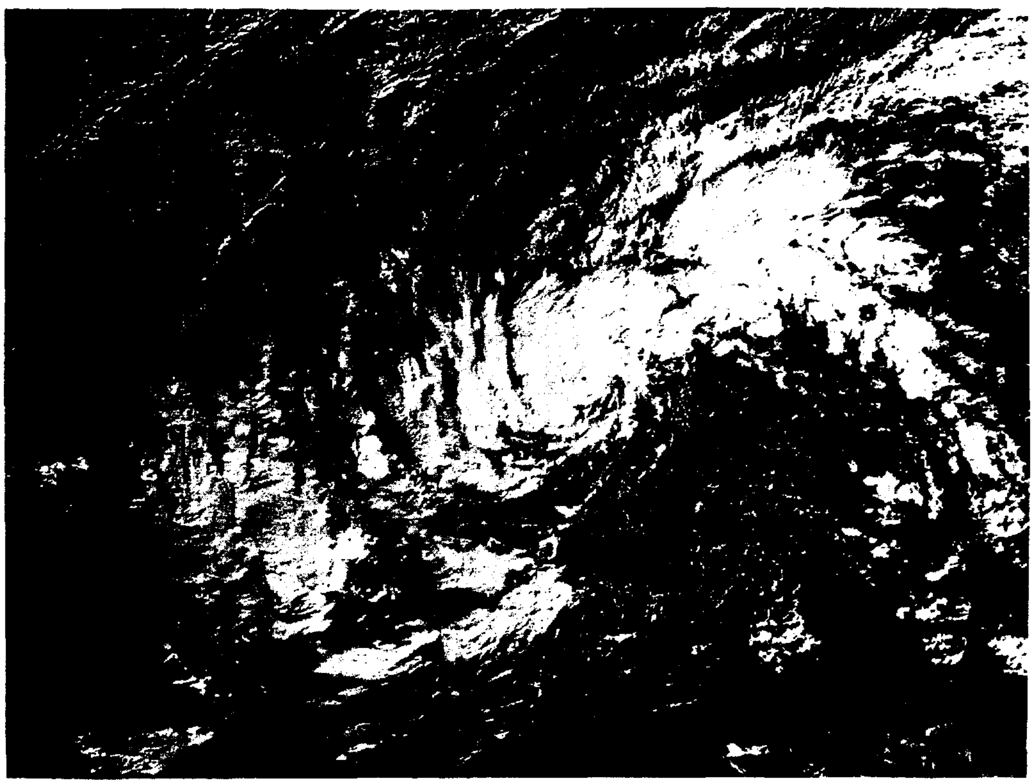
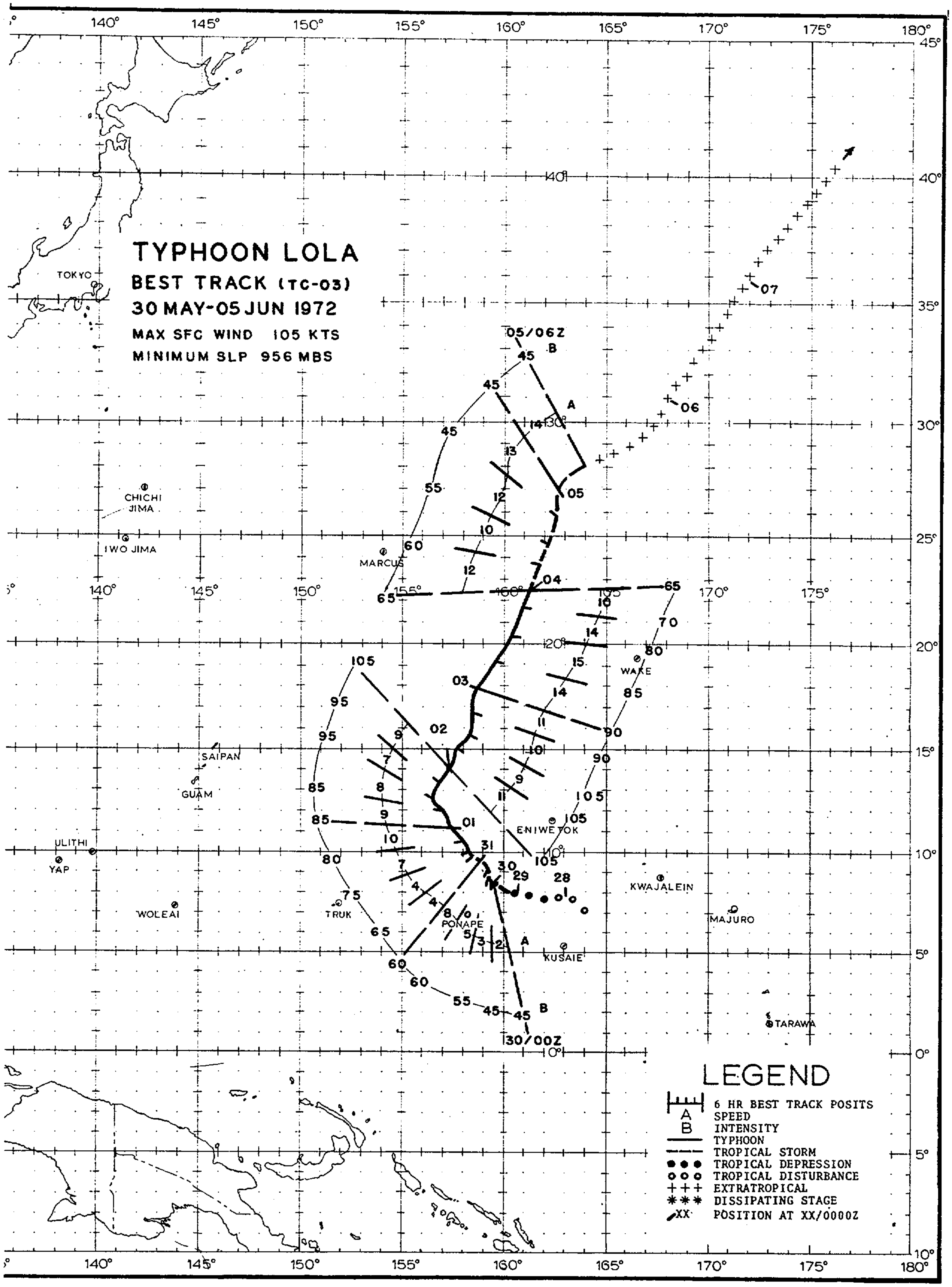


FIGURE 4-2. *Typhoon Kit near peak intensity 200 nm east of the Leyte Gulf, 6 January 1972, 2324 GMT (DAPP data).*


TYPHOON LOLA
BEST TRACK (TC-03)
30 MAY-05 JUN 1972
MAX SFC WIND 105 KTS
MINIMUM SLP 956 MBS
TOKYO
CHICHI JIMA
IWO JIMA
MARCUS
SAIPAN
GUAM
ULITHI
YAP
WOLEAI
TRUK
PONAPE
KUSAIE
ENIWETOK
WAKE
KWAJALEIN
MAJURO
TARAWA
05/06Z
30/00Z
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
XX POSITION AT XX/0000Z

Lola developed as part of a cyclone pair that formed on opposite sides of the equator near 165°E (Figure 4-3). The tendency for such development is greater during late fall and early spring when tropical cyclone activity is shifting into the oncoming summer hemisphere.

The beginning of Lola appeared in satellite pictures on the 28th. The system, destined to become Lola, drifted slowly westward through the eastern Carolines, attaining tropical storm intensity the next day, about 150 nm northeast of Ponape. Shifting to a more northerly track, Lola reached typhoon strength on the afternoon of the 31st.

During Lola's passage north of Ponape, the maximum sustained wind was 30 kt with gusts to 50 kt (30/1600 GMT). Lola's forward motion brought high winds and seas to Ponape and nearby atolls for a prolonged period, and extensive damage resulted. Two fishermen were reported missing and estimates of damage to public buildings and crops exceeded 18,000 dollars (U.S.). Wave action destroyed most of the water system creating a serious fresh water shortage. Reports from Pingelap and Mokil atolls stated that high seas had inundated inland areas destroying over 60 houses.

As Lola was developing to typhoon intensity (Figure 4-4), a block formed in the westerlies in the central North Pacific with ridging extending northeastward to the Aleutian chain. With this distortion of the subtropical ridge, a trough developed west-southwestward from a 500-mb low near Midway. By the evening of the 1st, Lola responded to this weakness and shifted to a north-northeast course at 10 kt.

Lola attained her peak intensity on the 2nd as reconnaissance aircraft reported a central pressure of 956 mb and maximum surface winds near 100 kt. The aircraft's radar detected little evidence of convective activity around the typhoon's circular, 40 nm eye. Reports from the aircraft's observer indicated that the wall cloud was comprised mainly of altostratus.

The USNS ASTERION, located 90 nm north-northwest of Lola's center (02/0000 GMT) observed 65-kt winds and a pressure of 987.8 mb.

Lola continued on a north-northeast heading for the next three days at an average speed of 14 kt, weakening to tropical storm force on the afternoon of the 4th. By the 5th Lola had swung to a more northeasterly heading and become extratropical.

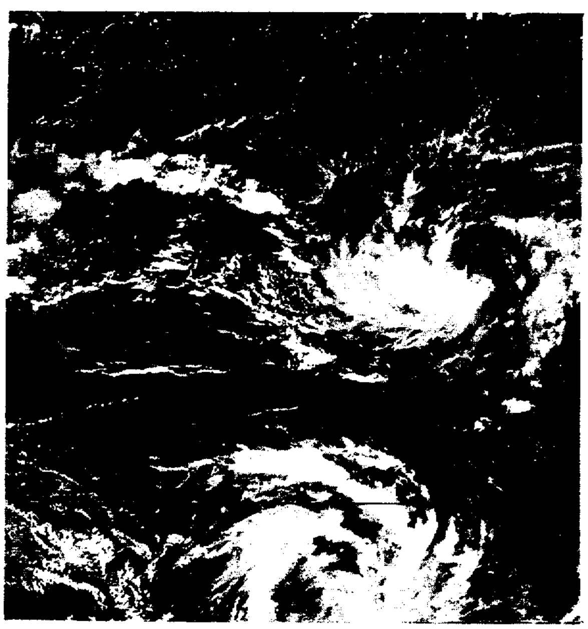


FIGURE 4-3. *The twin tropical storms of Lola (120 nm northeast of Ponape) and Ida (in the Solomon Island group), 30 May 1972, 0212 GMT (DAPP data).*

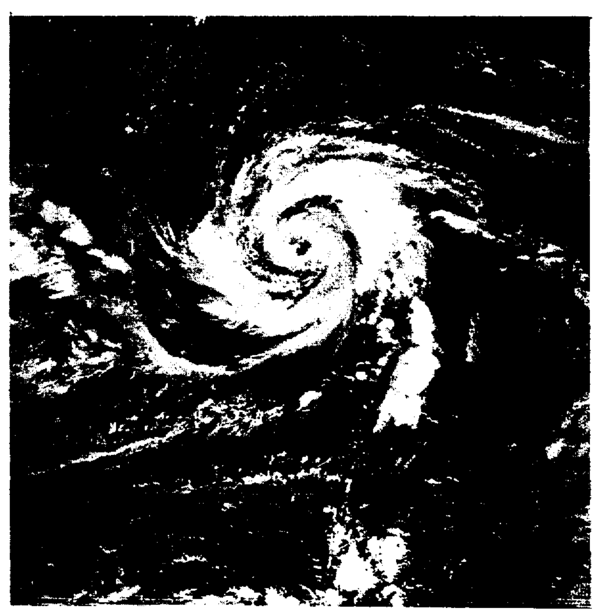
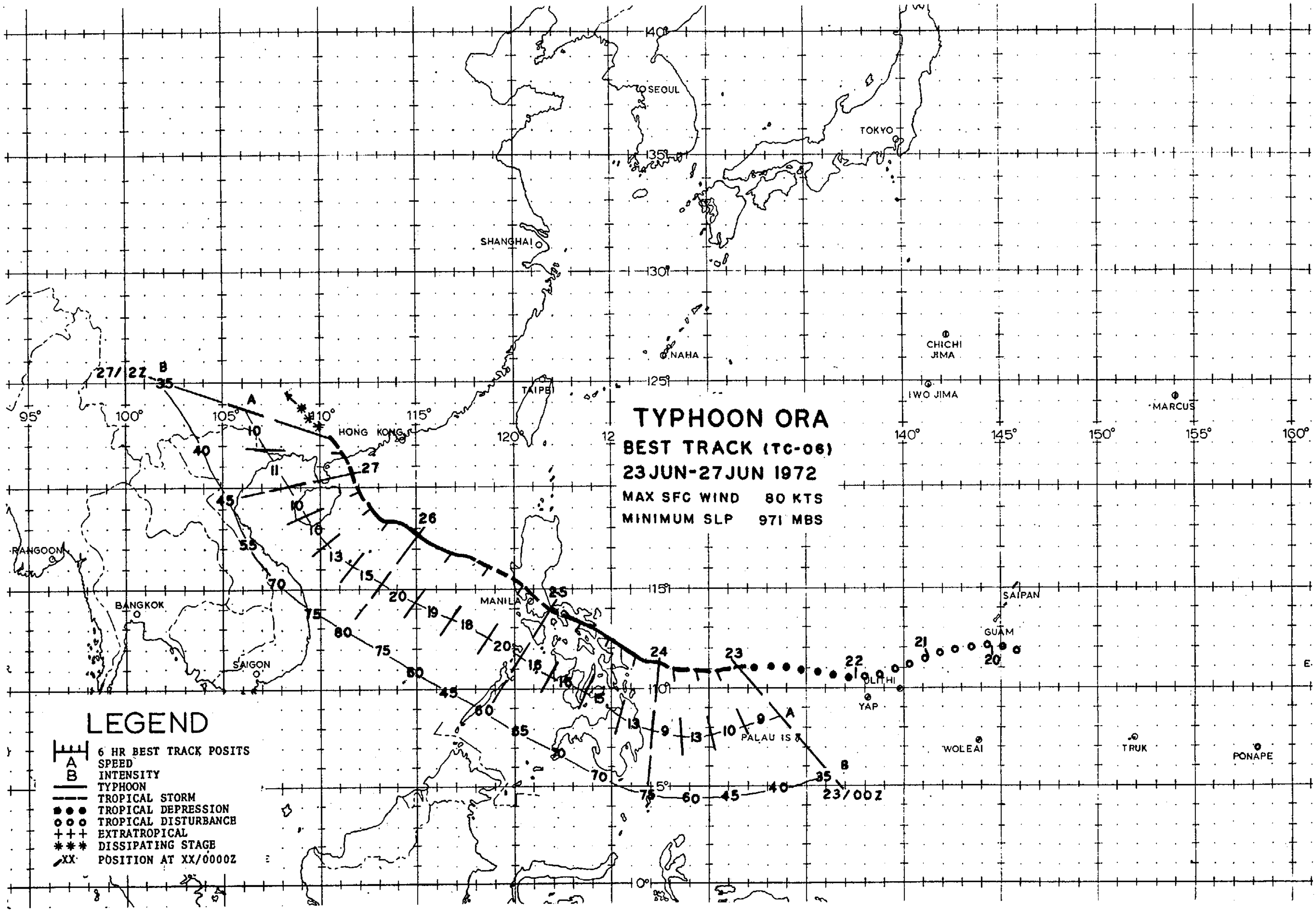


FIGURE 4-4. *Typhoon Lola 270 nm west of Eniwetok, 1 June 1972, 0143 GMT (DAPP data).*


TYPHOON ORA
BEST TRACK (TC-06)
23 JUN-27 JUN 1972
MAX SFC WIND 80 KTS
MINIMUM SLP 971 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
XX POSITION AT XX/0000Z
27/22Z
23/00Z
SEOUL
TOKYO
SHANGHAI
NAHA
TAIPEI
CHICHI JIMA
IWO JIMA
MARCUS
HONG KONG
RANGOON
BANGKOK
MANILA
SAIGON
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
PONAPE
95°
100°
105°
110°
115°
120°
140°
145°
150°
155°
160°

The beginning stages of Ora can be traced to a closed cyclonic circulation in the equatorial trough south of Guam on 20 June. During the next four days, the system moved westward at 14-17 kt across the Philippine Sea with little development.

Reconnaissance aircraft, on the afternoon of the 23rd, observed a 40 nm calm area with a central pressure of 1006 mb, 330 nm east of Leyte Gulf. Ora was poorly organized at this time, having maximum winds of 35 kt in the northern periphery.

Ora slowed and intensified rapidly during the next 18 hours, reaching typhoon force before skirting the northern coast of Samar (Figure 4-5). She later moved ashore on the Bicol peninsula near Legaspi.

Prior to landfall, a mid-tropospheric high cell had begun to build south of the Ryukyu chain causing Ora to accelerate and veer to a more northerly track. She crossed southern Luzon at speeds of 16-20 kt on the 25th, emerging over the South China Sea that evening.

Legaspi City observed a minimum pressure of 970.7 mb in the eye of Ora and a gust of 110 kt from the south (24/1703 GMT) after passage of the center. A 24-hour total of 9.3 in. of rain was measured at Legaspi during Ora's transit. Eye passage was recorded near Clark Air Base that afternoon (25/0510 GMT). Maximum winds at Clark were estimated at 39 kt with a peak gust of 56 kt and minimum sea level pressure of 973.5 mb. As Ora passed north of Manila, the Weather Bureau Office in Quezon City measured gusts of 65 kt.

Manila was particularly hard hit by Ora as torrential rains caused waist-deep floodwaters in many parts of the city. Electrical power to most parts of the city

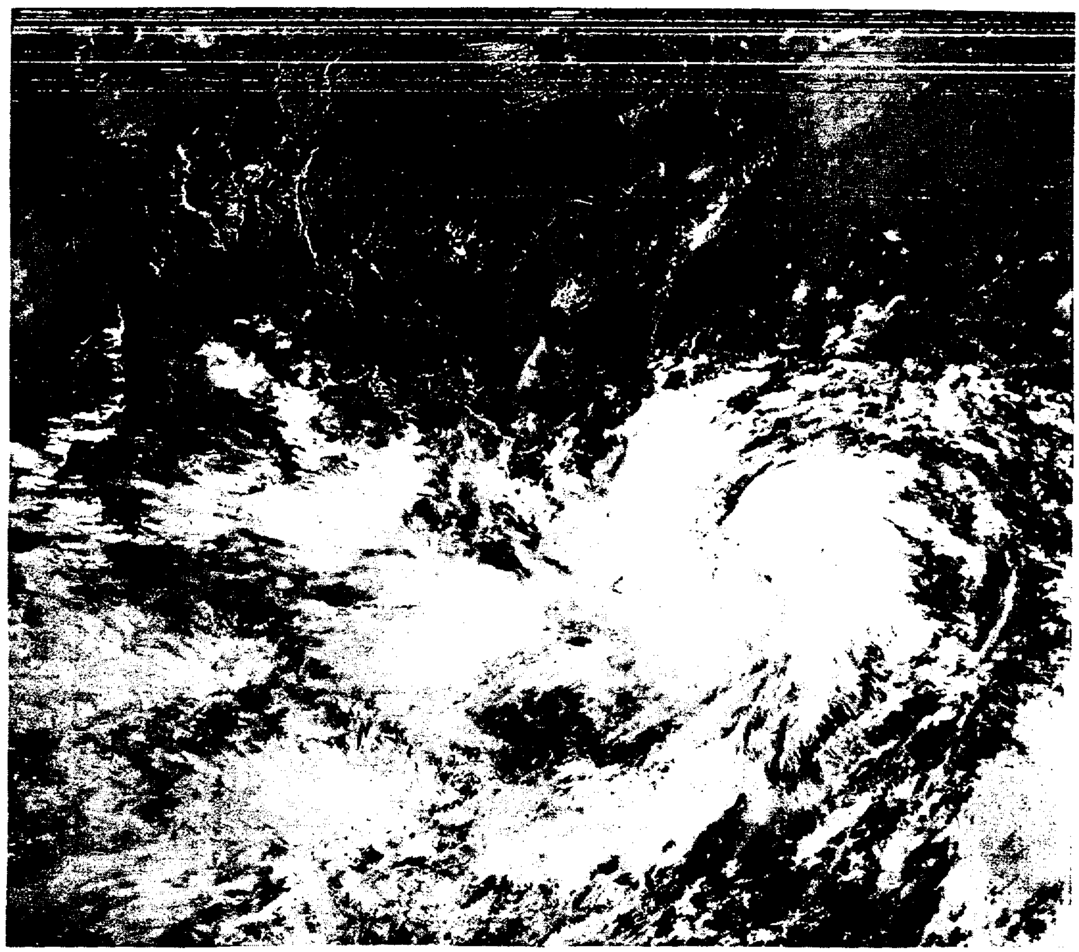


FIGURE 4-5. *Typhoon Ora 120 nm east of Samar Island, 23 June 1972, 2355 GMT (DAPP data).*

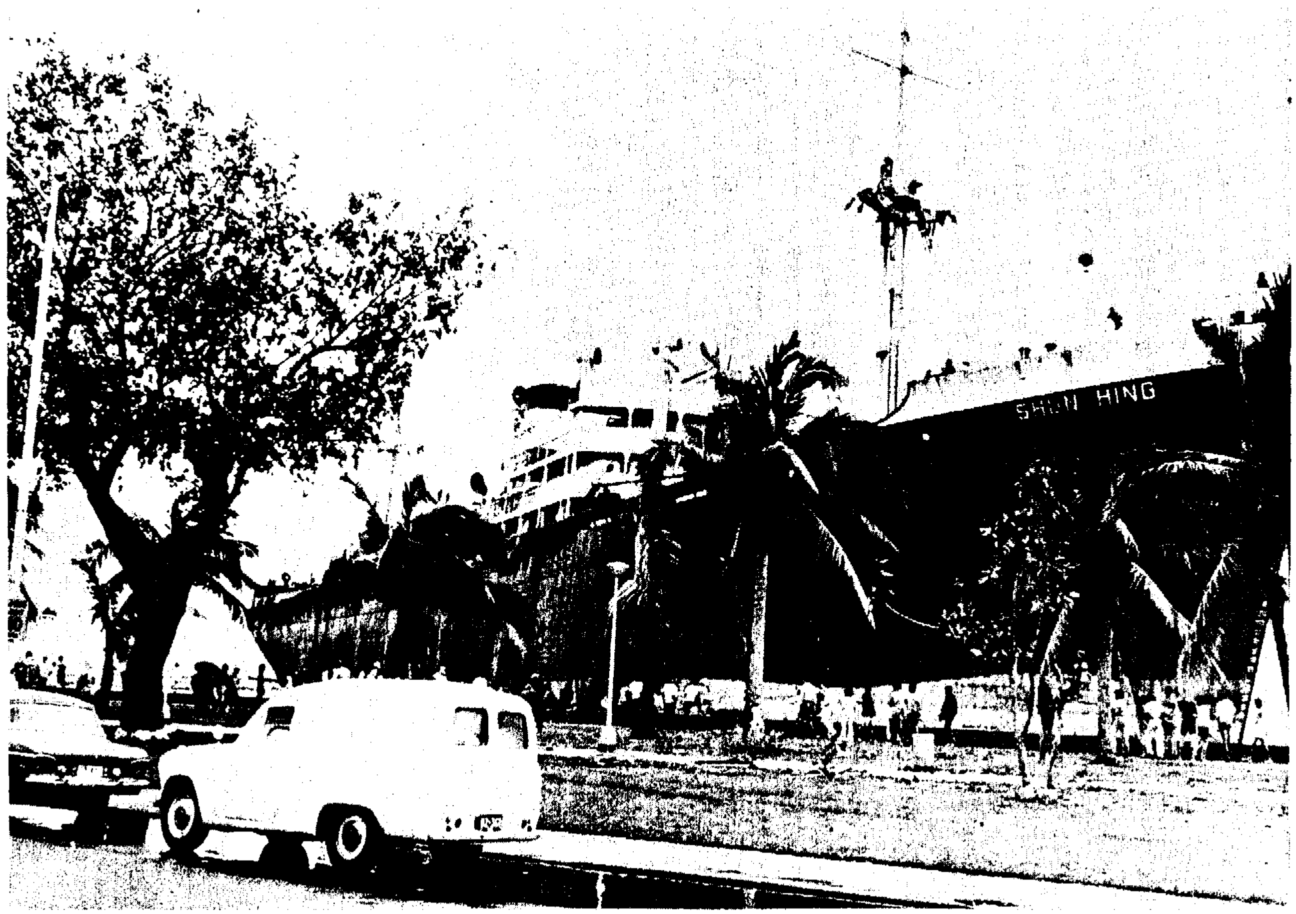


FIGURE 4-6. *Aftermath of Typhoon Ora--the Singapore ship SHUN HING run aground on Roxas Boulevard, Manila.--Courtesy of Mariners Weather Log, EDS, NOAA.*

was interrupted and water service was cut. Several ocean-going vessels anchored in Manila Bay were blown ashore along Roxas Boulevard. These vessels included the Singapore freighter SHUN HING, the Philippine flagship PHIL-ASIA ORANI, the ENCANTADA MANILA, and the PMI COLLEGE (Figure 4-6).

Ora left a death toll of 131 persons with an additional 385,000 people homeless. Property damage was estimated near 15 million dollars (U.S.). One maritime casualty, occurring outside the Manila area, was the capsizing of the MV VARTE, sailing from Legaspi City to Rapu-Rapu Island in the Bicol region. One passenger drowned, three were reported missing, and eight survived.

After leaving Luzon, Ora continued her northwest track at 20 kt while crossing the South China Sea. Climatologically, this is an unusually high speed for June. As Ora approached Hainan Island on the evening of the 26th, she began to slow and turn to a more northerly course.

The West German ship HAVELSTEIN BOELWERFT, located 55 miles south-southeast of the center, experienced 65-kt winds and a minimum sea level pressure of 995.8 mb (26/1200 GMT). Early on the 27th, Ora weakened to tropical storm force, and that afternoon, crossed the South China coast east of the Luichow peninsula. Ora degenerated rapidly into an area of low pressure as she moved inland.

During Ora's transit of the South China Sea, reconnaissance aircraft reported sustained winds of typhoon force in the southeast quadrant, although no wall cloud was present (Figure 4-7). This unusual feature has been noted in other years. Probably the best documentation was provided by Fett[3] (1968) concerning observations in Typhoon Billie in 1967.

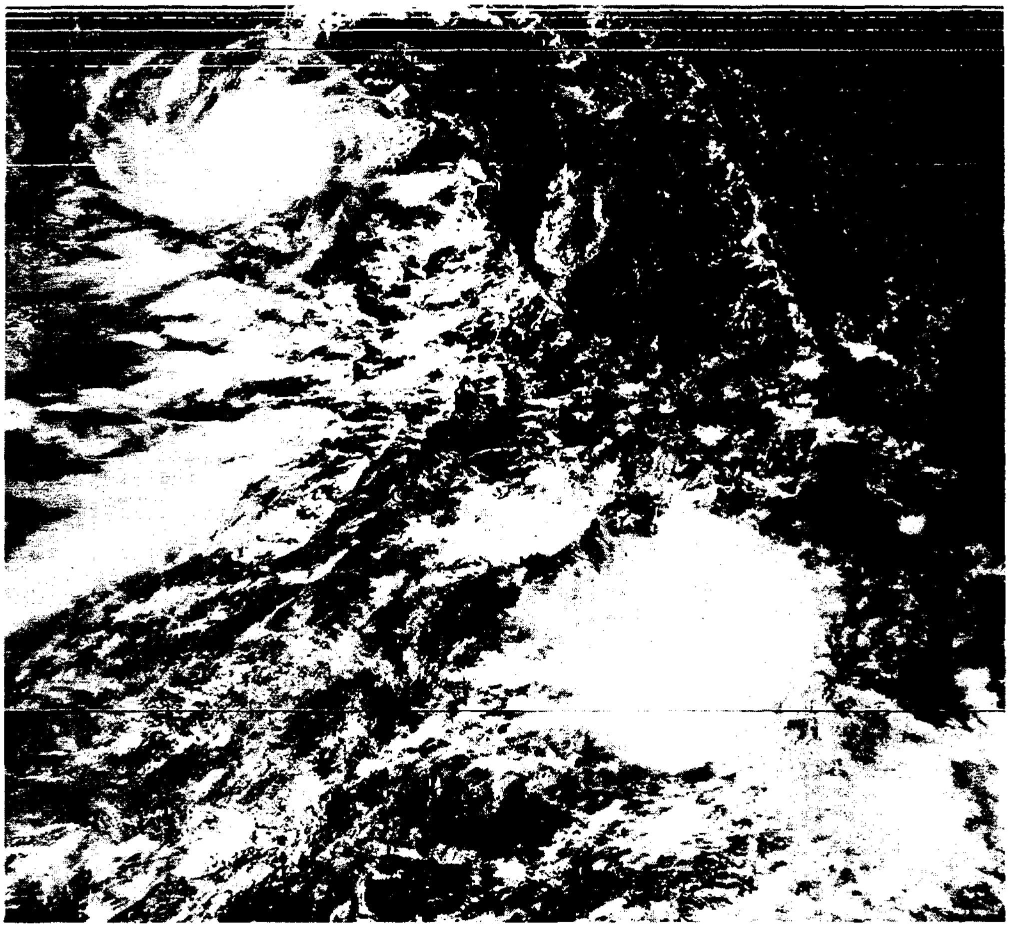
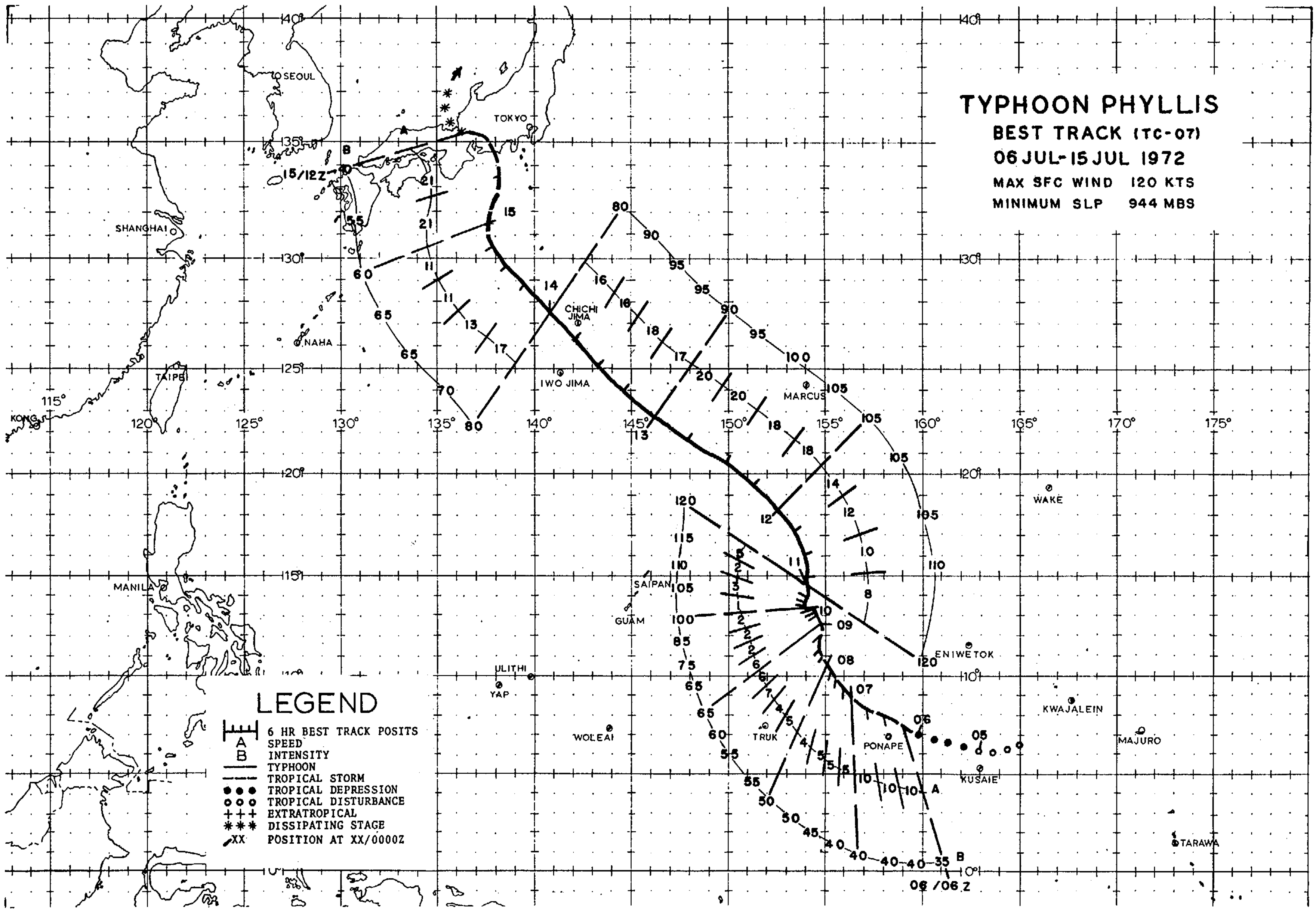


FIGURE 4-7. *Typhoon Ora in the northern South China Sea 330 nm west-northwest of Luzon. Surface center is delineated by low-level cloudiness on eastern edge of cirrus canopy, 26 June 1972, 0410 GMT (DAPP data).*

[3]Fett, R. F., "Some Unusual Aspects Concerning the Development and Structure of Typhoon Billie," Monthly Weather Review, Vol. 96, No. 9, September 1968, pp 637-648.


TYPHOON PHYLLIS
BEST TRACK (TC-07)
06 JUL-15 JUL 1972
MAX SFC WIND 120 KTS
MINIMUM SLP 944 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
XX POSITION AT XX/0000Z
SEOUL
TOKYO
SHANGHAI
NAHA
TAIPEI
KONG
CHICHI JIMA
IWO JIMA
MARCUS
WAKE
MANILA
SAIPAN
GUAM
ENIWETOK
ULITHI
YAP
WOLEAI
TRUK
PONAPE
KUSAIE
KWAJALEIN
MAJURO
TARAWA
15/12Z
06/06Z

With her genesis in the eastern Carolines (Figure 4-8), Phyllis passed 30 nm northeast of Ponape on a northwesterly heading, strengthening to tropical storm force on 6 July. During the next 72 hours, Phyllis slowly intensified, reaching typhoon force on the 9th. She then stalled and drifted northward, 500 miles east of the Marianas (Figure 4-9), as the subtropical ridge receded to the north producing a weak steering current.

By the 11th the subtropical ridge began to rebuild, causing Phyllis to accelerate and shift to a northwesterly track. Reconnaissance aircraft reported a central pressure of 944 mb and 110-kt surface winds on the afternoon of the 11th as Phyllis reached her maximum intensity.

Located in the convergent flow between a strengthening ridge to the northeast and the circulation of Typhoon Rita to the west, Phyllis accelerated to 20 kt. She passed 40 nm southeast of Chichi Jima on the morning of the 14th with a recorded minimum sea level pressure of 994.7 mb (14/2100 GMT).

As Phyllis approached Japan, a mid-tropospheric low developed in a stationary trough over the Sea of Japan. Phyllis assumed a more northerly track when she was approximately 300 nm south of Tokyo late on the 14th. She struck the coastline just east of Ise Bay. A minimum pressure of 985.5 mb was recorded at Irako (15/1010 GMT). Maximum sustained winds reported during landfall were 57 kt with gusts to 71 kt at Irozaki. Phyllis then weakened and accelerated toward central Honshu where she merged with a low-pressure system, becoming extratropical late on the 15th.

Inland, Phyllis caused heavy rains in the Kanto, Chubu, and Kinki regions resulting in flooded streams and over 300 landslides. Rainfall of 14.9 in. was recorded at Oshima in the mountainous terrain of the Chubu region. Three deaths were attributed to Phyllis and over 6,600 homes and 1,600 hectares of land were flooded.

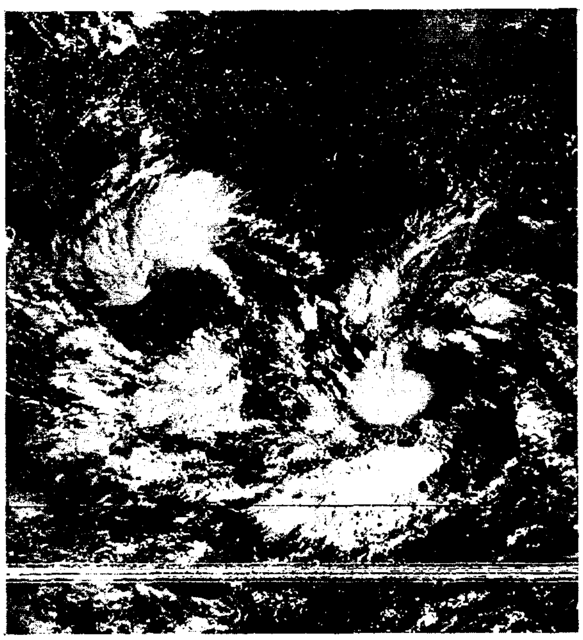


FIGURE 4-8. *Formative stages of Rita (left) south of the Marianas and Phyllis (right) in the eastern Carolines, 5 July 1972, 2149 GMT (DAPP data).*

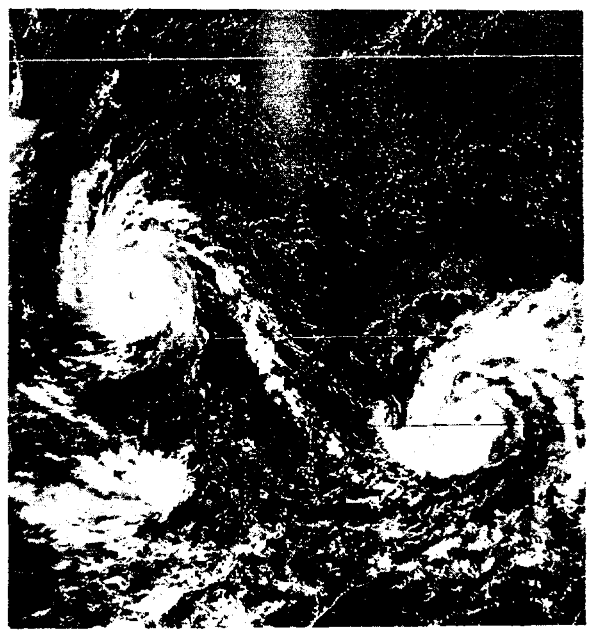
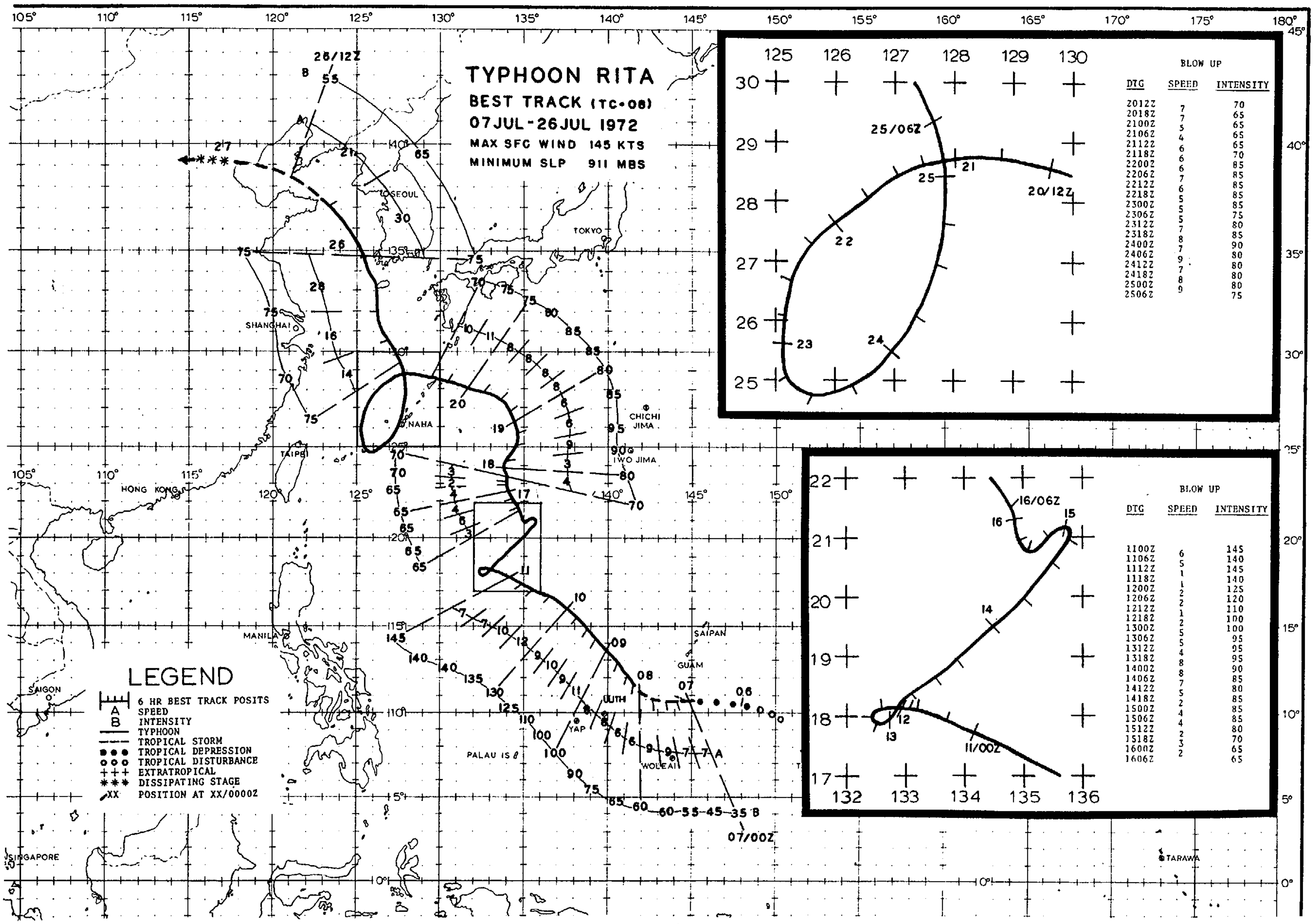


FIGURE 4-9. *Typhoon Phyllis (right) quasi-stationary east of the Marianas and Super Typhoon Rita (left) in the Philippine Sea, 10 July 1972, 0229 GMT (DAPP data).*


TYPHOON RITA
BEST TRACK (TC-08)
07JUL-26JUL 1972
MAX SFC WIND 145 KTS
MINIMUM SLP 911 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
XX POSITION AT XX/0000Z
SEOUL
TOKYO
SHANGHAI
NAHA
TAIPEI
CHICHI JIMA
IWO JIMA
HONG KONG
MANILA
SAIGON
SAIPAN
GUAM
ULITHI
YAP
WOLEAI
PALAU IS
SINGAPORE
TARAWA
26/12Z
07/00Z
BLOW UP
DTG SPEED INTENSITY
2012Z 70
2018Z 7 65
2100Z 7 65
2106Z 5 65
2112Z 4 65
2118Z 6 70
2200Z 6 85
2206Z 6 85
2212Z 7 85
2218Z 6 85
2300Z 5 85
2306Z 5 75
2312Z 5 80
2318Z 7 85
2400Z 8 90
2406Z 7 80
2412Z 9 80
2418Z 7 80
2500Z 8 80
2506Z 9 75
25/06Z
20/12Z
BLOW UP
DTG SPEED INTENSITY
1100Z 145
1106Z 6 140
1112Z 5 145
1118Z 1 140
1200Z 1 125
1206Z 2 120
1212Z 2 110
1218Z 1 100
1300Z 2 100
1306Z 5 95
1312Z 5 95
1318Z 4 95
1400Z 8 90
1406Z 8 85
1412Z 7 80
1418Z 5 85
1500Z 2 85
1506Z 4 85
1512Z 4 80
1518Z 2 70
1600Z 3 65
1606Z 2 65
16/06Z
11/00Z

Rita had her genesis southeast of Guam in an equatorial trough that spawned a simultaneous set of four tropical cyclones. Before Rita dissipated, she brought her influence to bear on almost every country of the Far East, with the exception of Indo-China. She persisted for 22 days, marking a record for tropical cyclone longevity in the western North Pacific. Typhoon Rita surpassed the previous record holder, Typhoon Opal (1967), for total warnings issued. In all, 79 warnings were issued on Rita.

Tracking south of Guam on 6-7 July, Rita attained typhoon strength about 120 nm northeast of Ulithi Atoll on the afternoon of the 8th. Earlier that day, an Air Force B-52 crashed into the ocean southwest of Guam, less than 150 nm in advance of Rita. Of the six-man crew, five were rescued from the typhoon's heavy seas.

During the 24-hour period (08/1000 GMT-09/1000 GMT), Rita's winds steadily strengthened and her central pressure plummeted 35 mb. Advancing northwestward on the morning of the 10th, Rita reached super typhoon force (Figure 4-10). By the 11th her central pressure had deepened to 911 mb and the maximum winds concentrated around her circular, 20-nm-diameter eye reached 145 kt.

Rita slowed and weakened as Phyllis began to accelerate northwestward. From 12-16 July Rita described an erratic track, marked with two stalls, as Phyllis swung around her circulation and struck Japan.

FIGURE 4-10. *Super Typhoon Rita 450 nm west of the Marianas. Cloudiness from the southeastern periphery of Tropical Storm Susan covers the northern Philippines. The vortex center of Susan, located 150 nm southeast of Hong Kong, appears on the edge of photo, 9 July 1972, 2322 GMT. (DAPP data)*

During this period Rita's circulation expanded to cover a large portion of the Philippine Sea (Figure 4-11). By the 18th gale-force winds stretched out approximately 350 nm, except in the western quadrant. The location of Rita and Tropical Storm Susan's presence in the northern South China Sea, combined to intensify the southwest monsoon flow over Luzon. This resulted in a prolonged period of torrential rains and the most disasterous flooding in the history of the area. In just one 24-hour period on 17 July, Baguio City recorded 18.86 in. of rain. Damages ran over 150 million dollars (U.S.) and flooding left an estimated death toll of 214 persons in its aftermath.

Rita began to slowly track northward late on the 16th. In response to a building high cell over the Sea of Japan, Rita made a bend to the west, skirting just north of Amami-o-Shima in the Ryukyu's on the evening of the 20th. The lowest minimum pressure recorded there was 968.9 mb (20/1100 GMT). Gaja Shima, 80 nm north of

FIGURE 4-11. *Typhoon Rita (left) centered 400 nm southwest of Iwo Jima dominates the Philippine Sea. Typhoon Tess (right) 400 nm south of Marcus Island is at peak intensity (125 kt). The remains of Phyllis are located over western Honshu, 15 July 1972, 2219 GMT. (DAPP data)*

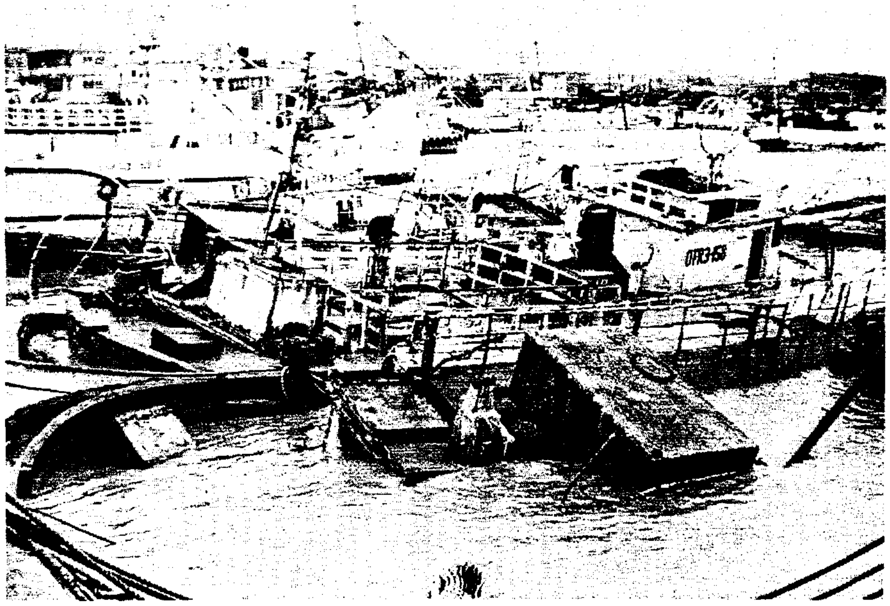


FIGURE 4-12. *Tuna boats lie swamped in Naha Port, victims of Typhoon Rita's torrential rains.--Courtesy of the Okinawa* *Morning Star.*

the center, reported sustained winds of 65 kt.

During her passage south of Kyushu, more than 23 in. of rain was recorded in two days on Mt. Yabitsu, Kyushu, and 9.68 in. in 24 hours on Kumamoto Prefecture.

As Rita entered the East China Sea, the prevailing mid-tropospheric flow weakened due to the presence of a low situated in central Manchuria. Rita was thus located in a col region and her forward progress slowed on the afternoon of the 21st. Typhoon Tess at that time had just passed north of the Bonin Islands and was located some 800 nm east of Rita. A Fujiwhara interaction took place, forcing Rita southwestward, describing a loop in the vicinity of the Ryukyu chain for the next three and a half days. During this loop, Rita's center passed just north of Miyako Jima and brushed the western coast of Okinawa.

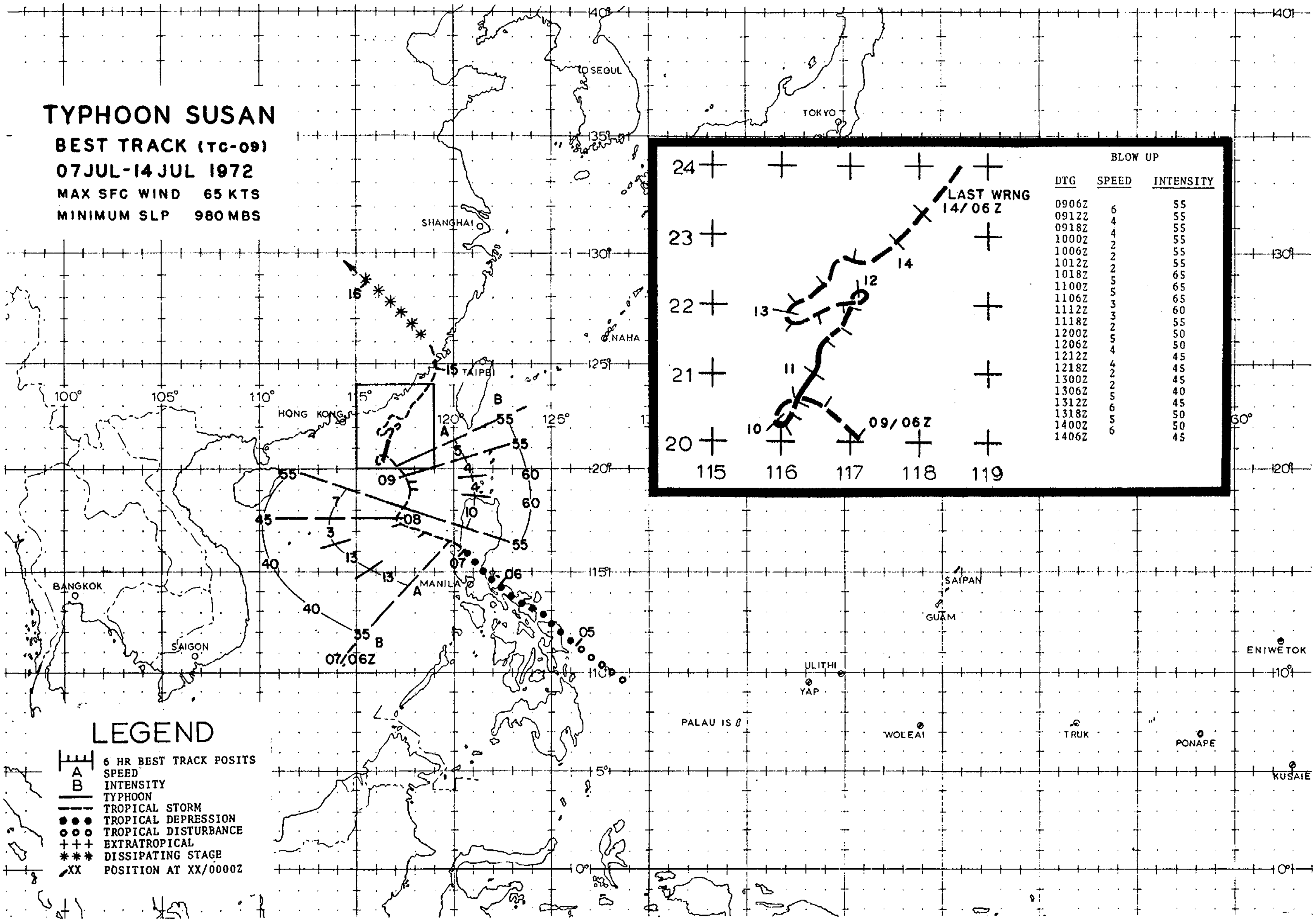
The lowest pressure registered in the islands during Rita's loop was at the Futema MCAS on Okinawa with 955.6 mb (24/0730 GMT). A maximum sustained wind of 72 kt was recorded at Okinoerabu Shima and gusts to 96 kt at Kume Shima.

Heavy rains of up to 9.6 in. in some mountain stations fell on Taiwan. Several villages were flooded, rendering over 700 persons homeless, while a train between Kaohsiung and Fangliao was derailed due to floods. Reports indicated three persons dead or missing.

Heaviest rains in the Ryukyu's occurred at Okinoerabu Shima, which recorded 31.87 in. in the five-day period it was under Rita's influence. Damage on Okinawa was primarily to farm crops. Sugar cane and pineapple crops averaged 30-35% destroyed, while the vegetable crops were also hard hit. In addition, many small boats were sunk (Figure 4-12) and several highways blocked by landslides. A total of three persons were reported killed in the Ryukyu's.

Completing the loop, Rita moved northward on the 25th. She began to accelerate as she entered a confluent zone, created by a trough over Manchuria and a building ridge over the Sea of Japan. Rita passed just west of Cheju Do on the morning of the 26th and then brushed southwestern Korea. Minimum pressure of 975.5 mb was recorded there (25/2100 GMT) with maximum sustained winds of 50 kt. Eight persons were reported killed in the southwestern tip of Korea and more than 200 buildings and 50 small boats were destroyed.

Rita accelerated to 30 kt in the Yellow Sea. She then took a more westward track, passing just south of Port Arthur on the evening of the 26th, weakening to a tropical storm. Entering the Gulf of Chihli, Rita moved ashore near Tientsin, China, and dissipated rapidly inland south of Peking on the 27th.



BLOW UP

DTG	SPEED	INTENSITY
0906Z	6	55
0912Z	4	55
0918Z	4	55
1000Z	2	55
1006Z	2	55
1012Z	2	55
1018Z	5	65
1100Z	5	65
1106Z	3	65
1112Z	3	60
1118Z	2	55
1200Z	5	50
1206Z	4	50
1212Z	4	45
1218Z	2	45
1300Z	2	45
1306Z	5	40
1312Z	6	45
1318Z	5	50
1400Z	6	50
1406Z		45

Susan led the procession of developing tropical cyclones in the equatorial trough during early July. She was detected in the synoptic data on 4 July east of southern Leyte. As a weak depression, she crossed the Philippine archipelago on a northwest track. Susan emerged west of Luzon on the afternoon of the 7th in the region of the Lingayen Gulf.

Susan intensified into a tropical storm as she moved over the South China Sea. She slowed on the 8th and began to move northward as a weak trough extended southwestward from the Sea of Japan, influencing her motion.

By the 9th, the trough filled partially and a col region formed in the general flow off the southeastern coast of China. Due to the weak steering currents, Susan moved erratically for the next four days. During this time the British ship MEMNON passed some 60 nm south of the center (10/0000 GMT) reporting 55-kt winds and 16-foot seas.

With Susan stalled in the South China Sea and Rita meandering in the central Philippine Sea, the circulations of these tropical cyclones intensified the southwest monsoon over the northern Philippines. High seas were built up over the South China Sea by the persistent, strong southwesterly flow. Inundation from high tides and large waves occurred along the western coast of Luzon. In Manila some sections of the sea wall were ripped away by wave action.

Heavy rains brought disasterous floods in many provinces of central Luzon during the several weeks that this strong flow persisted. As Rita was largely responsible for these prolonged conditions, the damage and death toll of the floods are listed in the discussion of that typhoon.

Reconnaissance aircraft revealed that Susan attained typhoon intensity for an 18-hour period on the 11th. Minimum central pressure during this time was 983 (Figure 4-13). Like Ora, Susan generated typhoon winds during a period in which she lacked a wall cloud. Satellite data at this time depicted the surface center delineated by low clouds as the cirrus overcast was sheared off to the southwest.

During the 14th, Susan began to move northward through the Taiwan Straits. She crossed the east coast of China near Hui An on the morning of the 15th and rapidly degenerated into an area of low pressure near Fooshow by evening.

The maximum rainfall recorded on Taiwan during Susan's meandering path in the South China Sea was 10.4 in. Four people were reported killed on the island due to direct or indirect causes of torrential rains. Also during this period, maximum winds of 39 kt occurred at the Hong Kong airport and 37 kt at the Royal Observatory. Since records began at the Royal Observatory, no other tropical cyclone remained within 200 miles of Hong Kong for such a long duration as Susan.

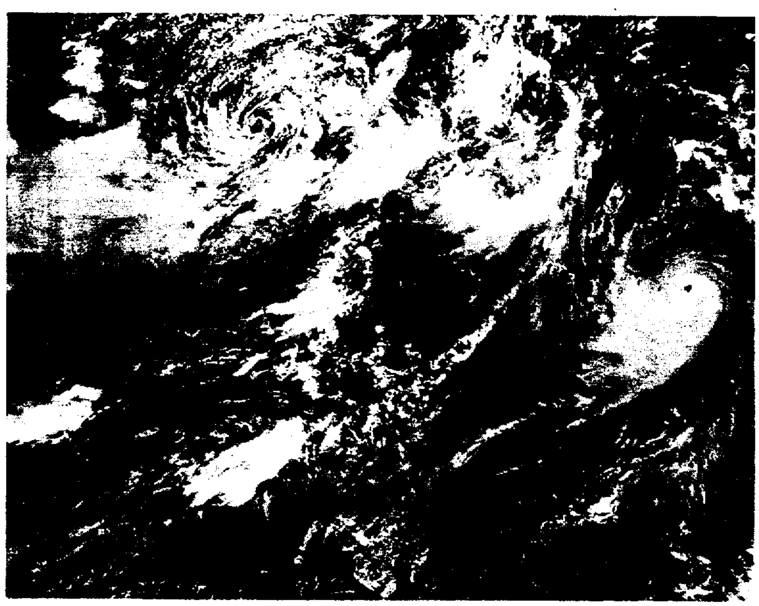
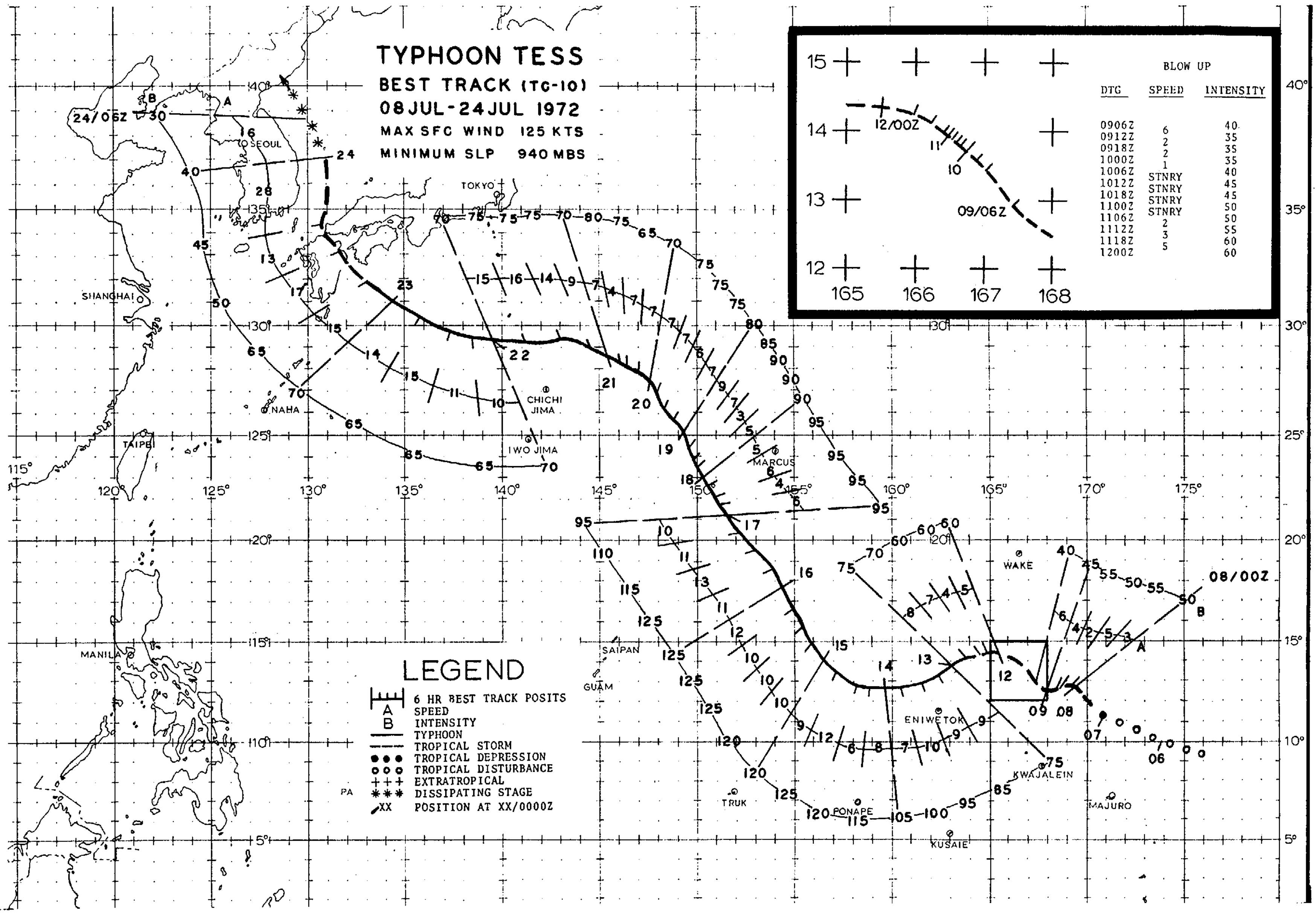


FIGURE 4-13. *Low level cloudiness spirals around the center of Susan (of minimal typhoon strength) located 150 nm southeast of Hong Kong. Typhoon Rita, in the central Philippine Sea, appears on the right edge of the photo, 11 July 1972, 0357 GMT. (DAPP data)*


TYPHOON TESS
BEST TRACK (TC-10)
08 JUL-24 JUL 1972
MAX SFC WIND 125 KTS
MINIMUM SLP 940 MBS
BLOW UP
DTG SPEED INTENSITY
0906Z 6 40
0912Z 2 35
0918Z 2 35
1000Z 1 35
1006Z STNRY 40
1012Z STNRY 45
1018Z STNRY 45
1100Z STNRY 50
1106Z 50
1112Z 2 55
1118Z 3 60
1200Z 5 60
12/00Z
09/06Z
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
XX POSITION AT XX/0000Z
24/06Z
08/00Z
SEOUL
TOKYO
SHANGHAI
NAHA
TAIPEI
CHICHI JIMA
IWO JIMA
MARCUS
MANILA
SAIPAN
GUAM
WAKE
ENIWETOK
KWAJALEIN
TRUK
PONAPE
KUSAIE
MAJURO

Tess was first observed in satellite pictures on 6 July, west of the international dateline near 9°N. She was positioned at the end of a chain of developing tropical cyclones stretching to the Philippines. She was tracked by satellite for the next six days while passing north of the Marshall Islands. Intensity estimates based on satellite imagery indicated Tess probably reached tropical storm force on the 7th. Late on the 12th, reconnaissance aircraft indicated Tess had reached typhoon intensity.

Due to a building high cell north of Wake Island, Tess began to move southwest on the 13th. Steadily gaining strength (Figure 4-14), Tess described a gradual bend back to the northwest late on the 14th as she rounded the southern extension of the ridge. Her central pressure reached a minimum on the afternoon of the 15th as dropsonde measurements recorded 940 mb. Tess achieved her maximum intensity at this time with winds of 125 kt occurring near her center.

Continuing on a northwesterly course for the next five days, Tess gradually lessened in intensity as she paralleled the southwest side of a high cell 500 nm northeast of Minami Tori Shima (Marcus Island).

By the 20th, the influence of a high cell over northern Honshu caused Tess to shift to a westerly course. Now a minimal typhoon, Tess began to increase in forward speed on the 21st as she approached the Nampō Shoto, south of Japan. With the slowdown of Rita in the East China Sea, the circulation of Tess began to interact with that of Rita, about 800 nm distant (Figure 4-15).

As a Fujiwhara effect began to take place, the path of Tess was dictated by both Rita's circulation and a high cell over Honshu. These two factors caused a 14-15 kt movement and landfall on northeastern Kyushu the evening of the 23rd. Emerging into the Sea of Japan as a tropical storm, Tess moved rapidly northward and weakened to a tropical depression. She finally merged with a front south of Vladivostok late on the 24th.

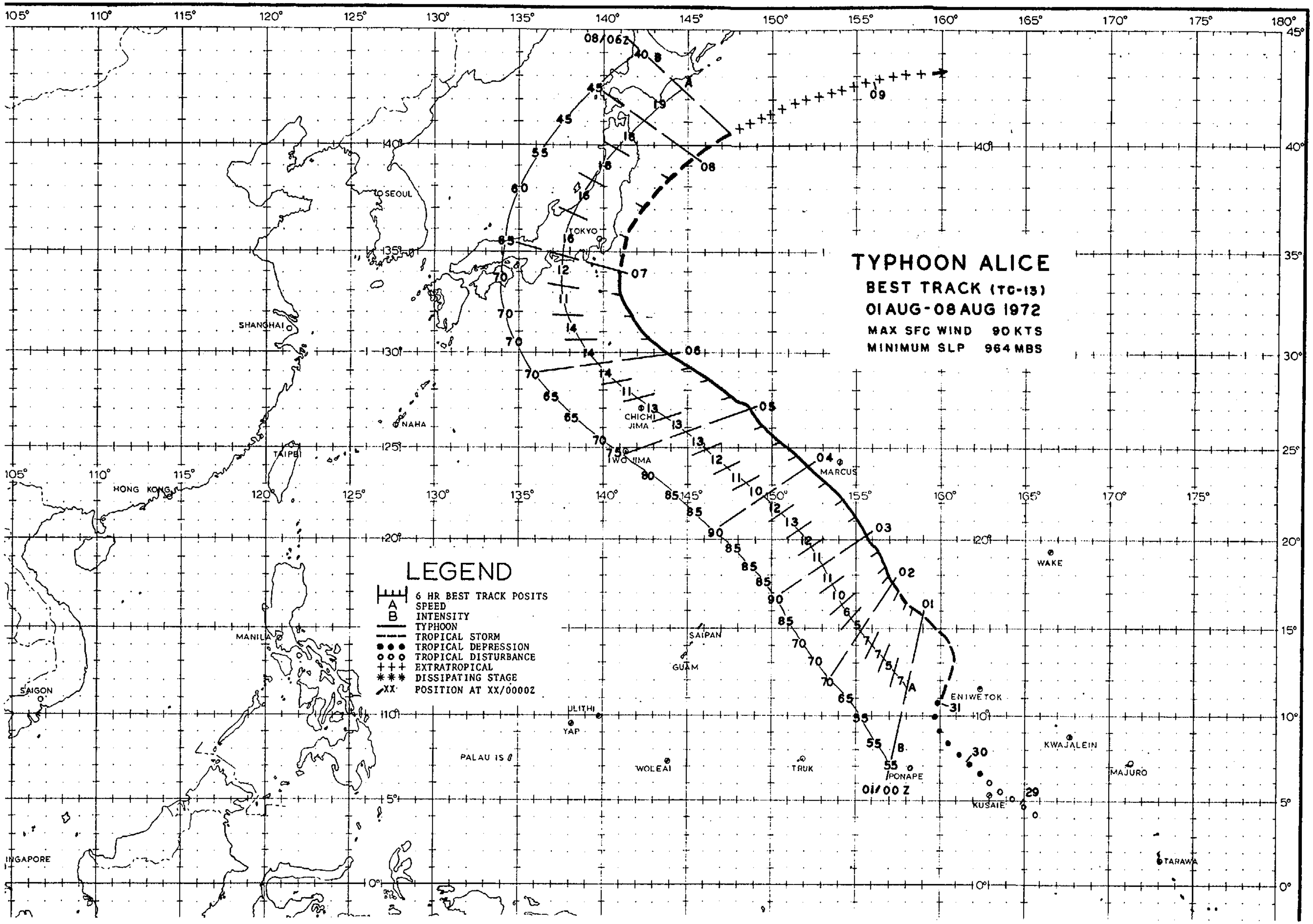
Torrential rains from Tess occurred over much of Shikoku (18.94 in. at Tsurugisan Weather Station) and the Kanto, Chubu and Kinki regions of Honshu. Resultant flooding caused inundation of over 3,500 homes and over 1,600 hectares of land. Newspaper reports indicated 29 persons killed and 20 missing in the aftermath of Tess. The majority of these were swimmers lost in the 6- to 12-foot surf which battered the central Japanese coastline prior to Tess's arrival.

The center passed over Oita, Kyushu, which registered the minimum pressure in the region of 979.4 mb. Maximum sustained winds of 72 kt and peak gust of 96 kt were recorded on Shikoku at Murotomisaki and Sukumo, respectively.

Although not a record breaker, Tess paralleled Rita in terms of longevity as she narrowly missed matching Typhoon Opal's (1967) performance. A total of 66 warnings was issued on Tess, three less than during Opal's lifetime.

FIGURE 4-14. *Typhoon Tess 90 nm north of Eniwetok, 13 July 1972, 2133 GMT. (DAPP data)*

FIGURE 4-15. *Typhoon Tess (right) 400 nm south of Tokyo is centered some 700 nm east of Typhoon Rita (left) in the East China Sea, 22 July 1972, 0259 GMT. (DAPP data)*


TYPHOON ALICE
BEST TRACK (TC-13)
01 AUG - 08 AUG 1972
MAX SFC WIND 90 KTS
MINIMUM SLP 964 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
XX POSITION AT XX/0000Z
01/00 Z
08/06Z
SEOUL
TOKYO
SHANGHAI
NAHA
TAIPEI
HONG KONG
MANILA
SAIGON
SINGAPORE
CHICHI JIMA
IWO JIMA
MARCUS
WAKE
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
PONAPE
KUSAIE
ENIWETOK
KWAJALEIN
MAJURO
TARAWA

Except for a brush with Honshu of the Japanese Islands, Alice spent her 12-day existence at sea. Forming in the equatorial trough, Alice was initially detected by satellite on 29 July.

Moving northward as a depression, Alice reached tropical storm force 125 nm west of Eniwetok. The synoptic situation depicted a general weakness in the mid-tropospheric subtropical ridge at the longitude of the storm. This was due to a trough extending southward from the Kamchatka peninsula. Alice continued her northerly movement but shifted to a more westward track by the 1st. The western edge of a high cell, northeast of Minami Tori Shima (Marcus Island), began to build north of Alice during the next five days, guiding her on a track towards Japan.

On the 4th, Alice passed 80 nm southwest of Minami Tori Shima. The Japanese meteorological station on the island registered maximum winds of 53 kt (03/2140 GMT) and peak gusts of 74 kt (03/1930 and 03/2135 GMT). Minimum pressure recorded was 990.0 mb (04/0000 GMT). A Japanese ship, NIPPON MARU, passed close to Alice's center on the 5th, observing 70-kt winds and a minimum pressure of 984.7 mb (05/0000 GMT).

With the long wave in the westerlies positioned over Manchuria, Alice began to decelerate as she approached the Boso peninsula of Honshu, Japan, (Figure 4-16) recurving once she crossed the 35th parallel. Accelerating to speeds of 19 kt, Alice passed south of Hokkaido on the 8th and acquired extratropical characteristics later that day.

The center of Alice passed 40 nm east of the Boso peninsula during the afternoon of the 7th. No winds in excess of 25 kt were reported along the coast during the passage of the weaker semicircle of Alice. A minimum pressure of 988.7 mb was measured at Choshi while rainfall amounts of 4.02 in. were totaled at Katsuura. In Iwaki, Fukushima Prefecture, some 300 houses were flooded when typhoon-generated waves caused the river in the city's Kunohama section to overflow.

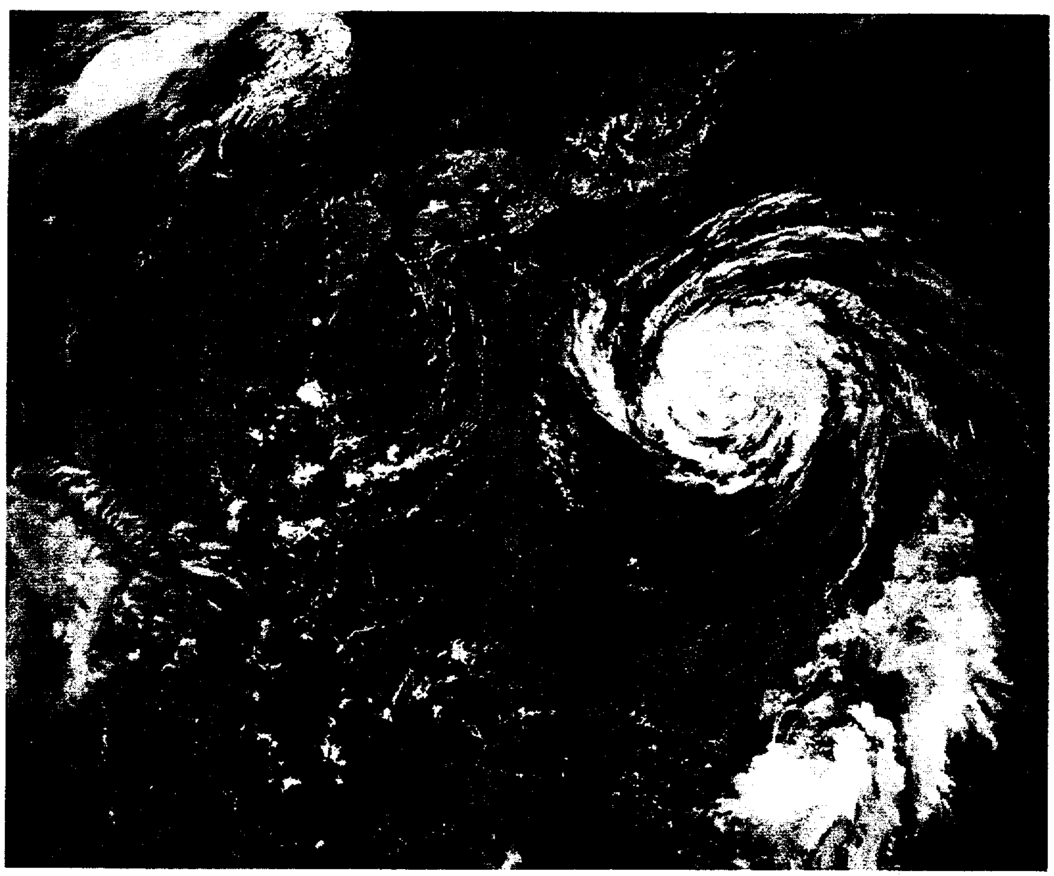
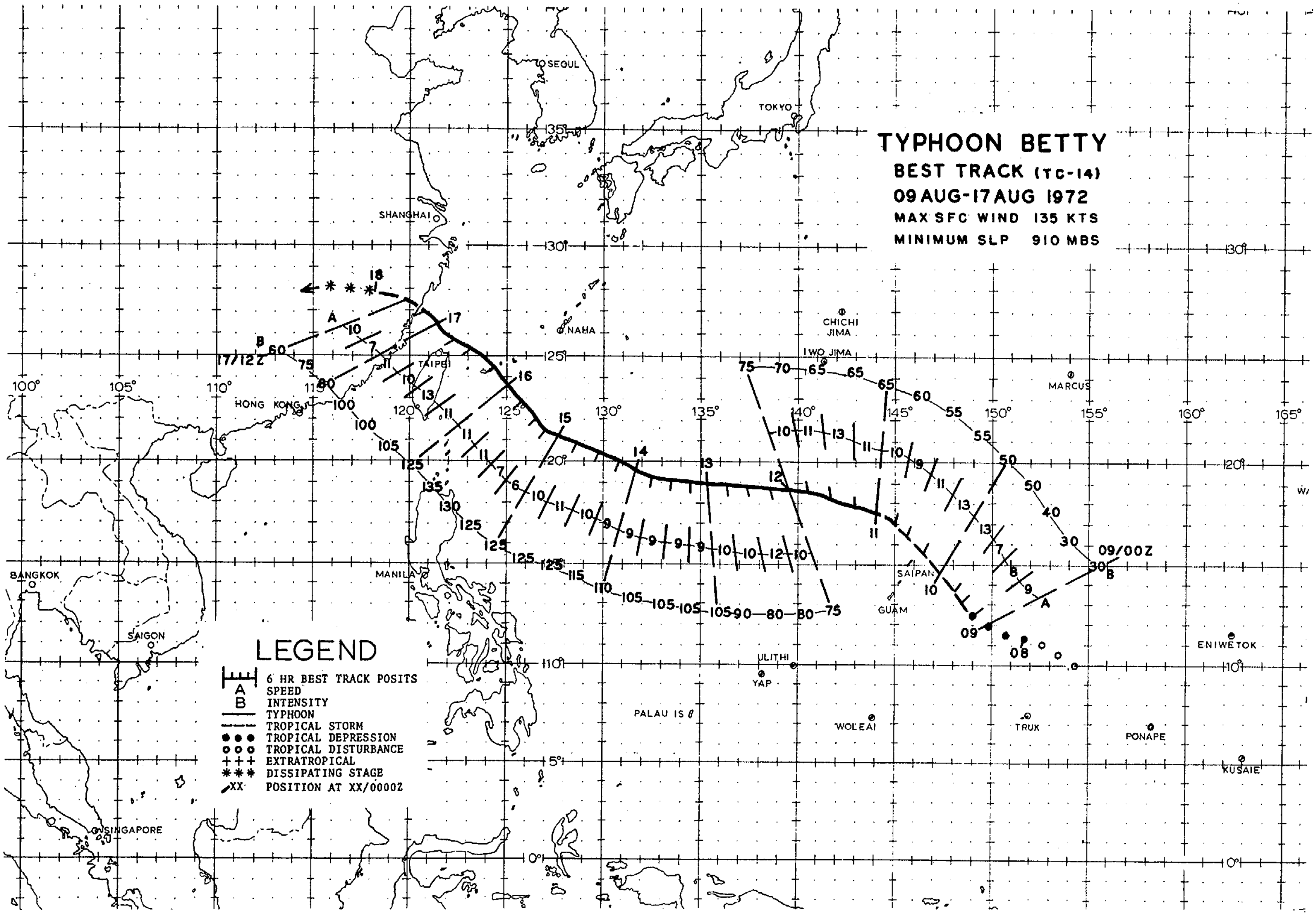


FIGURE 4-16. *Typhoon Alice 360 nm south-southeast of Tokyo, 6 August 1972, 0246 GMT. (DAPP data)*


TYPHOON BETTY
BEST TRACK (TC-14)
09 AUG-17 AUG 1972
MAX SFC WIND 135 KTS
MINIMUM SLP 910 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
XX POSITION AT XX/0000Z
SEOUL
TOKYO
SHANGHAI
NAHA
TAIPEI
HONG KONG
MANILA
BANGKOK
SAIGON
SINGAPORE
CHICHI JIMA
IWO JIMA
MARCUS
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
PONAPE
ENIWETOK
KUSAIE
09/00Z
17/12Z

Betty, destined to become the second super typhoon of the season, was first detected by satellite on 7 August north of the eastern Carolines. After reaching tropical storm intensity 200 nm southeast of Guam, Betty passed 50 nm north of Saipan. Westerly winds of 30 kt with gusts to 50 kt and some local flooding were experienced there during the afternoon and evening of the 10th.

Betty attained typhoon strength after passing through the Marianas, and shifted to a more westerly course as the subtropical ridge began to build northeast of Iwo Jima. The central sea level pressure dropped steadily during her five-day journey toward the southern Ryukyu's. A minimum pressure of 910 mb and maximum sustained winds of 135 kt were observed by reconnaissance aircraft on the 15th (Figure 4-17).

At that time, gale-force winds reached 450 nm from the center in the eastern semicircle, and 300 nm elsewhere. The extent of typhoon-force winds was also exceptional. A Japanese ship, TAKAMATSU MARU, reported 65-kt winds 200 nm southeast of the eye (16/0600 GMT).

Betty's track during 15-16 August appeared to be influenced by a col over the northern East China Sea. This weakness in the ridge to the north resulted in a more northerly track. The center thus passed through the southern Ryukyu's during the morning and afternoon of the 16th. The eye crossed the northern tip of Ishigaki Shima (16/0612 GMT) when the barograph recorded 942.5 mb. Maximum sustained winds on Miyako Shima, 60 nm from the center, were 61 kt from the south-southeast (16/1555 GMT). A maximum gust of 96 kt was recorded at Kume Jima, located 165 nm northeast of the center.

During her advance toward the southern Ryukyu's, Betty's circulation intensified the southwest monsoonal flow over Luzon bringing torrential rains. The resulting floods caused seven deaths in the northern province of Ilocos Sur. A light aircraft with four persons aboard was also reported missing.

Betty passed 40 nm north of Taiwan during 16-17 August. A minimum sea level pressure of 940.9 mb was registered at Pengchia Hsu Island (16/1745 GMT) as the eye passed overhead. Maximum sustained winds of 101 kt (16/2045 GMT) and a gust of 108 kt (16/2010 GMT) were also reported at that station.

Heavy rains (32.42 in.) were recorded at Alishan, resulting in considerable flooding in Taiwan. An estimated 300,000 people were stranded by floodwaters in Sanchung City (Figure 4-18) and the two adjacent townships of Luichow and Wuku, west of Taipei. Many highways were made impassable and rail service was interrupted by landslides in northern and central Taiwan. Eighteen storm-related deaths were reported in Taiwan while over 220 homes were totally destroyed and over 130 badly damaged.

Betty made landfall the evening of the 17th on the China coast near 27°N and lost strength rapidly as she moved inland.

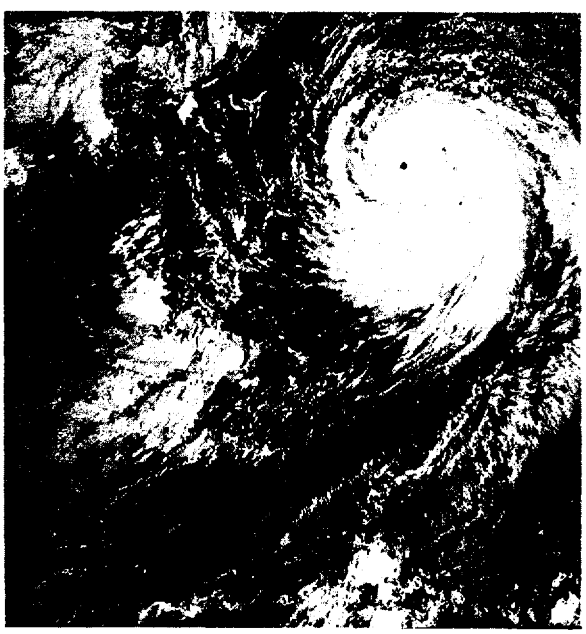
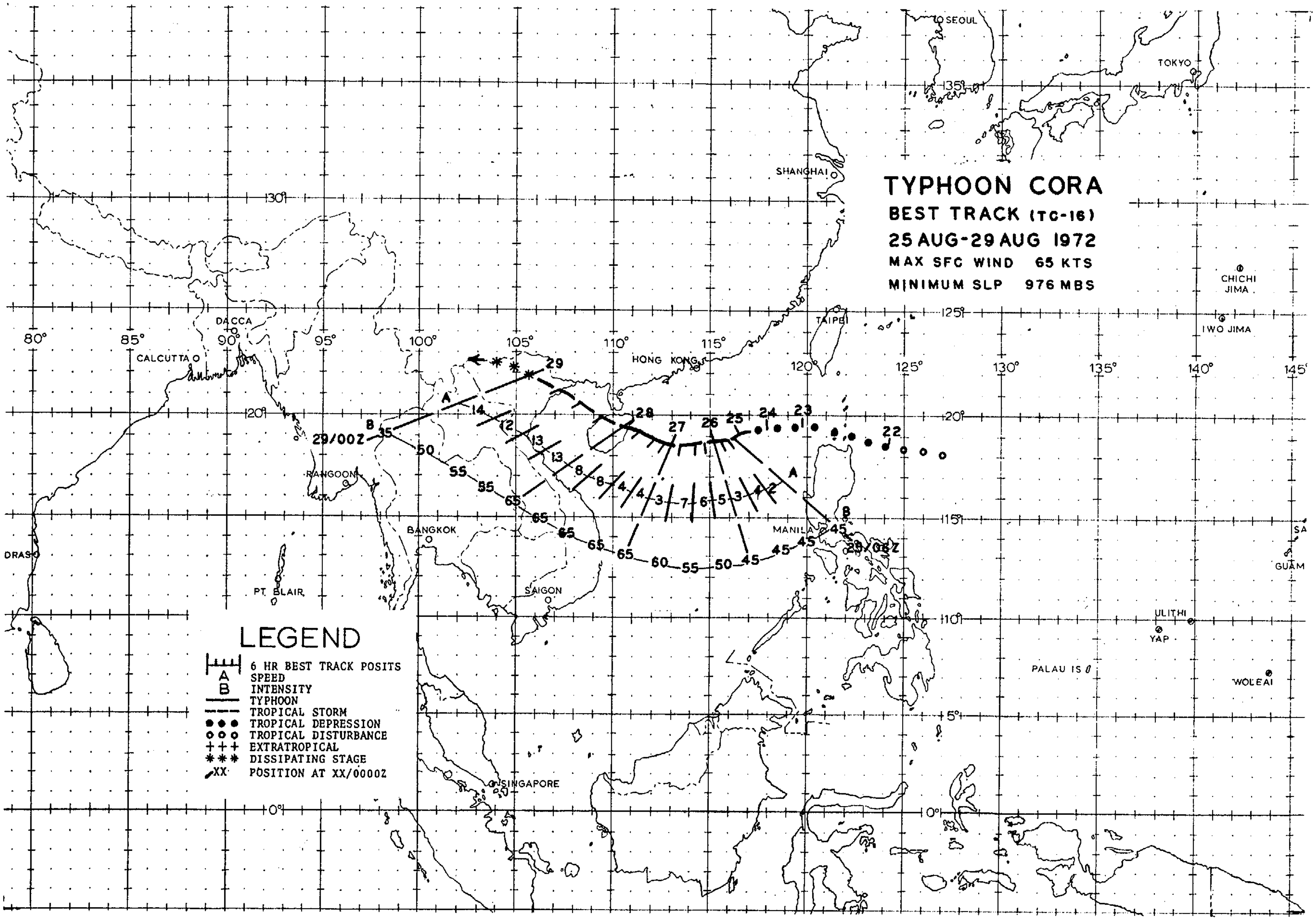


FIGURE 4-17. *Super Typhoon Betty 420 nm east-southeast of Taipei, Taiwan, 14 August 1972, 2347 GMT. (DAPP data)*

FIGURE 4-18. *The flooded Sanchung district of Taipei, Taiwan, due to torrential rains brought by Typhoon Betty.--Courtesy of China Post*


TYPHOON CORA
BEST TRACK (TC-16)
25 AUG-29 AUG 1972
MAX SFC WIND 65 KTS
MINIMUM SLP 976 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
XX POSITION AT XX/0000Z
SEOUL
TOKYO
SHANGHAI
TAIPEI
HONG KONG
MANILA
CHICHI JIMA
IWO JIMA
DACCA
CALCUTTA
RANGOON
BANGKOK
SAIGON
PT. BLAIR
SINGAPORE
ULITHI
YAP
PALAU IS
WOLEAI
GUAM
29/00Z
28/06Z

First signs of a disturbance east of Luzon were indicated by satellite and ship data on 21 August. The developing depression moved across the southern Luzon Straits early on the 23rd and entered the South China Sea as Tropical Storm Cora. Cora was guided on a slow westerly course by the flow from a high cell over eastern China (Figure 4-19). She developed to a minimal typhoon on the 27th, less than 24 hours from landfall.

Cora crossed Hainan Island on the 28th and transited the northern Tonkin Gulf that evening. Making landfall as a tropical storm near Haiphong, she quickly dissipated.

Cora was only the fourth tropical storm to reach typhoon intensity in August in the South China Sea since 1945. The most recent was Shirley in 1968.

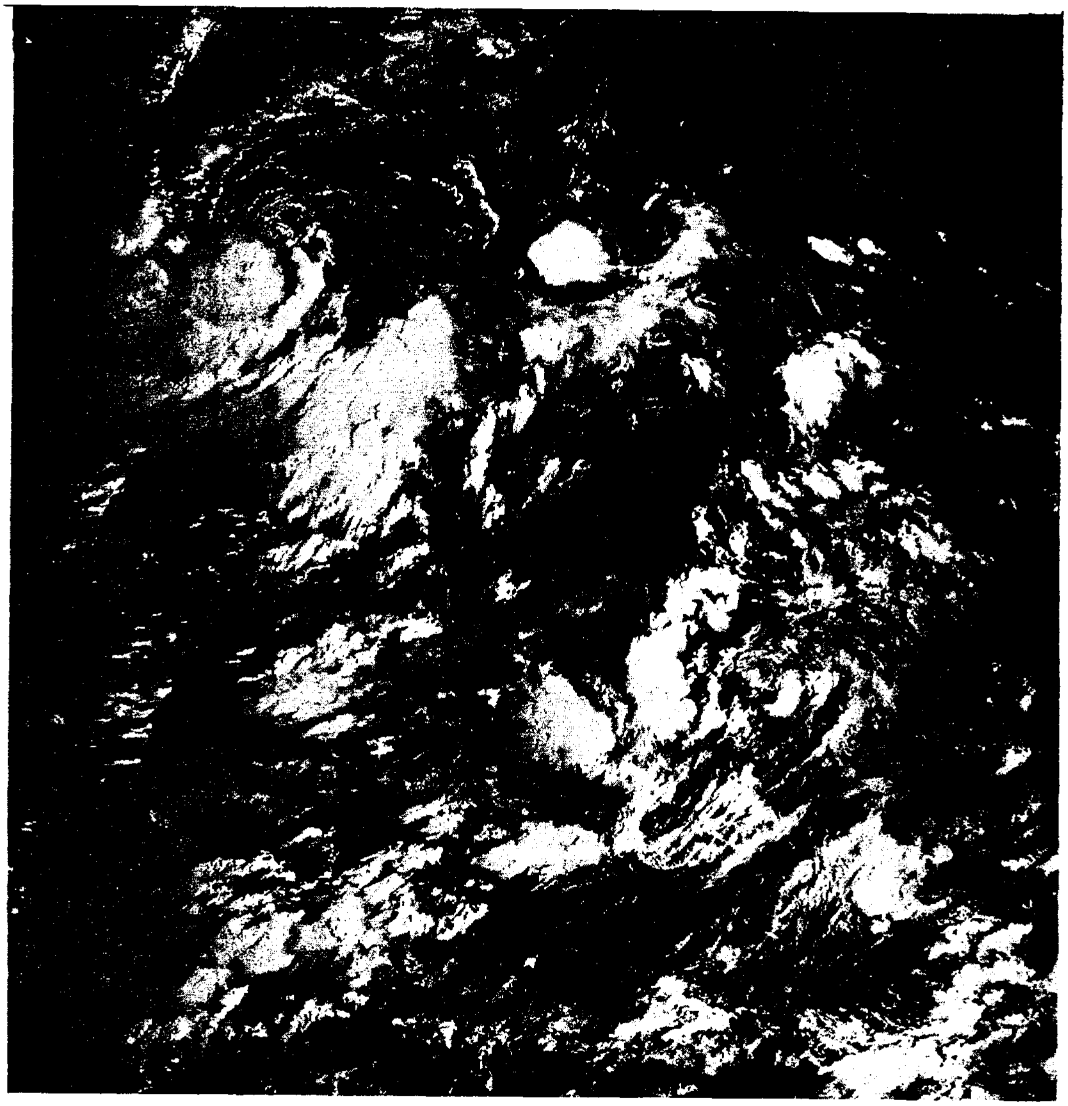
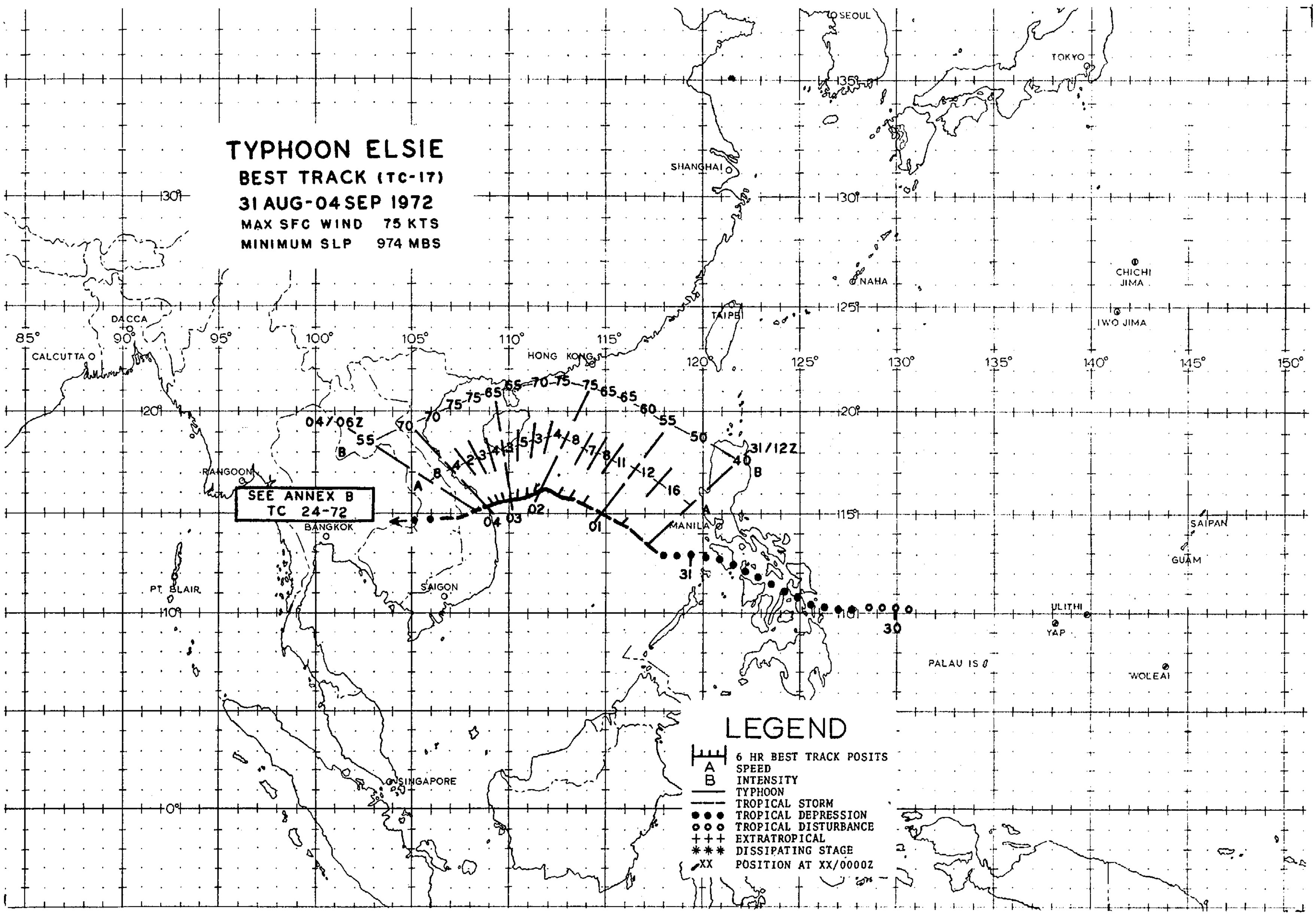


FIGURE 4-19. *Tropical Storm Cora in the northern South China Sea 270 nm east of Hainan Island, 25 August 1972, 2349 GMT. (DAPP data)*

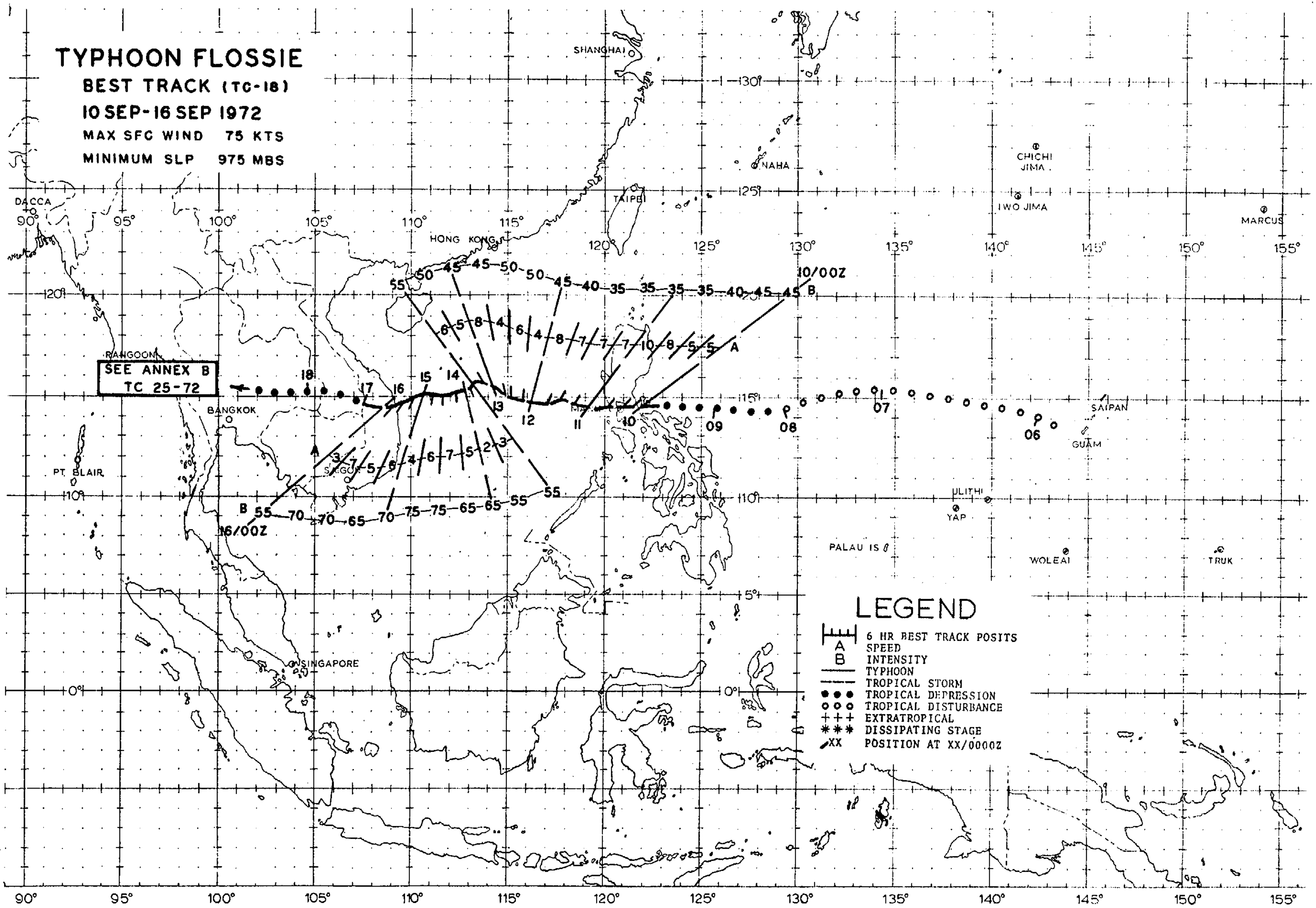

TYPHOON ELSIE
BEST TRACK (TC-17)
31 AUG-04 SEP 1972
MAX SFC WIND 75 KTS
MINIMUM SLP 974 MBS
SEE ANNEX B
TC 24-72
04/06Z
31/12Z
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
XX POSITION AT XX/0000Z
SEOUL
TOKYO
SHANGHAI
NAHA
CHICHI JIMA
IWO JIMA
TAIPEI
HONG KONG
DACCA
CALCUTTA
RANGOON
BANGKOK
SAIGON
MANILA
PT. BLAIR
SINGAPORE
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI

The fourth typhoon of the month, Elsie, was first spotted by satellite as a disturbance east of Leyte Gulf on 29 August. After crossing the central Philippines as a depression, Elsie entered the South China Sea west of Mindoro on the 31st. Tropical-storm force was achieved later that day. By 1 September Elsie began to slow, apparently due to a slow-moving trough over China.

Elsie reached typhoon force near the Paracel Islands, then shifted to a southwest track as heights began to build in southern China. Moving slowly across the South China Sea toward the Vietnam coast, Elsie required two days to travel 160 nm (Figure 4-20). As her center passed Quang Ngai, a minimum sea level pressure of 991 mb was registered and peak gusts of 60 kt were reported.

Elsie weakened rapidly as she moved into Thailand but maintained her identity across the Indo-China peninsula, redeveloping to typhoon strength in the Bay of Bengal (see Annex B). Elsie was only the second tropical cyclone in September to reach severe storm intensity (>47 kt) in the Bay of Bengal since 1943. During her passage over Thailand, Elsie caused three days of heavy rains, flooding many parts of the country.

FIGURE 4-20. *Radarscope presentation (AN/SPS-30, range 150 nm) of Elsie taken aboard USS KITTY HAWK while the typhoon was centered 130 nm south of Hainan Island, 2 September 1972, 1720 GMT. Blip in eye is return from weather reconnaissance aircraft.*


TYPHOON FLOSSIE
BEST TRACK (TC-18)
10 SEP-16 SEP 1972
MAX SFC WIND 75 KTS
MINIMUM SLP 975 MBS
SEE ANNEX B
TC 25-72
10/00Z
16/00Z
SHANGHAI
NAHA
TAIPEI
HONG KONG
DACCA
RANGOON
BANGKOK
SAIGON
PT. BLAIR
SINGAPORE
CHICHI JIMA
IWO JIMA
MARCUS
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
XX POSITION AT XX/0000Z
90° 95° 100° 105° 110° 115° 120° 125° 130° 135° 140° 145° 150° 155°

On 6 September, as Elsie was crossing Thailand, a weak circulation was noted on satellite pictures in the southern Marianas. The ill-defined system crossed the Philippine Sea and developed into Tropical Storm Flossie prior to landfall in the Lamon Bay region of Luzon.

A trough extending south-southwestward from the Kuril Islands weakened the subtropical ridge over southern China. The resulting weak steering flow caused Flossie to move slowly westward across the South China Sea during 11-14 September (Figure 4-21). Reaching minimal typhoon strength south of the Paracel Islands, Flossie shifted to a more southerly track. She moved ashore between Qui Nhon and Quang Ngai, South Vietnam, in the early morning of 16 September.

After weakening to a tropical depression, Flossie closely paralleled Elsie's track across Thailand, causing heavy rains on 18-19 September. Three provinces north of Bangkok were under floodwaters of up to 2-1/2 feet. Flossie, like Elsie, retained her identity across the Indo-China peninsula and regenerated to typhoon force in the Bay of Bengal (see Annex A). As Tropical Cyclone 25-72, she became the second tropical cyclone to achieve typhoon intensity in the Bay of Bengal during September. Since 1884[4], there had never been more than one tropical cyclone reaching severe storm force (>47 kt) in the Bay of Bengal during September.

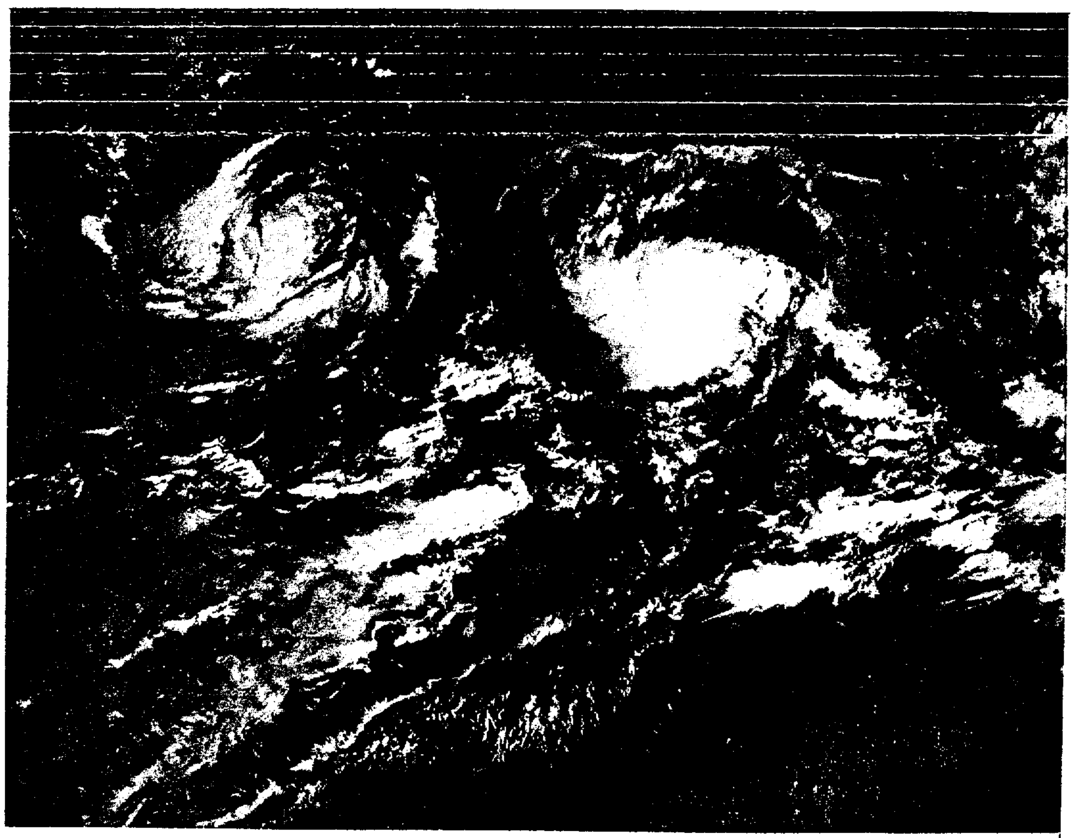
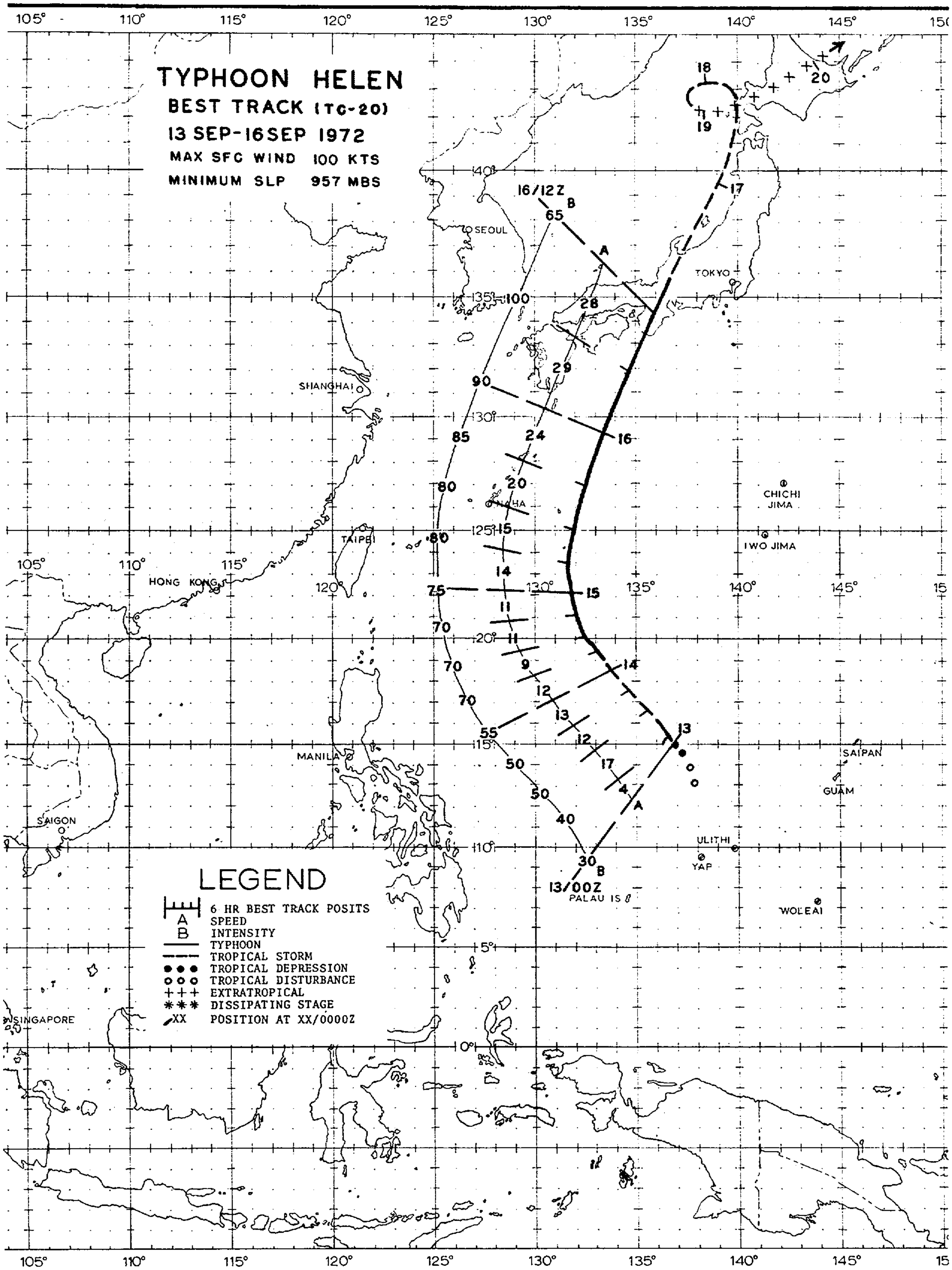


FIGURE 4-21. *Tropical Storm Flossie (left) in the South China Sea 300 nm east of Danang, Vietnam. A second tropical storm, Grace, is centered just east of Luzon, 13 September 1972, 0002 GMT. (DAPP data)*

[4]Tracks of storms and depressions in the Bay of Bengal and the Arabian Sea 1877-1960, India Meteorological Department, 1964.


TYPHOON HELEN
BEST TRACK (TC-20)
13 SEP-16SEP 1972
MAX SFC WIND 100 KTS
MINIMUM SLP 957 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
XX POSITION AT XX/0000Z
16/12Z
13/00Z
SEOUL
TOKYO
SHANGHAI
NAHA
TAIPEI
HONG KONG
MANILA
SAIGON
SINGAPORE
CHICHI JIMA
IWO JIMA
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI

While Flossie moved slowly across the South China Sea and Tropical Storm Grace stalled east of Luzon, a third circulation appeared in the equatorial trough west of Guam. This tropical cyclone would be the most destructive to strike Japan in 1972.

Reconnaissance aircraft, the afternoon of 13 September, indicated the presence of a tropical storm near 16°N and 136°E. Moderate feeder band activity was detected and flight level winds (700 mb) of 58 kt were measured in the eastern quadrant. Minimum central pressure, as determined by extrapolation from 700 mb, was 987 mb.

Taking a northwesterly course around a high cell centered between Minami Tori Shima (Marcus Island) and Chichi Jima, Helen attained typhoon intensity on the afternoon of the 14th. She then veered to a more northerly course due to a deepening trough in the East China Sea. This trough and an intense high pressure cell east of Chichi Jima combined to produce strong south-southwesterly flow south of Japan. Helen reacted by accelerating to 20 kt late on the 15th (Figure 4-22) and to 29 kt the following afternoon. Reconnaissance aircraft observed flight level winds of 100 kt in the right semicircle during this period.

Helen moved ashore near Cape Kushimoto during the evening of the 16th, crossing Honshu just west of Ise Bay. She passed between Osaka and Nagoya and moved into the Sea of Japan near Toyama 12 hours later.

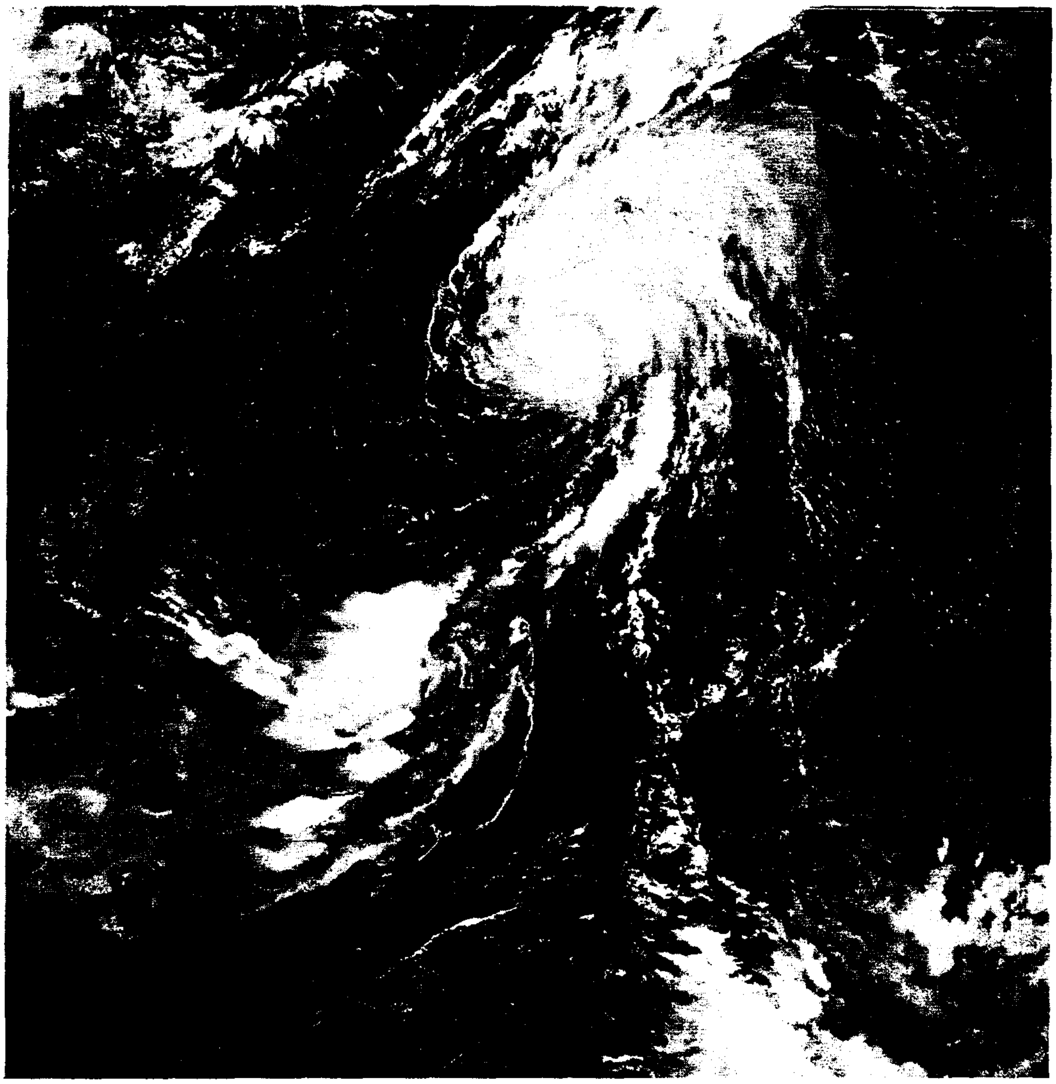


FIGURE 4-22. *Typhoon Helen 300 nm southeast of Okinawa, 15 September 1972, 0318 GMT. (DAPP data)*

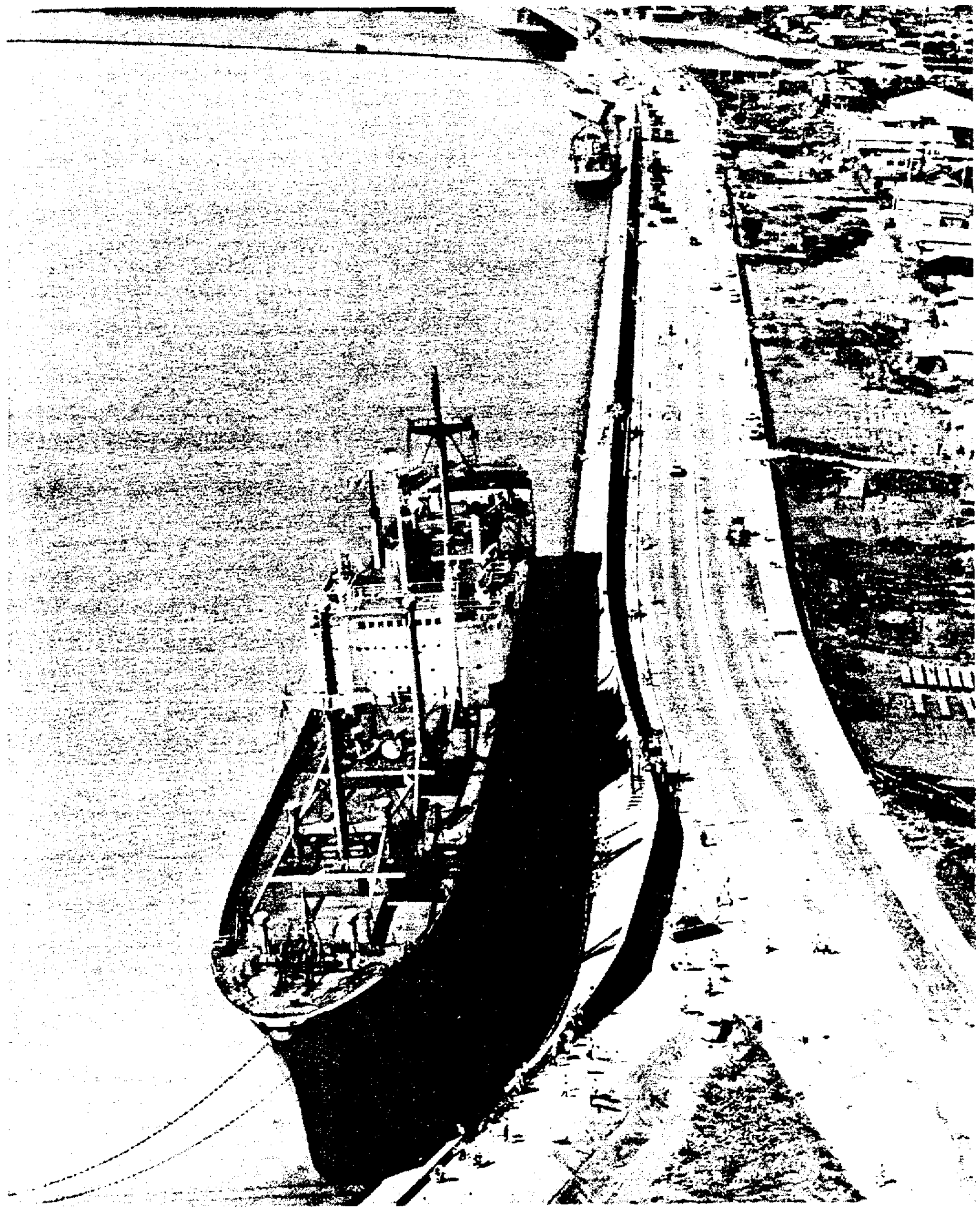


FIGURE 4-23. *The aftermath of Typhoon Helen - Kawagoe Town, Mie Prefecture, Japan. Philippine cargo ship MARIA ROSELLO (9,000 tons) blown against causeway (Meiyon National Highway). Two other ships behind cargo ship are also blown against causeway while another is overturned in the background.--Courtesy of Kyodo Tsushin*

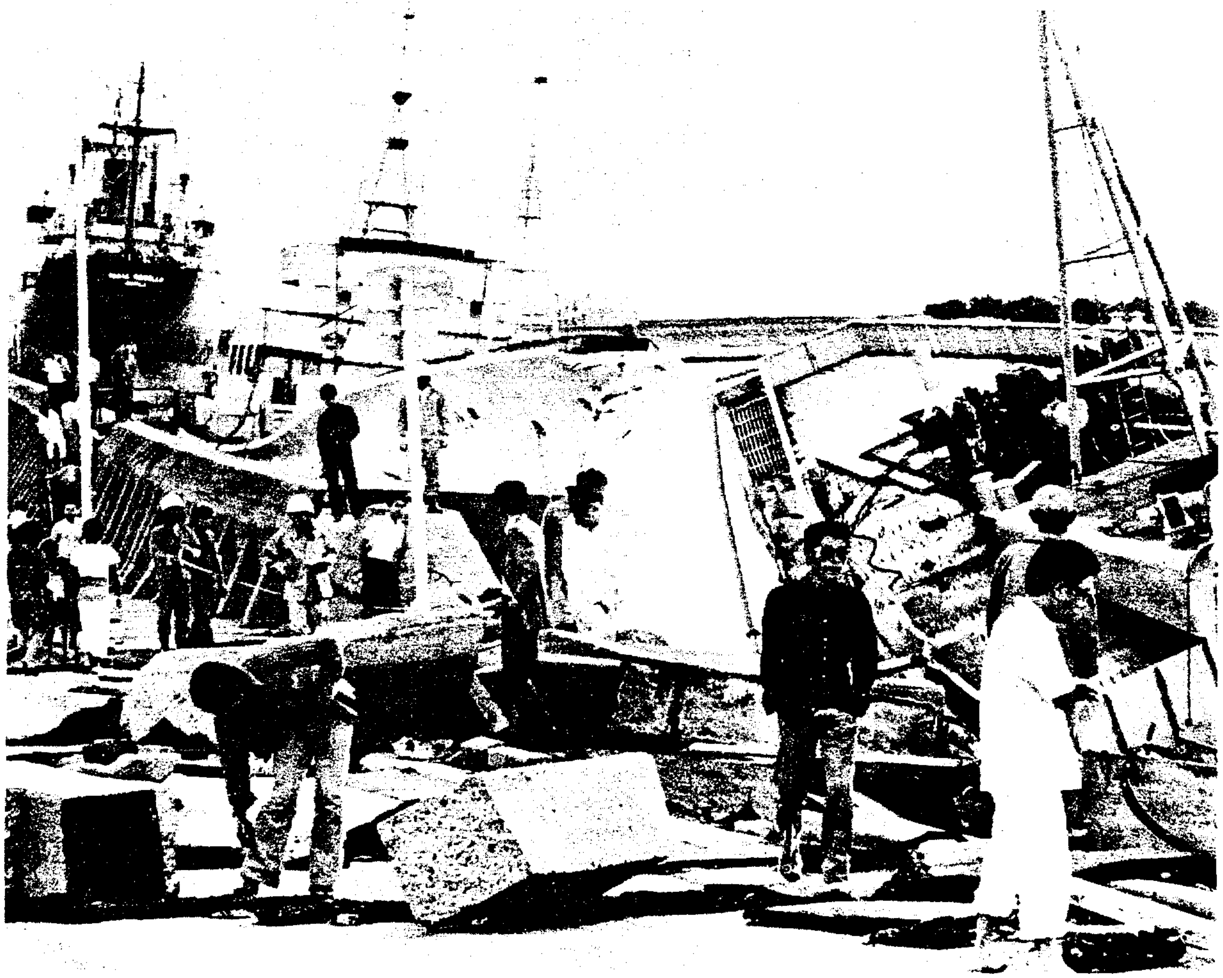


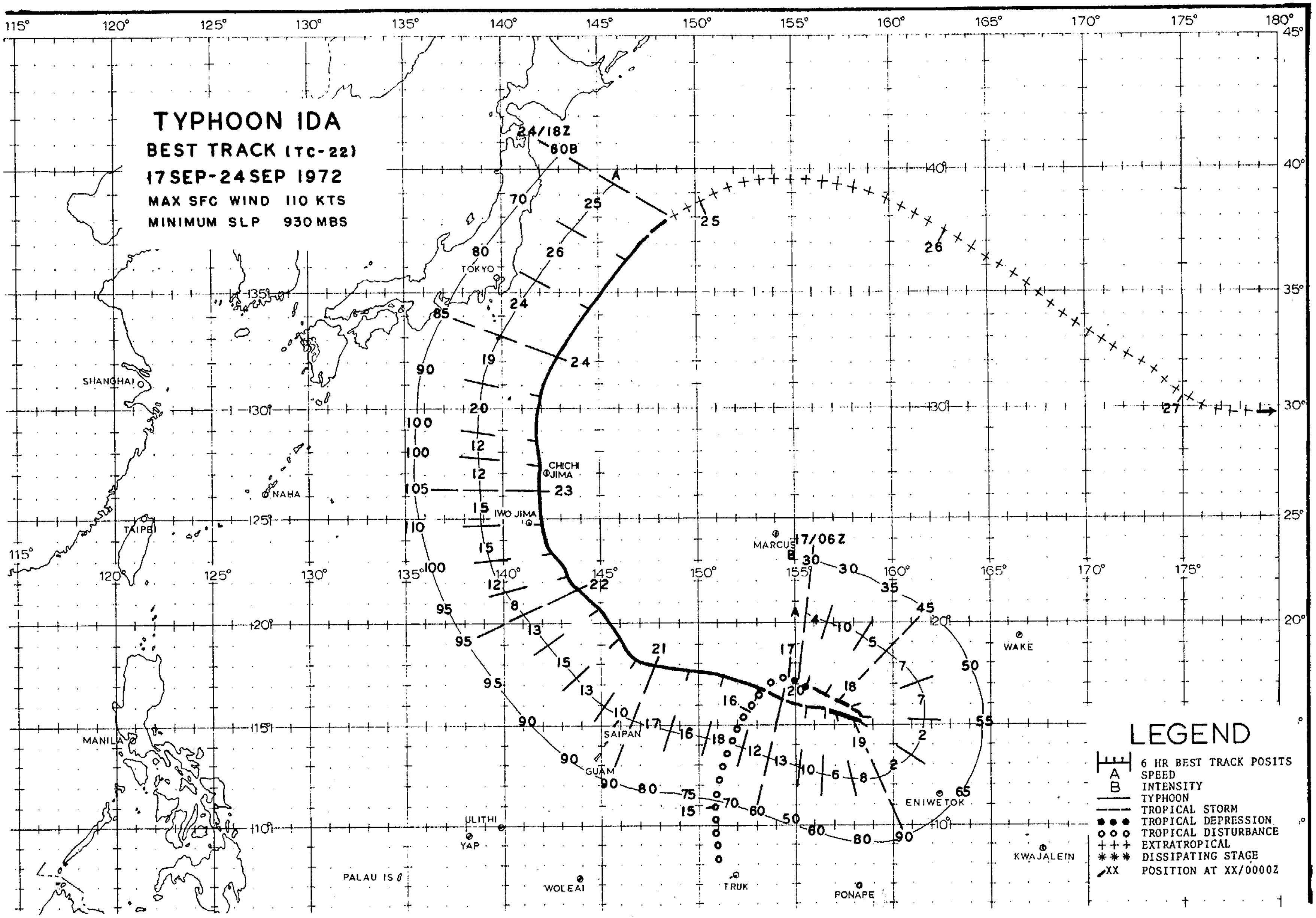
FIGURE 4-24. *Fishing vessel and cargo ship MARIA ROSELLO smashed against causeway due to Helen. Debris from wrecked causeway lies on the National Highway, Kawagoe Town, Mie Prefecture, Japan.--Courtesy of Kyodo Tsushin*

The lowest recorded pressure of 956.9 mb (16/0940 GMT) and maximum sustained winds of 70 kt (16/0900 GMT) from the north were observed at Shionomisaki, west of Helen's track. A peak gust of 98 kt (16/0850 GMT) was registered at Sumoto located near Osaka Bay, 60 nm west of the track.

Heavy rains disrupted land, sea, and air transportation in central and eastern Japan. There were 38 deaths and 158 injuries reported, most of which were attributed to landslides and flooding. Over 360 houses were destroyed or badly damaged by landslides and over 77,000 homes were inundated by floodwaters. Losses from damage to roads and river embankments were estimated near 102 million dollars (U.S.). Helen also generated a tornado near Higashi Matsuyama north of Tokyo, destroying eight homes.

Nine cargo ships ran aground in Ise Bay, including the 6,244-ton Indian ship, STATE OF TRAJAN COCHIN, and the 9,031-ton Philippine freighter, MARIA ROSELLO (Figures 4-23, 4-24). Two fishing boats were sunk near Hachijo Jima. Of a combined crew of 30, only six fishermen were rescued.

After weakening to tropical storm force in the Sea of Japan, Helen slowed near Hokkaido late on the 17th and merged with an upper level low the following day. Rains up to 31 in. fell on Hokkaido with flash floods and landslides accounting for eight dead and two missing. High tides generated by Helen, while west of Hokkaido, accounted for at least two deaths along the east coast of Korea.


TYPHOON IDA
BEST TRACK (TC-22)
17 SEP-24 SEP 1972
MAX SFC WIND 110 KTS
MINIMUM SLP 930 MBS
24/18Z
17/06Z
TOKYO
SHANGHAI
NAHA
TAIPEI
MANILA
CHICHI JIMA
IWO JIMA
MARCUS
WAKE
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
PONAPE
ENIWETOK
KWAJALEIN
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
XX POSITION AT XX/0000Z

On 14-15 September, surface and upper air reports in the eastern Carolines depicted a weak circulation in the equatorial trough north of Truk. Satellite pictures for the next few days showed this disturbance drifting northward and gaining a more organized appearance.

On the 18th, reconnaissance aircraft indicated the disturbance had become a tropical storm (Figure 4-25), midway between the Marianas and Wake.

Ida tracked to the southeast, apparently under the influence of a mid-tropospheric trough extending from the Kamchatka peninsula to the vicinity of Wake Island. As heights began to build west of the trough, Ida reversed course, moved westward and intensified. She reached typhoon intensity the afternoon of 20 September.

Approaching the northern Marianas at 16-18 kt, Ida took a more northerly track on 21 September due to the deepening of a short wave trough over Japan. Pagan Island reported northwesterly winds of 30 kt with gusts to 50 kt and a minimum sea level pressure of 988.6 mb as the center passed 60 nm to the northeast.

Ida's central pressure dropped to 932 mb prior to passing 35 nm east of Iwo Jima early on the 23rd. Iwo Jima experienced maximum sustained winds of 56 kt with gusts to 83 kt (23/1140 GMT) before equipment failure. Later that afternoon, Ida passed 25 nm west of Chichi Jima where a minimum sea level pressure of 972 mb was recorded (Figure 4-26).

By the 23rd, a strong southwesterly flow was established over Japan due to the increased pressure gradient between a low over Manchuria and a ridge north of Marcus Island. In response, Ida began to recurve and accelerated to 20 kt north of the Bonin Islands.

Moving at 24 kt east of Honshu on the 24th, Ida brought typhoon-force winds to several ships including the Norwegian ship NEGO ANNE, which experienced 80-kt winds 50 nm east of the center.

The next day Ida became an extratropical system as she merged with a frontal zone east of Hokkaido.

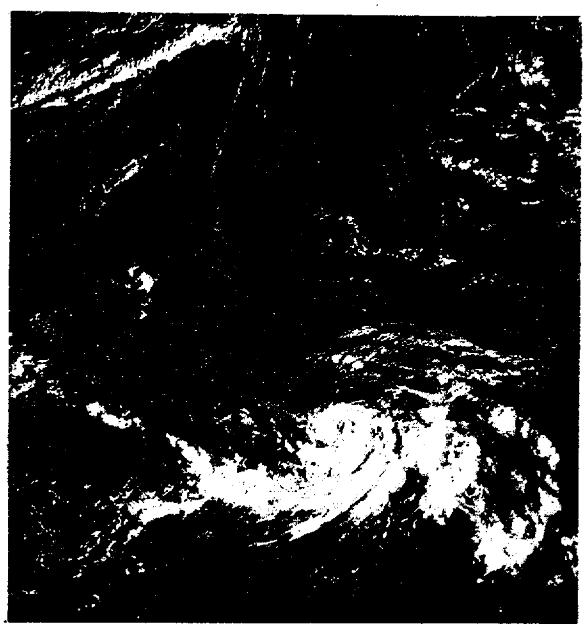


FIGURE 4-25. *Tropical Storm Ida 400 nm northwest of Eniwetok, 17 September 1972, 2145 GMT. (DAPP data)*

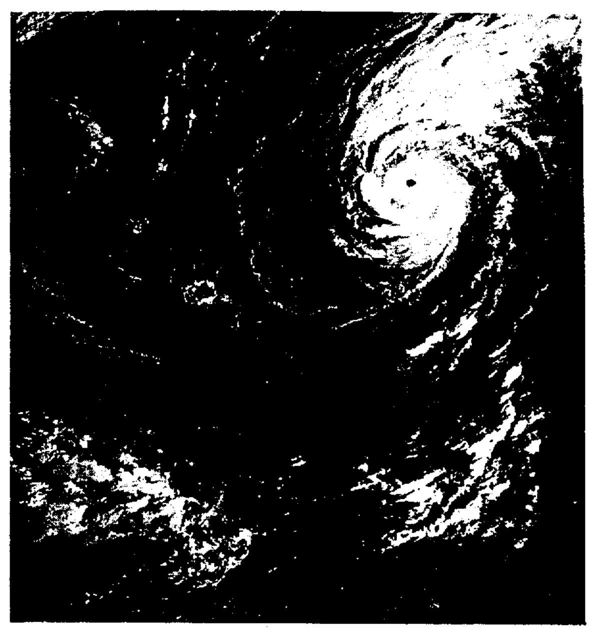
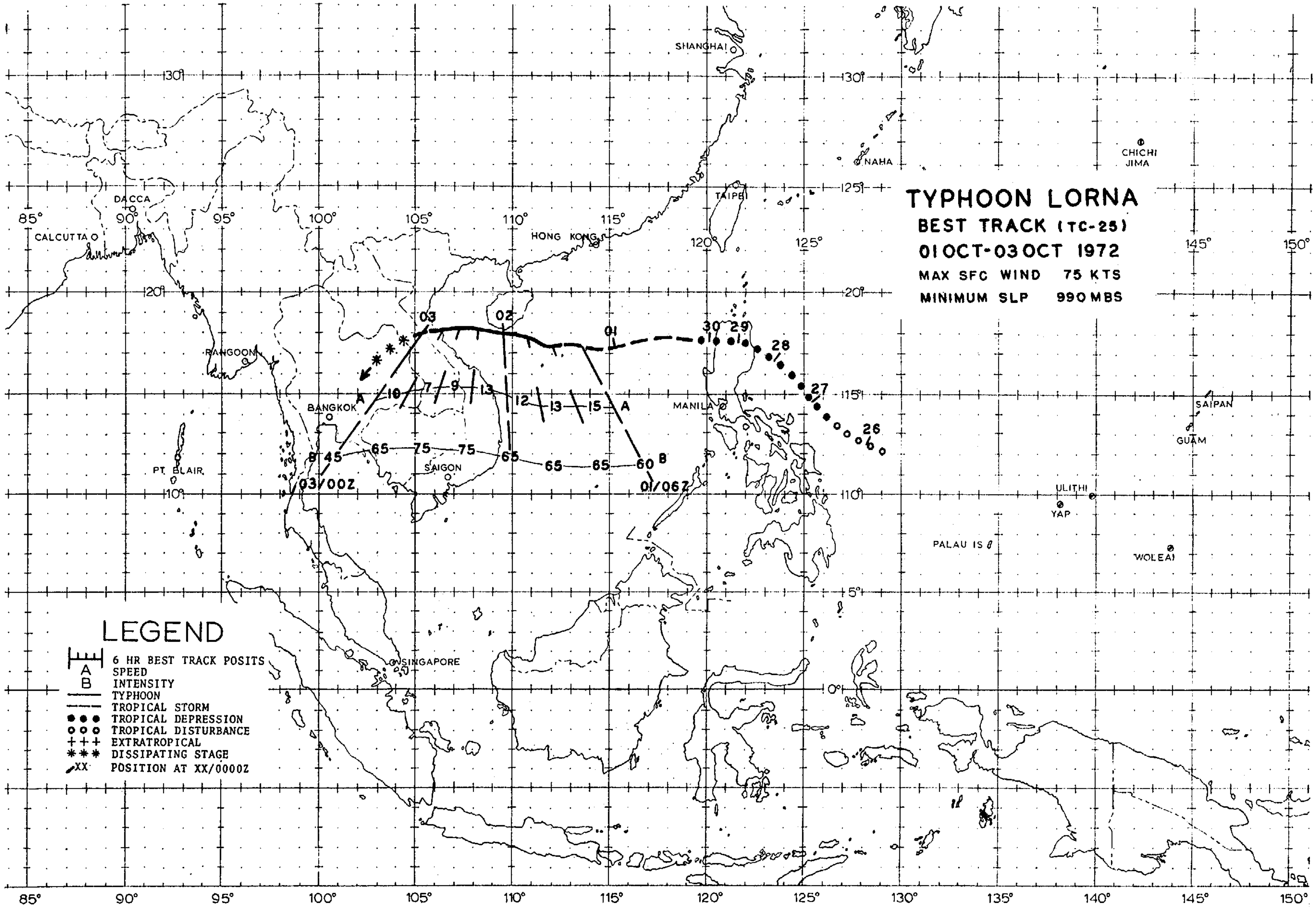


FIGURE 4-26. *Typhoon Ida 125 nm northeast of Iwo Jima, 22 September 1972, 2250 GMT. (DAPP data)*


TYPHOON LORNA
BEST TRACK (TC-25)
01 OCT-03 OCT 1972
MAX SFC WIND 75 KTS
MINIMUM SLP 990 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
XX POSITION AT XX/0000Z
SHANGHAI
NAHA
CHICHI JIMA
TAIPEI
DACCA
CALCUTTA
HONG KONG
RANGOON
BANGKOK
MANILA
SAIPAN
GUAM
PT. BLAIR
SAIGON
ULITHI
YAP
PALAU IS
WOLEAI
SINGAPORE
03
02
01
30
29
28
27
26
03/00Z
01/06Z
85° 90° 95° 100° 105° 110° 115° 120° 125° 130° 135° 140° 145° 150°
30° 25° 20° 15° 10° 5° 0°

Lorna, like Cora and Elsie, developed from a depression in the Philippine Sea and crossed the Philippine archipelago (Figure 4-27).

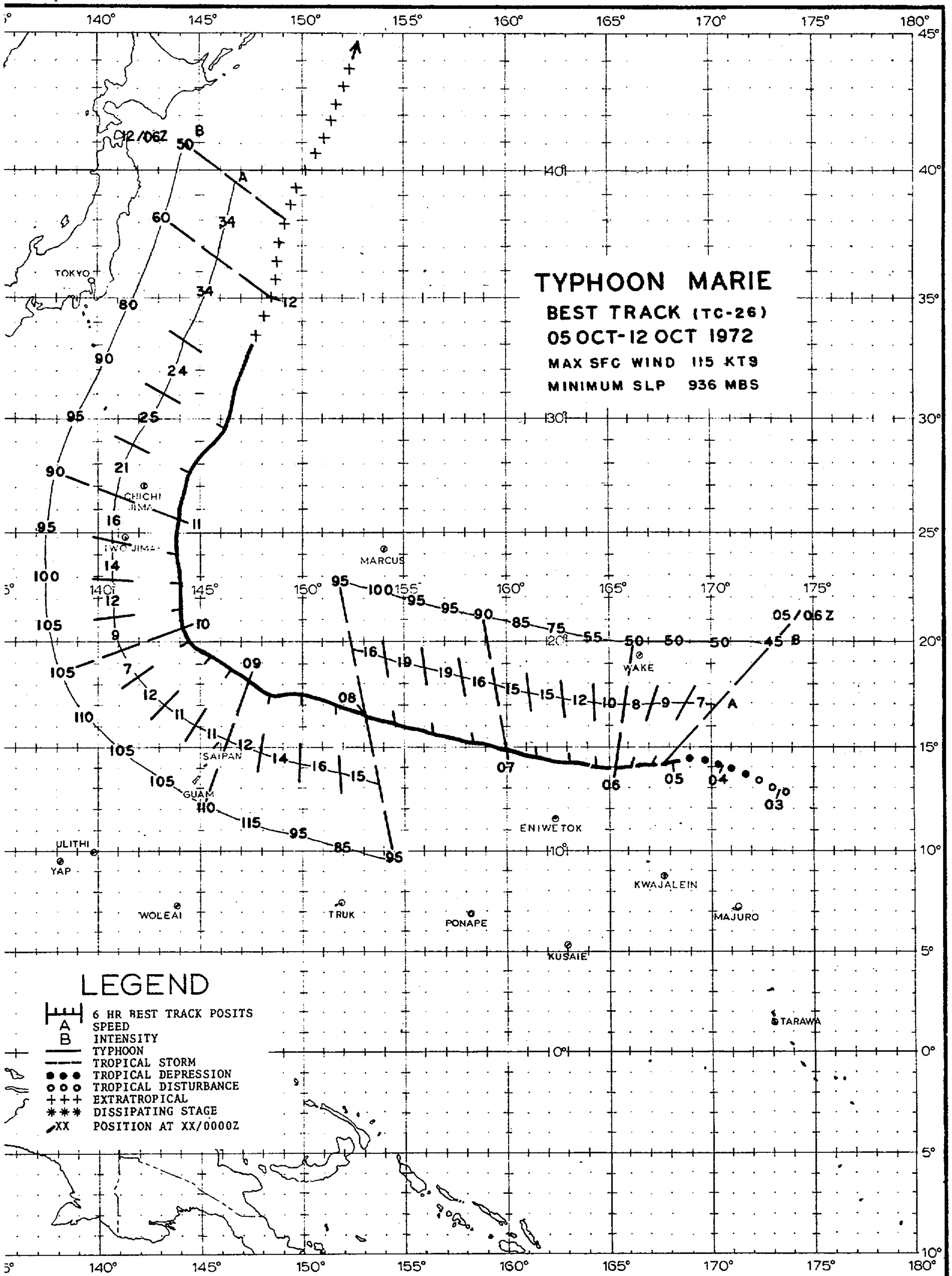
After transiting Luzon, Lorna moved across the South China Sea at 12-15 kt as ridging dominated southern China.

Satellite pictures on the 30th indicated the disturbance was rather small but of tropical storm intensity. The United Kingdom ship MARON, 70 nm north of the center, reported 45-kt winds from the southeast (01/0000 GMT). Reconnaissance aircraft found winds of 60 kt just northeast of the center a few hours later.

Lorna transited south of Hainan Island on the 2nd as her 15-nm-diameter eye was tracked closely by aircraft and ship radar. Although the radar presentations depicted Lorna as a well-developed cyclone, her circulation was quite small. Gale-force winds were limited to a radius of 75 nm from the center in the northern semicircle.

Early on the 3rd, Lorna moved ashore on the North Vietnam coast north of Dong Hoi and degenerated into a low pressure system after crossing central Laos. She dissipated in Thailand late that night.

FIGURE 4-27. *Lorna as a tropical depression east of Luzon, 27 September 1972, 0348 GMT. (DAPP data)*


TYPHOON MARIE
BEST TRACK (TC-26)
05 OCT-12 OCT 1972
MAX SFC WIND 115 KTS
MINIMUM SLP 936 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
XX POSITION AT XX/0000Z
12/06Z
05/06Z
TOKYO
CHICHI JIMA
IWO JIMA
MARCUS
WAKE
SAIPAN
GUAM
ULITHI
YAP
WOLEAI
TRUK
PONAPE
ENIWETOK
KWAJALEIN
MAJURO
KUSAIE
TARAWA

Marie began as a broad circulation in the equatorial trough north of the Marshall Islands on 3 October (Figure 4-28) while Tropical Storm Kathy was passing north of the Marianas. On the 5th, she achieved tropical storm intensity, becoming a typhoon two days later as she passed 200 nm north of Eniwetok.

Marie's circulation was quite extensive, covering an area over 700 nm in diameter. Strong westerlies up to 20 kt were experienced in the eastern Caroline and Marshall Islands. Eniwetok, about 180 nm south of the center, recorded 40 kt sustained winds from the west with gusts to 52 kt the evening of 6 October. Squalls with gusts of up to 50 kt occurred in the Ponape district felling coconut trees, one of which killed one person on Kusaie.

Marie moved along the southern extent of the subtropical ridge centered north of Minami Tori Shima (Marcus Island) at 15-19 kt during 6-8 October. As she approached the northern Marianas, Marie began to slow. Her maximum winds reached 115 kt and central pressure dropped to 936 mb. Marie began a northwesterly track on the 9th, passing through the northern Marianas late in the day.

On Pagan, Agrihan and Alamagan islands, food crops were nearly 100% destroyed. Buildings were 80-95% destroyed; however, property damage was less severe on Agrihan due to sturdier construction.

Although 200 nm south of Marie's center, Saipan experienced gusts of 45-55 kt. High seas in the southern Marianas were responsible for capsizing at least five motorboats and caused two drownings. By the 10th reconnaissance aircraft reported 100-kt winds extended 75-100 nm east of the center (Figure 4-29).

Passing east of the Volcano Islands on the 11th, Marie accelerated to 21 kt. The Japanese ship, YAEKAWA MARU, about 170 nm east-southeast of the center, reported 60 kt (11/0000 GMT).

Marie weakened as she transited the North Pacific east of Honshu at up to 34 kt, merging with a frontal system east of Hokkaido on the 12th. Winds of up to 40 kt and gusts to 59 kt were experienced at Urakawa along the southeastern coast of Hokkaido. Sixteen of eighteen crewmembers were lost when a 77-ton Japanese fishing boat capsized off Miyagi Prefecture.

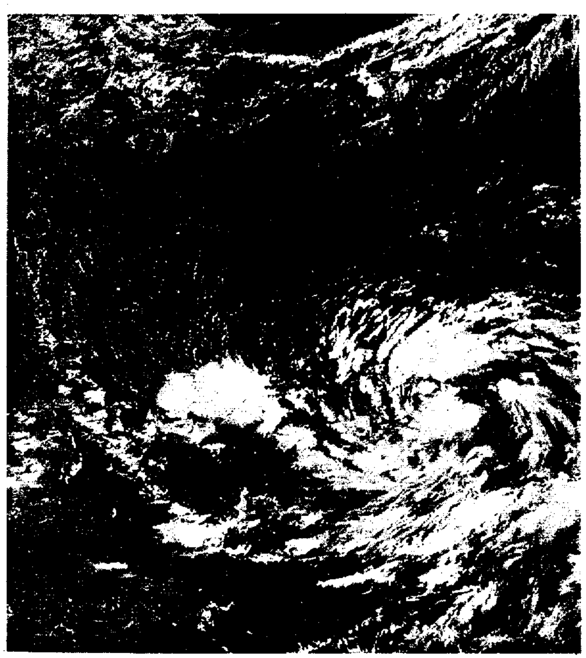
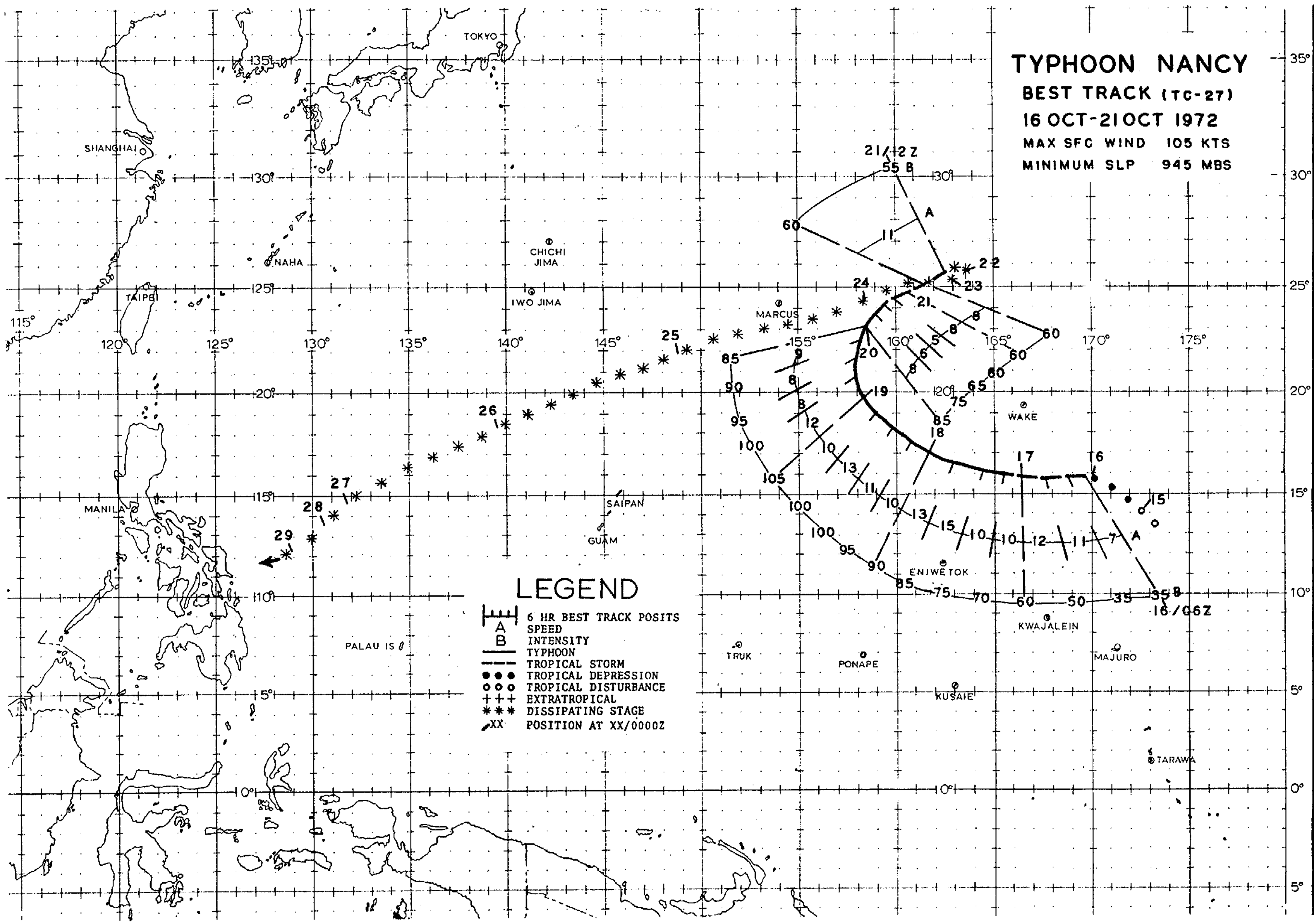


FIGURE 4-28. *Formative stages of Marie centered some 350 nm northeast of Kwajalein, 3 October, 1972, 2112 GMT. (DAPP data)*

FIGURE 4-29. *Typhoon Marie 350 nm north-northwest of Saipan, 10 October 1972, 0221 GMT. (DAPP data)*


TYPHOON NANCY
BEST TRACK (TC-27)
16 OCT-21 OCT 1972
MAX SFC WIND 105 KTS
MINIMUM SLP 945 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
POSITION AT XX/0000Z
21/12Z
55 B
16/06Z
35 B
TOKYO
SHANGHAI
NAHA
TAIPEI
MANILA
CHICHI JIMA
IWO JIMA
MARCUS
WAKE
SAIPAN
GUAM
PALAU IS
TRUK
PONAPE
ENIWETOK
KWAJALEIN
MAJURO
KUSAIE
TARAWA

Nancy was the third tropical cyclone to develop north of the Marshalls in less than a month. Initially detected by satellite on 15 October, Nancy reached typhoon intensity 48 hours later, 200 nm south of Wake Island.

Tracking south of the subtropical ridge, Nancy took a more northerly course late on the 17th as the trough in the westerlies eroded the ridge near 155°E. On the 18th, reconnaissance aircraft reported a central pressure of 945 mb as Nancy's maximum winds of 105 kt were recorded.

Nancy began to recurve late on the 19th as she moved under upper tropospheric westerlies of 45-50 kt. Early on the 21st, strong vertical shear weakened Nancy to a tropical storm and satellite data showed much of her cirrus canopy removed. Within 48 hours she degenerated into a tropical depression.

On the 22nd, Nancy stalled as she failed to recurve toward a trough in the westerlies. An intensifying ridge behind the trough caused Nancy, now a tropical depression, to track west-southwest for the next several days. Low-level cloud features were readily identifiable on satellite pictures as she moved into the Philippine Sea where the circulation finally lost its identity.

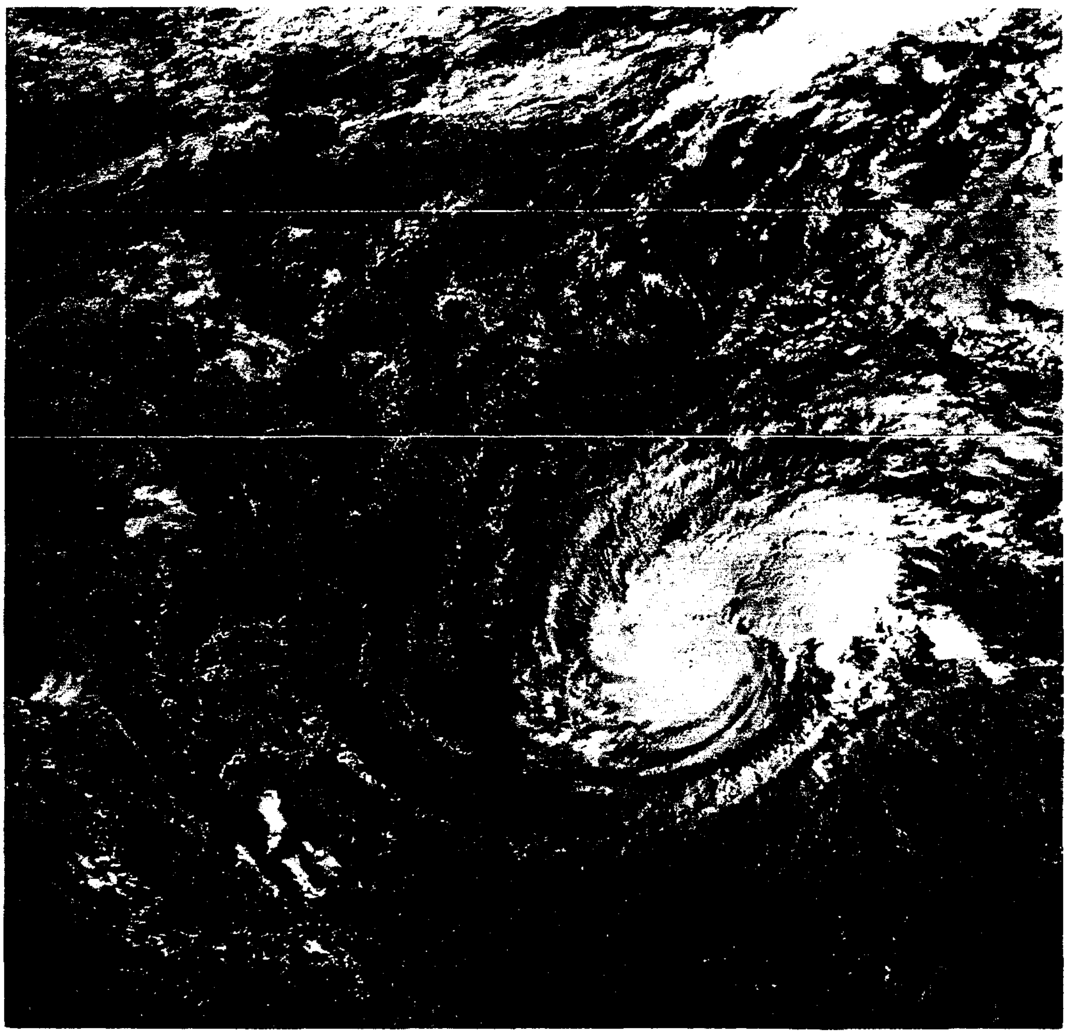
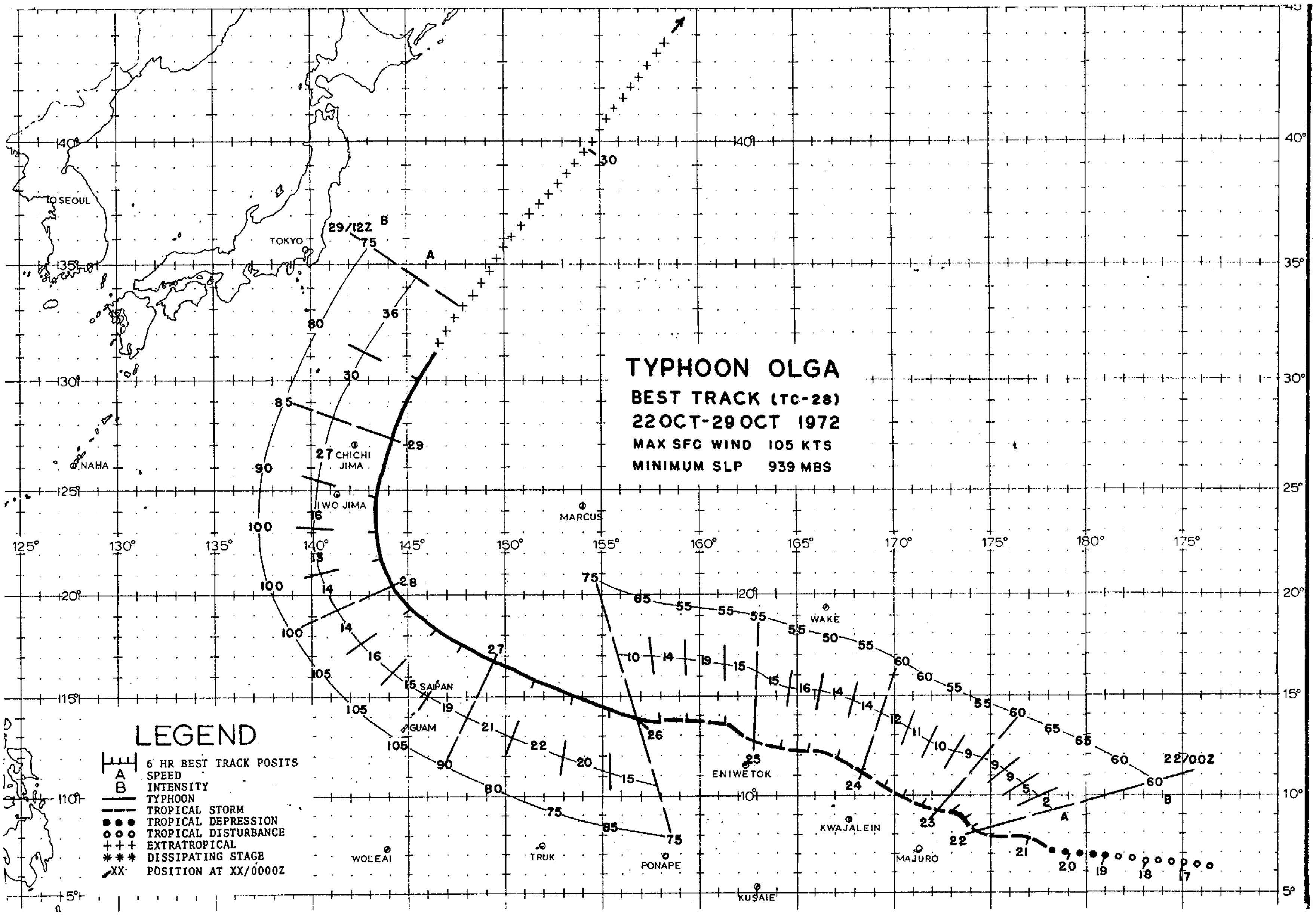


FIGURE 4-30. *Typhoon Nancy 270 nm southwest of Wake Island, 17 October 1972, 2132 GMT. (DAPP data)*


TYPHOON OLGA
BEST TRACK (TC-28)
22 OCT-29 OCT 1972
MAX SFC WIND 105 KTS
MINIMUM SLP 939 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
XX POSITION AT XX/0000Z
SEOUL
TOKYO
NAHA
CHICHI JIMA
IWO JIMA
MARCUS
WAKE
SAIPAN
GUAM
ENIWETOK
KWAJALEIN
MAJURO
WOLEAI
TRUK
PONAPE
KUSAIE
29/12Z
22/00Z

A twin cyclone system, one developing in the northern hemisphere and another in the southern hemisphere, became apparent in satellite photographs on 17 October near 175°W. The northern system, destined to be Olga, crossed the dateline on a westerly track and attained tropical storm intensity on the 21st. Bebe, in the southern hemisphere, developed to hurricane force and passed over Funafuti Atoll of the Ellice Islands during the night of the 21st.

Reconnaissance aircraft on the morning of the 22nd indicated that Olga was a strong tropical storm, 170 nm northeast of Majuro Atoll (Figure 4-31). During 23-24 October, Olga showed little change in intensity as she tracked through the northern Marshall Islands. Since the strongest winds were in the northern semicircle, the maximum sustained winds reported in the islands were only 25 kt.

Olga intensified to typhoon force early on the 26th. Continuing to gain strength, Olga accelerated to 20-22 kt late on the 26th and headed for the northern Marianas. During the night of 27-28 October, Olga became the second typhoon in three weeks to sweep through that area. The following morning her central pressure dropped to 939 mb, generating maximum winds of 105 kt (Figure 4-32).

Since Typhoon Marie had destroyed most of the agricultural crops and coconut trees in the islands a few weeks earlier, Olga's effect was less noticeable than it might normally have been.

As a trough deepened over the East China Sea on the 28th, Olga headed northward, rounding the subtropical ridge east of the Volcano Islands late that day. Gale-force winds extended a considerable distance as the United Kingdom ship CAPE YORK, 200 nm east of the center, observed winds of 50-55 kt that night and the following morning.

Accelerating to 30 kt in the strong southwesterly flow southeast of Japan, Olga tracked northeastward and merged with a front east of Honshu late on the 29th.

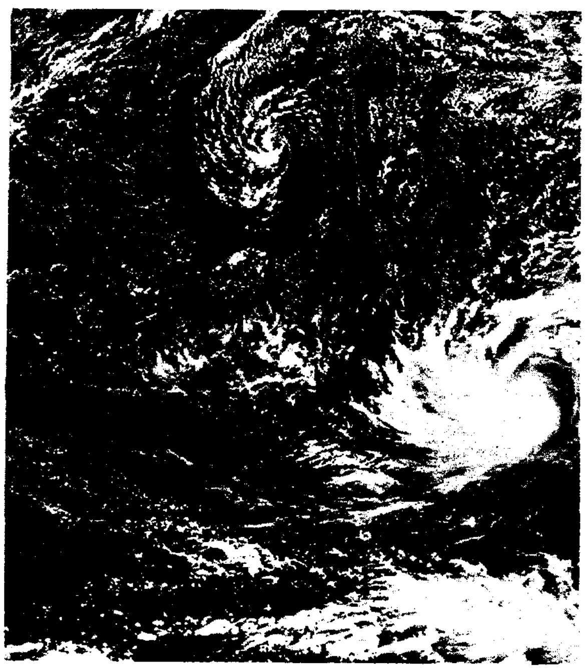


FIGURE 4-31. *Tropical Storm Olga 170 nm northeast of Majuro Atoll. The circulation depicted in the cloud pattern 1200 nm northwest of Olga is the remains of Nancy, 22 October 1972, 0108 GMT. (DAPP data)*

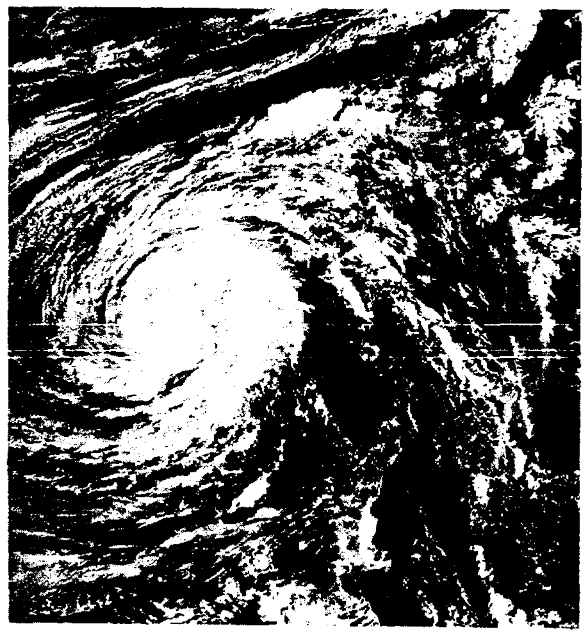
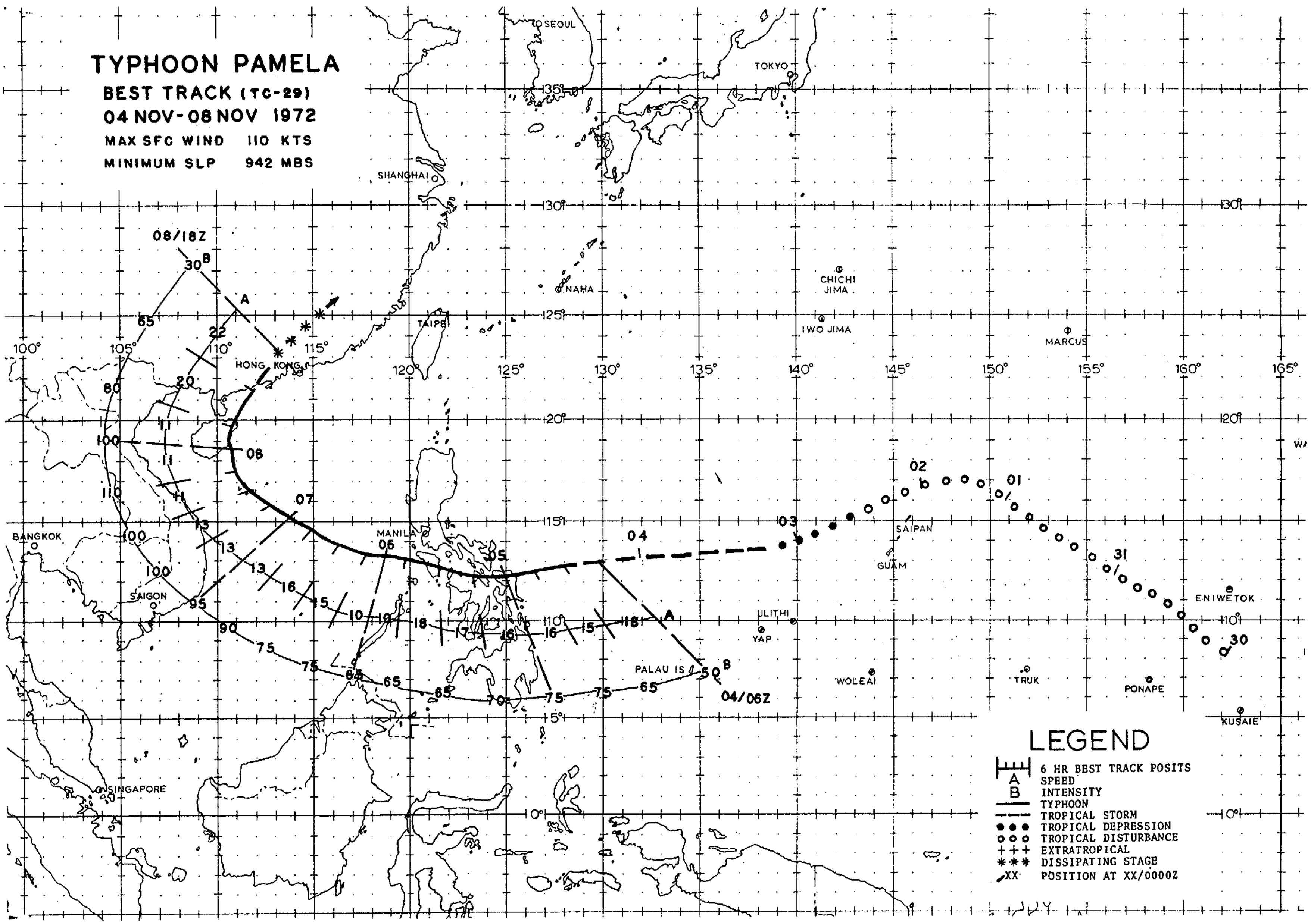


FIGURE 4-32. *Typhoon Olga 300 nm south-southeast of Iwo Jima, 27 October 1972, 2201 GMT. (DAPP data)*


TYPHOON PAMELA
BEST TRACK (TC-29)
04 NOV-08 NOV 1972
MAX SFC WIND 110 KTS
MINIMUM SLP 942 MBS
08/18Z
04/06Z
SEOUL
TOKYO
SHANGHAI
NAHA
CHICHI JIMA
IWO JIMA
MARCUS
TAIPEI
HONG KONG
MANILA
BANGKOK
SAIGON
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
PONAPE
ENIWETOK
KUSAIE
SINGAPORE
LEGEND
6 HR BEST TRACK POSITS
SPEED
INTENSITY
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
POSITION AT XX/0000Z

It was nearly a week after detection by satellite that Pamela reached typhoon intensity, just east of Samar Island, Republic of the Philippines.

The formative stage of Pamela appeared in the eastern Carolines, on 30 October, as an area of enhanced convection. The system was poorly organized for the next several days until it entered the Philippine Sea. Satellite data indicated that tropical-storm intensity was acquired on the afternoon of 3 November as Pamela passed 250 nm north of Yap.

Reconnaissance aircraft, in the afternoon of the following day, located Pamela near 15°N and 130.5°E. The storm was poorly organized with a calm area 40 nm in diameter, a central pressure of 1004 mb, and 700-mb-level winds of 48 kt in the eastern semicircle.

Pamela traversed the Philippine Sea at 15-18 kt as she moved under the influence of a strong subtropical ridge. Satellite pictures and military aircraft radar reports indicate Pamela developed to typhoon intensity prior to her landfall on Samar.

Making landfall on northern Samar the morning of the 5th, Pamela crossed the center of the Republic of the Philippines and emerged 24 hours later west of Mindoro Island. Four fatalities and estimated damage to property and crops of over 700,000 dollars (U.S.) were reported.

Upon entering the South China Sea on the 6th, Pamela's forward speed decreased to 10 kt. Her circulation began to expand as a ship 90 nm east of the center reported winds of 60 kt from the south (06/0000 GMT). Pamela headed west-northwest for the first 18 hours, then northwest on the 7th as a trough in the mid-troposphere moved across the Indo-China peninsula.

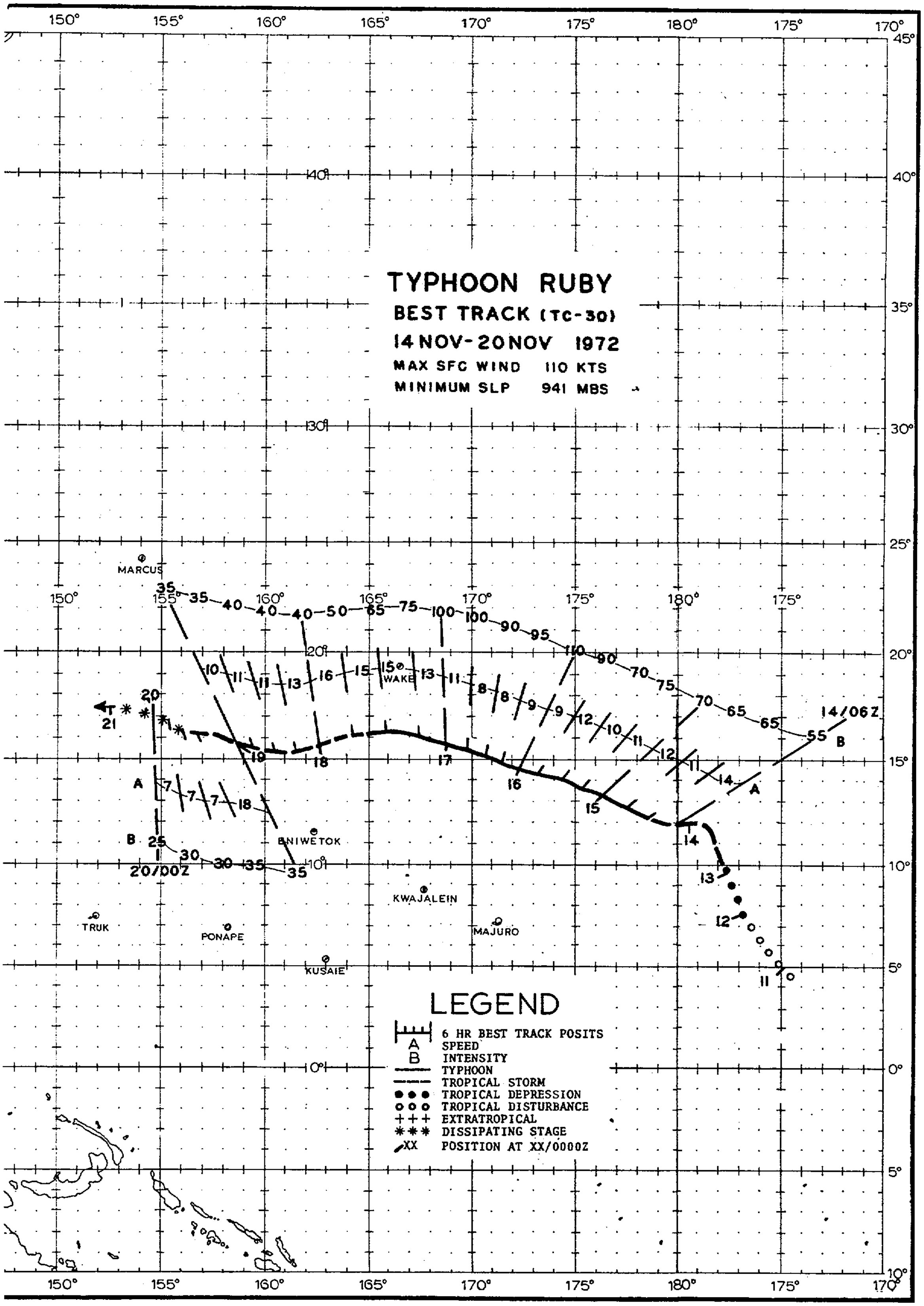
Passing near the Paracel Islands on the evening of the 7th, reconnaissance aircraft reported a central pressure of 942 mb as Pamela reached her peak intensity of 110 kt (Figure 4-33). As she approached Hainan Island in advance of the trough, Pamela began to recurve and skirted the eastern end of the island on the 8th.

Pamela crossed the South China coast in Kwangtun Province about 180 nm west-southwest of Hong Kong. She moved inland during the evening and degenerated into an area of low pressure by the 9th.

Pamela brought strong winds to Hong Kong as gusts of 60 kt were recorded at the International Airport and 59 kt at the Royal Observatory.

As Pamela approached the southern China coast during high tide, flooding occurred in many low-lying areas of Hong Kong. One person was killed and eight were injured, but only minor property damage occurred in the colony. A freighter, SS VAN MINT, ran aground on the southern shore of Lei Yue Mun.

FIGURE 4-33. *Typhoon Pamela in the South China Sea, 7 November 1972, 0300 GMT, ESSA-8 satellite.--Courtesy of Royal Observatory, Hong Kong*



TYPHOON RUBY
BEST TRACK (TC-30)
14 NOV-20 NOV 1972
MAX SFC WIND 110 KTS
MINIMUM SLP 941 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
XX POSITION AT XX/0000Z
MARCUS
WAKE
ENIWETOK
KWAJALEIN
MAJURO
TRUK
PONAPE
KUSAIE
14/06Z
20/00Z

Ruby was the first tropical storm to form in the central Pacific and cross the international dateline since Typhoon Sarah in September 1967.

An area of enhanced convection was first evidenced in satellite pictures on 7 November south of the Hawaiian Islands near 4°N and 167°W. No organized circulation appeared until the 11th, at which time the system began to drift northward. Indication that winds had reached tropical storm strength was evidenced in satellite data by the 13th. Reconnaissance aircraft observed Ruby to have typhoon-strength winds just west of the international dateline on the 14th.

With a mid-tropospheric anticyclone located between Midway and Wake Island, Ruby moved on a west-northwesterly course at 9-12 kt for the next three days. She reached her peak intensity east of Taongi Atoll on the 16th as reconnaissance aircraft observed a central pressure of 944 mb and maximum winds of 110 kt.

Although the central pressure in Ruby had rapidly risen 20 mb to 983 mb during the morning of the 17th, reconnaissance aircraft observed 100-kt winds in a small band north of the center (Figure 4-34). This observed wind was relatively high for the standard pressure-wind relationship used at JTWC (Takahashi, 1939). By that afternoon the maximum winds had weakened considerably.

Passing south of Wake Island late on the 17th, Ruby was of minimal typhoon force as she shifted to a west-southwest heading. Like Nancy, Ruby moved beneath upper tropospheric westerlies while in the tropics and began to weaken significantly. On the 18th satellite pictures showed the cirrus canopy removed from over the center, revealing the low-level cloud structure of the storm (Figure 4-35). By late on the 19th, Ruby had been reduced to a tropical depression and finally dissipated east of the northern Marianas on the 21st.

FIGURE 4-34. *Typhoon Ruby near her maximum intensity 270 nm south-southeast of Wake, 16 November 1972, 2118 GMT. (DAPP data)*

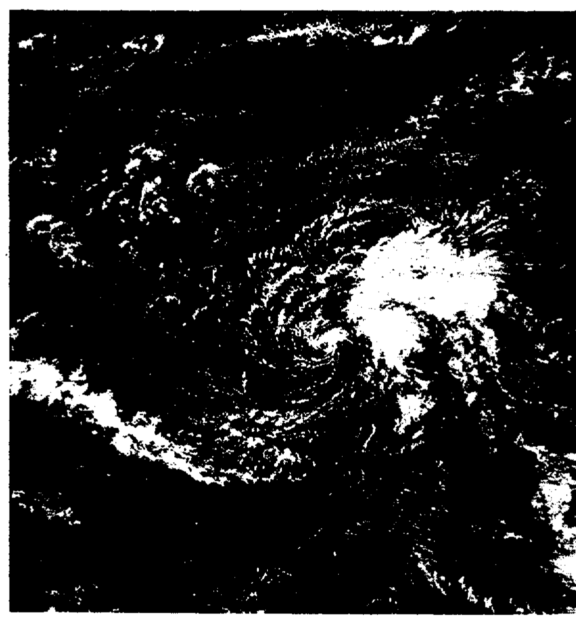
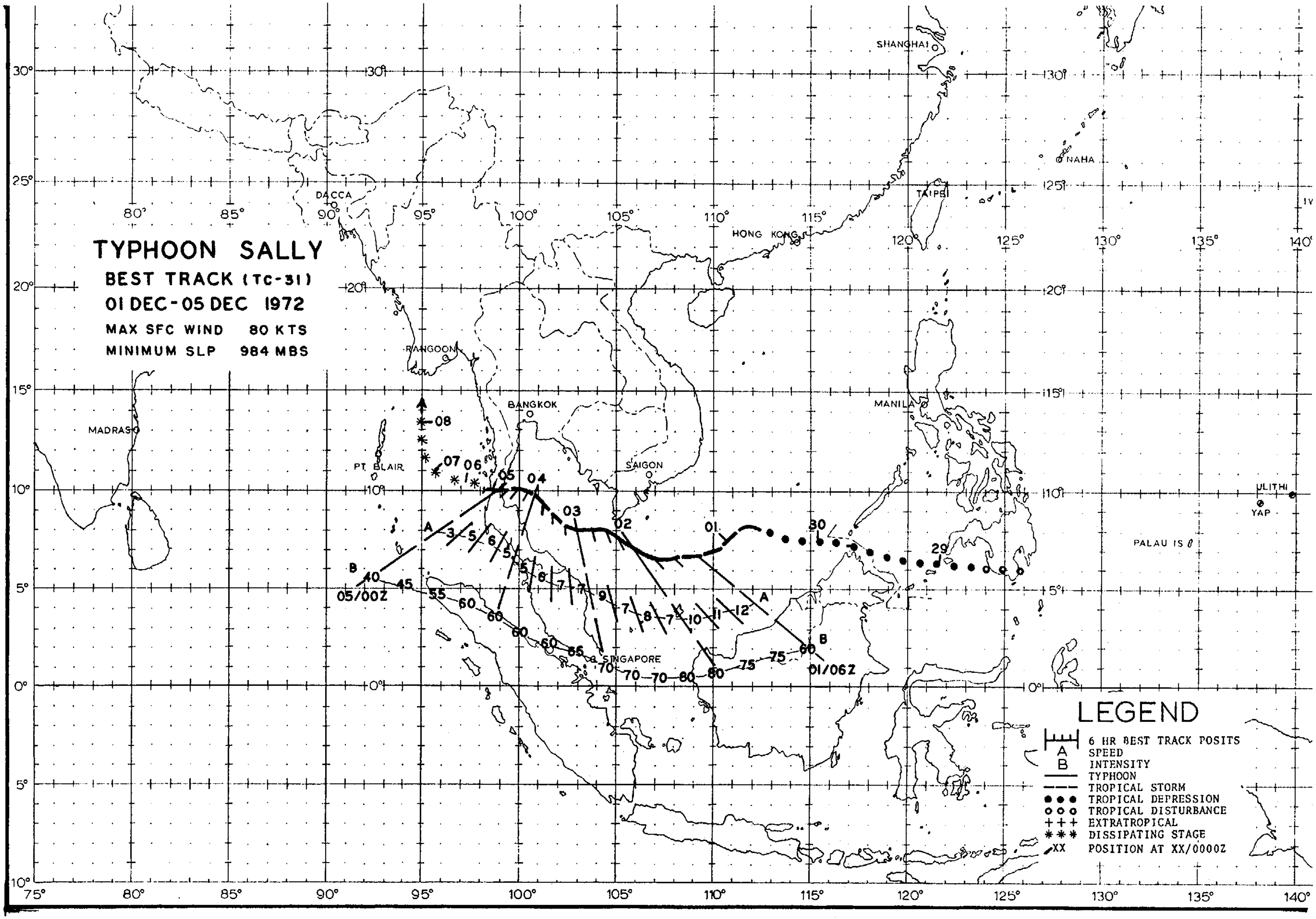


FIGURE 4-35. *Low-level clouds outline the remains of Tropical Storm Ruby 300 nm southwest of Wake, 18 November 1972, 0123 GMT. (DAPP Data)*


TYPHOON SALLY
BEST TRACK (TC-31)
01 DEC-05 DEC 1972
MAX SFC WIND 80 KTS
MINIMUM SLP 984 MBS
SHANGHAI
NAHA
TAIPEI
DACCA
HONG KONG
RANGOON
BANGKOK
MANILA
MADRAS
PT. BLAIR
SAIGON
ULITHI
YAP
PALAU IS
SINGAPORE
05/00Z
01/06Z
LEGEND
6 HR BEST TRACK POSITS
SPEED
INTENSITY
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
POSITION AT XX/0000Z

Sally was the first tropical cyclone to develop to typhoon intensity in the month of December since Pamela in 1966. She was also the first tropical cyclone of typhoon intensity, since before 1945, to transit the Gulf of Thailand.

Sally crossed the Sulu Sea on 29 November as a depression in the equatorial trough. Satellite pictures indicated increased organization as she entered the southern portion of the South China Sea. Continuing her low-latitude track, Sally came under the influence of an anticyclone centered south of Hainan Island and was forced equatorward late on the 30th.

Reconnaissance aircraft arrived in the area on the morning of 1 December. A small circular eye of 5 nm in diameter with a partially-formed wall cloud was located. The central pressure was 989 mb and flight level (700 mb) winds were 55 kt in the northeast quadrant. The Japanese ship, TAGAMARU, passed 50 nm northeast of the center (01/1200 GMT). She observed 60-kt winds from the south and a minimum pressure of 992.5 mb.

Attaining typhoon strength, Sally tracked westward, passing the southern tip of Vietnam on the evening of the 2nd (Figure 3-36) and reaching her peak intensity of 80 kt. Sally's track across the Gulf of Thailand on 3-4 December followed the periphery of an irregularly-shaped mid-tropospheric ridge which dominated the synoptic pattern over the Indo-China peninsula.

Late on the 3rd, Sally fell below typhoon strength, continuing to weaken slowly before striking the coast of Thailand on the morning of the 5th. She moved ashore south of Chumphon and crossed the Malaya peninsula at 10°N. Moving over the Andaman Sea that evening, Sally never regained her former intensity and slowly dissipated during the next two days.

Sally brought heavy rains to Thailand, flooding Chumphon and several surrounding provinces (Figure 4-36). Agricultural crops were damaged, hundreds of houses were destroyed, and thousands of coconut trees were uprooted. Twenty trawlers on Samuni and Phangan islands off the coast from Surat Thani were sunk. In the aftermath of Sally, 11 persons were reported killed and five missing.

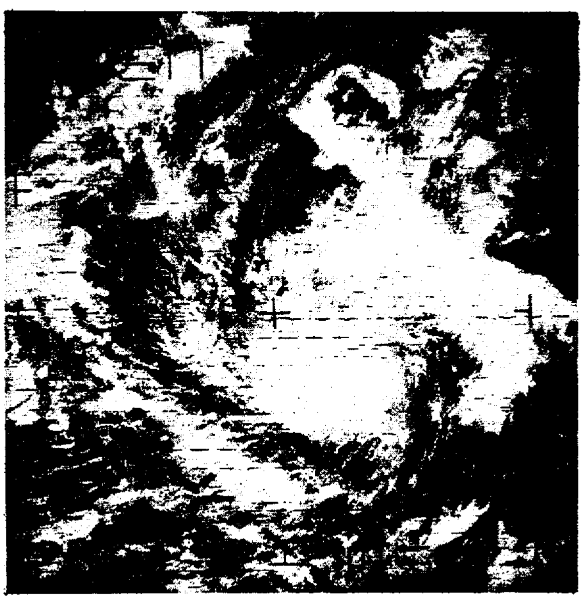
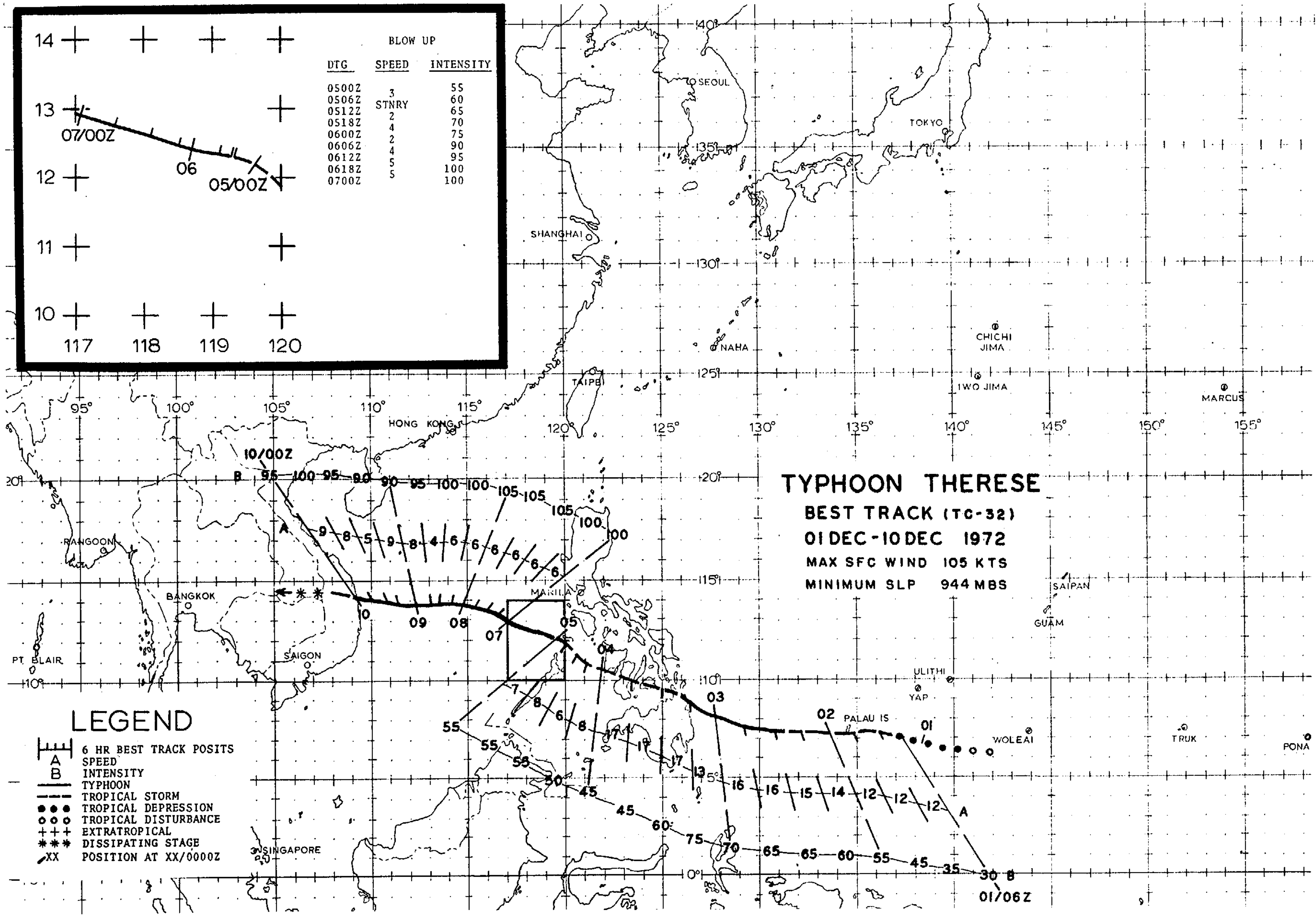


FIGURE 4-36. *Typhoon Sally off the southern coast of Vietnam, 2 December 1972, 0316 GMT, ESSA-8 satellite.--Courtesy of Royal Observatory, Hong Kong*

FIGURE 4-37. *Floodwaters in the coastal town Chumphon, Thailand, resulting from the torrential rains of Sally.--Courtesy of Bangkok Post*


TYPHOON THERESE
BEST TRACK (TC-32)
01 DEC-10 DEC 1972
MAX SFC WIND 105 KTS
MINIMUM SLP 944 MBS
BLOW UP
DTG SPEED INTENSITY
0500Z 3 55
0506Z STNRY 60
0512Z 2 65
0518Z 4 70
0600Z 2 75
0606Z 4 90
0612Z 5 95
0618Z 5 100
0700Z 100
07/00Z
06
05/00Z
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
XX POSITION AT XX/0000Z
10/00Z
01/06Z
SEOUL
TOKYO
SHANGHAI
NAHA
CHICHI JIMA
TAIPEI
IWO JIMA
MARCUS
HONG KONG
RANGOON
BANGKOK
MANILA
SAIPAN
GUAM
PT. BLAIR
SAIGON
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
PONA
SINGAPORE

The season's last typhoon developed in the central Carolines from a circulation in the equatorial trough, first noted in satellite and synoptic data on 30 November. While Sally was navigating the South China Sea south of Vietnam, Therese intensified to tropical storm strength. Taking a westerly course, Therese approached the Palau Islands late on 1 December, passing near Koror the morning of the 2nd. Maximum winds observed at Koror were from the north at 43 kt (01/2013 GMT), gusting to 54 kt (01/2009 GMT). Minimum pressure was 995.8 mb (01/2030 GMT).

With the subtropical ridge located over the central Philippine Sea, Therese remained on a westerly course for the next 30 hours at 15-17 kt before making landfall on Mindanao. A few hours prior to the center moving ashore, the United Kingdom ship, DERWENTFIELD, observed 70-kt winds from the south and a minimum pressure of 999.0 mb.

Therese, weakened to tropical-storm intensity by terrain effects, crossed the southern Visayan Island Group the night of 2-3 December. She slowed to 7-8 kt over the northern Sulu Sea before passing over Vusuanga Island the morning of the 5th. The Cuyo Weather Station reported gusts of 55 kt (04/1132 GMT) as the center passed north of the island.

Considerable damage was reported in the Surigao del Sur, Misamis Oriental, and Suriago del Norte provinces of northern Mindanao. Over 4,700 homes were destroyed and 90% of the agricultural crops in these regions were damaged. Total damage estimates were placed at over a million dollars (U.S.). A death toll of 90 persons was reported in the aftermath of the storm. Hardest hit was Cagayan de Oro where 87 persons were drowned in flash flooding in the mountainous terrain.

It took Therese five days to transit the South China Sea after leaving the Republic of the Philippines. This was, in part, due to a stationary trough off the eastern China coast which had weakened the subtropical ridge north of the storm, producing only a weak westerly steering current. Therese intensified significantly during the 24-hour period she was stalled just west of Busuanga Island, transforming from a strong tropical storm to a 95-kt typhoon (Figure 4-38). Her central pressure gradually dropped for the next several days until reconnaissance aircraft reported a minimum of 954 mb on the afternoon of the 8th.

The occurrence of such a well-developed typhoon and the fact that 90-100 kt maximum sustained winds persisted near her center for such a long time (four days) is rare for the South China Sea in December.

Therese arrived ashore on the South Vietnam coast near 14°N on the morning of the 10th. Qui Nhon, 20 nm south of the center, reported gusts of 78 kt and a minimum pressure of 999.8 mb during the typhoon's passage. More than 1,000 homes were heavily damaged and the village of Cat Trang virtually destroyed. Extensive crop damage in the region was also reported.

Moving inland over the highlands region on the evening of the 10th, Therese weakened to a low pressure area and dissipated over eastern Thailand on the 11th.

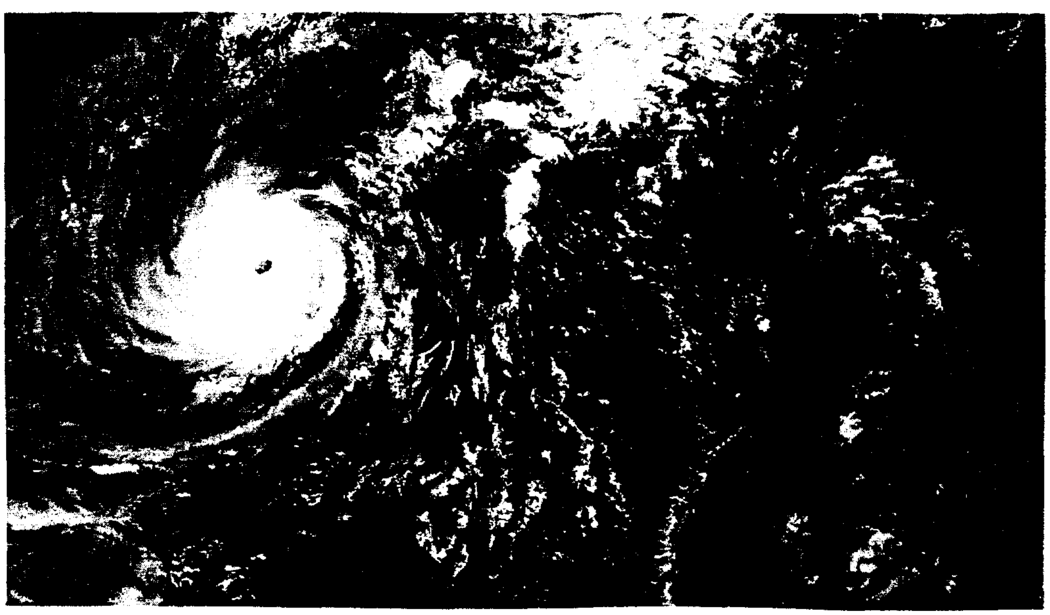


FIGURE 4-38. *Typhoon Therese in the eastern South China Sea 90 nm west of Busuanga Island, Philippines, 6 December 1972, 0350 GMT. (DAPP data)*

3. TYPHOON CENTER FIX DATA

a. DISCUSSION OF DATA:

(1) SATELLITE - These data, listed in the column labeled SAT, were derived from bulletins received from FLEWEAFAC and NESS Suitland. They were based on stored readout of ESSA-9 or NOAA-2 products. Bulletins from APT sites (identified by ICAO letters) were based on ESSA-8 imagery. The source and satellite designator appear in the remarks column. Unless otherwise noted, ESSA-9/NOAA-2 data were supplied by FLEWEAFAC Suitland. Intensity estimates, including two individual systems of classification, follow the fix category column. Detailed information on the interpretation of these data can be found in AWS Technical Report 212 (Section E) and NOAA Technical Memorandum 36.

(2) RADAR - This information is listed in the FIX CAT column and identified by platform as follows:

LRDR - Land Radar
AC R - Aircraft Radar
S RDR - Ship Radar

The latitude and longitude of land-based radars is given in the remarks column. The position of weather reconnaissance aircraft is relative to the vortex center. Position data for aircraft pilot reports (PIREPS) is not normally available. A list of land-based radars providing data in the fix printout follows:

LOCATION	STATION NO.	ICAO SIGN
15.2N 120.5E	98327	RPMK
16.1N 108.2E	48855	VVSD
24.0N 121.6E	46763	RCYU
24.3N 124.2E	47918	
24.8N 125.3E	47927	ROMY
25.0N 121.5E	46692	
25.1N 121.5E	46696	RCTP
26.2N 127.7E	47936	
26.3N 127.8E	47931	RODN
28.4N 129.5E	47909	
30.6N 131.0E	47869	
33.2N 134.2E	47899	
33.6N 130.5E	47808	RJFF
34.4N 132.4E	47765	
35.3N 136.9E	47635	RJNN
35.3N 138.7E	47639	
35.3N 139.7E	47696	RJTX
35.7N 139.8E	47662	RJTD
35.8N 139.4E	47643	RJTJ
36.4N 140.5E	47629	
37.1N 127.0E	47122	RKSO
38.1N 140.9E	47569	RJSS
38.3N 140.9E	47590	

(3) WEATHER RECONNAISSANCE AIRCRAFT - Data from reconnaissance aircraft are denoted in the FIX CAT column by the letter P (penetration). These data were normally obtained at scheduled fix times. Additional reconnaissance aircraft fixes are made during the peripheral data-gathering legs between scheduled fixes. These fixes normally provide date, time, and position data only.

The categories containing information from reconnaissance aircraft fixes are:

(a) ACCY (Accuracy)

The estimated navigation (first number) and meteorological (second number) accuracies are expressed in nautical miles.

(b) FLT LVL (Flight Level)

A constant-pressure-surface flight level (listed in millibars) is normally maintained during a tropical cyclone fix mission. Low-level missions (1500 feet) are conducted at a constant, true altitude.

(c) FLT LVL WND

Wind speed (kt) at flight level is measured by the AN/APN-82 doppler radar system aboard the WC-130 aircraft. The values entered in this category represent the maximum wind measured prior to obtaining a scheduled fix. This measurement may not represent the maximum wind because the aircraft samples only those portions of the central core region along the flight path. For this reason, the maximum wind observed may be significantly lower than the true maximum wind in the circulation (i.e., penetration through weak semicircle on first fix).

A limitation of the doppler radar system occasionally prevents the measurement of the maximum wind in intense typhoons. In areas of heavy rainfall, the radar may track energy reflected from precipitation rather than the sea surface, preventing accurate wind measurement. Also, the doppler radar mount on the WC-130 restricts wind measurements to drift angles ≤27° if wind is normal to heading of aircraft.

(d) OBS SFC WND

The maximum surface wind (kt) observed from flight level is entered in this column. The observation is an estimate based on the state of the sea (refer to 9WRWGM 105-1, Vol II, pp 2-27, -28). The sampling limitation noted in paragraph (c) also exists for this category. In addition, availability of these data is dependent on undercast conditions. The position relative to the vortex center of items (c) and (d) need not coincide.

(e) OBS MIN SLP

The minimum, observed sea level pressure is normally obtained from a dropsonde released in the vortex center. If the ocean surface is visible, the dropsonde will be released over the center of the area of calm seas; otherwise it is released at the flight level wind center. If the fix is made at 1500 feet, the sea level pressure is extrapolated from that level.

(f) MIN 700 MB HT

The minimum height of the 700 mb surface in the vortex center is recorded in decameters.

(g) FLT LVL T_i/T_o

This denotes maximum temperature measured in the center (T_i) and ambient temperature outside the center (T_o). Ambient temperature is measured just prior to entering the wall cloud. Both temperature observations are in degrees celsius and are made at a flight level of constant pressure surface (700, 500 mb).

Reconnaissance aircraft seldom penetrate on the same azimuth from one fix to another. Thus, the position of T_o normally varies from the center, both in bearing and range. The distance is directly dependent on radar definition of the storm.

(h) EYE FORM/ORIENTATION/DIA

The shape and diameter (nautical miles) of the eye are determined by radar. This is reported only if the center is 50% or more surrounded by wall cloud (see definition in Appendix). The orientation of the major axis is for elliptical cases. Abbreviations for the eye form are:

CIRC - Circular
ELIP - Elliptical
CONC - Concentric

(i) POSIT OF RADAR/REMARKS

This includes the items discussed in (1) and (2) and the remarks contained in the Detailed Vortex/Center Data Message that pertain to conditions near the center of the tropical cyclone. These remarks include character of the wall cloud and feederbands as depicted on the aircraft's radar (APN-59/X-band). Visual flight conditions such as cloudiness in the eye or center are mentioned. If an eye is not depicted on radar, the diameter of the surface or flight level wind center may be included. The storm mission number is entered to the far right of the column to indicate when fix data is received from different aircraft. Three entries of 04 would indicate three fixes obtained by an aircraft on the fourth mission conducted into a tropical cyclone. Abbreviations used in the remarks category follow:

ABBREVIATIONS

ABT	About	EVID	Evidence	PRESS	Pressure
ACFT	Aircraft	EXC	Excellent	PRELIM	Preliminary
ACTV	Activity	EXTDS	Extends	PRTL	Partial
ANAL	Analysis	FBS	Feeder Bands	PSBL	Possible
APPROX	Approximately	FIL	Filled	PSG	Passage
APPRS	Appears	FL	Flight Level	QUAD	Quadrant
APRNT	Apparent	FNTL	Frontal	RDR	Radar
BCMG	Becoming	FRMG	Forming	RETRN	Return
BGNG	Beginning	GRAD	Gradient	RMR	Remark
BLO	Below	GT	Greater Than	RPDLY	Rapidly
BLTN	Bulletin	HR	Hour	SAT	Satellite
BRKN	Broken	HVY	Heavy	SC	Stratocumulus
BRKS	Breaks	IMPVG	Improving	SEMIC	Semicircle
BRLY	Barely	IRREG	Irregular	SEV	Severe
BRT	Bright	K	Thousand	SFC	Surface
BSD	Based	KT	Knots	SHWG	Showing
CHG	Change	LCTD	Located	SML	Small
CI	Cirrus	LGT	Light	SPRL	Spiral
CIRC	Circulation	LND	Land	STG	Stage
CLD	Cloud	LRG	Large	STN	Station
CLSD	Closed	LTL	Little	STRM	Storm
CONSBL	Considerable	LTNG	Lightning	TEMPS	Temperatures
CONT	Continuous	L/V	Light and Variable	TF	Trough
CONV	Convective	MDT	Moderate	THKN	Thickness
CS	Cirrostratus	MSLP	Minimum Sea Level Pressure	TURB	Turbulence
CURV	Curviture	NEG	Negative	UKN	Unknown
DEF	Defined	NM	Nautical Miles	UNDET	Undetermined
DEVEL	Developed	NR	Near	V	Very
DEVELG	Developing	ORG	Organization	VSBL	Visible
DIA	Diameter	ORGANIZ	Organized	W/	With
DIF	Diffuse	OVC	Overcast	WC	Wall Cloud
DISORG	Disorganized	OVR	Over	WCS	Wall Clouds
DSPTG	Dissipating	PIREP	Pilot Report	WK	Weak
DTR	Determined	POSIT	Position	WKR	Weaker
ELSW	Elsewhere	PR	Poorly	WND	Wind
EST	Estimated	PRES	Presentation	YSTY	Yesterday

b. FIX DATA PRINTOUT:

TYPHOON KIT
FIX POSITIONS FOR CYCLONE NO. 1
2 JAN - 9 JAN

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FLT LVL	FLT LVL WND	OBS SFC WND	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TD	EYE FORM	ORIEN-TATION	EYE DIA	THKN WALL CLD	POSIT OF RADAR/REMARKS	
1	020418Z	10.0N 152.0E	SAT	STG B											ESSA 9	
2	050110Z	10.2N 132.8E	P	- -	700MB	35	25	-	-	9 -	-	- -	-	-		
3	050519Z	10.0N 136.5E	SAT	STG C											ESSA 9	
4	050941Z	9.8N 136.0E	P	- -	700MB	30	15	-	-	11 -	-	- -	-	-		
5	052310Z	10.2N 133.1E	P	2 -	700MB	52	35	992	300	10 10	-	- -	-	-	NEG WC	04
6	060355Z	10.5N 132.4E	P	3 5	700MB	48	35	986	294	12 9	-	- -	-	-	NEG WC	04
7	060618Z	11.0N 132.0E	SAT	STG A	DIA 2	CAT 2.5									ESSA 9	
8	060930Z	11.1N 131.3E	P	10 5	700MB	52	40	985	294	11 7	CIRC		25	-	OPEN SW	05
9	061300Z	11.1N 130.7E	P	10 5	700MB	60	-	977	288	14 11	CIRC		20	-	CLSD WC	05
10	062210Z	11.4N 128.7E	P	5 2	700MB	100	100	947	263	17 13	CONC	-	5-18	-	INNER-CLSD+OUT-BRKS ALQDS	06
11	062359Z	11.5N 128.5E	P	- -	700MB	102	85	-	-	20 -	-	- -	-	-		
12	070300Z	11.8N 127.6E	P	3 2	700MB	110	120	933	250	20 14	CIRC		5	-	CLSD WC	06
13	070525Z	11.0N 126.0E	SAT	STG A	DIA 3	CAT 4.0									ESSA 9	
14	071100Z	11.5N 126.2E	P	10 -	700MB	95	-	956	272	17 8	CIRC		7-30	30	INNER-CLSD+OUTER-WK	07
15	071300Z	11.4N 126.0E	P	10 -	500MB	60	-	961	-	-4 -9	ELIP	SE-NW	30X22	6	INNER WC DISPL, CLSD WC	07
16	071610Z	11.1N 125.7E	P	10 -	500MB	60	-	974	-	-7 -7	ELIP	SE-NW	20X15	-	CLSD WC	07
17	080050Z	10.6N 124.7E	P	2 15	500MB	70	-	-	-	-9 -9	-	- -	-	-	NEG HOR PRES	08
18	080400Z	10.7N 124.5E	P	2 15	500MB	70	-	-	-	-8 -8	-	- -	-	-	NEG EYE	08
19	080620Z	12.0N 122.5E	SAT	STG A	DIA 5	CAT 3.5									ESSA 9	
20	080700Z	10.9N 124.3E	P	2 15	500MB	50	-	-	-	-8 -8	-	- -	-	-	NEG EYE	08
21	080830Z	11.0N 124.4E	P	2 13	500MB	60	-	-	-	-8 -8	-	- -	-	-	NEG EYE	08
22	081625Z	10.5N 122.7E	P	7 13	500MB	40	-	-	-	-8 11	-	- -	-	-	NEG EYE	09
23	082215Z	11.5N 121.7E	P	2 8	500MB	30	-	-	-	-6 -6	-	- -	-	-	NEG EYE	09
24	090600Z	13.0N 121.0E	SAT	STG UNK											ESSA 9	

TYPHOON LOLA
FIX POSITIONS FOR CYCLONE NO. 3
26 MAY - 6 JUN

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FLT LVL	FLT LVL WND	OBS SFC WND	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TD	EYE FORM	ORIEN-TATION	EYE DIA	THKN WALL CLD	POSIT OF RADAR/REMARKS	
1	260210Z	12.1N 136.7E	P	15 10	700MB	-	16	1007	-	- -	-	- -	-	-		
2	260359Z	6.0N 164.0E	SAT	STG B											ESSA 9	
3	262245Z	7.7N 159.9E	SAT	T2.0											ESSA 8 (GUAM)	
4	290457Z	8.0N 160.0E	SAT	STG B											ESSA 9	
5	300100Z	8.3N 159.9E	P	5 10	700MB	40	40	996	300	- -	-	- -	-	-	NEG EYE	02
6	300410Z	8.0N 159.7E	SAT	STG C											ESSA 9	
7	301015Z	8.4N 159.3E	P	2 10	700MB	40	-	998	305	13 11	CIRC	- -	20	-	WC WELL DEF E	03
8	301620Z	8.9N 159.4E	P	3 10	700MB	40	-	992	302	14 11	-	- -	-	-	NEG HOR PRES	03
9	302305Z	9.7N 159.0E	P	20 10	700MB	40	35	991	299	14 12	-	- -	-	-	NEG WC	04
10	310320Z	9.8N 159.4E	P	10 10	700MB	55	50	987	297	13 11	-	- -	-	-	NEG WC	04
11	310459Z	9.5N 159.0E	SAT	STG C+											ESSA 9	
12	311030Z	9.9N 158.5E	P	2 10	700MB	45	-	984	296	14 12	-	- -	-	-	NEG HOR EYE	05
13	311530Z	10.2N 158.3E	P	2 5	700MB	52	-	979	292	15 12	CIRC		50	-	WC PR DEF	05
14	312255Z	11.1N 157.7E	P	3 15	700MB	40	45	977	286	15 -	-	- -	-	-	NEG EYE	06
15	312312Z	11.0N 158.0E	SAT	STG A	DIA 4	CAT 2.5									ESSA 8 (GUAM)	
16	010333Z	11.8N 157.2E	P	4 2	700MB	60	55	-	-	14 13	CIRC		30	-		
17	010401Z	11.5N 157.0E	SAT	STG A	DIA 5	CAT 3.0									ESSA 9	
18	010958Z	12.5N 156.7E	P	- -	700MB	-	-	-	-	- -	-	- -	-	-		
19	011100Z	12.5N 156.5E	P	20 -	700MB	73	-	966	282	16 11	CIRC	- -	40	-	CLSD WC	07
20	011232Z	12.7N 156.3E	P	- -	700MB	-	-	-	-	- -	-		-	-		
21	011544Z	13.0N 156.9E	P	15 -	700MB	77	-	962	277	17 14	CIRC		40	-	CLSD WC	07
22	012225Z	13.7N 157.0E	P	5 3	700MB	80	60	-	273	18 12	CIRC		40	-	NEG WC	08
23	020330Z	14.0N 157.5E	P	10 5	700MB	95	70	-	272	18 10	CIRC		40	-	NEG WC	08
24	020501Z	15.0N 157.0E	SAT	T6.5/6.5/D0.5/24HRS											ESSA 9	
25	021000Z	15.5N 158.1E	P	30 20	700MB	-	-	965	280	22 12	CONC	-	15-40	-	INNER CLSD-OUTER CLSD	09
26	021221Z	16.0N 158.0E	AC R	-							-	- -	-	-		
27	021600Z	16.1N 158.3E	P	15 15	700MB	-	-	956	273	23 14	CIRC		40	-	WC OPEN E PR DEF	09
28	030430Z	18.5N 159.0E	P	2 10	700MB	85	65	960	275	15 13	-	- -	-	-	NEG WC	10
29	030911Z	19.6N 159.7E	P	2 10	700MB	75	-	961	277	16 13	-	- -	-	-	NEG WC	10
30	032230Z	22.2N 160.9E	P	2 5	700MB	38	25	973	264	14 12	-	- -	-	-	NEG EYE	11
31	040000Z	23.0N 162.9E	SAT	STG A	DIA 6	CAT 2.0									ESSA 8 (HOUS)	
32	040313Z	23.5N 162.4E	SAT	STG X	DIA 2	CAT 2.0									ESSA 9	
33	040400Z	23.3N 161.4E	P	2 5	700MB	70	70	973	281	17 13	CIRC		50	-	WC PR DEF	
34	050412Z	27.5N 163.7E	SAT	T3.0/3.5MINUS/W1/24HRS											ESSA 9	
35	060319Z	31.0N 169.0E	SAT	T2.0/3.0/W1/24HRS											ESSA 9	

TYPHOON ORA
FIX POSITIONS FOR CYCLONE NO. 6
23 JUN - 26 JUN

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV	ACCRY MET	FLT LVL	FLT LVL WND	OBS SFC WND	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIEN-TATION	EYE DIA	THKN WALL CLD	POSIT OF RADAR /REMARKS	
1	230420Z	10.9N 130.6E	P	5	15	700MB	35	30	1006	310	- -	-	- -	-	-		
2	230600Z	11.0N 130.0E	SAT	T2.5/2.5PLUS/D1/24HRS													
3	232000Z	10.5N 127.8E	SRDR		-							-	- -	-	-	ESSA 9	
4	232212Z	11.1N 127.7E	P	5	2	700MB	70	80	985	297	15 9	CIRC		25	10	CLSD WC	02
5	240145Z	11.2N 127.2E	SAT	STG X DIA 3 CAT 2.0												ESSA 8 (RODN)	
6	240350Z	11.4N 126.5E	P	15	5	850MB	50	65	981	-	16 11	CIRC		15	-	WC PR DEF OPEN NE-SW	03
7	240607Z	11.8N 126.2E	P	-	-	700MB	50	65	-	-	- -	-	- -	-	-		
8	240900Z	12.3N 125.7E	P	-	-	500MB	40	70	-	-	- -4	CIRC		30	-	CLSD WC	03
9	241742Z	13.3N 123.4E	LRDR		-							-	- -	-	-	15.2N 120.5E	
10	242100Z	13.8N 122.8E	LRDR		-							-	- -	-	-	15.2N 120.5E	
11	242328Z	14.1N 122.0E	P	10	5	500MB	70	-	987	-	- -3	ELIP	N-S	15X12	5	CLSD WC	05
12	242330Z	14.1N 122.0E	LRDR		-							-	- -	-	-	15.2N 120.5E	
13	250115Z	14.4N 121.7E	LRDR		-							-	- -	-	-	15.2N 120.5E	
14	250236Z	12.5N 119.6E	SAT	STG X DIA NA CAT 2.0												ESSA 8 (RODN)	
15	250245Z	14.6N 121.1E	LRDR		-							-	- -	-	-	15.2N 120.5E	
16	250335Z	12.5N 119.7E	SAT	STG X DIA 6 CAT 2.0												ESSA 8 (RODN)	
17	250340Z	14.8N 121.1E	LRDR		-							-	- -	-	-	15.2N 120.5E	
18	250410Z	14.8N 120.8E	LRDR		-							-	- -	-	-	15.2N 120.5E	
19	250610Z	15.3N 120.6E	LRDR		-							-	- -	-	-	15.2N 120.5E	
20	250629Z	14.8N 119.5E	SAT	T4.0/4.5/W0/24HRS (NESS)												ESSA 9	
21	250710Z	15.4N 120.4E	LRDR		-							-	- -	-	-	15.2N 120.5E	
22	251625Z	16.4N 117.3E	P	10	10	700MB	60	-	987	298	13 11	CIRC		10	-	WC PR DEF	06
23	251640Z	17.0N 117.5E	AC R		-							-	- -	-	-		
24	252100Z	17.0N 116.0E	AC R		-							-	- -	-	-		
25	252205Z	17.7N 115.5E	P	10	10	700MB	40	85	987	297	14 12	CIRC		20	-	CLSD WC	06
26	260400Z	18.3N 114.5E	P	10	10	500MB	45	85	-	-	5 9	-	- -	-	-	NEG EYE	07
27	260728Z	19.0N 111.5E	SAT	T3.0/4.0MINUS/W0.5/24HRS												ESSA 9	
28	260730Z	18.6N 114.0E	P	10	15	500MB	50	85	-	-	3 1	-	- -	-	-	NEG EYE	07
29	261220Z	19.3N 112.5E	AC R		41							CIRC		18	-		

TYPHOON PHYLLIS
FIX POSITIONS FOR CYCLONE NO. 7
6 JUL - 16 JUL

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV	ACCRY MET	FLT LVL	FLT LVL WND	OBS SFC WND	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIEN-TATION	EYE DIA	THKN WALL CLD	POSIT OF RADAR /REMARKS	
1	062220Z	8.9N 156.3E	P	5	10	700MB	35	50	1005	311	9 9	-	- -	-	-	NEG EYE	01
2	070315Z	9.0N 156.2E	P	5	7	700MB	30	45	-	306	12 11	-	- -	-	-	NO DEF EYE	01
3	070442Z	10.0N 157.0E	SAT	T3.0/3.0/D1.5/24HRS												ESSA 9	
4	071040Z	9.4N 155.6E	P	20	20	700MB	35	-	1006	310	10 10	-	- -	-	-	NEG EYE	02
5	071618Z	9.7N 155.4E	P	25	20	700MB	35	-	999	307	15 12	-	- -	-	-	NEG WC	02
6	080023Z	10.0N 157.0E	SAT	STG C+												ESSA8(GUAM)	•
7	080345Z	10.5N 155.0E	SAT	T3.5/3.5D0.5/24HRS												ESSA 9	
8	080415Z	10.8N 155.1E	P	3	3	700MB	35	50	995	305	16 9	ELIP	SW-NE	18X10	5	WC SW	03
9	080630Z	10.8N 155.0E	P	-	-	700MB	-	-	-	-	- -	-	- -	-	-		
10	080955Z	11.0N 154.6E	P	5	10	700MB	45	-	984	305	15 11	CIRC		30	20	WC OPEN N	03
11	081540Z	11.4N 155.2E	P	10	10	700MB	30	-	990	301	14 10	CIRC		15	-		
12	081818Z	11.9N 155.0E	P	-	-	700MB	-	-	-	-	- -	-	- -	-	-	WC BRKN SW	04
13	082140Z	12.2N 154.8E	P	15	10	700MB	40	40	-	300	15 11	CIRC		10	-	WC E-S	04
14	090400Z	12.8N 154.5E	P	20	10	700MB	65	-	993	299	12 10	ELIP	E-W	20X 8	-	OVC AS IN EYE	05
15	090444Z	13.0N 155.5E	SAT	4.5/4 5/D1.0/24HRS												ESSA 9	
16	090514Z	12.8N 154.5E	P	-	-	700MB	-	-	-	-	- -	-	- -	-	-		
17	091000Z	13.2N 154.5E	P	5	2	700MB	55	40	987	298	14 11	CIRC		20	4	CLSD WC	05
18	092315Z	13.2N 154.2E	P	10	5	700MB	75	90	971	285	16 11	ELIP	E-W	25X20	-	WC OPEN SE	06
19	100056Z	13.1N 154.2E	P	-	-	700MB	-	-	-	-	- -	-	- -	-	-		
20	100347Z	13.4N 154.5E	SAT	T5.5/5.5/D1.0/24HRS												ESSA 9	
21	100400Z	13.2N 154.1E	P	15	10	700MB	80	130	971	278	15 11	ELIP	E-W	10X20	8	CLSD WC	06
22	101015Z	13.5N 154.0E	P	10	2	700MB	78	-	949	265	17 10	CIRC		12	4	CLSD WC	07
23	101555Z	13.7N 153.9E	P	10	2	700MB	70	-	944	260	18 11	CIRC		15	4	CLSD WC	07
24	102300Z	14.1N 154.1E	P	2	2	700MB	80	100	944	261	18 11	CIRC		15	5	CLSD WC	08
25	110350Z	14.8N 154.0E	P	5	2	700MB	85	120	950	284	21 13	ELIP	SW-NE	15X12	5	WC OPEN SE	08
26	110443Z	15.0N 154.0E	SAT	T6.0/6.0/D0.5/24HRS												ESSA 9	
27	111055Z	15.8N 153.9E	P	5	3	700MB	80	-	-	276	20 10	CIRC		25	10	WC OPEN S-SE	09
28	111530Z	16.4N 153.6E	P	10	4	700MB	60	-	970	276	14 10	-	- -	-	-	WC PR DEF	09
29	112230Z	17.7N 152.2E	P	10	10	700MB	78	100	959	279	21 10	CIRC		40	-	WC PR DEF	10
30	112335Z	18.6N 152.7E	SAT	STG X DIA 4 CAT 4.0												ESSA 8 (RODN)	
31	120030Z	18.3N 152.2E	P	-	-	700MB	-	-	-	-	- -	-	- -	-	-		
32	120325Z	18.8N 152.5E	P	10	10	700MB	65	100	962	280	16 13	CIRC		40	-	WC OPEN NE-SW	10
33	120351Z	19.0N 152.0E	SAT	STG X DIA NA CAT 3.5													
34	121350Z	21.0N 148.9E	P	10	15	700MB	50	-	966	282	19 14	CIRC		50	-	WC OPEN SE	11
35	121550Z	21.3N 148.4E	P	10	20	700MB	90	-	964	280	18 10	CIRC		50	5	WC OPEN SE	11
36	122220Z	22.4N 146.6E	P	5	5	700MB	-	80	967	280	18 12	ELIP	E-W	35X30	5	CLSD WC	13
37	130044Z	22.4N 145.7E	SAT	STG X DIA 3 CAT 3.0												ESSA 8 (RODN)	
38	130330Z	23.3N 145.3E	P	5	5	700MB	-	80	952	268	19 12	ELIP	N-S	35X25	5	CLSD WC	13
39	130945Z	24.5N 143.6E	P	1	3	700MB	70	60	945	264	23 14	CIRC		20	5	WC OPEN W	14
40	131140Z	24.8N 143.1E	P	-	-	700MB	-	-	-	-	- -	-	- -	-	-		
41	131545Z	25.4N 142.3E	P	5	5	700MB	80	-	954	270	20 12	CIRC		25	5	WC OPEN W	14
42	140134Z	27.4N 141.2E	SAT	STG C												ESSA 8 (RODN)	
43	140445Z	28.4N 139.9E	P	10	10	700MB	45	45	975	288	15 8	-	- -	-	-	NEG DEF	15
44	141030Z	29.4N 138.6E	P	10	10	700MB	65	-	980	292	15 11	-	- -	-	-	WC PR DEF OPEN S	16
45	141207Z	29.6N 138.4E	P	-	-	700MB	-	-	-	-	- -	-	- -	-	-		
46	141500Z	29.9N 138.3E	P	10	20	700MB	65	-	985	295	15 16	-	- -	-	-	NEG EYE	16
47	142202Z	30.9N 137.6E	P	10	10	700MB	55	-	983	295	18 14	-	- -	-	-	NEG EYE	17
48	150125Z	32.8N 138.1E	LRDR		-							-	- -	-	-		
49	150130Z	32.7N 138.2E	LRDR		-							-	- -	-	-	35.8N 139.4E	
50	150457Z	33.0N 138.0E	SAT	T4.0/5.0 MINUS/W0.5/24HRS												ESSA 9	
51	150800Z	34.6N 137.8E	LRDR		-							-	- -	-	-	35.3N 138.7E	
52	150900Z	34.9N 137.8E	LRDR		-							-	- -	-	-	35.3N 138.7E	
53	151000Z	35.1N 138.0E	LRDR		-							-	- -	-	-	35.3N 138.7E	
54	151100Z	35.0N 137.1E	LRDR		-							-	- -	-	-	35.3N 136.9E	
55	151200Z	35.0N 137.1E	LRDR		-							-	- -	-	-	35.3N 136.9E	
56	151200Z	35.0N 137.0E	LRDR		-							-	- -	-	-	35.3N 138.7E	
57	160556Z	36.5N 135.5E	SAT	T2.0/3.0 MINUS/W2.0/24HRS												ESSA 9	

TYPHOON RITA
FIX POSITIONS FOR CYCLONE NO. 8
8 JUL - 26 JUL

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FLT LVL	FLT LVL WND	OBS SFC WND	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIEN-TATION	EYE DIA	THKN WALL CLD	POSIT OF RADAR /REMARKS	
1	061330Z	10.0N 147.5E	SAT	SG												
2	070442Z	11.0N 144.5E	SAT	T1.5/1.5/W0.5/24HRS											ESSA 9	
3	070600Z	10.5N 144.3E	P	20 6	700MB	-	40	998	-	28 25	-	- -	-	-	RDR INDICATES FBS FRMG	02
4	071000Z	10.4N 143.9E	P	10 20	700MB	-	50	994	304	12 -	-	- -	-	-	WND CNTR 40NM DIA	02
5	071515Z	10.5N 143.1E	P	15 15	700MB	50	-	991	299	14 9	-	- -	-	-	RDR PRES POOR	02
6	080020Z	11.0N 142.0E	SAT	SIG X DIA 3 CAT 2.0											ESSA 8 (RODN)	
7	080023Z	11.5N 142.0E	SAT	SIG X DIA NA CAT 2.0											ESSA 8 (GUAM)	
8	080315Z	11.4N 141.6E	P	5 5	700MB	65	70	980	292	16 13	CIRC		30	-	WC OPEN SW	03
9	080540Z	11.2N 141.8E	SAT	T3.5/3.5PLUS/D2.0/24HRS											ESSA 9	
10	081000Z	11.9N 141.2E	P	10 10	700MB	60	80	976	288	13 11	CIRC		30	4	CLSD WC	04
11	081138Z	12.0N 141.1E	P	- -	700MB	-	-	-	-	- -	-	- -	-	-		
12	081600Z	12.4N 140.8E	P	10 10	700MB	90	-	961	277	17 10	CIRC		18	10	CLSD WC	04
13	082200Z	13.0N 140.1E	P	1 5	700MB	100	130	953	266	18 17	CIRC		18	-	WC OPEN SE	05
14	090044Z	13.2N 139.9E	P	- -	700MB	-	-	-	-	- -	-	- -	-	-		
15	090444Z	14.0N 140.0E	SAT	T4.5/4.5/D1.0/24HRS											ESSA 9	
16	091009Z	14.6N 138.9E	P	3 3	700MB	115	-	941	258	17 13	CIRC		22	5	CLSD WC	06
17	091205Z	14.8N 138.9E	P	- -	700MB	-	-	-	-	- -	-	- -	-	-		
18	091600Z	15.3N 138.0E	P	3 3	700MB	120	-	-	250	23 10	CIRC		22	5	CLSD WC	06
19	092205Z	15.8N 137.5E	P	2 2	700MB	122	120	930	247	21 16	CIRC		25	2	CLSD WC	07
20	100542Z	16.5N 136.5E	SAT	T7.0/7.0PLUS/D1.0/24HRS											ESSA 9	
21	101140Z	17.3N 135.4E	P	1 1	700MB	102	-	-	236	23 -	CIRC		17	4	CLSD WC	08
22	101358Z	17.4N 135.2E	P	- -	700MB	-	-	-	-	- -	CIRC		17	-		
23	101445Z	17.4N 134.9E	P	1 1	700MB	120	-	-	232	22 14	CIRC		17	5	CLSD WC	08
24	102315Z	17.5N 134.3E	P	- -	700MB	105	85	911	231	21 18	CIRC		20	4	CLSD WC	09
25	110640Z	18.5N 134.0E	SAT	T7.5/7.5/D0.5/24HRS											ESSA 9	
26	111620Z	18.2N 133.1E	P	5 2	700MB	103	-	936	249	22 13	CIRC		20	8	CLSD WC	10
27	120150Z	18.1N 133.9E	SAT	SIG X DIA 4 CAT 4.0											ESSA 8 (RODN)	
28	120544Z	18.1N 132.5E	SAT	SIG X DIA 2 CAT 3.0											ESSA 9	
29	121100Z	18.1N 132.5E	P	3 5	700MB	95	-	947	261	18 14	CIRC		35	2	EYE SHAPE CHGING RPDLY	11
30	121340Z	17.6N 132.3E	P	- -	700MB	-	-	-	-	- -	-	- -	-	-		
31	121530Z	18.1N 132.5E	P	3 8	700MB	105	-	946	262	16 16	CIRC		35	-	PR DEF WC BRKN	11
32	122205Z	17.9N 132.5E	P	10 5	700MB	55	40	952	266	16 15	CIRC		13	-	WC OPEN NW	12
33	130044Z	17.6N 132.4E	SAT	SIG C											ESSA 8 (RODN)	
34	130336Z	18.1N 132.7E	P	2 5	700MB	65	55	953	269	16 13	CIRC		8	-	CLSD WC	12
35	131600Z	19.0N 134.1E	P	1 2	700MB	55	-	963	276	14 12	-	- -	-	-	NEG WC	13
36	132310Z	17.9N 132.5E	P	- -	700MB	-	-	-	-	- -	-	- -	-	-		
37	140140Z	20.0N 135.1E	SAT	SIG X DIA NA CAT 3.0											ESSA 8	
38	140210Z	19.9N 135.0E	P	2 2	700MB	70	-	966	282	17 13	-	- -	-	-	NEG WC	14
39	140410Z	20.2N 135.1E	P	2 3	700MB	50	50	967	282	15 15	-	- -	-	-	NEG WC	14
40	141240Z	20.8N 135.7E	P	3 10	700MB	60	-	964	280	18 -	-	- -	-	-		
41	141600Z	20.9N 135.7E	P	3 10	700MB	70	-	962	279	19 -	-	- -	-	-	NEG WC	15
42	142228Z	21.1N 135.6E	P	2 3	700MB	70	50	965	280	17 15	CIRC		40	-	WND CNTR 40NM DIA	16
43	150453Z	20.5N 135.5E	SAT	T5.0/5.0/S0/24HRS											ESSA 9	
44	160552Z	22.0N 135.0E	SAT	SIG X DIA 3 CAT 2.0												
45	161030Z	21.7N 134.7E	P	3 20	700MB	50	-	965	280	15 -	-	- -	-	-	700MB WND CNTR 30NM DIA	17
46	162120Z	22.5N 134.3E	P	5 5	700MB	32	-	966	281	16 13	-	- -	-	-	OVC ABV AND BLO IN CNTR	18
47	170400Z	22.9N 133.8E	P	5 10	700MB	30	25	965	279	15 -	-	- -	-	-	CNTR FIL W/ SC	19
48	170455Z	23.0N 133.5E	SAT	T4.5/4.5PLUS/D1.5/24HRS											ESSA 9	
49	170603Z	22.9N 133.8E	P	- -	700MB	-	-	-	-	- -	-	- -	-	-		
50	170930Z	23.1N 133.8E	P	5 5	700MB	60	40	-	278	14 15	-	- -	-	-	SFC CNTR 50NM DIA	19
51	171600Z	23.5N 133.9E	P	5 10	700MB	60	-	966	277	15 12	CIRC		60	15	CLSD WC	20
52	172115Z	23.5N 133.9E	P	5 10	700MB	80	50	962	277	14 14	CIRC		80	15	WC OPEN SW	20
53	180110Z	23.9N 134.0E	SAT	SIG X DIA NA CAT 3.0											ESSA 8 (RODN)	
54	180554Z	24.3N 133.8E	SAT	T5.0/5.0/D0.5/24HRS											ESSA 9	
55	181550Z	25.2N 134.4E	P	5 5	700MB	60	-	960	274	16 14	CIRC		70	15	WC OPEN NW	21
56	181716Z	25.6N 134.6E	P	- -	700MB	-	-	-	-	- -	-	- -	-	-		
57	182215Z	26.1N 134.5E	P	3 10	700MB	40	40	961	276	16 15	-	- -	-	-	SFC CNTR GT 50NM DIA	22
58	190000Z	26.1N 134.1E	P	- -	700MB	-	-	-	-	- -	-	- -	-	-		
59	190155Z	26.1N 135.2E	SAT	SIG X DIA NA CAT 3.0											ESSA 8 (RODN)	
60	190330Z	26.6N 134.2E	P	5 10	700MB	60	45	960	276	16 16	-	- -	-	-	SFC CNTR GT 50NM DIA	22
61	190458Z	26.5N 134.0E	SAT	T5.5/5.5/D0.5/24HRS											ESSA 9	
62	191017Z	27.3N 133.4E	P	2 8	700MB	50	36	962	276	- -	-	- -	-	-	OVC AS ABV	
63	191220Z	27.3N 133.4E	P	- -	700MB	-	-	-	-	- -	-	- -	-	-		
64	191535Z	27.5N 132.7E	P	2 10	700MB	60	-	964	277	- -	-	- -	-	-		23
65	192200Z	27.9N 132.0E	P	2 10	700MB	65	-	964	278	16 14	-	- -	-	-	OVC BLO-SC IN CNTR	24
66	200058Z	28.0N 131.7E	SAT	SIG X DIA NA CAT 4.0											ESSA 8 (RODN)	
67	200230Z	28.1N 131.2E	P	- -	700MB	-	-	-	-	- -	-	- -	-	-		
68	200300Z	28.2N 131.1E	P	2 10	700MB	80	65	965	279	16 14	-	- -	-	-	WND CNTR 35NM DIA	24
69	200556Z	28.5N 130.5E	SAT	T4.5/5.5MINUS/W1.0/24HRS											ESSA 9	
70	201005Z	28.4N 129.8E	P	5 5	700MB	55	-	963	277	14 14	-	- -	-	-	LRG CNTR-SIZE UNDET	25
71																
72	201300Z	28.5N 129.4E	P	- -	700MB	-	-	-	-	- -	-	- -	-	-		
73	201508Z	28.6N 129.0E	P	5 5	700MB	60	-	-	280	14 13	-	- -	-	-	FL CNTR V BROAD	25
74	202210Z	28.8N 128.4E	P	1 5	700MB	30	-	-	285	- -	-	- -	-	-	FL CNTR V BROAD	26
75	202345Z	28.9N 128.3E	P	- -	700MB	-	-	-	-	- -	-	- -	-	-		
76	210030Z	28.7N 127.6E	LRDR	-							-	- -	-	-	26.3N 127.8E	
77	210225Z	28.7N 127.4E	LRDR	-							-	- -	-	-	26.3N 127.8E	
78	210330Z	28.7N 127.1E	LRDR	-							-	- -	-	-	26.3N 127.8E	
79	210400Z	28.6N 127.6E	LRDR	-							ELIP	E-W	99X70	-	26.3N 127.8E	
80	210415Z	28.8N 127.6E	P	1	700MB	60	45	972	285	- -	-	- -	-	-	FL CNTR BROAD AND DIF	26
81	210655Z	28.5N 127.5E	SAT	SIG X DIA 2 CAT 3.0											ESSA 9	
82	211005Z	28.7N 127.3E	P	5 5	700MB	35	40	967	281	13 11	-	- -	-	-		27
83	211255Z	28.4N 126.9E	P	- -	700MB	-	-	-	-	- -	-	- -	-	-		
84	211515Z	28.2N 126.9E	P	10 5	700MB	60	-	967	280	15 14	-	- -	-	-		27
85	211900Z	27.9N 126.8E	LRDR	-							-	- -	-	-	26.2N 127.7E	
86	211958Z	27.6N 126.5E	LRDR	-							-	- -	-	-	26.3N 127.8E	
87	220000Z	27.9N 126.6E	LRDR	-							-	- -	-	-	26.2N 127.7E	
88	220043Z	27.9N 125.8E	P	5 3	700MB	65	65	-	279	17 15	CIRC		40	-	WC OPEN W	28
89	220100Z	27.9N 126.3E	LRDR	-							-	- -	-	-	26.2N 127.7E	
90	220300Z	27.9N 125.9E	LRDR	-							-	- -	-	-	26.2N 127.7E	
91	220408Z	27.5N 125.6E	P	5 5	700MB	65	70	-	278	17 14	CIRC		40	-	WC PR DEF	28
92	220558Z	27.4N 125.7E	SAT	T6.0/6.0/D0.5/24HRS											ESSA 9	
93	220600Z	27.3N 125.6E	LRDR	-							-	- -	-	-	24.8N 125.3E	
94	220650Z	27.4N 125.5E	P	2 5	700MB	-	-	960	277	15 13	-	- -	-	-	NEG WC	29
95	220700Z	27.2N 125.4E	LRDR	-							-	- -	-	-	26.2N 127.7E	
96	220800Z	27.2N 127.2E	LRDR	-							-	- -	-	-	24.8N 125.3E	
97	220800Z	26.9N 126.6E	LRDR	-							-	- -	-	-	26.2N 127.7E	
98	220900Z	27.1N 125.4E	LRDR	-							-	- -	-	-	24.8N 125.3E	
99	221230Z	26.4N 124.9E	LRDR	-							-	- -	-	-	26.3N 127.8E	

TYPHOON RITA
FIX POSITIONS FOR CYCLONE NO. 8
6 JUL - 26 JUL

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV	ACCRY MET	FLT LVL	FLT LVL WND	OBS SFC WND	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TD	EYE FORM	ORIEN-TATION	EYE DIA	THKN WALL CLD	POSIT OF RADAR /REMARKS	
100	221330Z	26.4N 125.2E	P	5	6	700MB	60	-	959	275	17 15	-	- -	-	-		30
101	221330Z	26.3N 124.9E	LRDR		-							-	- -	-	-	26.3N 127.8E	
102	221400Z	26.4N 125.1E	LRDR		-							-	- -	-	-	24.8N 125.3E	
103	221400Z	26.5N 124.7E	LRDR		-							-	- -	-	-	26.2N 127.7E	
104	221450Z	26.3N 124.9E	LRDR		-							-	- -	-	-	26.3N 127.8E	
105	221500Z	26.3N 125.0E	LRDR		-							-	- -	-	-	24.8N 125.3E	
106	221500Z	26.3N 124.7E	LRDR		-							-	- -	-	-	26.2N 127.7E	
107	221600Z	26.2N 124.9E	LRDR		-							-	- -	-	-	24.8N 125.3E	
108	221600Z	25.9N 124.9E	LRDR		-							-	- -	-	-	26.2N 127.7E	
109	221635Z	26.6N 125.6E	LRDR		-							-	- -	-	-	26.3N 127.8E	
110	221642Z	25.8N 125.0E	LRDR		-							-	- -	-	-	26.3N 127.8E	
111	221900Z	26.1N 125.2E	LRDR		-							-	- -	-	-	24.8N 125.3E	
112	221900Z	26.1N 125.1E	LRDR		-							-	- -	-	-	26.2N 127.7E	
113	222000Z	26.0N 125.3E	LRDR		-							-	- -	-	-	24.8N 125.3E	
114	222000Z	26.0N 125.1E	LRDR		-							-	- -	-	-	26.2N 127.7E	
115	222030Z	25.9N 125.1E	P	3	10	700MB	60	-	961	277	16 14	CIRC		50	10	WC OPEN SE-W	31
116	222115Z	26.3N 125.7E	LRDR		-							-	- -	-	-	26.2N 127.7E	
117	222200Z	25.7N 125.2E	P	3	5	700MB	50	-	961	277	15 13	CIRC		50	-	WC PR DEF	31
118	222200Z	25.8N 125.0E	LRDR		-							-	- -	-	-	24.8N 125.3E	
119	222200Z	25.7N 125.0E	LRDR		-							-	- -	-	-	26.2N 127.7E	
120	230000Z	25.4N 125.0E	LRDR		-							-	- -	-	-	24.0N 121.6E	
121	230000Z	25.6N 124.9E	LRDR		-							-	- -	-	-	24.8N 125.3E	
122	230136Z	23.5N 125.3E	SAT	SIG X DIA 6 CAT 4.0												ESSA 8 (NJT2)	
123	230200Z	25.4N 125.0E	LRDR		-							-	- -	-	-	24.8N 125.3E	
124	230200Z	25.5N 125.2E	LRDR		-							-	- -	-	-	26.2N 127.7E	
125	230300Z	25.4N 125.2E	LRDR		-							-	- -	-	-	24.8N 125.3E	
126	230300Z	25.3N 125.1E	LRDR		-							-	- -	-	-	26.2N 127.7E	
127	230400Z	25.7N 125.3E	LRDR		-							-	- -	-	-	24.0N 121.6E	
128	230400Z	25.4N 125.0E	LRDR		-							-	- -	-	-	24.8N 125.3E	
129	230400Z	24.9N 125.1E	LRDR		-							-	- -	-	-	26.2N 127.7E	
130	230430Z	25.5N 125.3E	LRDR		-							-	- -	-	-	24.0N 121.6E	
131	230500Z	25.5N 124.9E	LRDR		-							-	- -	-	-	24.0N 121.6E	
132	230530Z	25.2N 125.3E	LRDR		-							-	- -	-	-	24.8N 125.3E	
133	230550Z	25.3N 125.4E	P	3	2	700MB	55	60	-	276	17 14	-	- -	-	-	SFC CNTR 20NM DIA	32
134	230600Z	25.2N 125.1E	LRDR		-							-	- -	-	-	24.8N 125.3E	
135	230610Z	25.2N 125.7E	LRDR		-							-	- -	-	-	26.3N 127.8E	
136	230657Z	25.3N 125.0E	SAT	SIG X DIA 4 CAT 3.5												ESSA 9	
137	230700Z	25.1N 125.3E	LRDR		-							-	- -	-	-	24.8N 125.3E	
138	230700Z	25.1N 125.0E	LRDR		-							-	- -	-	-	26.2N 127.7E	
139	230707Z	25.1N 125.3E	P	3	2	700MB	70	60	-	276	17 13	CIRC		50	-		32
140	230715Z	25.0N 125.8E	LRDR		-							-	- -	-	-	26.3N 127.8E	
141	230745Z	24.8N 125.3E	LRDR		-							-	- -	-	-	26.3N 127.8E	
142	230800Z	25.0N 124.6E	LRDR		-							-	- -	-	-	24.0N 121.6E	
143	230800Z	25.0N 125.3E	LRDR		-							-	- -	-	-	24.8N 125.3E	
144	230800Z	25.0N 124.9E	LRDR		-							-	- -	-	-	26.2N 127.7E	
145	230815Z	25.2N 125.7E	LRDR		-							-	- -	-	-	26.3N 127.8E	
146	230830Z	24.8N 125.3E	LRDR		-							CIRC		90	-	26.2N 127.7E	
147	230900Z	25.0N 125.3E	LRDR		-							-	- -	-	-	24.7N 125.3E	
148	230900Z	25.0N 124.6E	LRDR		-							-	- -	-	-	24.0N 121.6E	
149	230900Z	24.8N 125.3E	LRDR		-							-	- -	-	-	26.3N 127.8E	
150	231000Z	24.9N 125.3E	LRDR		-							-	- -	-	-	24.7N 125.3E	
151	231000Z	24.8N 125.5E	LRDR		-							-	- -	-	-	26.3N 127.8E	
152	231000Z	24.8N 125.5E	LRDR		-							-	- -	-	-	26.2N 127.7E	
153	231100Z	24.8N 125.3E	LRDR		-							-	- -	-	-	24.8N 125.3E	
154	231100Z	24.8N 125.5E	LRDR		-							-	- -	-	-	26.2N 127.7E	
155	231100Z	24.8N 125.8E	LRDR		-							-	- -	-	-	26.3N 127.8E	
156	231200Z	24.8N 125.3E	LRDR		-							-	- -	-	-	24.2N 127.7E	
157	231330Z	24.9N 126.0E	LRDR		-							-	- -	-	-	26.3N 127.8E	
158	231400Z	24.7N 125.9E	LRDR		-							-	- -	-	-	24.8N 125.3E	
159	231400Z	25.0N 125.9E	LRDR		-							-	- -	-	-	26.2N 127.7E	
160	231400Z	24.8N 125.7E	LRDR		-							-	- -	-	-	26.3N 127.8E	
161	231530Z	24.8N 125.8E	LRDR		-							-	- -	-	-	26.3N 127.8E	
162	231600Z	24.6N 125.8E	LRDR		-							-	- -	-	-	26.3N 127.8E	
163	231600Z	24.2N 125.9E	LRDR		-							-	- -	-	-	24.2N 124.2E	
164	231600Z	24.7N 126.0E	LRDR		-							-	- -	-	-	24.8N 125.3E	
165	231700Z	24.8N 126.3E	LRDR		-							-	- -	-	-	26.3N 127.8E	
166	231710Z	24.6N 126.2E	LRDR		-							-	- -	-	-	26.3N 127.8E	
167	231725Z	24.5N 126.2E	LRDR		-							-	- -	-	-	26.3N 127.8E	
168	231811Z	24.9N 126.4E	LRDR		-							-	- -	-	-	26.3N 127.8E	
169	231900Z	25.0N 126.5E	LRDR		-							-	- -	-	-	24.8N 125.3E	
170	231900Z	24.9N 126.4E	LRDR		-							-	- -	-	-	26.3N 127.8E	
171	231900Z	25.0N 126.6E	LRDR		-							-	- -	-	-	26.2N 127.7E	
172	231945Z	24.8N 126.3E	LRDR		-							-	- -	-	-	26.2N 127.7E	
173	232000Z	25.0N 126.5E	LRDR		-							-	- -	-	-	24.8N 125.3E	
174	232100Z	25.2N 126.8E	LRDR		-							-	- -	-	-	24.2N 127.7E	
175	232100Z	25.3N 126.7E	LRDR		-							-	- -	-	-	26.3N 127.8E	
176	232100Z	25.1N 126.7E	LRDR		-							-	- -	-	-	24.8N 125.3E	
177	232200Z	25.3N 126.9E	LRDR		-							-	- -	-	-	26.2N 127.7E	
178	232300Z	25.5N 126.8E	P	2	10	700MB	75	60	959	273	16 16	CIRC		60	-	WC PR DEF	33
179	232300Z	25.5N 126.8E	LRDR		-							-	- -	-	-	26.2N 127.7E	
180	232300Z	25.4N 126.7E	LRDR		-							-	- -	-	-	24.8N 125.3E	
181	240000Z	25.5N 126.8E	LRDR		-							-	- -	-	-	26.2N 127.7E	
182	240000Z	25.6N 126.8E	LRDR		-							-	- -	-	-	24.8N 125.3E	
183	240100Z	25.6N 126.9E	LRDR		-							-	- -	-	-	24.8N 125.3E	
184	240100Z	25.6N 127.0E	LRDR		-							-	- -	-	-	26.2N 127.7E	
185	240110Z	25.7N 126.8E	P	5	10	700MB	65	-	-	272	16 13	CIRC		50	-	WC V PR DEF	33
186	240200Z	25.7N 127.0E	LRDR		-							-	- -	-	-	24.8N 125.3E	
187	240200Z	25.7N 127.0E	LRDR		-							-	- -	-	-	26.2N 127.7E	
188	240222Z	25.6N 126.9E	SAT	SIG X DIA 5 CAT 3.0												ESSA 8 (NJT2)	
189	240300Z	25.8N 127.0E	P	-	-	700MB	-	-	-	-	- -	-	- -	-	-		
190	240300Z	25.7N 127.1E	LRDR		-							-	- -	-	-	24.8N 125.3E	
191	240300Z	25.7N 127.1E	LRDR		-							-	- -	-	-	26.2N 127.7E	
192	240345Z	25.9N 127.1E	P	5	10	700MB	70	-	954	269	17 14	CIRC		50	-	WC PR DEF	33
193	240400Z	25.9N 127.3E	LRDR		-							-	- -	-	-	24.8N 125.3E	
194	240400Z	25.8N 127.1E	LRDR		-							-	- -	-	-	26.2N 127.7E	
195	240500Z	25.8N 127.4E	LRDR		-							-	- -	-	-	24.8N 125.3E	
196	240500Z	25.6N 127.3E	LRDR		-							-	- -	-	-	26.2N 127.7E	
197	240600Z	26.2N 127.0E	SAT	T6.0/6.0PLUS/S0/24HRS												ESSA 9	
198	240600Z	26.1N 127.4E	LRDR		-							-	- -	-	-	24.8N 125.3E	

TYPHOON RITA
FIX POSITIONS FOR CYCLONE NO. 8
6 JUL - 26 JUL

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV	ACCRY MET	FLT LVL	FLT LVL WND	OBS SFC WND	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TD	EYE FORM	ORIEN-TATION	EYE DIA	THKN WALL CLD	POSIT OF RADAR /REMARKS	
199	240000Z	26.1N 127.3E	LRDR		-							-	- -	-	-	26.2N 127.7E	
200	240727Z	26.6N 127.5E	AC R		-							-	- -	-	-		
201	240740Z	26.5N 127.5E	P	-	-	700MB	65	-	-	272	13 11	CIRC		30	20	WC OPEN NE	34
202	240900Z	26.4N 127.5E	LRDR		-							-	- -	-	-	26.2N 127.7E	
203	241000Z	26.5N 127.6E	LRDR		-							-	- -	-	-	26.2N 127.7E	
204	241027Z	26.5N 127.7E	P	3	3	700MB	81	45	-	268	15 13	CIRC		30	15	CLSD WC	35
205	241200Z	26.9N 127.7E	LRDR		-							-	- -	-	-	26.2N 127.7E	
206	241215Z	26.7N 127.6E	LRDR		-							-	- -	-	-	26.3N 127.8E	
207	241234Z	26.8N 127.5E	P	10	5	700MB	72	-	-	270	15 14	CIRC		30	15	CLSD WC	35
208	241245Z	27.0N 127.6E	LRDR		-							-	- -	-	-	26.3N 127.8E	
209	241400Z	27.1N 127.9E	LRDR		-							-	- -	-	-	26.4N 129.5E	
210	241400Z	27.1N 127.7E	LRDR		-							-	- -	-	-	26.2N 127.7E	
211	241500Z	27.3N 127.6E	LRDR		-							-	- -	-	-	26.2N 127.7E	
212	241600Z	27.5N 127.5E	LRDR		-							-	- -	-	-	26.4N 129.5E	
213	241600Z	27.4N 127.6E	LRDR		-							-	- -	-	-	26.2N 127.7E	
214	241700Z	27.6N 127.6E	LRDR		-							-	- -	-	-	26.4N 129.5E	
215	241700Z	27.6N 127.5E	LRDR		-							-	- -	-	-	26.2N 127.7E	
216	241740Z	27.7N 127.7E	LRDR		-							-	- -	-	-	26.3N 127.8E	
217	241800Z	27.1N 127.9E	LRDR		-							-	- -	-	-	26.4N 129.5E	
218	241800Z	27.7N 127.8E	LRDR		-							-	- -	-	-	26.2N 127.7E	
219	241830Z	27.7N 127.8E	LRDR		-							-	- -	-	-	26.3N 127.8E	
220	241900Z	27.7N 127.9E	LRDR		-							-	- -	-	-	26.4N 129.5E	
221	241900Z	27.8N 127.6E	LRDR		-							-	- -	-	-	26.2N 127.7E	
222	250000Z	28.5N 127.7E	LRDR		-							-	- -	-	-	26.4N 129.5E	
223	250115Z	28.3N 128.0E	P	4	10	700MB	65	-	957	272	15 13	CIRC		45	-	WC OPEN NE-SW	36
224	250124Z	28.9N 127.9E	SAT	SIG X DIA 5 CAT 3.0												ESSA 8 (RJTZ)	
225	250200Z	28.7N 127.9E	LRDR		-							-	- -	-	-	26.4N 129.5E	
226	250335Z	28.9N 127.8E	P	5	10	700MB	70	-	956	271	15 12	CIRC		40	-	WC V PR DEF	36
227	250400Z	29.1N 127.8E	LRDR		-							-	- -	-	-	26.4N 129.5E	
228	250500Z	29.3N 127.7E	LRDR		-							-	- -	-	-	26.4N 129.5E	
229	250507Z	29.5N 127.5E	SAT	T5.0/6.0/W1.0/24HRS												ESSA 9	
230	250525Z	29.4N 127.6E	P	5	10	700MB	70	-	955	271	15 13	CIRC		40	-	WC V PR DEF	36
231	250700Z	29.5N 127.6E	LRDR		-							-	- -	-	-	26.4N 129.5E	
232	250800Z	29.6N 127.7E	LRDR		-							-	- -	-	-	26.4N 129.5E	
233	250900Z	30.0N 127.6E	LRDR		-							-	- -	-	-	26.4N 129.5E	
234	251000Z	30.3N 127.6E	LRDR		-							-	- -	-	-	26.4N 129.5E	
235	251020Z	30.2N 127.9E	P	-	-	700MB	60	45	958	273	14 12	CIRC		45	-	CLSD WC	37
236	251100Z	30.3N 127.5E	LRDR		-							-	- -	-	-	26.4N 129.5E	
237	251210Z	30.0N 127.2E	LRDR		-							-	- -	-	-	33.6N 130.4E	
238	251230Z	30.8N 126.2E	P	-	-	700MB	-	-	-	-	- -	-	- -	-	-		
239	251300Z	30.6N 127.2E	LRDR		-							-	- -	-	-	33.6N 130.4E	
240	251310Z	30.7N 127.1E	LRDR		-							-	- -	-	-	33.6N 130.4E	
241	251400Z	31.8N 127.3E	LRDR		-							-	- -	-	-	33.6N 130.4E	
242	251500Z	31.2N 126.3E	P	5	7	700MB	45	-	965	277	14 13	CIRC		40	-	WC OPEN S	37
243	251600Z	30.5N 126.3E	LRDR		-							-	- -	-	-	33.6N 130.4E	
244	251707Z	31.0N 126.2E	LRDR		-							-	- -	-	-	33.6N 130.4E	
245	251800Z	31.8N 125.9E	LRDR		-							-	- -	-	-	33.6N 130.4E	
246	251810Z	32.3N 126.5E	LRDR		-							-	- -	-	-	33.6N 130.4E	
247	251900Z	32.1N 126.4E	LRDR		-							-	- -	-	-	33.6N 130.4E	
248	251945Z	32.8N 126.3E	LRDR		-							-	- -	-	-	37.1N 127.0E	
249	252000Z	32.0N 126.2E	LRDR		-							-	- -	-	-	33.6N 130.4E	
250	252005Z	33.2N 126.4E	LRDR		-							-	- -	-	-	33.6N 130.4E	
251	252045Z	32.8N 126.3E	LRDR		-							-	- -	-	-	37.1N 127.0E	
252	252100Z	33.1N 126.3E	LRDR		-							-	- -	-	-	37.1N 127.0E	
253	252100Z	32.1N 126.3E	LRDR		-							-	- -	-	-	33.6N 130.4E	
254	252200Z	32.7N 126.1E	LRDR		-							-	- -	-	-	33.6N 130.4E	
255	260210Z	34.8N 124.2E	SAT	SIG X DIA 3 CAT 3.0												ESSA 8	
256	260215Z	34.5N 124.9E	SAT	SIG X DIA NA CAT 2.0												ESSA 8	
257	260600Z	38.0N 122.5E	SAT	T4.5/5.0MINUS/W0.5/24HRS												ESSA 9	

TYPHOON SUSAN

FIX POSITIONS FOR CYCLONE NO. 9
5 JUL - 13 JUL

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV	ACCRY MET	FLT LVL	FLT LVL WND	OBS SFC WND	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TD	EYE FORM	ORIEN-TATION	EYE DIA	THKN WALL CLD	POSIT OF RADAR /REMARKS	
1	051750Z	14.0N 124.6E	SAT	SIG B													
2	060734Z	15.0N 121.5E	SAT	T1.5/1.5/D0.5/24HRS												ESSA 9	
3	070500Z	16.5N 120.5E	LRDR		-							-	- -	-	-	15.8N 120.7E	
4	070637Z	14.0N 120.5E	SAT	T2.0/2.0/ - -												ESSA 9	
5	080212Z	14.5N 117.0E	SAT	SIG C+													
6	080215Z	17.0N 117.5E	SAT	STG UNK												ESSA 8 (VIDU)	
7	080736Z	13.0N 117.5E	SAT	T3.0/3.0/D1.0/24HRS												ESSA 9	
8	080927Z	18.8N 118.1E	P	10	5	700MB	40	25	985	298	14 12	-	- -	-	-	NEG WC	03
9	081045Z	18.9N 118.0E	P	-	-	700MB	-	40	-	-	- -	-	- -	-	-		
10	090305Z	20.0N 118.0E	SAT	SIG C+												ESSA 8 (RODN)	
11	090630Z	20.1N 117.1E	P	2	1	700MB	35	50	-	294	18 16	ELIP	SW-NE	10X 5	-	SFC CNTR 10X5 NM SW-NE	04
12	090644Z	20.2N 117.2E	SAT	T3.0/3.0/S0/24HRS												ESSA 9	
13	091000Z	20.5N 116.6E	P	2	2	700MB	52	70	-	296	18 16	-	- -	-	-	NEG WC	04
14	100736Z	20.5N 115.5E	SAT	T3.0/3.0/S0/24HRS												ESSA 9	
15	101010Z	20.1N 116.2E	P	1	8	700MB	45	90	-	-	19 -	-	- -	-	-	NEG WC	05
16	101225Z	20.4N 116.0E	P	-		700MB	-	-	-	-	- -	-	- -	-	-		
17	101325Z	20.3N 116.2E	P	-	-	700MB	-	-	-	-	- -	-	- -	-	-		
18	101410Z	20.3N 116.2E	P	-	-	700MB	-	-	-	-	- -	-	- -	-	-		
19	101515Z	20.3N 116.2E	P	1	5	700MB	30	-	-	-	20 -	-	- -	-	-	NEG WC	05
20	110250Z	21.8N 117.2E	SAT	SIG C+												ESSA 8 (RODN)	
21	110645Z	22.0N 117.2E	SAT	T3.0/3.0/S0.0/24 HRS												ESSA 9	
22	120150Z	22.5N 117.6E	SAT	SIG C												ESSA 8 (RODN)	
23	120739Z	22.3N 117.1E	SAT	T2.5/3.0/W0.5/24HRS												ESSA 9	
24	130239Z	22.4N 116.2E	SAT	SIG B												ESSA 8 (RODN)	

TYPHOON TESS
FIX POSITIONS FOR CYCLONE NO. 10
7 JUL - 24 JUL

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FLT LVL	FLT LVL WND	OBS SFC WND	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIEN-TATION	EYE DIA	THKN WALL CLD	POSIT OF RADAR /REMARKS	
1	070246Z	12.5N 173.0E	SAT	STG B											ESSA 9	
2	080345Z	13.5N 169.0E	SAT	T1.5/2.0MINUS/W0.5/24HRS											ESSA 9	
3	082229Z	8.0N 170.0E	SAT	STG C											ESSA 8 (GUAM)	
4	090248Z	13.0N 168.5E	SAT	T1.5/1.5/S0/24HRS											ESSA 9	
5	100347Z	14.0N 167.0E	SAT	T2.0/2.0PLUS/D1.0/24HRS											ESSA 9	
6	110254Z	13.5N 167.0E	SAT	T3.0/3.0/D1.0/24HRS											ESSA 9	
7	120347Z	13.8N 165.5E	SAT	T4.0/4.0/D1.0/24HRS											ESSA 9	
8	121145Z	14.3N 164.6E	P	10 15	700MB	40	-	986	297	16 12	-	- -	-	-	WC FRMG SE	01
9	121510Z	14.3N 164.2E	P	10 15	700MB	52	-	980	290	16 13	CIRC		25	-	WC OPEN S AND W	01
10	122200Z	13.8N 163.4E	P	5 5	700MB	50	55	981	294	15 10	-	- -	-	-	WC PRTL FORMED	02
11	122307Z	13.8N 163.2E	P	5 5	700MB	60	70	980	293	15 13	-	- -	-	-		02
12	130321Z	13.4N 162.8E	P	5 10	700MB	-	65	977	290	15 12	-	- -	-	-		02
13	130451Z	13.2N 162.5E	SAT	T5.5/5.5PLUS/D1.0/24HRS											ESSA 9	
14	131124Z	13.1N 161.2E	P	10 10	700MB	85	-	-	288	19 15	CIRC		40	-	WC OPEN N	03
15	131600Z	12.6N 161.1E	P	15 10	700MB	85	-	-	282	19 11	CIRC		45	-	CLSD WC	03
16	140351Z	12.5N 159.0E	SAT	T6.0/6.0PLUS/D1.0/24HRS											ESSA 9	
17	141605Z	13.0N 157.7E	P	15 10	700MB	115	-	-	261	21 10	CIRC		35	-	WC OPEN N	04
18	142137Z	13.4N 156.5E	P	15 10	700MB	115	130	-	264	19 12	CIRC		35	-	WC OPEN N	04
19	150032Z	13.8N 156.5E	SAT	STG X DIA 4 CAT 4.0											ESSA 8 (RODN)	
20	150430Z	14.7N 155.9E	P	5 5	700MB	90	130	945	262	18 10	CIRC		30	15	CLSD WC	05
21	150448Z	14.5N 156.0E	SAT	T5.0/6.0MINUS/W1.0/24HRS											ESSA 9	
22	150448Z	14.5N 156.0E	SAT	STG X DIA 2 CAT 3.5											ESSA 9	
23	150910Z	15.1N 155.7E	P	10 5	700MB	100	-	940	257	19 11	CIRC		25	-	CLSD WC	05
24	151225Z	15.8N 155.2E	AC R	-							-	- -	-	-		
25	151330Z	16.0N 155.4E	AC R	-							-	- -	-	-		
26	160400Z	18.1N 153.8E	P	4 2	700MB	110	115	940	257	20 11	CIRC		25	5	WC OPEN S	06
27	160403Z	18.0N 154.0E	SAT	T7.0/7.0MINUS/D2.0/24HRS											ESSA 9	
28	161015Z	19.3N 153.3E	P	5 3	700MB	100	-	945	262	17 14	CIRC		30	5	WC OPEN S	06
29	161653Z	20.2N 152.6E	P	3 2	700MB	75	-	949	264	16 12	CIRC		25	5	WC OPEN S SEMIC	07
30	170455Z	21.5N 151.5E	SAT	T5.0/6.0/W2.0/24HRS											ESSA 9	
31	170455Z	21.5N 151.5E	DVORAK I NC.T5													
32	171106Z	21.9N 151.1E	P	15 5	700MB	70	-	946	262	20 12	CIRC		25	10	WC OPEN SW	08
33	171501Z	22.1N 150.8E	P	10 5	700MB	75	-	949	264	18 13	CIRC		25	10	WC OPEN SW-NW	08
34	180359Z	23.5N 150.5E	SAT	T5.0/6.0PLUS/S0/24HRS											ESSA 9	
35	181019Z	23.0N 149.6E	P	10 10	700MB	75	-	-	275	20 16	-	- -	-	-	WC OPEN SE-NW	09
36	181202Z	23.8N 149.7E	P	- -	700MB	-	-	-	-	- -	-	- -	-	-		
37	181522Z	24.2N 149.7E	P	10 10	700MB	100	-	-	277	19 16	-	- -	-	-	NO DEF	09
38	190015Z	24.9N 148.9E	P	10 10	700MB	87	90	967	281	17 -	-	- -	-	-		10
39	190121Z	24.9N 149.0E	P	- -	700MB	-	-	-	-	- -	-	- -	-	-		
40	190325Z	25.8N 149.2E	P	10	700MB	75	85	962	278	16 -	-	- -	-	-	LTRD CLDS IN CNTR	10
41	190458Z	26.0N 149.0E	SAT	T5.0/5.0/S0/24HRS											ESSA 9	
42	191015Z	26.0N 148.3E	P	5 5	700MB	50	-	964	279	15 15	-	- -	-	-	SC UNDERCAST IN CNTR	11
43	191144Z	26.2N 148.1E	P	- -	700MB	-	-	-	-	- -	-	- -	-	-		
44	191430Z	26.3N 147.8E	P	3 3	700MB	54	-	961	276	16 12	-	- -	-	-	SC UNDERCAST IN CNTR	11
45	200052Z	27.2N 149.4E	SAT	STG X DIA 4 CAT 2.0											ESSA 8 (RODN)	
46	200405Z	27.5N 147.5E	SAT	T4.0/5.0/W1.0/24HRS											ESSA 9	
47	200503Z	27.8N 147.1E	P	5 5	700MB	50	50	966	279	15 13	-	- -	-	-	BRKN-OVC CI ABV IN CNTR	12
48	200635Z	27.9N 146.9E	P	- -	700MB	-	-	-	-	- -	-	- -	-	-		
49	200908Z	27.8N 146.7E	P	5 3	700MB	70	40	967	280	15 13	-	- -	-	-	BRKN-OVC CI ABV IN CNTR	12
50	201614Z	28.2N 145.7E	P	5 3	700MB	70	-	-	281	16 14	-	- -	-	-	LRG AREA OF L/V	13
51	201815Z	28.1N 146.1E	P	- -	700MB	-	-	-	-	- -	-	- -	-	-		
52	202048Z	28.2N 146.2E	P	- -	700MB	-	-	-	-	- -	-	- -	-	-		
53	202105Z	28.2N 146.2E	P	10 5	700MB	65	65	966	281	17 13	-	- -	-	-	BRKN AS LTRD IN CNTR	13
54	210459Z	29.0N 144.5E	SAT	STG C											ESSA 9	
55	211000Z	29.0N 143.4E	P	2 10	700MB	80	-	965	276	16 10	-	- -	-	-	OVC CS ABV IN CNTR	14
56	212228Z	29.1N 139.6E	P	25 5	700MB	51	70	971	284	14 12	CIRC		40	-	WC OPEN SW	15
57	220330Z	29.4N 139.0E	P	3 5	700MB	70	50	-	282	14 13	-	- -	-	-		16
58	221820Z	30.3N 135.9E	P	15 5	700MB	97	-	970	284	15 -	-	- -	-	-		17
59	230000Z	31.1N 134.3E	P	3 3	700MB	45	65	970	284	15 12	-	- -	-	-	CNTR BRKN ABV OVC BLO	18
60	230130Z	31.0N 134.0E	SAT	STG X DIA 4 CAT 3.0											ESSA 8 (RJTZ)	
61	230330Z	31.6N 133.4E	P	3 5	700MB	57	50	972	284	15 13	-	- -	-	-	CNTR WIDE AND DIF	18
62	230500Z	31.9N 133.1E	LRDR	-							-	- -	-	-	33.3N 134.2E	
63	230505Z	31.8N 133.0E	SAT	STG X DIA 1 CAT 2.0											ESSA 9	
64	230600Z	31.9N 132.8E	LRDR	-							-	- -	-	-	30.6N 131.0E	
65	230600Z	32.0N 132.8E	LRDR	-							-	- -	-	-	33.3N 134.2E	
66	230700Z	31.9N 132.3E	LRDR	-							-	- -	-	-	34.3N 132.6E	
67	230700Z	32.0N 132.6E	LRDR	-							-	- -	-	-	30.6N 131.0E	
68	230700Z	32.2N 132.5E	LRDR	-							-	- -	-	-	33.3N 134.2E	
69	230800Z	32.2N 132.3E	LRDR	-							-	- -	-	-	30.6N 131.0E	
70	230800Z	32.2N 132.4E	LRDR	-							-	- -	-	-	34.3N 132.6E	
71	230800Z	32.3N 132.3E	LRDR	-							-	- -	-	-	33.3N 134.2E	
72	230900Z	32.3N 132.3E	LRDR	-							-	- -	-	-	34.3N 132.6E	
73	230900Z	32.4N 132.1E	LRDR	-							-	- -	-	-	30.6N 131.0E	
74	231000Z	32.8N 131.9E	LRDR	-							-	- -	-	-	33.3N 134.2E	
75	231000Z	32.9N 132.0E	LRDR	-							-	- -	-	-	33.4N 130.4E	
76	231100Z	32.9N 132.0E	LRDR	-							-	- -	-	-	33.3N 134.2E	
77	231100Z	33.1N 131.7E	LRDR	-							-	- -	-	-	33.4N 130.4E	
78	231110Z	32.8N 132.0E	LRDR	-							-	- -	-	-	33.4N 130.4E	
79	231200Z	33.1N 131.6E	LRDR	-							-	- -	-	-	30.6N 131.0E	
80	231200Z	33.1N 131.5E	LRDR	-							-	- -	-	-	34.3N 132.6E	
81	231200Z	33.1N 131.6E	LRDR	-							-	- -	-	-	33.4N 130.4E	
82	231211Z	33.1N 131.6E	LRDR	-							-	- -	-	-	33.4N 130.4E	
83	231813Z	34.4N 130.4E	LRDR	-							-	- -	-	-	33.4N 130.4E	
84	240222Z	39.0N 129.5E	SAT	STG C.											ESSA 8 (RJTZ)	

TYPHOON ALICE
FIX POSITIONS FOR CYCLONE NO. 13
30 JUL - 9 AUG

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV	ACCRY MET	FLT LVL	FLT LVL WND	OBS SFC WND	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT	FLT LVL TD	EYE FORM	ORIEN-TATION	EYE DIA	THKN WALL CLD	POSIT OF RADAR /REMARKS	
1	300405Z	7.0N 163.0E	SAT	T2.0/2.0/D1.0/24HRS													ESSA 9	
2	310310Z	12.0N 162.5E	SAT	T3.0/3.0PLUS/D2.0/24HRS													ESSA 9	
3	010220Z	15.3N 158.9E	P	10	5	700MB	50	45	988	299	11	9	-	- -	-	-	NEG WC	01
4	010414Z	16.0N 158.0E	SAT	T3.5/3.5PLUS/D0.5/24HRS													ESSA 9	
5	011312Z	16.3N 157.6E	P	-	-	700MB	-	-	-	-	-	-	-	- -	-	-		
6	011547Z	16.6N 157.9E	P	10	5	700MB	44	-	991	300	12	10	CIRC		40	20	WC OPEN NW-SSW	02
7	020508Z	17.5N 156.5E	SAT	T4.5/4.5/D1.0/24HRS													ESSA 9	
8	020535Z	17.9N 156.8E	P	2	10	700MB	55	60	978	290	14	13	CIRC		60	-	WC PR DEF	03
9	030400Z	20.8N 155.2E	P	3	2	700MB	60	70	966	282	18	14	-	- -	-	-	WC APPRS FRMG NW	04
10	030413Z	21.0N 155.0E	SAT	T5.5/5.5PLUS/D1.0/24HRS													ESSA 9	
11	030700Z	21.3N 154.8E	P	8	-	700MB	-	-	967	-	-	-	-	- -	-	-		
12	030815Z	21.3N 155.0E	P	10	5	700MB	76	70	965	281	17	15	-	- -	-	-	PRIL WC	04
13	040123Z	24.2N 152.6E	SAT	STG X DIA 4 CAT 3.0													ESSA 8 (ROUN)	
14	040320Z	24.0N 151.5E	SAT	T6.5/6.5PLUS/D1.0/24HRS													ESSA 9	
15	040428Z	24.4N 151.5E	P	15	3	700MB	90	75	965	277	16	14	-	- -	-	-	NEG WC	05
16	040845Z	25.0N 151.1E	P	15	-	700MB	-	-	-	-	-	-	-	- -	-	-		
17	040950Z	25.0N 150.7E	P	3	8	700MB	85	65	964	277	17	15	CIRC		50	8	CLSD WC-PR DEF	05
18	041041Z	25.0N 150.8E	SAT	STG UNK														
19	050205Z	26.0N 148.6E	SAT	STG X DIA 1 CAT 2.0														
20	050415Z	27.5N 147.6E	P	2	5	700MB	55	45	971	284	15	-	-	- -	-	-	NEG WC	06
21	050618Z	27.8N 147.4E	P	-	-	700MB	-	-	-	-	-	-	-	- -	-	-		
22	050900Z	28.0N 146.7E	P	2	6	700MB	70	40	972	285	15	-	-	- -	-	-	NEG RDR PRES	06
23	051600Z	28.6N 145.7E	P	15	10	700MB	65	-	974	286	15	-	-	- -	-	-	WK FBS SE	07
24	052100Z	29.6N 144.9E	P	5	10	700MB	68	55	984	293	14	11	-	- -	-	-	NEG RDR PRES	07
25	060520Z	30.5N 143.0E	SAT	T4.5/6.0/W1.5/24HRS													ESSA 9	
26	061200Z	31.8N 142.1E	LRDR	-									-	- -	-	-	35.3N 138.7E	
27	061400Z	32.1N 141.6E	LRDR	-									-	- -	-	-	35.3N 138.7E	
28	061500Z	32.4N 141.4E	LRDR	-									-	- -	-	-	35.3N 138.7E	
29	061600Z	32.6N 141.2E	LRDR	-									-	- -	-	-	35.3N 138.7E	
30	061700Z	32.8N 141.1E	LRDR	-									-	- -	-	-	35.3N 138.7E	
31	061705Z	32.8N 140.9E	P	2	5	700MB	45	-	978	289	14	-	-	- -	-	-	NEG WC	09
32	061900Z	33.1N 140.8E	LRDR	-									-	- -	-	-	35.3N 138.7E	
33	062000Z	33.3N 141.0E	LRDR	-									-	- -	-	-	35.3N 138.7E	
34	062100Z	33.3N 140.7E	P	2	5	700MB	75	45	981	291	15	-	-	- -	-	-	RDR PRES POOR	09
35	062300Z	33.8N 141.2E	LRDR	-									-	- -	-	-		
36	062300Z	33.7N 141.0E	LRDR	-									-	- -	-	-	35.7N 139.8E	
37	062300Z	33.5N 141.1E	LRDR	-									-	- -	-	-		
38	062340Z	34.0N 140.9E	LRDR	-									-	- -	-	-		
39	070000Z	33.9N 141.2E	LRDR	-									-	- -	-	-	35.7N 139.8E	
40	070100Z	34.2N 141.0E	LRDR	-									-	- -	-	-	35.7N 139.8E	
41	070100Z	34.3N 141.0E	LRDR	-									-	- -	-	-		
42	070138Z	34.6N 141.0E	LRDR	-									-	- -	-	-		
43	070200Z	35.0N 141.3E	LRDR	-									-	- -	-	-	35.7N 139.8E	
44	070200Z	34.7N 140.9E	LRDR	-									-	- -	-	-		
45	070359Z	34.9N 140.9E	P	5	10	700MB	75	35	984	296	14	9	-	- -	-	-	NEG RDR PRES	10
46	070400Z	34.8N 141.1E	LRDR	-									-	- -	-	-		
47	070400Z	35.2N 141.2E	LRDR	-									-	- -	-	-	35.7N 139.8E	
48	070422Z	34.6N 141.0E	SAT	T4.0/4.5/W0.5/24HRS													ESSA 9	
49	070452Z	35.1N 141.2E	P	-	-	700MB	-	-	-	-	-	-	-	- -	-	-		
50	070500Z	35.4N 141.3E	LRDR	-									-	- -	-	-		
51	070500Z	35.2N 141.2E	LRDR	-									-	- -	-	-	35.7N 139.8E	
52	070600Z	35.5N 141.6E	LRDR	-									-	- -	-	-	35.3N 138.7E	
53	070700Z	35.9N 141.8E	LRDR	-									-	- -	-	-	36.4N 140.5E	
54	070700Z	35.4N 141.4E	LRDR	-									-	- -	-	-	35.7N 139.8E	
55	070600Z	36.2N 141.8E	LRDR	-									-	- -	-	-	35.3N 138.7E	
56	070800Z	36.0N 141.7E	LRDR	-									-	- -	-	-	36.3N 140.9E	
57	070830Z	36.4N 141.5E	P	-	-	700MB	-	-	-	-	-	-	-	- -	-	-		
58	070900Z	36.2N 141.8E	LRDR	-									-	- -	-	-	35.3N 138.7E	
59	070900Z	36.4N 142.0E	LRDR	-									-	- -	-	-	36.3N 140.9E	
60	070900Z	36.5N 141.9E	LRDR	-									-	- -	-	-		
61	071000Z	36.6N 141.6E	P	5	10	700MB	40	35	987	297	14	-	-	- -	-	-	- - -	10
62	071100Z	36.8N 141.7E	LRDR	-									-	- -	-	-	36.3N 140.9E	
63	071100Z	37.0N 141.9E	LRDR	-									-	- -	-	-	35.3N 138.7E	
64	071500Z	37.7N 142.9E	LRDR	-									-	- -	-	-	35.3N 138.7E	
65	080526Z	40.8N 147.1E	SAT	STG C													ESSA 9	
66	090429Z	43.0N 158.5E	SAT	T1.5/2.5/W1.0/24HRS													ESSA 9	

TYPHOON BETTY
FIX POSITIONS FOR CYCLONE NO. 14
8 AUG - 17 AUG

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FLT LVL	FLT LVL WND	OBS SFC WND	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TD	EYE FORM	ORIEN-TATION	EYE DIA	THKN WALL CLD	POSIT OF RADAR /REMARKS	
1	080511Z	12.0N 154.0E	SAT	T1.0/1.0/D1.0/24HRS											ESSA 9	
2	080906Z	11.5N 150.5E	P	3 10	700MB	20	-	1006	310	10 -	ELIP	SW-NE	20X10	-	WND CNTR	01
3	082235Z	11.7N 149.8E	P	5 10	700MB	30	30	1005	311	11 9	-	- -	-	-	WC PSBLY FRMG SE QUAD	02
4	090003Z	11.8N 149.5E	P	- 10	700MB	25	30	1003	310	11 10	-	- -	-	-	WC BCMG DEF S SEMIC	02
5	090300Z	12.1N 149.5E	P	5 10	700MB	30	30	1001	310	12 10	-	- -	-	-	WC SHNG ORG S SEMIC	02
6	090420Z	12.0N 149.5E	SAT	T2.5/2.5PLUS/D1.5/24HRS											ESSA 9	
7	091230Z	13.1N 148.4E	P	3 15	700MB	25	-	996	306	12 -	-	- -	-	-	NEG RDR PRES	03
8	091605Z	13.3N 148.3E	P	3 10	700MB	40	-	993	303	19 -	-	- -	-	-	NEG RDR PRES	03
9	092130Z	14.2N 147.7E	P	5 2	700MB	40	50	993	300	14 10	-	- -	-	-	NEG WC FB E SEMIC	04
10	092322Z	14.4N 147.6E	P	- -	700MB	-	-	-	-	- -	-	- -	-	-		
11	100349Z	15.1N 146.8E	P	2 2	700MB	55	45	985	298	17 13	ELIP	N-S	40X35	-	WC PR DEF S AND OPEN N	04
12	100519Z	15.4N 146.8E	SAT	T4.0/4.0/D2.0/25HRS											ESSA 9	
13	100930Z	16.0N 146.0E	P	2 2	700MB	75	-	986	298	16 11	CIRC		20	-	WC OPEN SW	05
14	101530Z	16.7N 144.8E	P	2 10	700MB	-	-	987	297	13 9	-	- -	-	-	EYE UNORG	05
15	110035Z	17.7N 144.7E	SAT	STG X DIA 4 CAT 2.0											ESSA 8 (RODN)	
16	110422Z	17.4N 144.3E	SAT	T4.5/4.5/D0.5/23HRS											ESSA 9	
17	110945Z	17.8N 142.3E	P	5 15	700MB	57	-	986	298	13 -	-	- -	-	-	SFC CNTR 15NM DIA	06
18	111215Z	18.5N 141.8E	P	- -	700MB	-	-	-	-	- -	-	- -	-	-		
19	111545Z	18.6N 141.1E	P	3 15	700MB	40	-	986	294	11 14	CIRC		5	7	WC OPEN SW	06
20	120405Z	18.6N 139.1E	P	2 5	700MB	75	80	961	276	16 -	-	- -	-	-		
21	120520Z	18.5N 138.5E	SAT	STG X DIA 2 CAT 3.5											ESSA 9	
22	120615Z	18.8N 138.7E	P	- -	700MB	-	-	-	-	- -	-	- -	-	-		
23	120848Z	18.8N 138.1E	P	- -	700MB	-	-	-	-	- -	-	- -	-	-		
24	121000Z	18.7N 137.8E	P	2 5	700MB	70	50	957	272	16 12	CIRC		30	-	NOR EYE FRMG RPDLY	07
25	121600Z	18.9N 136.6E	P	3 3	700MB	100	-	954	269	19 10	CIRC		30	5	CLSD WC	08
26	121745Z	18.9N 136.3E	P	3 3	700MB	75	-	955	269	19 10	CIRC		30	5	CLSD WC	08
27	121920Z	19.0N 136.1E	P	3 3	700MB	60	-	949	266	20 -	CIRC		30	5	CLSD WC	08
28	122045Z	19.1N 135.9E	P	- -	700MB	- -	-	-	-	- -	-	- -	-	-		
29	122135Z	18.6N 135.5E	AC R	-							CIRC		40	-		
30	122205Z	18.6N 135.8E	P	5 5	700MB	105	85	948	265	21 13	CIRC		20	-	CLSD WC	09
31	130024Z	19.0N 136.0E	SAT	STG X DIA 4 CAT 4.0											ESSA 8 (RODN)	
32	130620Z	19.0N 134.0E	SAT	T6.0/6.0/S0/24HRS											ESSA 9	
33	130910Z	19.0N 134.1E	P	5 2	700MB	100	85	933	253	22 14	CIRC		20	5	CLSD WC	10
34	131053Z	19.2N 133.6E	P	- -	700MB	-	-	-	-	- -	-	- -	-	-		
35	131520Z	19.1N 133.1E	P	4 2	700MB	110	-	923	243	26 13	CIRC		20	-	CLSD WC	11
36	131722Z	19.4N 132.8E	P	- -	700MB	-	-	-	-	- -	-	- -	-	-		
37	140118Z	19.4N 132.0E	SAT	STG X DIA 4 CAT 4.0											ESSA 8 (RODN)	
38	140405Z	19.9N 131.7E	P	5 5	700MB	110	100	916	237	23 13	CIRC		25	4	CLSD WC	12
39	140945Z	20.2N 130.3E	P	10 5	700MB	100	100	920	235	20 13	CIRC		17	4	CLSD WC	13
40	141203Z	20.4N 130.0E	P	- -	600MB	-	-	-	-	- -	-	- -	-	-		
41	141520Z	20.6N 129.4E	P	5 6	700MB	100	-	923	242	21 13	CIRC		20	5	CLSD WC	14
42	142200Z	21.2N 128.1E	P	1 2	700MB	100	120	926	244	18 15	CIRC		20	-	CLSD WC	15
43	142345Z	21.1N 127.7E	P	- -	700MB	-	-	-	-	- -	-	- -	-	-		
44	150207Z	21.5N 128.1E	SAT	STG X DIA 5 CAT 4.0											ESSA 8 (RODN)	
45	150250Z	21.5N 127.3E	AC R	-							CIRC		19	-		
46	150415Z	21.1N 127.0E	P	3 3	700MB	97	115	920	239	17 16	CIRC		15	3	CLSD WC	16
47	150622Z	21.2N 126.9E	SAT	T7.0/7.0/D0.5/25HRS											ESSA 9	
48	150635Z	21.4N 127.0E	P	- -	700MB	-	-	-	-	- -	-	- -	-	-		
49	151005Z	21.7N 126.8E	P	15 3	700MB	95	-	910	230	20 14	CIRC		12	5	CLSD WC	17
50	151147Z	21.9N 126.6E	P	- -	700MB	-	-	-	-	- -	-	- -	-	-		
51	151200Z	21.6N 126.2E	SCF				-	-								
52	151300Z	21.9N 126.5E	LRDR	-							-	- -	-	-	24.8N 125.3E	
53	151400Z	22.2N 126.4E	LRDR	-							-	- -	-	-	24.3N 124.2E	
54	151410Z	22.3N 126.5E	LRDR	-							-	- -	-	-	24.8N 125.3E	
55	151500Z	22.5N 126.3E	P	10 5	700MB	100	-	915	234	18 14	CIRC		15	5	CLSD WC	17
56	151500Z	22.4N 126.2E	LRDR	-							-	- -	-	-	24.8N 125.3E	
57	151500Z	22.4N 126.2E	LRDR	-							-	- -	-	-	24.3N 124.2E	
58	151545Z	22.7N 126.3E	LRDR	-							-	- -	-	-	24.8N 125.3E	
59	151600Z	22.6N 126.0E	LRDR	-							-	- -	-	-	24.8N 125.3E	
60	151600Z	22.5N 126.1E	LRDR	-							-	- -	-	-	24.3N 124.2E	
61	151645Z	22.8N 126.1E	LRDR	-							-	- -	-	-	25.0N 121.5E	
62	151700Z	22.7N 126.0E	LRDR	-							-	- -	-	-	24.8N 125.3E	
63	151700Z	22.7N 125.9E	LRDR	-							-	- -	-	-	24.3N 124.2E	
64	151800Z	22.9N 125.8E	LRDR	-							-	- -	-	-	24.8N 125.3E	
65	151800Z	22.9N 125.8E	LRDR	-							-	- -	-	-	24.3N 124.2E	
66	151900Z	23.0N 125.7E	LRDR	-							-	- -	-	-	24.8N 125.3E	
67	151900Z	22.9N 125.7E	LRDR	-							-	- -	-	-	24.3N 124.2E	
68	152030Z	23.3N 125.5E	LRDR	-							-	- -	-	-	25.0N 121.5E	
69	152100Z	23.2N 125.4E	LRDR	-							-	- -	-	-	24.3N 124.2E	
70	152100Z	23.3N 125.4E	LRDR	-							-	- -	-	-	24.8N 125.3E	
71	152150Z	23.4N 125.4E	LRDR	-							-	- -	-	-	24.8N 125.3E	
72	152200Z	23.4N 125.2E	LRDR	-							-	- -	-	-	24.3N 124.2E	
73	152200Z	23.4N 125.3E	LRDR	-							-	- -	-	-	24.8N 125.3E	
74	152230Z	23.5N 124.3E	LRDR	-							-	- -	-	-	24.8N 125.3E	
75	152300Z	23.5N 125.1E	LRDR	-							-	- -	-	-	24.3N 124.2E	
76	152300Z	23.5N 125.1E	LRDR	-							-	- -	-	-	24.8N 125.3E	
77	160000Z	23.7N 125.0E	LRDR	-							-	- -	-	-	24.8N 125.3E	
78	160100Z	23.9N 124.9E	LRDR	-							-	- -	-	-	24.8N 125.3E	
79	160200Z	23.9N 124.9E	LRDR	-							-	- -	-	-	25.0N 121.5E	
80	160200Z	24.0N 124.7E	LRDR	-							-	- -	-	-	24.8N 125.3E	
81	160200Z	24.0N 124.8E	LRDR	-							-	- -	-	-	24.3N 124.2E	
82	160300Z	24.2N 124.6E	LRDR	-							-	- -	-	-	24.8N 125.3E	
83	160300Z	24.2N 124.7E	LRDR	-							-	- -	-	-	25.0N 121.5E	
84	160400Z	24.3N 124.4E	LRDR	-							-	- -	-	-	24.8N 125.3E	
85	160400Z	24.4N 124.5E	LRDR	-							-	- -	-	-	24.3N 124.2E	
86	160446Z	24.2N 124.2E	SAT	T6.0/7.0MINUS/W1.0/24HRS											ESSA 9	
87	160500Z	24.4N 124.5E	LRDR	-							-	- -	-	-	25.1N 121.5E	
88	160500Z	24.4N 124.3E	LRDR	-							-	- -	-	-	24.8N 125.3E	
89	160600Z	24.6N 124.3E	LRDR	-							-	- -	-	-	24.8N 125.3E	
90	160600Z	24.7N 124.2E	LRDR	-							-	- -	-	-	24.3N 124.2E	
91	160700Z	24.9N 124.1E	LRDR	-							-	- -	-	-	25.1N 121.5E	
92	160700Z	24.5N 124.1E	LRDR	-							-	- -	-	-	24.8N 125.3E	
93	160800Z	24.9N 124.0E	LRDR	-							-	- -	-	-	24.8N 125.3E	
94	160800Z	25.0N 124.0E	LRDR	-							-	- -	-	-	24.3N 124.2E	
95	160900Z	25.1N 123.8E	LRDR	-							-	- -	-	-	24.3N 124.2E	
96	160900Z	25.2N 123.8E	LRDR	-							-	- -	-	-	24.8N 125.3E	
97	161000Z	25.3N 123.7E	LRDR	-							-	- -	-	-	24.3N 124.2E	

TYPHOON BETTY

FIX POSITIONS FOR CYCLONE NO. 14
8 AUG - 17 AUG

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FLT LVL	FLT LVL WND	OBS SFC WND	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TD	EYE FORM	ORIEN-TATION	EYE DIA	THKN WALL CLD	POSIT OF RADAR /REMARKS	
98	161000Z	25.2N 123.7E	LRDR	-							-	- -	-	-	24.8N 125.3E	
99	161000Z	25.2N 123.5E	LRDR	-							-	- -	-	-	24.0N 121.6E	
100	161015Z	25.2N 123.6E	P	5 10	700MB	65	-	937	253	16 -	ELIF	SW-NE	30X20	3	AC PR DEF	18
101	161100Z	25.3N 123.3E	LRDR	-							-	- -	-	-	24.8N 125.3E	
102	161100Z	24.9N 124.0E	LRDR	-							-	- -	-	-	26.2N 127.7E	
103	161100Z	25.3N 123.3E	LRDR	-							-	- -	-	-	24.0N 121.6E	
104	161200Z	25.5N 123.2E	LRDR	-							-	- -	-	-	24.3N 124.2E	
105	161200Z	25.3N 123.2E	LRDR	-							-	- -	-	-	24.8N 125.3E	
106	161300Z	25.5N 122.8E	LRDR	-							-	- -	-	-	25.1N 121.5E	
107	161300Z	25.5N 122.9E	LRDR	-							-	- -	-	-	24.8N 125.3E	
108	161330Z	25.5N 122.7E	LRDR	-							-	- -	-	-	25.1N 121.5E	
109	161400Z	25.5N 122.6E	LRDR	-							-	- -	-	-	24.3N 124.2E	
110	161430Z	25.5N 122.5E	LRDR	-							-	- -	-	-	25.1N 121.5E	
111	161500Z	25.8N 122.2E	LRDR	-							-	- -	-	-	25.1N 121.5E	
112	161630Z	25.7N 122.3E	P	5 5	700MB	60	-	937	254	17 14	CIRC		12	-	CLSD WC	19
113	161800Z	25.8N 122.0E	LRDR	-							-	- -	-	-	25.1N 121.5E	
114	162000Z	25.5N 121.5E	LRDR	-							-	- -	-	-	25.0N 121.5E	
115	162100Z	25.8N 121.7E	LRDR	-							-	- -	-	-	25.0N 121.5E	
116	162200Z	26.1N 121.5E	LRDR	-							-	- -	-	-	25.0N 121.5E	
117	170100Z	26.5N 121.5E	LRDR	-							-	- -	-	-	25.0N 121.5E	
118	170200Z	26.9N 121.4E	LRDR	-							-	- -	-	-	25.0N 121.5E	
119	170230Z	26.0N 121.0E	SAT STG X DIA 6 CAT 2.0												ESSA 8 (RJTZ)	
120	170300Z	26.9N 121.0E	LRDR	-							-	- -	-	-	25.0N 121.5E	
121	170630Z	27.3N 120.6E	LRDR	-							-	- -	-	-	25.0N 121.5E	
122	170700Z	27.3N 120.3E	LRDR	-							-	- -	-	-	25.0N 121.5E	

TYPHOON CORA

FIX POSITIONS FOR CYCLONE NO. 16
23 AUG - 28 AUG

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FLT LVL	FLT LVL WND	OBS SFC WND	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TD	EYE FORM	ORIEN-TATION	EYE DIA	THKN WALL CLD	POSIT OF RADAR /REMARKS	
1	230630Z	19.8N 119.0E	SAT T2.0/2.0/D0.5/24HRS												ESSA 9	
2	240728Z	19.5N 118.0E	SAT T2.5/2.5/D0.5/24HRS												ESSA 9	
3	250600Z	19.1N 116.5E	P	5 3	1500FT	40	30	991	-	27 -	-	- -	-	-	SFC CNTR CALM-15NM DIA	02
4	250632Z	19.0N 116.0E	SAT T3.0/3.0/D0.5/24HRS												ESSA 9	
5	250740Z	18.0N 116.0E	AC R	-							-	- -	-	-		
6	252320Z	18.8N 115.1E	P	5 5	700MB	40	35	988	299	15 12	-	- -	-	-	FB FM 80NM TO NW	03
7	260656Z	18.8N 114.6E	P	5 8	700MB	35	55	984	299	19 13	-	- -	-	-	WK FB FRMG SE	04
8	260730Z	18.5N 114.5E	SAT T4.0/4.0/D1.0/24HRS												ESSA 9	
9	260955Z	18.7N 114.5E	P	5 8	700MB	45	55	981	296	18 14	-	- -	-	-	CNTR BRKN-FIL W/ SC	04
10	262100Z	18.8N 113.7E	LRDR	-							-	- -	-	-	22.4N 114.1E	
11	262200Z	18.7N 111.3E	LRDR	-							-	- -	-	-	22.4N 114.1E	
12	270000Z	18.7N 111.3E	LRDR	-							-	- -	-	-	22.4N 114.1E	
13	270050Z	18.8N 113.5E	P	5 5	700MB	-	60	976	290	15 13	-	- -	-	5	NEG DEF	05
14	270300Z	18.6N 113.3E	P	5 5	700MB	55	60	976	289	15 13	CIRC		20	10	WC OPEN N	05
15	270632Z	18.5N 114.0E	SAT T3.0/3.5/D1.0/24HRS												ESSA 9	
16	271200Z	19.1N 111.2E	LRDR	-							-	- -	-	-	22.4N 114.1E	
17	271500Z	19.2N 111.9E	LRDR	-							-	- -	-	-	22.4N 114.1E	
18	280732Z	20.0N 108.5E	SAT T4.0/4.0MINUS/D1.0/24HRS												ESSA 9	

TYPHOON ELSIE
FIX POSITIONS FOR CYCLONE NO. 17
31 AUG - 3 SEP

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV	ACCRY MET	FLT LVL	FLT LVL WND	OBS SFC WND	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT	FLT LVL TD	EYE FORM	ORIEN-TATION	EYE DIA	THKN WALL CLD	POSIT OF RADAR /REMARKS	
1	310628Z	12.0N 117.0E	SAT T2.0/2.0/D0.5/24HRS														ESSA 9	
2	310845Z	13.0N 117.8E	P	5	20	700MB	40	30	1002	306	10	9	-	- -	-	-	WK CIRC SFC AND FL	02
3	311030Z	13.3N 117.5E	P	7	25	700MB	45	30	-	-	9	8	-	- -	-	-	CIRC VRY BROAD AND WK	02
4	312225Z	14.7N 115.2E	P	2	2	700MB	-	45	987	294	13	10	-	- -	-	-	SFC CNTR 20NM DIA	03
5	312331Z	15.6N 113.5E	SRDR		-								-	- -	-	-		
6	010310Z	15.2N 115.1E	SAT	STG UNK													ESSA 8 (HUDW)	
7	010313Z	15.1N 114.2E	P	2	8	700MB	65	65	983	295	14	8	CIRC		20	3	WC OPEN NW	04
8	010314Z	14.5N 114.2E	SAT	STG UNK													ESSA 8 (VTBU)	
9	010330Z	15.5N 113.8E	SRDR		-								-	- -	-	-		
10	010445Z	15.9N 110.3E	LRDR		-								-	- -	-	-	16.0N 108.2E	
11	010500Z	15.9N 113.7E	SRDR		-								-	- -	-	-		
12	010535Z	15.4N 114.0E	AC R		-								-	- -	-	-	15.4N 114.0E	
13	010700Z	15.3N 114.4E	SRDR		-								-	- -	-	-		
14	010727Z	15.5N 113.5E	P	2	0	700MB	70	75	985	298	14	12	CIRC		12	-	OPEN N-NW	04
15	010736Z	15.5N 113.5E	SAT T3.5/3.5/D1.5/24HRS														ESSA 9	
16	010800Z	15.5N 113.7E	SRDR		-								-	- -	-	-		
17	010900Z	15.6N 113.9E	SRDR		-								-	- -	-	-		
18	011029Z	15.7N 113.2E	P	3	2	700MB	65	65	986	298	16	9	CIRC		20	-	WALL SE-SW	05
19	011100Z	15.6N 113.4E	SRDR		-								-	- -	-	-		
20	011151Z	15.6N 113.4E	SRDR		-								-	- -	-	-		
21	011200Z	15.7N 113.2E	SRDR		-								-	- -	-	-		
22	011232Z	16.7N 113.2E	SRDR		-								-	- -	-	-		
23	011244Z	15.8N 113.0E	P	3	5	700MB	55	-	990	299	17	10	-	- -	-	-		05
24	011400Z	15.9N 113.0E	SRDR		-								-	- -	-	-		
25	011410Z	15.9N 113.0E	SRDR		-								-	- -	-	-		
26	011615Z	15.8N 112.7E	P	5	5	700MB	45	-	-	298	13	8	CIRC		20	5	OPEN N SEMIC	06
27	011800Z	16.1N 112.7E	SRDR		-								-	- -	-	-		
28	011833Z	16.1N 112.7E	SRDR		-								-	- -	-	-		
29	011845Z	16.0N 112.0E	SRDR		-								-	- -	-	-		
30	011900Z	16.1N 112.1E	P	5	5	700MB	45	-	-	298	14	8	CIRC		20	5	OPEN N SEMIC	06
31	011908Z	16.0N 112.0E	SRDR		-								-	- -	-	-		
32	011945Z	16.1N 112.1E	SRDR		-								-	- -	-	-		
33	012001Z	16.1N 112.1E	SRDR		-								-	- -	-	-		
34	012110Z	16.3N 111.7E	P	5	5	700MB	-	-	-	298	14	10	CIRC		20	-	OPEN N SEMIC	06
35	020210Z	15.5N 111.5E	SAT	STG UNK													ESSA 8 (VIBU)	
36	020445Z	16.0N 110.3E	LRDR		-								-	- -	-	-	16.0N 108.2E	
37	020615Z	16.1N 111.2E	LRDR		-								-	- -	-	-	16.0N 108.2E	
38	020643Z	15.7N 111.0E	SAT T4.5/4.5/D1.0/24HRS														ESSA 9	
39	020715Z	16.1N 111.3E	LRDR		-								-	- -	-	-	16.0N 108.2E	
40	020800Z	15.9N 111.3E	P	4	15	700MB	-	-	-	-	-	-	CIRC		15	-	WC STG NE	
41	020930Z	15.8N 111.1E	P	4	15	700MB	-	-	996	-	-	-	CIRC		15	-	RDR PRES POOR	07
42	021045Z	15.9N 110.8E	LRDR		-								-	- -	-	-	16.0N 108.2E	
43	021047Z	15.4N 110.8E	LRDR		-								-	- -	-	-	16.0N 108.2E	
44	021220Z	15.9N 110.5E	SRDR		-								-	- -	-	-		
45	021325Z	15.7N 111.0E	P	5	5	700MB	50	-	983	293	14	10	ELIP	N-S	20X15	-	WC OPEN NW AND SE	08
46	021400Z	15.7N 110.7E	SRDR		-								-	- -	-	-		
47	021426Z	15.7N 110.7E	SRDR		-								-	- -	-	-		
48	021452Z	15.7N 110.8E	AC R		-								-	- -	-	-	15.7N 110.8E	
49	021545Z	15.9N 110.3E	LRDR		-								-	- -	-	-	16.0N 108.2E	
50	021610Z	15.7N 110.5E	P	5	5	700MB	68	-	-	292	14	10	ELIP	SE-NW	20X15	-	WC OPEN NE AND S	08
51	021615Z	15.8N 110.4E	LRDR		-								CIRC		20	-	16.0N 108.2E	
52	021745Z	15.5N 110.4E	LRDR		-								-	- -	-	-	16.0N 108.2E	
53	021815Z	15.7N 110.2E	P	5	5	700MB	65	-	978	289	14	11	CIRC		28	10	WC OPEN NE	08
54	021912Z	15.4N 110.5E	SRDR		-								-	- -	-	-		
55	021945Z	15.7N 110.7E	LRDR		-								CIRC		25	-	16.0N 108.2E	
56	022006Z	15.4N 110.4E	SRDR		-								-	- -	-	-		
57	022045Z	15.6N 110.4E	LRDR		-								-	- -	-	-	16.0N 108.2E	
58	022114Z	15.4N 110.4E	SRDR		-								-	- -	-	-		
59	022245Z	15.6N 110.4E	LRDR		-								CIRC		23	-	16.0N 108.2E	
60	022315Z	15.8N 110.3E	LRDR		-								CIRC		28	-	16.0N 108.2E	
61	022345Z	15.8N 110.3E	LRDR		-								CIRC		35	-	16.0N 108.2E	
62	030015Z	15.8N 110.2E	LRDR		-								CIRC		35	-	16.0N 108.2E	
63	030045Z	15.7N 110.2E	LRDR		-								CIRC		35	-	16.0N 108.2E	
64	030045Z	15.6N 110.3E	SRDR		-								-	- -	-	-		
65	030100Z	15.6N 110.3E	P	5	3	700MB	65	90	976	288	16	8	ELIP	SE-NW	30X20	3	WC OPEN NW	09
66	030130Z	15.5N 110.5E	SRDR		-								-	- -	-	-		
67	030145Z	15.7N 110.2E	LRDR		-								CIRC		35	-	16.0N 108.2E	
68	030215Z	15.6N 110.2E	SRDR		-								-	- -	-	-		
69	030245Z	15.6N 110.1E	LRDR		-								-	- -	-	-	16.0N 108.2E	
70	030400Z	15.5N 110.0E	P	5	5	700MB	65	65	978	287	15	10	ELIP	N-S	30X20	3	WC OPEN N	09
71	030445Z	15.5N 109.8E	LRDR		-								-	- -	-	-	16.0N 108.2E	
72	030600Z	15.5N 109.9E	P	5	5	700MB	55	65	974	284	15	9	ELIP	N-S	30X25	-	NEG WC	09
73	030736Z	15.0N 110.0E	SAT T4.0/4.5/W0.5/24HRS														ESSA 9	
74	030745Z	15.4N 109.3E	LRDR		-								-	- -	-	-	16.0N 108.2E	
75	030910Z	15.4N 109.6E	LRDR		-								-	- -	-	-	16.0N 108.2E	
76	031115Z	15.7N 109.5E	LRDR		-								-	- -	-	-	16.0N 108.2E	
77	031215Z	15.6N 109.6E	LRDR		-								-	- -	-	-	16.0N 108.2E	
78	031315Z	15.6N 109.6E	LRDR		-								-	- -	-	-	16.0N 108.2E	
79	031715Z	15.5N 109.4E	LRDR		-								-	- -	-	-	16.0N 108.2E	
80	031745Z	15.5N 109.4E	LRDR		-								-	- -	-	-	16.0N 108.2E	
81	031845Z	15.4N 109.4E	LRDR		-								-	- -	-	-	16.0N 108.2E	
82	032005Z	15.1N 109.3E	P	3	10	700MB	53	-	-	291	13	13	-	- -	-	-		
83	032115Z	15.2N 109.2E	P	3	10	700MB	53	-	-	291	12	10	-	- -	-	-	NEG WC	11
84	032145Z	15.9N 109.1E	LRDR		-								-	- -	-	-	16.0N 108.2E	
85	032315Z	15.4N 108.8E	LRDR		-								-	- -	-	-	16.0N 108.2E	
86	032345Z	15.3N 108.7E	LRDR		-								-	- -	-	-	16.0N 108.2E	

TYPHOON FLOSSIE
FIX POSITIONS FOR CYCLONE NO. 18
10 SEP - 16 SEP

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV	ACCRY MET	FLT LVL	FLT LVL WND	OBS SFC WND	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIEN-TATION	EYE DIA	THKN WALL CLD	POSIT OF RADAR/REMARKS	
1	1021052	14.8N 119.8E	AC R		-							-	- -	-	-		
2	1022182	14.4N 119.9E	P	1	8	700MB	35	-	-	307	9 8	-	- -	-	-	AS OVC ABV IN CNTR	03
3	1102482	14.8N 118.4E	P	-	-	600MB	-	-	-	-	- -	-	- -	-	-		
4	1104142	14.8N 118.7E	P	1	8	600MB	35	20	1004	310	7 7	-	- -	-		CALM SFC AREA EXTDS 90NM SW OF 700 CNTR	03
5	1110102	15.1N 117.8E	P	3	10	700MB	20	25	1004	305	9 8	-	- -	-	-	ICU ALQDS-SI CLDS DOM	04
6	1115302	14.8N 117.5E	P	2	5	700MB	30	-	-	310	10 10	-	- -	-	-	SFC CNTR 20NM DIA	05
7	1121062	14.6N 116.3E	P	5	10	700MB	40	-	-	309	9 11	-	- -	-	5	SFC CNTR 30NM DIA	05
8	1203522	15.0N 116.2E	P	2	5	700MB	30	30	1003	309	10 9	-	- -	-	-	SFC CNTR 8NM DIA	06
9	1209222	14.9N 115.4E	P	2	4	700MB	35	25	999	305	11 10	-	- -	-	-	FBS S	06
10	1211432	15.0N 115.5E	SAT T3.5/3.5/D1.0/24HRS													ESSA 9	
11	1215112	15.0N 115.0E	P	5	5	700MB	25	-	995	303	12 10	-	- -	-	-	RDR PRES POOR	07
12	1221552	15.4N 114.6E	P	5	3	700MB	30	-	992	300	14 13	-	- -	-	-	SFC CNTR 20NM DIA	08
13	1300202	15.4N 114.5E	P	-	-	700MB	-	-	-	-	- -	-	- -	-	-		
14	1302042	15.3N 113.8E	SAT SIG X DIA NA CAT 2.0													ESSA 8 (RDDN)	
15	1304002	15.6N 114.1E	P	5	10	700MB	35	20	991	300	13 9	-	- -	-	-	SFC CNTR 30NM DIA	09
16	1308302	15.8N 113.5E	P	5	10	700MB	35	-	990	298	12 10	-	- -	-	-	SFC CNTR 30NM DIA	09
17	1315572	15.5N 113.0E	P	2	2	700MB	40	-	985	295	12 13	-	- -	-	-	NO ORG ON RDR	10
18	1322152	15.3N 112.8E	P	5	5	500MB	45	-	984	-	3 -1	CIRC		22	3	WC OPEN W-N	11
19	1403002	15.3N 112.8E	P	3	3	700MB	66	60	982	292	16 10	CIRC		23	-	WC OPEN W-N	11
20	1406252	15.0N 111.5E	SAT T4.5/4.5/D1.5/24HRS													ESSA 9	
21	1410262	15.1N 112.0E	P	2	3	700MB	50	65	975	288	19 13	CIRC		20	5	WC OPEN N-E	12
22	1415212	15.0N 111.3E	P	5	5	700MB	58	-	977	290	17 11	-	- -	-	-	SFC CNTR 30NM DIA	12
23	1421432	15.0N 110.9E	P	1	2	700MB	65	-	976	286	15 11	CIRC		30	5	CLSD WC	13
24	1422302	14.9N 110.7E	LRDR		-							CIRC		30	-		
25	1423002	14.9N 110.6E	LRDR		-							CIRC		30	-		
26	1423432	15.0N 110.8E	P	-	-	700MB	-	-	-	-	- -	-	- -	-	-		
27	1500002	14.9N 110.6E	LRDR		-							-	- -	-	-		
28	1501312	14.9N 110.9E	LRDR		-							-	- -	-	-		
29	1502002	15.0N 110.5E	LRDR		-							-	- -	-	-		
30	1502152	15.1N 110.5E	LRDR		-							-	- -	-	-	16.1N 108.2E	
31	1502452	15.1N 110.5E	LRDR		-							-	- -	-	-	16.1N 108.2E	
32	1503102	15.0N 110.4E	P	1	2	700MB	75	70	978	289	15 12	CIRC		30	20	WC OPEN W	13
33	1505452	14.9N 110.1E	LRDR		-							-	- -	-	-	16.1N 108.2E	
34	1506452	15.1N 110.2E	LRDR		-							CIRC		40	-		
35	1506452	14.3N 109.9E	LRDR		-							-	- -	-	-	16.1N 108.2E	
36	1507532	15.0N 109.0E	SAT T4.0/4.5MINUS/W0.5/24HRS													ESSA 9	
37	1508002	15.0N 110.0E	LRDR		-							CIRC		50	-		
38	1509452	14.8N 110.0E	P	4	5	700MB	60	-	978	291	18 15	CIRC		30	-	WC OPEN E	14
39	1510452	14.7N 109.8E	LRDR		-							-	- -	-	-	16.1N 108.2E	
40	1511452	14.7N 109.8E	LRDR		-							-	- -	-	-	16.1N 108.2E	
41	1512152	14.2N 109.7E	LRDR		-							CIRC		25	-	16.1N 108.2E	
42	1512302	14.8N 109.5E	P	-	-	700MB	-	-	-	295	- -	-	- -	-	4		
43	1512452	14.7N 109.7E	LRDR		-							CIRC		20	-	16.1N 108.2E	
44	1513452	14.8N 109.3E	LRDR		-							CIRC		25	-	16.1N 108.2E	
45	1515002	14.8N 109.4E	LRDR		-							-	- -	-	-		
46	1515002	14.8N 109.3E	P	2	5	700MB	70	-	-	295	19 -	CIRC		30	10	WC WELL DEF N-S	14
47	1515452	14.5N 109.1E	LRDR		-							CIRC		15	-	16.1N 108.2E	
48	1516152	14.5N 109.1E	LRDR		-							CIRC		18	-	16.1N 108.2E	
49	1516452	14.5N 109.0E	LRDR		-							CIRC		16	-	16.1N 108.2E	
50	1517152	14.5N 108.9E	LRDR		-							CIRC		15	-	16.1N 108.2E	
51	1517452	14.5N 108.9E	LRDR		-							ELIP	N-S	17X10	-	16.1N 108.2E	
52	1518152	14.5N 108.9E	LRDR		-							CIRC		15	-	16.1N 108.2E	
53	1518222	14.4N 109.0E	LRDR		-							-	- -	-	-	16.1N 108.2E	
54	1519452	14.5N 108.9E	LRDR		-							CIRC		15	-	16.1N 108.2E	
55	1520152	14.5N 108.8E	LRDR		-							CIRC		15	-	16.1N 108.2E	
56	1600452	14.5N 108.6E	LRDR		-							CIRC		18	-	16.1N 108.2E	
57	1601452	14.5N 108.6E	LRDR		-							CIRC		17	-	16.1N 108.2E	
58	1602452	14.5N 108.5E	LRDR		-							ELIP	N-S	23X16	-	16.1N 108.2E	

TYPHOON HELEN
FIX POSITIONS FOR CYCLONE NO. 20
13 SEP - 17 SEP

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV	ACCRY MET	FLT LVL	FLT LVL WND	OBS SFC WND	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIEN-TATION	EYE DIA	THKN WALL CLD	POSIT OF RADAR/REMARKS	
1	130300Z	15.7N 136.3E	P	5	5	700MB	58	50	-	298	16 12	CIRC		30	-	WC PR DEF	02
2	130914Z	16.5N 135.9E	P	5	5	700MB	64	65	978	291	18 13	CIRC		25	-	WC OPEN NW	02
3	140054Z	18.1N 134.0E	SAT STG X DIA NA CAT 2.0													ESSA 8 (RODN)	
4	140500Z	20.0N 133.0E	DVORAK T NC.14														
5	140930Z	19.8N 132.7E	P	2	5	700MB	90	35	965	278	18 15	CIRC		40	8	WC OPEN SE-W	03
6	141102Z	20.0N 132.5E	P	-	-	700MB	-	-	-	-	- -	-	- -	-	-		
7	141440Z	20.4N 132.3E	P	-	-	700MB	-	-	-	-	- -	-	- -	-	-		
8	141515Z	20.6N 132.2E	P	2	5	700MB	90	-	963	277	18 11	CIRC		30	10	WC OPEN NE-S	03
9	150148Z	22.0N 132.4E	SAT STG X DIA 2 CAT 4.0													ESSA 8 (RODN)	
10	150559Z	23.5N 131.8E	SAT T5.5/5.5/D1.0/24HRS													ESSA 9	
11	151030Z	24.9N 131.9E	P	5	5	700MB	80	-	957	273	17 13	-	- -	-	-	WC OPEN E-W	04
12	151245Z	25.2N 131.9E	P	-	-	700MB	55	-	-	-	- -	-	- -	-	-		
13	151630Z	26.7N 132.3E	P	3	3	700MB	85	-	958	273	20 13	CIRC		40	-	CLSD WC	05
14	151700Z	26.6N 132.3E	LRDR		-							-	- -	-	-	28.4N 129.5E	
15	151800Z	26.9N 132.5E	LRDR		-							-	- -	-	-	28.4N 129.5E	
16	152200Z	28.8N 133.0E	LRDR		-							-	- -	-	-	35.9N 139.6E	
17	152320Z	28.8N 133.2E	LRDR		-							-	- -	-	-	35.9N 139.6E	
18	160000Z	29.5N 133.8E	LRDR		-							-	- -	-	-	35.9N 139.6E	
19	160100Z	29.5N 133.5E	LRDR		-							-	- -	-	-	35.9N 139.6E	
20	160200Z	30.0N 133.8E	LRDR		-							-	- -	-	-	33.3N 134.2E	
21	160200Z	29.8N 133.8E	LRDR		-							-	- -	-	-	35.9N 139.6E	
22	160300Z	30.2N 134.1E	LRDR		-							-	- -	-	-	35.9N 139.6E	
23	160300Z	30.2N 134.1E	LRDR		-							-	- -	-	-	33.3N 134.2E	
24	160400Z	30.3N 134.3E	LRDR		-							-	- -	-	-	35.9N 139.6E	
25	160400Z	30.6N 134.4E	LRDR		-							-	- -	-	-	33.3N 134.2E	
26	160449Z	31.4N 134.5E	P	2	5	700MB	-	80	959	274	14 17	-	- -	-	-	FL WND CNTR 50NM DIA	07
27	160500Z	31.1N 134.8E	LRDR		-							-	- -	-	-	33.3N 134.2E	
28	160600Z	31.5N 135.1E	LRDR		-							-	- -	-	-	33.3N 134.2E	
29	160600Z	31.6N 134.9E	LRDR		-							-	- -	-	-	35.4N 138.7E	
30	160630Z	32.1N 134.8E	P	-	-	700MB	-	-	-	-	- -	-	- -	-	-		
31	160700Z	32.4N 135.0E	P	2	5	700MB	100	-	963	273	18 11	-	- -	-	-	RDR PRES POOR	07
32	160700Z	32.4N 135.1E	LRDR		-							-	- -	-	-	33.3N 134.2E	
33	160700Z	33.0N 135.5E	LRDR		-							-	- -	-	-	35.2N 137.0E	
34	160800Z	32.8N 135.2E	P	2	5	700MB	85	65	963	274	17 -	-	- -	-	-		
35	160800Z	32.5N 135.5E	LRDR		-							-	- -	-	-	35.4N 138.7E	
36	160800Z	32.8N 135.6E	LRDR		-							-	- -	-	-	33.3N 134.2E	
37	160800Z	33.4N 135.6E	LRDR		-							-	- -	-	-	35.2N 137.0E	
38	160800Z	33.2N 135.5E	LRDR		-							-	- -	-	-	34.6N 135.7E	
39	160900Z	33.4N 135.5E	P	2	5	700MB	65	-	958	273	14 -	-	- -	-	-	FL WND CNTR 50NM DIA	07
40	160900Z	33.3N 135.7E	LRDR		-							-	- -	-	-	33.3N 134.2E	
41	160900Z	33.1N 135.6E	LRDR		-							-	- -	-	-	35.4N 138.7E	
42	160900Z	33.4N 135.6E	LRDR		-							-	- -	-	-	34.6N 135.7E	
43	161000Z	33.7N 135.7E	LRDR		-							-	- -	-	-	34.6N 135.7E	
44	161000Z	33.5N 135.5E	LRDR		-							-	- -	-	-	35.4N 138.7E	
45	161000Z	33.8N 135.8E	LRDR		-							-	- -	-	-	33.3N 134.2E	
46	161100Z	34.2N 135.9E	LRDR		-							-	- -	-	-	36.2N 136.2E	
47	161100Z	34.2N 135.9E	LRDR		-							-	- -	-	-	33.3N 134.2E	
48	161100Z	34.0N 135.5E	LRDR		-							-	- -	-	-	35.4N 138.7E	
49	161100Z	34.1N 136.0E	LRDR		-							-	- -	-	-	34.1N 136.0E	
50	161200Z	34.8N 136.4E	LRDR		-							-	- -	-	-	35.2N 137.0E	
51	161200Z	34.6N 136.0E	LRDR		-							-	- -	-	-	36.2N 136.2E	
52	161200Z	34.3N 135.6E	LRDR		-							-	- -	-	-	35.4N 138.7E	
53	161300Z	34.7N 136.2E	LRDR		-							-	- -	-	-	35.4N 138.7E	
54	161400Z	35.3N 136.6E	LRDR		-							-	- -	-	-	34.6N 135.7E	
55	161400Z	35.3N 136.6E	LRDR		-							-	- -	-	-		
56	161400Z	35.1N 136.4E	LRDR		-							-	- -	-	-	35.4N 138.7E	
57	161400Z	35.6N 136.3E	LRDR		-							-	- -	-	-	36.2N 136.2E	
58	161500Z	35.5N 136.8E	LRDR		-							-	- -	-	-	35.4N 138.7E	
59	161500Z	35.7N 136.5E	LRDR		-							-	- -	-	-	34.6N 135.7E	
60	161600Z	35.0N 137.3E	LRDR		-							-	- -	-	-	35.4N 138.7E	
61	161700Z	37.0N 138.0E	LRDR		-							-	- -	-	-	35.4N 138.7E	
62	162100Z	38.7N 138.7E	LRDR		-							-	- -	-	-	39.7N 140.1E	
63	162200Z	39.1N 139.0E	LRDR		-							-	- -	-	-	39.7N 140.1E	
64	170400Z	41.4N 140.4E	LRDR		-							-	- -	-	-	41.8N 140.7E	

TYPHOON IDA
FIX POSITIONS FOR CYCLONE NO. 22
16 SEP - 24 SEP

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV	ACCRY MET	FLT LVL	FLT LVL WND	OBS SFC WND	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI	FLT LVL TO	EYE FORM	ORIEN-TATION	EYE DIA	THKN WALL CLD	POSIT OF RADAR /REMARKS	
1	160502Z	15.5N 155.5E	SAT	T2.0/2.0/D1.0/24HRS													ESSA 9	
2	170358Z	17.5N 154.5E	SAT	T3.0/3.0/D1.0/24HRS													ESSA 9	
3	170505Z	17.2N 155.1E	P	10	15	700MB	45	35	993	304	15	12	ELIP	SW-NE	20X10	-	WC V PR DEF	02
4	170800Z	17.0N 155.1E	P	10	15	700MB	47	40	991	300	13	13	CIRC	-	15	-	WC V PR DEF	02
5	171815Z	16.1N 156.7E	P	10	10	700MB	45	-	984	294	13	11	CIRC		35	5	CLSD WC	03
6	172130Z	16.5N 156.8E	P	10	10	700MB	60	55	966	297	13	12	CIRC		40	-	CLSD WC	03
7	180406Z	16.0N 157.5E	P	10	20	700MB	50	60	-	292	18	13	CIRC		20	5	WC OPEN NW-N	04
8	180614Z	15.8N 157.7E	P	-	-	700MB	65	70	-	-	-	-	-	-	-	-		
9	180905Z	15.7N 158.1E	P	5	5	700MB	68	-	977	290	19	11	ELIP	E-W	30X25	7	WC OPEN NW-NE	04
10	181750Z	15.4N 158.1E	P	10	10	700MB	80	-	969	284	19	13	CIRC		23	-	WC OPEN NW-NE	05
11	182000Z	15.3N 158.3E	P	-	-	700MB	-	-	-	-	-	-	-	-	-	-	WC OPEN N SEMIC	05
12	182120Z	15.3N 158.5E	P	10	10	700MB	80	80	969	283	18	13	CIRC		25	-		
13	190404Z	15.5N 156.8E	SAT	T5.5/5.5/D3.0/48HRS													ESSA 9	
14	190430Z	15.8N 157.3E	P	15	10	700MB	-	100	968	284	18	12	ELIP	SW-NE	20X10	-	WC OPEN NW-N-E	06
15	190608Z	15.8N 157.3E	P	-	-	700MB	-	-	-	-	-	-	-	-	-	-		
16	190918Z	15.8N 156.8E	P	20	20	700MB	-	-	970	284	18	23	ELIP	SW-NE	20X10	-	WC OPEN NW-NE	06
17	200350Z	16.7N 153.3E	P	10	5	700MB	55	50	985	296	16	12	CIRC		30	-	WC OPEN SW-NW	07
18	200503Z	16.5N 153.0E	SAT	T4.5/5.5/W1.0/24HRS													ESSA 9	
19	200605Z	16.8N 152.9E	P	-	-	700MB	-	-	-	-	-	-	-	-	-	-		
20	200920Z	17.0N 152.3E	P	5	5	700MB	45	-	976	288	19	13	CIRC		30	10	WC OPEN NW-NE	07
21	201512Z	17.5N 150.3E	P	2	5	700MB	60	-	972	285	16	13	CIRC		20	-	WC OPEN NW	08
22	202145Z	17.8N 148.7E	P	3	2	700MB	55	100	965	277	16	15	CIRC		17	-	BRKS IN WC	08
23	210105Z	18.0N 148.5E	SAT	STG X DIA MA CAT 2.0													ESSA 8 (ROUN)	
24	210319Z	18.2N 147.2E	P	10	12	700MB	70	70	953	269	18	16	CIRC		15	-	CLSD WC	09
25	210409Z	18.5N 147.3E	SAT	T5.5/5.5PLUS/D1.0/24HRS													ESSA 9	
26	210457Z	18.2N 146.8E	P	-	-	700MB	-	85	-	-	-	-	-	-	-	-		
27	210900Z	18.8N 146.5E	P	10	10	700MB	-	-	-	-	19	15	ELIP	SE-NW	17X10	-	CLSD WC	09
28	220000Z	21.8N 143.9E	SAT	STG X DIA 3 CAT 4.0													ESSA 8 (ROUN)	
29	220115Z	21.6N 143.7E	P	5	5	700MB	100	85	-	251	17	14	CIRC		18	5	CLSD WC	09
30	220825Z	22.3N 143.3E	AC R		-								-	-	-	-		
31	221040Z	22.3N 143.0E	SAT	T6.0/6.0/D0.5/24HRS													ESSA 9	
32	221228Z	23.4N 142.6E	P	10	10	700MB	75	-	932	251	19	12	CIRC		20	-	CLSD WC	11
33	221510Z	23.7N 142.6E	AC R		-								-	-	-	-		
34	221547Z	23.8N 142.4E	P	-	-	700MB	-	-	-	-	-	-	-	-	-	-		
35	221549Z	24.0N 142.4E	P	5	8	700MB	65	-	933	251	17	15	CIRC		20	-	CLSD WC	11
36	230608Z	27.4N 142.0E	SAT	T6.0/6.0/S0/24HRS													ESSA 9	
37	231015Z	25.0N 141.8E	P	10	5	700MB	-	-	933	250	20	14	CIRC		30	15	CLSD WC	12
38	231215Z	28.6N 141.6E	P	5	5	700MB	100	-	937	255	-	-	CIRC		20	7	CLSD WC	13
39	231420Z	29.2N 141.7E	P	-	-	700MB	-	-	-	-	-	-	-	-	-	-		
40	231515Z	29.4N 141.8E	P	5	5	700MB	90	-	940	256	-	-	CIRC		18	12	CLSD WC	13
41	231900Z	30.9N 142.2E	LRDR		-								-	-	-	-	35.4N 138.7E	
42	232000Z	31.3N 142.1E	LRDR		-								-	-	-	-	35.4N 138.7E	
43	232100Z	31.3N 142.3E	LRDR		-								-	-	-	-	35.4N 138.7E	
44	232130Z	31.5N 142.2E	P	5	5	700MB	76	100	942	259	16	14	CIRC		20	-	WC OPEN S SEMIC	14
45	232200Z	31.6N 142.6E	LRDR		-								-	-	-	-	35.4N 138.7E	
46	232300Z	31.9N 142.7E	LRDR		-								-	-	-	-	35.4N 138.7E	
47	240000Z	32.1N 143.0E	LRDR		-								-	-	-	-	35.4N 138.7E	
48	240030Z	32.3N 142.7E	P	5	5	700MB	86	85	949	265	17	13	CIRC		20	-	WC OPEN S	14
49	240100Z	32.5N 143.3E	LRDR		-								-	-	-	-	35.4N 138.7E	
50	240200Z	32.7N 143.3E	LRDR		-								-	-	-	-	35.4N 138.7E	
51	240300Z	33.1N 143.3E	P	5	5	700MB	88	100	-	266	17	14	CIRC		20	-	WC OPEN S SEMIC	14
52	240300Z	33.1N 143.5E	LRDR		-								-	-	-	-	35.4N 138.7E	
53	240400Z	33.5N 143.8E	LRDR		-								-	-	-	-	35.4N 138.7E	
54	240500Z	34.0N 144.0E	LRDR		-								-	-	-	-	35.4N 138.7E	
55	240600Z	34.2N 144.2E	LRDR		-								-	-	-	-	35.4N 138.7E	
56	240700Z	34.6N 144.6E	LRDR		-								-	-	-	-	35.4N 138.7E	
57	241025Z	36.1N 145.7E	P	5	5	700MB	68	-	956	272	19	-	CIRC		10	-	WC PR DEF	15
58	241230Z	36.6N 146.2E	P	5	5	700MB	30	-	961	274	16	-	CIRC		10	-	WC OPEN W	15
59	241500Z	36.9N 147.0E	P	5	5	700MB	30	-	963	276	16	-	CIRC		10	-	WC PR DEF	15

TYPHOON LORNA
FIX POSITIONS FOR CYCLONE NO. 25
27 SEP - 3 OCT

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV	ACCRY MET	FLT LVL	FLT LVL WND	OBS SFC WND	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TO	EYE FORM	ORIEN-TATION	EYE DIA	THKN WALL CLD	POSIT OF RADAR /REMARKS	
1	270608Z	15.0N 124.0E	SAT	T3.0/3.0/D1.5/24HRS												ESSA 9	
2	300713Z	18.2N 117.5E	SAT	T3.0/3.0/D1.5/24HRS												ESSA 9	
3	010216Z	17.0N 113.0E	SAT	STG UNK												ESSA 8 (VTBU)	
4	010308Z	17.1N 114.3E	P	10	3	700MB	50	60	995	304	13 10	-	- -	-	-	CNTR FIL W/ CLDS AT FL	03
5	010600Z	17.4N 113.6E	P	5	2	700MB	55	80	990	300	15 12	-	- -	-	-	PRIL WC S	03
6	010740Z	18.1N 108.2E	SRDR		-							-	- -	-	-		
7	011400Z	17.3N 111.1E	SRDR		-							-	- -	-	-		
8	011500Z	17.7N 111.0E	SRDR		-							-	- -	-	-		
9	011700Z	18.0N 110.8E	SRDR		-							-	- -	-	-		
10	011800Z	17.9N 110.9E	SRDR		-							-	- -	-	-		
11	011830Z	17.7N 110.6E	LRDR		-							-	- -	-	-	16.0N 108.2E	
12	011900Z	17.9N 110.7E	SRDR		-							-	- -	-	-		
13	011915Z	17.9N 110.7E	SRDR		-							-	- -	-	-		
14	012000Z	17.9N 110.5E	SRDR		-							-	- -	-	-		
15	012100Z	17.9N 110.3E	SRDR		-							-	- -	-	-		
16	012100Z	18.0N 110.2E	SRDR		-							-	- -	-	-		
17	012200Z	17.9N 110.0E	SRDR		-							-	- -	-	-		
18	012300Z	18.0N 109.8E	SRDR		-							-	- -	-	-		
19	012330Z	17.9N 109.7E	LRDR		-							-	- -	-	-	16.0N 108.2E	
20	020100Z	18.0N 108.3E	SRDR		-							-	- -	-	-		
21	020200Z	18.1N 108.9E	SRDR		-							-	- -	-	-		
22	020210Z	18.3N 109.1E	AC R		-							-	- -	-	-		
23	020251Z	17.7N 108.7E	SAT	STG X DIA 2 CAT 4.0												ESSA 8 (RODN)	
24	020300Z	18.1N 108.8E	SRDR		-							-	- -	-	-		
25	020330Z	18.2N 108.9E	AC R		-							-	- -	-	-		
26	020400Z	18.3N 108.6E	SRDR		-							-	- -	-	-		
27	020400Z	18.0N 108.7E	SRDR		-							-	- -	-	-		
28	020430Z	18.1N 108.4E	AC R		-							-	- -	-	-		
29	020600Z	18.1N 108.3E	SRDR		-							-	- -	-	-		
30	020615Z	18.2N 108.3E	SRDR		-							-	- -	-	-		
31	020630Z	18.1N 108.2E	LRDR		-							-	- -	-	-	16.0N 108.2E	
32	020700Z	18.1N 108.1E	SRDR		-							-	- -	-	-		
33	020718Z	18.5N 107.4E	SAT	T5.0/5.0/D1.0/24HRS												ESSA 9	
34	020800Z	18.2N 108.0E	SRDR		-							-	- -	-	-		
35	020830Z	18.1N 107.7E	LRDR		-							-	- -	-	-	16.0N 108.2E	
36	020900Z	18.2N 107.8E	SRDR		-							-	- -	-	-		
37	020900Z	18.2N 107.8E	SRDR		-							-	- -	-	-		
38	021000Z	18.2N 107.6E	SRDR		-							-	- -	-	-		
39	021100Z	18.2N 107.5E	SRDR		-							-	- -	-	-		
40	021100Z	18.2N 107.5E	SRDR		-							-	- -	-	-		
41	021100Z	18.1N 107.4E	LRDR		-							-	- -	-	-	16.0N 108.2E	
42	021200Z	18.4N 107.2E	SRDR		-							-	- -	-	-		
43	021300Z	18.1N 107.1E	LRDR		-							-	- -	-	-	16.0N 108.2E	
44	021300Z	18.2N 107.2E	SRDR		-							-	- -	-	-		
45	021400Z	18.1N 106.9E	LRDR		-							-	- -	-	-	16.0N 108.2E	
46	021400Z	18.2N 107.0E	SRDR		-							-	- -	-	-		
47	021500Z	18.1N 106.7E	LRDR		-							-	- -	-	-	16.0N 108.2E	
48	021500Z	18.2N 106.9E	SRDR		-							-	- -	-	-		
49	021600Z	18.2N 106.7E	SRDR		-							-	- -	-	-		
50	021700Z	18.2N 106.5E	SRDR		-							-	- -	-	-		
51	021800Z	18.2N 106.3E	SRDR		-							-	- -	-	-		
52	021900Z	18.1N 106.2E	SRDR		-							-	- -	-	-		
53	022140Z	18.0N 105.8E	LRDR		-							-	- -	-	-	17.4N 104.7E	
54	022240Z	18.0N 105.8E	LRDR		-							-	- -	-	-	17.4N 104.7E	
55	022311Z	18.0N 105.7E	LRDR		-							-	- -	-	-	17.4N 104.7E	
56	030040Z	17.9N 105.3E	LRDR		-							-	- -	-	-	17.4N 104.7E	
57	030110Z	17.8N 105.1E	LRDR		-							-	- -	-	-	17.4N 104.7E	
58	030140Z	17.8N 105.0E	LRDR		-							-	- -	-	-	17.4N 104.7E	
59	030515Z	18.0N 105.3E	LRDR		-							-	- -	-	-	17.4N 102.8E	
60	030540Z	17.5N 104.0E	LRDR		-							-	- -	-	-	17.4N 102.8E	

TYPHOON MARIE
FIX POSITIONS FOR CYCLONE NO. 26
4 OCT - 12 OCT

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV	ACCRY MET	FLT LVL	FLT LVL WND	OBS SFC WND	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TO	EYE FORM	ORIEN-TATION	EYE DIA	THKN WALL CLD	POSIT OF RADAR /REMARKS	
1	040322Z	15.0N 168.0E	SAT	T2.5/2.5PLUS/D1.0/24HRS												ESSA 9	
2	050330Z	14.4N 168.3E	P	5	10	700MB	30	40	988	297	14 12	-	- -	-	-	WND CIRC WELL DEF	01
3	050423Z	14.0N 167.4E	SAT	T3.5/3.5/D1.0/24HRS												ESSA 9	
4	060325Z	14.5N 164.5E	SAT	T4.0/4.0/D0.5/24HRS												ESSA 9	
5	060415Z	13.9N 164.7E	P	5	10	700MB	60	50	970	285	16 14	-	- -	-	-	CNTR FIL W/ CLDS	02
6	060935Z	14.3N 163.7E	P	5	10	700MB	-	-	971	284	16 15	CIRC		10	-	WC OPEN E SEMIC	02
7	070402Z	15.1N 159.2E	P	10	5	700MB	-	70	962	274	17 15	CIRC		10	5	WC OPEN NE-SE	03
8	070423Z	15.4N 158.6E	SAT	T5.0/5.0/D1.0/24HRS												ESSA 9	
9	070914Z	15.2N 157.3E	P	3	10	700MB	75	-	954	271	19 11	-	- -	-	-	OVC ABV AND BLO IN CNTR	04
10	080315Z	16.7N 152.5E	P	00	00	700MB	62	70	-	266	17 16	CIRC		40	5	WC PR DEF	05
11	080453Z	16.8N 152.2E	P	-	-	700MB	-	-	-	-	- -	-	- -	-	-		
12	080520Z	16.5N 152.0E	SAT	T4.5/5.0/W0.5/24HRS												ESSA 9	
13	080606Z	16.9N 151.6E	P	-	-	700MB	-	-	-	-	- -	-	- -	-	-		
14	080905Z	17.2N 150.8E	P	5	5	700MB	50	-	-	267	16 12	CIRC		60	10	WC PR DEF	05
15	081519Z	17.3N 148.6E	P	-	-	700MB	-	-	-	-	- -	-	- -	-	-		
16	081751Z	17.6N 148.3E	P	10	15	700MB	-	-	946	263	19 -	-	- -	-	-	CNTR FIL W/ SC, AS ABV	06
17	082030Z	17.8N 147.8E	P	-	-	700MB	-	-	-	-	- -	-	- -	-	-		
18	082106Z	17.8N 147.6E	P	10	10	700MB	-	100	941	259	17 -	-	- -	-	-	WC BGNG TO FRM	06
19	090110Z	18.3N 148.2E	SAT	STG X DIA 2 CAT 4.0												ESSA 8 (RODN)	
20	090425Z	18.0N 146.0E	SAT	T6.0/6.0/D1.5/24HRS												ESSA 9	
21	090535Z	18.8N 146.9E	P	10	5	700MB	80	75	937	255	15 14	CIRC		10	-	WC PR DEF	07
22	090700Z	18.8N 146.3E	P	-	-	700MB	-	-	-	-	- -	-	- -	-	-		
23	090900Z	18.9N 145.9E	P	1	5	700MB	90	-	936	254	16 13	CIRC		10	-	WC PR DEF	07
24	100010Z	21.0N 143.7E	SAT	STG X DIA 3 CAT 4.0												ESSA 8 (RODN)	
25	100310Z	20.9N 144.1E	P	10	5	700MB	80	50	946	260	19 14	CIRC		15	15	WC OPEN W SEMIC	08
26	100526Z	21.2N 144.2E	P	-	-	700MB	-	-	-	-	- -	-	- -	-	-		
27	100526Z	21.7N 144.0E	SAT	T6.5/6.5/D0.5/24HRS												ESSA 9	
28	100921Z	21.9N 144.1E	P	3	5	700MB	100	60	942	258	16 14	CONC	-	10-25	-	WC PR DEF	08
29	101748Z	24.0N 143.6E	P	10	10	700MB	75	-	941	259	17 14	-	- -	-	-	NEG WC	09
30	102030Z	24.5N 144.0E	P	-	-	700MB	-	-	-	-	- -	-	- -	-	-		
31	102114Z	24.7N 144.0E	P	10	10	700MB	75	60	945	262	16 15	-	- -	-	-	PRIL WC TO NE	09
32	110405Z	26.8N 144.2E	P	5	5	700MB	89	70	951	266	17 13	-	- -	-	-	PRIL WC ON E SEMIC	10
33	110608Z	27.6N 144.4E	P	-	-	700MB	-	-	-	-	- -	-	- -	-	-		
34	110900Z	28.5N 145.5E	P	5	5	700MB	100	70	950	266	18 14	-	- -	-	-	RDR PRES POOR	11
35	120610Z	37.5N 148.[illegible]E	P	10	5	700MB	40	70	965	278	16 11	-	- -	-	-	NO RDR PRES	12

TYPHOON NANCY
FIX POSITIONS FOR CYCLONE NO. 27
16 OCT - 24 OCT

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV	ACCRY MET	FLT LVL	FLT LVL WND	OBS SFC WND	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI	FLT LVL TO	EYE FORM	ORIEN-TATION	EYE DIA	THKN WALL CLD	POSIT OF RADAR /REMARKS	
1	160335Z	15.6N 170.5E	SAT	T2.0/2.0/D0.5/25HRS													ESSA 9	
2	160430Z	15.7N 169.6E	P	5	10	700MB	40	45	998	306	12	-	CIRC		3	4	WC OPEN	01
3	162130Z	15.7N 167.1E	P	2	2	700MB	50	80	993	302	12	12	CIRC		5	-	WC OPEN E-SE	02
4	170140Z	15.7N 166.6E	AC R		-								-	- -	-	-		
5	170330Z	15.9N 166.1E	P	2	2	700MB	45	60	985	295	15	11	OCNC	-	15-25	-	FBS ALQDS HVY N QUAD	02
6	170434Z	16.0N 165.5E	SAT	T4.5/4.5/D2.0/24HRS													ESSA 9	
7	170925Z	16.0N 164.9E	P	4	5	700MB	40	-	975	288	14	10	CIRC		20	-	EYE FRMED BY FB	03
8	171203Z	16.1N 164.4E	P	-	-	700MB	-	-	-	-	-	-	-	- -	-	-		
9	171500Z	16.3N 163.6E	P	4	5	700MB	65	-	972	282	16	-	CIRC		30	-	EYE BCMG DIF	03
10	180340Z	17.3N 161.0E	P	10	2	700MB	80	130	954	269	16	9	CIRC		15	-	CLSD WC	04
11	180357Z	17.0N 160.5E	SAT	STG X DIA 2 CAT 4.0													ESSA 9	
12	180600Z	17.4N 160.8E	P	-	-	700MB	-	-	-	-	-	-	-	- -	-	-		
13	180900Z	17.7N 160.5E	P	10	2	700MB	90	-	945	260	17	8	CIRC		20	15	CLSD WC	04
14	190340Z	20.3N 158.2E	P	10	3	700MB	110	130	-	266	21	-	CIRC		30	-	WC WK-OPEN SE	05
15	190436Z	20.7N 158.0E	SAT	T5.5/5.5/S0/24HRS													ESSA 9	
16	190630Z	20.7N 158.0E	P	-	-	700MB	-	-	-	-	-	-	-	- -	-	-		
17	190900Z	21.1N 157.8E	P	10	10	700MB	100	-	958	271	19	12	-	- -	-	-	FL CNTR APPRS LIKE IF	05
18	201834Z	24.7N 159.8E	P	15	10	700MB	55	-	-	299	19	12	-	- -	-	-	NEG RDR PRES	06
19	202100Z	24.4N 160.0E	P	7	5	700MB	55	85	-	301	18	15	-	- -	-	-	NEG RDR PRES	06
20	240347Z	24.0N 157.0E	SAT	STG C-													ESSA 9	

TYPHOON OLGA
FIX POSITIONS FOR CYCLONE NO. 28
21 OCT - 29 OCT

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV	ACCRY MET	FLT LVL	FLT LVL WND	OBS SFC WND	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI	FLT LVL TO	EYE FORM	ORIEN-TATION	EYE DIA	THKN WALL CLD	POSIT OF RADAR /REMARKS	
1	210234Z	7.5N 177.0E	SAT	STG C													ESSA 9	
2	211953Z	7.9N 174.9E	P	10	10	700MB	50	100	-	303	15	11	-	- -	-	-	CNTR FILLED WITH 7/8 AS	01
3	212339Z	8.1N 174.5E	P	10	10	700MB	55	100	-	303	16	14	-	- -	-	-	WC FRMG S SEMIC	01
4	220335Z	9.0N 172.0E	SAT	T3.0/3.0/D1.0/24HRS													ESSA 9	
5	220830Z	8.2N 174.2E	P	-	-	700MB	-	-	-	-	-	-	-	- -	-	-		
6	220910Z	8.1N 174.1E	P	5	2	700MB	50	-	-	294	14	14	ELIP	N-S	8X 5	-	WC PR DEF	02
7	221620Z	8.9N 173.6E	P	5	12	700MB	30	-	993	304	12	10	-	- -	-	-	WC APPRS TO FRM SW SIDE	03
8	222230Z	9.2N 172.3E	P	5	10	700MB	45	65	-	306	16	11	-	- -	-	-	NEG RDR PRES	04
9	230245Z	9.0N 171.5E	SAT	STG C													ESSA 9	
10	230303Z	9.5N 172.0E	P	5	10	700MB	35	65	-	303	15	14	CIRC		20	-	WC OPEN N SEMIC	04
11	231415Z	10.1N 169.8E	P	-	-	700MB	-	-	-	-	-	-	-	- -	-	-		
12	231550Z	10.4N 169.8E	P	1	10	700MB	37	-	994	304	17	-	-	- -	-	-	HVY TSTM ACTV S-NW	05
13	240050Z	11.0N 168.2E	P	5	5	1500FT	40	30	999	-	25	-	-	- -	-	-	NEG RDR PRES	06
14	240305Z	11.4N 168.2E	P	5	5	1500FT	40	30	996	-	26	-	-	- -	-	-	NO CLD CRG AT CNTR	07
15	240343Z	10.5N 164.5E	SAT	T4.0/4.0/D1.0/24HRS													ESSA 9	
16	240925Z	12.2N 166.3E	P	3	10	700MB	50	-	993	305	14	-	-	- -	-	-	NEG RDR PRES	08
17	241545Z	11.8N 164.5E	P	10	20	700MB	30	-	995	302	15	13	-	- -			700MB CNTR ENGULFED IN TSTM SYSTEM 30NM WIDE	08
18	242223Z	12.3N 163.0E	P	1	10	1500FT	55	50	994	-	25	25	-	- -			700MB CNTR ILL DEF DUE CB COVERING ENTIRE CNTR	09
19	250441Z	12.9N 162.0E	SAT	T4.5/4.5/D0.5/24HRS													ESSA 9	
20	250530Z	13.5N 161.5E	P	10	5	700MB	45	55	987	296	15	14	-	- -	-	-	TCU NR CNTR-FRMG WC	10
21	250930Z	13.6N 159.9E	P	10	3	700MB	55	-	989	298	15	15	-	- -	-	-	NEG ORG ON RDR	10
22	251825Z	13.7N 157.9E	P	10	10	700MB	50	-	982	292	15	-	-	- -	-	-	CONSBL CONV ACTV ALWDS	11
23	252115Z	13.8N 157.5E	P	10	7	700MB	60	65	979	292	16	-	-	- -	-	-	CHG CB AT EXACT CNTR	11
24	260045Z	14.3N 156.9E	AC R		-								-	- -	-	-		
25	260344Z	14.1N 156.1E	P	5	5	700MB	60	100	974	287	16	13	CIRC		20	-	WC PR DEF	12
26	260535Z	14.6N 155.6E	P	-	-	700MB	-	-	-	-	-	-	-	- -	-	-		
27	260718Z	14.4N 155.3E	P	15	10	700MB	65	120	981	289	14	13	CIRC		20	-	WC PR DEF	12
28	261023Z	14.9N 154.1E	P	10	10	700MB	40	-	972	285	15	14	-	- -	-	-	WC PR DEF	13
29	261230Z	15.2N 153.6E	P	-	-	700MB	51	-	-	-	-	-	-	- -	-	-		
30	261532Z	15.7N 151.9E	P	5	2	700MB	40	-	967	279	17	15	CIRC		10	-	WC FRMG ALWDS	14
31	262030Z	16.1N 150.9E	P	-	-	700MB	-	-	-	-	-	-	-	- -	-	-		
32	262100Z	16.1N 150.6E	P	5	7	700MB	70	65	961	277	16	12	CIRC		30	7	CLSD WC	14
33	270318Z	17.0N 148.4E	P	10	10	700MB	65	55	948	264	19	13	CIRC		15	5	WELL DEF	15
34	270545Z	17.5N 147.9E	P	-	-	700MB	-	-	943	-	-	-	-	- -	-	-		
35	271025Z	17.9N 146.9E	P	5	5	700MB	85	-	940	257	16	15	CIRC		10	2	CLSD WC	16
36	271220Z	18.4N 146.3E	P	-	-	700MB	-	-	-	-	-	-	-	- -	-	-		
37	271500Z	18.9N 145.8E	P	2	2	700MB	75	-	-	283	16	16	CIRC		12	8	CLSD WC	16
38	272110Z	19.9N 144.5E	P	5	5	700MB	70	120	939	256	18	16	CIRC		15	-	CLSD WC	17
39	272300Z	20.3N 144.3E	P	-	-	700MB	-	-	-	-	-	-	-	- -	-	-		
40	280730Z	22.1N 143.5E	P	5	5	700MB	85	60	-	262	17	13	CIRC		20	-	OPEN W SEMIC	18
41	281915Z	25.3N 143.1E	P	5	10	700MB	40	-	951	268	21	-	CIRC		40	-	WC PR DEF	19
42	282030Z	25.5N 143.6E	P	-	-	700MB	-	-	-	-	-	-	-	- -	-	-		
43	282100Z	25.7N 143.3E	P	5	10	700MB	35	80	952	268	21	18	CIRC		40	-	WC PR DEF	19
44	290450Z	29.5N 145.5E	SAT	T4.0/5.0/W1.0/24HRS													ESSA 9	
45	290626Z	30.1N 145.9E	P	-	-	700MB	-	-	-	-	-	-	-	- -	-	-		
46	290659Z	30.6N 145.8E	P	5	20	700MB	75	60	964	279	14	13	-	- -	-	-	NS IN CNTR-CONT MDT N	20
47	290804Z	31.2N 146.2E	P	-	-	700MB	-	-	-	-	-	-	-	- -	-	-		
48	290900Z	31.7N 146.5E	P	3	5	700MB	50	-	969	280	14	16	-	- -	-	-	RDR PRES NIL	

TYPHOON PAMELA

FIX POSITIONS FOR CYCLONE NO. 29

30 NOV - 8 NOV

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FLT LVL	FLT LVL WND	OBS SFC WND	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TD	EYE FORM	ORIEN-TATION	EYE DIA	THKN WALL CLD	POSIT OF RADAR /REMARKS	
1	300347Z	10.5N 159.5E	SAT	T1.0/1.0/D0.5/24HRS											ESSA 9	
2	310450Z	14.5N 153.5E	SAT	T2.5/2.5/D1.0/24HRS											ESSA 9	
3	010349Z	18.0N 150.0E	SAT	T2.0/2.5/W0.5/24HRS											ESSA 9	
4	040410Z	12.9N 130.6E	P	10 20	700MB	48	70	1004	308	13 11	-	- -	-	-	CALM SFC CNTR 40X65NM	02
5	040649Z	12.5N 129.5E	SAT	T2.5/2.5/D1.0/24HRS											ESSA 9	
6	041025Z	13.0N 128.0E	AC R	-							-	- -	-	-		
7	041300Z	12.7N 127.7E	AC R	-							-	- -	-	-		
8	041300Z	12.7N 127.8E	AC R	-							-	- -	-	-		
9	041450Z	13.0N 127.0E	AC R	-							-	- -	-	-		
10	041900Z	12.6N 126.6E	AC R	-							-	- -	-	-		
11	042300Z	12.5N 125.0E	AC R	-							-	- -	-	-		
12	042300Z	12.5N 125.0E	AC R	-							-	- -	-	-	13.0N 125.0E	
13	050120Z	11.0N 124.1E	SAT	STG UNK												
14	050228Z	11.9N 124.7E	SAT	T4.0/4.0/D1.5/24HRS											ESSA 9	
15	050430Z	12.3N 123.2E	P	1 20	500MB	-	-	-	-	-1 -7	-	- -	-	-	RDR PRES POOR	03
16	050613Z	12.0N 123.0E	AC R	-							-	- -	-	-		
17	050815Z	12.3N 122.5E	AC R	-							-	- -	-	-		
18	050900Z	12.4N 122.3E	AC R	-							-	- -	-	-		
19	050900Z	12.5N 122.1E	LRDR	-							-	- -	-	-		
20	050900Z	12.6N 122.1E	LRDR	-							-	- -	-	-	13.6N 124.2E	
21	051030Z	12.3N 122.2E	AC R	-							-	- -	-	-		
22	051140Z	12.5N 122.1E	LRDR	-							-	- -	-	-	13.6N 124.2E	
23	051200Z	12.0N 121.7E	LRDR	-							-	- -	-	-	13.9N 121.1E	
24	051200Z	12.7N 121.4E	LRDR	-							-	- -	-	-		
25	051215Z	12.7N 121.4E	AC R	-							-	- -	-	-		
26	051300Z	13.0N 121.3E	LRDR	-							-	- -	-	-	13.9N 121.1E	
27	051300Z	12.8N 121.2E	LRDR	-							-	- -	-	-		
28	051400Z	12.8N 120.8E	LRDR	-							-	- -	-	-	13.9N 121.3E	
29	051610Z	12.8N 120.4E	P	5 10	500MB	60	-	989	-	-5 -4	CIRC		12	-	WC CLSD	04
30	051610Z	13.0N 119.8E	P	5 10	500MB	50	-	985	-	-6 -6	CIRC		14	-	WC CLSD	04
31	051810Z	13.0N 119.8E	AC R	-							-	- -	-	-		
32	051837Z	13.5N 120.0E	AC R	-							-	- -	-	-		
33	052100Z	13.1N 118.6E	P	1 3	700MB	55	-	984	295	12 9	CIRC		15	5	WC OPEN N SEMIC	05
34	052200Z	13.1N 118.6E	SRDR	-							-	- -	-	-		
35	052300Z	13.2N 118.4E	P	- -	700MB	-	-	-	-	- -	-	- -	-	-		
36	052345Z	13.0N 118.9E	AC R	-							-	- -	-	-		
37	060003Z	13.2N 118.1E	P	1 5	700MB	40	60	-	296	15 12	CIRC		20	-	WC OPEN S	05
38	060205Z	13.9N 117.6E	SAT	T5.0/5.0PLUS/D0.5/24HRS											ESSA 8 (RODN)	
39	060300Z	13.4N 117.3E	P	5 5	700MB	50	65	987	295	18 11	CIRC		30	-		
40	060300Z	13.0N 120.1E	SRDR	-							-	- -	-	-		
41	060310Z	11.8N 119.4E	SAT	STG X DIA 9 CAT 3.0											ESSA 8 (RODN)	
42	060400Z	13.0N 120.0E	SRDR	-							-	- -	-	-		
43	060500Z	13.0N 119.6E	AC R	-							-	- -	-	-		
44	060600Z	13.5N 116.6E	P	5 2	700MB	65	65	980	251	17 14	CIRC		20	-	WC CLSD	06
45	060600Z	13.8N 116.8E	AC R	-							-	- -	-	-		
46	060600Z	13.2N 119.5E	SRDR	-							-	- -	-	-		
47	060650Z	13.0N 116.2E	SAT	T4.5/4.5/D0.5/24HRS											ESSA 9	
48	060800Z	13.2N 119.1E	SRDR	-							-	- -	-	-		
49	060915Z	14.0N 116.2E	AC R	-							-	- -	-	-		
50	061005Z	13.8N 115.8E	P	3 5	700MB	-	65	970	284	16 10	CIRC		25	-	WC CLSD	07
51	061045Z	14.0N 116.0E	AC R	-							-	- -	-	-		
52	061145Z	14.0N 115.4E	AC R	-							-	- -	-	-		
53	061212Z	14.1N 115.7E	P	3 10	700MB	-	-	968	283	16 9	CIRC		25	-	WELL DEF RDR-ENE SEMIC	07
54	061300Z	13.5N 116.6E	SRDR	-							-	- -	-	-		
55	061300Z	13.5N 116.8E	SRDR	-							-	- -	-	-		
56	061420Z	14.4N 115.4E	P	- -	700MB	-	-	-	-	- -	-	- -	-	-		
57	061515Z	14.4N 115.1E	P	3 10	700MB	-	-	965	280	16 13	ELIP	N-S	25X20	-	WC OPEN WSW SEMIC	07
58	061615Z	14.5N 115.1E	AC R	-							-	- -	-	-		
59	061853Z	14.7N 114.5E	P	10 5	700MB	88	-	964	277	18 17	CIRC		20	5	WC OPEN W	08
60	062020Z	14.9N 114.4E	AC R	-							-	- -	-	-		
61	062130Z	14.9N 114.0E	P	5 5	700MB	82	-	958	274	20 17	CIRC		25	10	WC OPEN W	08
62	070020Z	15.0N 115.5E	AC R	-							-	- -	-	-	WC OPEN S	08
63	070035Z	15.1N 113.4E	P	15 10	700MB	80	100	952	269	20 19	CIRC		30	7		
64	070100Z	15.3N 113.4E	SRDR	-							-	- -	-	-		
65	070200Z	15.5N 113.2E	SRDR	-							-	- -	-	-		
66	070255Z	13.5N 113.5E	SAT	STG X DIA 6 CAT 3.0											ESSA 8 (VIBO)	
67	070300Z	14.9N 113.2E	SAT	STG X DIA 5 CAT 4.0											ESSA 8 (RODN)	
68	070300Z	15.6N 113.0E	SRDR	-							-	- -	-	-		
69	070400Z	15.7N 112.9E	SRDR	-							-	- -	-	-		
70	070425Z	15.7N 112.9E	P	00 00	700MB	90	70	948	265	20 16	CIRC		23	5	WC SML, OPEN S	09
71	070430Z	16.0N 113.0E	AC R	-							-	- -	-	-		
72	070500Z	15.8N 112.6E	SRDR	-							-	- -	-	-		
73	070600Z	15.8N 112.6E	SRDR	-							-	- -	-	-		
74	070612Z	15.9N 112.6E	AC R	-							-	- -	-	-		
75	070645Z	16.0N 112.5E	P	00 00	700MB	105	75	942	260	19 11	CIRC		23	5	WC CLSD	09
76	070700Z	16.1N 112.3E	SRDR	-							-	- -	-	-		
77	070749Z	16.0N 112.2E	SAT	TS.5/5.5/D1.0/24HRS											ESSA 9	
78	070900Z	16.2N 112.1E	AC R	2 -							-	- -	-	5		
79	070900Z	16.3N 112.1E	AC R	-							-	- -	-	5		
80	070900Z	16.4N 111.9E	SRDR	-							-	- -	-	-		
81	070900Z	16.4N 111.9E	SRDR	-							-	- -	-	-		
82	070900Z	16.3N 112.1E	SRDR	-							-	- -	-	-		
83	071000Z	16.5N 111.7E	SRDR	-							-	- -	-	-		
84	071100Z	16.7N 111.6E	SRDR	-							-	- -	-	-		
85	071200Z	16.8N 111.5E	SRDR	-							-	- -	-	-		
86	071225Z	16.8N 111.6E	AC R	5 5							CIRC		20	-	15.4N 111.8E	
87	071300Z	16.9N 111.3E	SRDR	-							-	- -	-	-		
88	071530Z	17.1N 111.0E	AC R	5 5							CIRC		30	5	16.5N 110.8E	
89	071800Z	17.5N 110.6E	AC R	5 10							CIRC		25	-	16.5N 110.8E	
90	072230Z	17.5N 110.9E	AC R	1 30							-	- -	-	-	16.4N 110.4E	
91	080156Z	17.5N 112.0E	SAT	STG UNK											ESSA 8 (VIBO)	
92	080652Z	20.0N 110.2E	SAT	T4.5/5.5/W1.0/24HRS											ESSA 9	

TYPHOON RUBY
FIX POSITIONS FOR CYCLONE NO. 30
11 NOV - 19 NOV

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FLT LVL	FLT LVL WND	OBS SFC WND	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIEN-TATION	EYE DIA	THKN WALL CLD	POSIT OF RADAR /REMARKS	
1	110202Z	6.0N 175.0W	SAT	T1.0/1.0/D0.5/24HRS											ESSA 9	
2	130209Z	9.5N 177.0W	SAT	T1.5/2.5MINUS/W1.0/24HRS											ESSA 9	
3	140306Z	12.0N 178.5W	SAT	T3.5/3.5/D2.0/24HRS											ESSA 9	
4	140443Z	11.9N 179.6W	P	10 3	700MB	58	70	-	293	17 13	CIRC		30	5	SRL OPENING IN WC NW	01
5	140641Z	11.9N 179.7E	P	10 5	700MB	50	60	-	294	19 15	CIRC		25	-	CLSD WC	01
6	150111Z	13.5N 177.0E	SAT	T4.0/4.0/D0.5/24HRS											ESSA 9	
7	150211Z	14.0N 177.0E	SAT	T4.5/4.5/D1.5/24HRS			(NESS)								ESSA 9 (NESS)	
8	150642Z	13.6N 174.9E	AC R	-							-	- -	-	-		
9	151352Z	14.3N 174.1E	P	20 20	700MB	80	-	-	-	- -	-	- -	-	-	NEG DEF	03
10	151601Z	14.4N 173.8E	P	5 5	700MB	60	-	-	257	20 11	-	- -	-	-	CLSD WC	03
11	152315Z	14.5N 172.3E	P	2 2	700MB	110	100	944	262	21 11	CIRC		20	-	CLSD WC	04
12	160138Z	14.7N 171.9E	P	- -	500MB	-	-	-	-	- -	-	- -	-	-		
13	160309Z	14.7N 171.5E	SAT	T5.0/5.0/D1.0/24HRS											ESSA 9	
14	160310Z	14.5N 171.3E	SAT	T4.5/4.5/S0/24HRS			(NESS)								ESSA 9 (NESS)	
15	160400Z	14.8N 171.7E	P	2 2	700MB	-	130	945	262	20 12	CIRC		20	15	WC OPEN SE QUAD	05
16	160600Z	15.0N 171.6E	P	- 6	700MB	-	-	-	-	- -	-	- -	-	-		
17	160900Z	15.3N 171.0E	P	2 5	700MB	-	-	-	270	20 12	CIRC		20	12	WC OPEN E-SE	05
18	161557Z	15.5N 170.0E	P	20 10	700MB	-	-	961	277	21 18	CIRC		20	-	WC PR DEF	06
19	162135Z	15.6N 169.2E	P	2 2	700MB	100	130	-	294	21 10	CIRC		30	-	WC OPEN S SEMIC	07
20	162355Z	15.8N 168.8E	P	- -	700MB	-	-	-	-	- -	-	- -	-	-		
21	170330Z	16.1N 168.0E	P	2 5	700MB	80	65	986	298	20 13	-	- -	-	-	WC DSPTD NE-S-NW	07
22	170408Z	15.8N 167.9E	SAT	T5.0/5.0/S0/24HRS											ESSA 9	
23	170409Z	16.0N 168.0E	SAT	T4.0/4.5/W0.5/24HRS			(NESS)								ESSA 9 (NESS)	
24	170650Z	16.1N 167.0E	P	5 10	700MB	40	-	994	303	22 20	-	- -	-	-	SFC CNTR FIL SC	08
25	170915Z	16.1N 166.5E	P	10 15	700MB	55	-	-	306	19 11	-	- -	-	-	SFC CNTR FIL SC	08
26	171532Z	16.2N 165.1E	P	5 10	700MB	40	-	994	304	15 11	-	- -	-	-	APRNT WC REMAINS NW	09
27	172244Z	15.8N 163.3E	SAT	T3.0/4.0/W1.0/24HRS			(NESS)								ESSA 9 (NESS)	
28	172244Z	15.5N 163.5E	SAT	T3.0/5.0/W2.0/24HRS												
29	180430Z	15.4N 161.9E	P	3 2	700MB	25	30	1001	311	15 -	-	- -	-	-	CALM SFC CNTR 10NM DIA	10
30	180933Z	15.3N 161.1E	P	5 5	700MB	20	-	1005	314	16 13	-	- -	-	-	APRNT CNTR 30NM DIA	11
31	181503Z	15.4N 160.0E	P	3 1	700MB	-	-	999	309	- -	-	- -	-	-	SFC CNTR 40NM DIA	12
32	182144Z	16.0N 161.0E	SAT	T3.0/3.0/W0/24HRS											NOAA 2	
33	182144Z	15.8N 158.7E	SAT	T3.0/3.0/W0/24HRS			(NESS)								NOAA 2 (NESS)	
34	190315Z	16.1N 157.9E	P	15 1	700MB	18	20	985	299	- -	-	- -	-	-		13
35	190740Z	16.2N 156.3E	P	10 1	700MB	24	25	989	302	- -	-	- -	-	-	FIX MADE AT SFC CNTR	13

TYPHOON SALLY
FIX POSITIONS FOR CYCLONE NO. 31
1 DEC - 8 DEC

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FLT LVL	FLT LVL WND	OBS SFC WND	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIEN-TATION	EYE DIA	THKN WALL CLD	POSIT OF RADAR /REMARKS	
1	010108Z	7.0N 110.5E	SAT	T3.0/3.0/S0/24HRS			(NESS)								NOAA 2	
2	010110Z	7.0N 110.5E	SAT	T3.5/3.5/S0/24HRS											NOAA 2	
3	010150Z	7.1N 110.3E	P	10 5	700MB	55	65	989	301	18 10	CIRC		5	10	WC OPEN NE	04
4	011030Z	6.5N 108.0E	P	5 10	700MB	70	55	984	298	16 9	CIRC		25	3	WC OPEN NW	05
5	011230Z	6.6N 107.7E	P	15 10	700MB	70	-	986	299	13 -	CIRC		25	4	CLSD WC	05
6	011500Z	6.8N 107.4E	P	15 10	700MB	65	-	985	297	16 10	CIRC		20	10	WC OPEN N	05
7	020122Z	7.1N 106.0E	P	5 5	700MB	70	90	988	301	16 12	CIRC		25	3	OPEN N HALF	06
8	020203Z	7.0N 106.3E	SAT	T4.0/4.0/D1.0/24HRS			(NESS)								NOAA 2	
9	020205Z	7.0N 105.5E	SAT	T4.0/4.0/D1.0/24HRS											NOAA 2	
10	020317Z	8.0N 103.8E	SAT	STG C											ESSA 8 (VIBU)	
11	020340Z	7.5N 105.5E	P	10 5	700MB	55	90	990	303	16 12	CIRC		25	3	WC OPEN N SEMIC	06
12	020615Z	7.2N 105.1E	P	10 5	700MB	85	75	989	303	15 10	CIRC		25	-	WC OPEN N SEMIC	06
13	021117Z	7.8N 105.0E	P	10 15	700MB	45	45	999	306	18 12	CIRC		15	-	WC W AND S VRY PR DEF	07
14	021235Z	7.9N 104.8E	P	10 15	700MB	50	-	999	310	15 12	-	- -	-	-	NEG WC	07
15	021515Z	8.2N 104.4E	P	10 15	700MB	50	-	993	302	16 -	-	- -	-	3	WC NW-SW	07
16	021800Z	7.9N 103.8E	P	10 5	700MB	70	-	987	298	14 10	CIRC		12	-	CLSD WC	07
17	022230Z	8.0N 103.5E	P	15 5	700MB	-	-	989	300	18 12	CIRC		23	-	WC OPEN E	08
18	030030Z	8.0N 103.0E	P	5 2	700MB	70	75	987	302	20 -	-	- -	-	-	SFC CNTR CIRC 20NM	08
19	030258Z	9.0N 102.5E	SAT	T4.5/4.5/D0.5/25HRS											NOAA 2	
20	030300Z	8.1N 102.6E	P	5 2	700MB	60	85	990	305	18 -	-	- -	-	-	SFC CNTR CIRC 20NM	08
21	030314Z	8.0N 103.0E	SAT	STG C											ESSA 8 (VIBU)	
22	030620Z	8.8N 102.1E	P	15 5	700MB	55	95	989	301	15 -	-	- -	-	-	SFC CNTR CIRC 25NM	09
23	030930Z	8.6N 102.1E	P	15 10	700MB	12	50	990	303	14 -	CIRC		20	-	SFC CNTR CIRC 25NM	09
24	031205Z	8.8N 101.9E	P	10 10	700MB	35	-	994	305	18 15	CIRC		20	-	WC PR DEF	09
25	031630Z	9.1N 101.4E	P	2 15	700MB	35	-	-	307	15 11	-	- -	-	-	NEG WC	10
26	031845Z	9.4N 101.4E	P	10 20	700MB	50	-	995	305	15 12	-	- -	-	-	NEG WC	10
27	032118Z	9.4N 101.4E	P	10 20	700MB	40	-	992	304	16 10	-	- -	-	-	NEG WC	10
28	040000Z	9.6N 101.3E	P	10 10	700MB	45	50	998	309	14 10	-	- -	-	-	NEG WC	10
29	040157Z	9.0N 101.0E	SAT	T4.0/4.0/S0/24HRS			(NESS)								NOAA 2	
30	040630Z	10.1N 100.5E	P	2 2	700MB	65	50	995	303	16 -	-	- -	-	-	SFC CNTR 30NM DIA	11
31	040910Z	9.9N 100.6E	P	2 4	700MB	35	50	996	306	17 -	-	- -	-	-	SFC CNTR 8 - NEG WC	11
32	041415Z	9.6N 99.3E	P	2 2	700MB	45	-	-	-	15 12	-	- -	-	-	NEG WC	12
33	041505Z	9.8N 98.9E	P	2 2	500MB	25	-	-	-	-1 -3	-	- -	-	-	NEG WC	12
34	041710Z	10.0N 98.8E	P	2 2	500MB	20	-	-	-	-2 -3	-	- -	-	-	FL WND CNTR 40NM DIA	12
35	050200Z	9.9N 99.0E	P	1 10	700MB	40	-	-	-	12 9	-	- -	-	-	OVC AS IN CNTR	13
36	050253Z	11.5N 98.5E	SAT	STG C+											NOAA 2	
37	050350Z	9.9N 98.9E	P	1 10	700MB	20	20	-	-	12 9	-	- -	-	-	OVC AS IN CNTR	13
38	050352Z	11.5N 97.9E	SAT	STG X DIA 2 CAT 3.0											ESSA (VIBU)	
39	050650Z	10.0N 98.6E	P	1 10	700MB	18	25	-	-	12 12	-	- -	-	-	OVC AS IN CNTR	13
40	060445Z	10.5N 96.7E	P	5 15	700MB	30	15	1009	315	12 12	-	- -	-	-	BRKN AS IN CNTR	14
41	070249Z	10.5N 96.0E	SAT	T2.0/2.0/D0.5/25HRS											NOAA 2	
42	070620Z	10.9N 95.6E	P	5 15	700MB	20	20	-	314	8 12	-	- -	-	-	OVC AS ABV	15
43	080146Z	13.3N 95.0E	SAT	T2.5/3.0/W0.5/24HRS			(NESS)								NOAA 2	
44	080148Z	14.0N 95.0E	SAT	T3.0/3.0/D0.5/23HRS											NOAA 2	

FIX POSITIONS FOR CYCLONE NO. 32
30 NOV - 10 DEC

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV	ACCRY MET	FLT LVL	FLT LVL WND	OBS SFC WND	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT	FLT LVL TD	EYE FORM	ORIEN-TATION	EYE DIA	THKN WALL CLD	POSIT OF RADAR /REMARKS	
1	300013Z	6.0N 145.0E	SAT	T2.0/2.0/D1.0/24HRS													NOAA 2	
2	302313Z	6.5N 138.5E	SAT	T2.0/2.0/S0/24HRS													NOAA 2	
3	012224Z	7.3N 134.0E	P	2	2	700MB	35	70	993	305	13	11	CIRC		20	-		
4	020008Z	7.0N 134.0E	SAT	T3,0/3.0/D1.0/24HRS				(NESS)									NOAA 2 (NESS)	
5	020009Z	7.0N 133.0E	SAT	T2.0/2.0/S0/25HRS													NOAA 2	
6	020234Z	7.3N 133.3E	P	2	2	700MB	40	75	991	305	15	13	-	- -	-	-	WND CIRC 20NM DIA	01
7	030015Z	8.1N 127.6E	P	10	10	700MB	65	65	992	302	16	14	CIRC		40	10	WC PR DEF	02
8	030103Z	9.0N 128.0E	SAT	T4.0/4.0/D2.0/25HRS													NOAA 2	
9	030105Z	7.5N 127.5E	SAT	T4.5/4.5/D1.5/24HRS				(NESS)									NOAA 2 (NESS)	
10	030210Z	8.3N 126.8E	DVORAK T NO.T5														ESSA 8 (RODN)	
11	030407Z	8.0N 126.5E	P	20	30	500MB	55	-	-	-	-	-	-	- -	-	-	WND CNTR 40NM DIA	02
12	040000Z	12.0N 122.0E	SAT	T4.5/4.5/S0/24HRS				(NESS)									NOAA 2 (NESS)	
13	040003Z	12.0N 121.5E	SAT	T3.5/4.0/W0.5/23HRS													NOAA 2	
14	040100Z	10.3N 122.1E	P	5	30	600MB	20	-	1006	-	6	6	-	- -	-	-	WND CNTR 20NM DIA	
15	040210Z	12.6N 119.0E	SAT	T5.0/6.0MINUS/W1.0/48HRS													ESSA 8 (RODN)	
16	040320Z	10.4N 121.7E	P	5	10	600MB	10	35	-	-	7	7	-	- -	-	-	WND CNTR 20NM DIA	04
17	040415Z	10.3N 121.3E	P	-	-	600MB	-	-	-	-	-	-	-	- -	-	-		
18	040600Z	10.7N 121.1E	P	10	10	600MB	25	-	1004	-	6	5	-	- -	-	-		
19	041210Z	11.1N 120.9E	P	3	-	600MB	30	-	-	-	7	10	-	- -	-	-	WND CNTR 10NM DIA	04
20	041510Z	11.4N 120.6E	P	5	15	600MB	30	-	-	-	5	7	CIRC		30	-	NEG WC	05
21	041830Z	11.8N 120.4E	P	5	15	600MB	33	-	-	-	-	-	CIRC		25	-	WC OPEN NE	05
22	042210Z	12.3N 119.6E	LRDR		-								-	- -	-	-	CLSD AND PR DEF	05
23	050010Z	12.3N 119.8E	P	5	5	700MB	20	45	997	304	14	14	CIRC		20	-	WC NW QUAD	06
24	050056Z	12.0N 119.0E	SAT	T4.5/4.5/D1.0/24HRS													NOAA 2	
25	050159Z	13.0N 119.6E	SAT	SIG X CIA 4 CAT 2.0													ESSA 8 (VIBU)	
26	050245Z	12.3N 119.5E	AC R		-								-	- -	-	-		
27	050300Z	12.3N 119.3E	P	10	3	700MB	20	35	989	299	15	15	CIRC		10	-	WC FRMG S SEMIC	06
28	050600Z	12.4N 119.3E	P	5	3	700MB	25	35	988	299	18	12	CIRC		30	-	EVID OF DEVELG WC ALODS	06
29	050922Z	12.4N 119.3E	P	3	3	700MB	40	-	988	296	14	11	CIRC		12	6	WC OPEN N-SE	07
30	051030Z	12.5N 119.3E	P	-	-	700MB	-	-	-	-	-	-	-	- -	-	-		
31	051210Z	12.4N 119.3E	P	3	3	700MB	65	-	986	298	14	-	CONC	-	10	15		
32	051430Z	12.4N 119.1E	P	-	-	700MB	-	-	-	-	-	-	-	- -	-	-		
33	051530Z	12.4N 119.1E	P	3	3	700MB	60	-	986	296	13	11	ELIP	N-S	35X25	10-35	OUTER WC OPEN NE INNER BARELY DEF	07
34	051700Z	12.4N 119.1E	P	-	-	700MB	-	-	-	-	-	-	-	- -	-	-		
35	051800Z	12.3N 119.0E	P	3	3	700MB	75	-	981	292	15	10	CIRC		30	8	CLSD WC	07
36	052130Z	12.4N 118.9E	P	3	-	700MB	80	-	-	-	15	-	-	- -	-	-	CLSD WC	08
37	060030Z	12.4N 118.7E	P	5	5	700MB	-	-	-	-	-	-	CIRC		25	-	CLSD WC	08
38	060330Z	12.5N 118.5E	P	5	5	700MB	-	100	-	-	-	-	CIRC		43	-	CLSD WC	08
39	060430Z	11.6N 118.8E	AC R		-								-	- -	-	-		
40	060609Z	12.6N 118.4E	P	5	5	700MB	65	100	-	-	-	-	ELIP	N-S	24X20	-	CLSD WC	08
41	060910Z	12.7N 118.1E	AC R		-								-	- -	-	-		
42	061015Z	12.6N 118.3E	P	5	3	700MB	75	-	963	278	16	11	CIRC		30	5	WC OPEN SE	09
43	061200Z	12.6N 118.0E	P	5	5	700MB	50	-	-	281	16	13	CIRC		30	-	WC S SEMIC	09
44	061310Z	12.8N 118.0E	AC R		-								-	- -	-	-		
45	061625Z	12.8N 117.9E	AC R		-								-	- -	-	-		
46	061780Z	12.7N 117.6E	P	5	10	700MB	75	-	969	283	15	13	CIRC		40	-	EVID WC NW SEMIC	09
47	061810Z	12.7N 117.5E	P	5	10	700MB	75	-	969	282	15	13	CIRC		40	-	WC FRMG ALODS	09
48	061820Z	12.7N 117.7E	AC R		-								-	- -	-	-		
49	062045Z	12.8N 117.3E	AC R		-								CIRC		40	-		
50	062140Z	12.8N 117.3E	AC R		-								-	- -	-	-		
51	062145Z	12.6N 117.2E	P	2	2	700MB	75	-	967	280	17	13	CIRC		40	-	CLSD WC	10
52	062319Z	12.9N 117.1E	P	-	-	700MB	-	-	-	-	-	-	-	- -	-	-		
53	070030Z	13.9N 114.9E	AC R		-								-	- -	-	-		
54	070100Z	12.8N 117.0E	P	5	5	700MB	80	100	961	276	20	15	CIRC		40	10	CLSD WC	10
55	070122Z	13.0N 116.8E	P	-	-	700MB	-	-	-	-	-	-	-	- -	-	-		
56	070230Z	13.5N 117.0E	SAT	SIG UNK													ESSA 8 (VIBU)	
57	070338Z	13.0N 117.0E	AC R		-								CIRC		30	-		
58	070350Z	13.1N 116.7E	AC R		-								CIRC		35	-		
59	070355Z	13.0N 116.7E	P	10	2	700MB	80	100	953	271	21	15	CIRC		30	10	CLSD WC	10
60	070600Z	13.1N 116.5E	P	10	5	700MB	80	100	952	269	21	15	CIRC		30	10	CLSD WC	10
61	070650Z	13.2N 116.1E	AC R		-								-	- -	-	-		
62	070920Z	13.3N 116.3E	SRDR		-								-	- -	-	-		
63	071052Z	13.3N 116.1E	P	1	3	700MB	80	-	944	262	22	11	CIRC		30	10	CLSD WC	11
64	071140Z	13.5N 116.0E	AC R		-								-	- -	-	-		
65	071200Z	13.3N 115.9E	P	1	3	700MB	-	-	944	263	22	-	CIRC		30	10	CLSD WC	11
66	071200Z	13.6N 116.0E	AC R		-								CIRC		35	-		
67	071500Z	13.5N 115.7E	SRDR		-								-	- -	-	-		
68	071625Z	13.6N 115.6E	P	3	3	700MB	95	-	955	272	20	16	CIRC		30	5	CLSD WC	12
69	071800Z	13.8N 115.3E	SRDR		-								-	- -	-	-		
70	071800Z	13.5N 115.5E	AC R		-								-	- -	-	-		
71	071850Z	13.7N 115.4E	P	10	10	700MB	100	-	957	273	20	16	CIRC		25	-	CLSD WC	12
72	072117Z	13.7N 115.2E	P	5	5	700MB	70	-	960	274	20	16	CIRC		25	5	CLSD WC	12
73	080020Z	13.9N 115.0E	P	3	3	700MB	110	65	960	275	20	19	CIRC		30	5	CLSD WC	12
74	080030Z	13.9N 114.9E	AC R		-								-	- -	-	-		
75	080146Z	14.0N 114.5E	SAT	T6.0/6.5MINUS/W0.5/24HRS													NOAA 2	
76	080230Z	14.0N 114.0E	AC R		-								-	- -	-	-		
77	080315Z	13.9N 114.3E	SAT	SIG UNK														
78	080330Z	13.9N 114.4E	P	5	5	700MB	105	100	959	274	21	14	CIRC		25	5	CLSD WC	13
79	080514Z	14.0N 114.3E	P	-	-	700MB	-	-	-	-	-	-	-	- -	-	-		
80	080700Z	13.9N 114.2E	P	5	5	700MB	100	100	954	271	22	14	CIRC		30	5	CLSD WC	13
81	080805Z	13.9N 114.1E	P	-	-	700MB	-	-	-	-	-	-	-	- -	-	-		
82	080930Z	13.9N 114.0E	P	5	5	700MB	100	100	960	276	21	14	CIRC		25	5	CLSD WC	13
83	080950Z	13.9N 113.9E	SRDR		-								-	- -	-	-		
84	081022Z	13.9N 113.8E	P	-	-	700MB	-	-	-	-	-	-	-	- -	-	-		
85	081135Z	13.9N 113.7E	P	5	5	700MB	100	-	965	279	19	14	CIRC		25	5	CLSD WC	13
86	081200Z	13.9N 113.9E	SRDR		-								-	- -	-	-		
87	081255Z	13.9N 113.6E	SRDR		-								-	- -	-	-		
88	081300Z	13.9N 113.8E	SRDR		-								-	- -	-	-		
89	081335Z	13.9N 113.6E	SRDR		-								-	- -	-	-		
90	081400Z	13.9N 113.6E	SRDR		-								-	- -	-	-		
91	081500Z	13.7N 113.4E	SRDR		-								-	- -	-	-		
92	081600Z	13.9N 113.3E	SRDR		-								-	- -	-	-		
93	081611Z	14.0N 113.2E	P	2	5	700MB	90	-	970	282	15	10	CIRC		25	8	CLSD WC	14
94	081625Z	14.0N 113.3E	AC R		-								-	- -	-	-		

TYPHOON THERESE

FIX POSITIONS FOR CYCLONE NO. 32
30 NOV - 10 DEC

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV	ACCRY MET	FLT LVL	FLT LVL WND	OBS SFC WND	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIEN-TATION	EYE DIA	THKN WALL CLD	POSIT OF RADAR /REMARKS	
95	081821Z	13.9N 112.9E	P	2	5	700MB	70	-	-	283	13 9	CIRC		25	8	CLSD WC	14
96	081914Z	13.9N 112.9E	SRDR		-							-	- -	-	-		
97	082000Z	13.8N 112.8E	SRDR		-							-	- -	-	-		
98	082100Z	13.9N 112.7E	P	2	5	700MB	80	-	971	282	13 10	CIRC		25	10	CLSD WC	14
99	082100Z	13.8N 112.6E	AC R		-							-	- -	-	-		
100	082223Z	14.0N 113.2E	AC R		-							-	- -	-	-		
101	090046Z	14.0N 112.0E	SAT	T5.5/6.0/W0.5/24HRS				(NESS)								NOAA 2 (NESS)	
102	090048Z	14.0N 111.8E	SAT	T6.0/6.0/S0/24HRS												NOAA 2	
103	090330Z	13.8N 112.1E	SAT	SIG UNK												ESSA 8 (VTBD)	
104	090500Z	14.0N 111.6E	SRDR		-							-	- -	-	-		
105	090600Z	14.0N 111.5E	SRDR		-							-	- -	-	-		
106	090652Z	14.0N 111.3E	P	1	4	700MB	80	100	962	276	18 -	CIRC		30	8	CLSD WC	15
107	090700Z	14.0N 111.4E	SRDR		-							-	- -	-	-		
108	090800Z	13.9N 111.3E	SRDR		-							-	- -	-	-		
109	090900Z	14.0N 111.3E	SRDR		-							-	- -	-	-		
110	090916Z	14.2N 111.5E	AC R		-							-	- -	-	-		
111	091000Z	13.9N 110.9E	SRDR		-							-	- -	-	-		
112	091100Z	14.0N 110.8E	SRDR		-							-	- -	-	-		
113	091200Z	13.9N 110.7E	SRDR		-							-	- -	-	-		
114	091210Z	13.9N 110.8E	P	5	5	700MB	90	-	971	284	21 15	CIRC		30	-	CLSD WC PR DEF	16
115	091300Z	14.0N 110.6E	SRDR		-							-	- -	-	-		
116	091305Z	14.0N 110.8E	AC R		-							CIRC		30	-		
117	091339Z	13.9N 110.5E	P	-	-	700MB	-	-	-	-	- -	-	- -	-	-		
118	091400Z	14.1N 110.5E	SRDR		-							-	- -	-	-		
119	091435Z	13.9N 111.3E	SRDR		-							-	- -	-	-		
120	091500Z	14.1N 110.2E	SRDR		-							-	- -	-	-		
121	091510Z	14.0N 110.3E	P	5	5	700MB	100	-	975	287	20 15	-	- -	-	-	WC NOT DEF	16
122	091600Z	14.1N 110.1E	SRDR		-							-	- -	-	-		
123	091700Z	14.1N 109.1E	SRDR		-							-	- -	-	-		
124	091745Z	14.1N 109.9E	AC R		-							-	- -	-	-		
125	091800Z	14.1N 109.9E	P	5	5	700MB	65	-	985	288	20 15	-	- -	-	-	WC NOT DEF	16
126	091800Z	14.2N 109.8E	SRDR		-							-	- -	-	-		
127	092000Z	14.3N 109.3E	AC R		-							-	- -	-	-		
128	092000Z	14.3N 109.3E	SRDR		-							-	- -	-	-		
129	092100Z	14.2N 109.3E	SRDR		-							-	- -	-	-		
130	092200Z	14.3N 109.1E	SRDR		-							-	- -	-	-		
131	092225Z	14.1N 109.2E	P	1	5	700MB	70	-	-	292	15 10	CIRC		25	10	OPEN TO N	17
132	092300Z	14.4N 108.9E	SRDR		-							-	- -	-	-		
133	100000Z	14.2N 109.0E	SRDR		-							-	- -	-	-		
134	100143Z	14.8N 108.3E	SAT	T5.0/6.0/W1.0/24HRS												NOAA 2	

CHAPTER V — SUMMARY OF FORECAST VERIFICATION DATA

1. COMPARISON OF OBJECTIVE TECHNIQUES

a. GENERAL:

Verification of objective forecasting techniques has been continuous since 1967, although year-to-year modifications and improvements have prevented any long period comparisons of more than a few of the techniques. None of the objective forecasts used now go beyond the simple steering cocept of a point vortex in a smoothed flow field with adjustments based on past movement. Intensification and its important relationship to movement are excluded in all objective forecasts.

b. DISCUSSION OF OBJECTIVE TECHNIQUES:

(1) EXTRAPOLATION - Past 12-hour movement is extrapolated to 24 and 48 hours.

(2) ARAKAWA (1963) - Grid overlay values of surface pressure are entered into regression equations. Previously hand computed, computations were computerized during the latter half of the 1972 season.

(3) HATRACK 700 mb, 500 mb (Hardie, 1967) - Point vortex advected on the 700-mb and 500-mb analysis or prognostic SR (space mean) field in six-hour time steps out through 84 hours (without bias correction).

(4) MOHATT 700/500 - A modification to HATRACK. It computes the previous 12-hour forecast error and applies a bias correction to forecasted positions.

(5) TYRACK - Tropical cyclone movement forecast on FLEWEACEN Pearl tropical fields (Herbert, 1968). This technique was lost on 23 September 1972 when the FLEWEACEN Pearl tropical fields were replaced by FLENUMWEACEN Monterey's global band upper air (GBUA) progs.

(6) TSGLOB - Modification of the basic TYRACK to use the FNWC Monterey GBUA progs. Further modifications by the JTWC provided forecasts out to 72 hours. Due to the similarity between the two programs, TYRACK and TSGLOB results have been combined under TSGLOB.

(7) TYFOON-72 - Modified version of the basic TYFOON program (Jarrell and Somervell, 1970). The program outputs forecast positions as the centers of probability ellipses out to 72 hours based on a group of analog storms which occurred within a time/space envelope centered about the date and position of the storm being forecast. Ellipses are based on the analog population weighted according to similarity to the existing storm.

c. TESTING AND RESULTS:

Table 5-1 presents a homogeneous comparison of all techniques used. The official JTWC forecast is included for comparison. The comparison reveals that the TYFOON-72 program was, on the average, superior to all existing techniques, yet inferior to the official JTWC forecasts. Research continues in an effort to improve the objective techniques used by the JTWC.

2. SUMMARY OF TROPICAL CYCLONE FORMATION ALERTS

The Tropical Cyclone Alert message, in its third year of use, provided JTWC with a means to adequately warn DOD activities of potentially dangerous tropical disturbances which normally had not reached the tropical depression stage.

During 1972 there were 41 tropical disturbances in the western North Pacific for which alerts were issued. The total number of alerts, including extensions was 72. Twelve alert systems were not subsequently placed in warning status. Twenty-eight of the 32 tropical cyclones placed in warning status during 1972 were initially covered by formation alerts.

SUMMARY

	NO. OF ALERT SYSTEMS	ALERT SYSTEMS WHICH BECAME NUMBERED TROPICAL CYCLONES	TOTAL NUMBERED TROPICAL CYCLONES	DEVELOPMENT RATE
1970	32	18	27	56%
1971	48	33	37	69%
1972	41	29	32	71%

MONTHLY DISTRIBUTION

J	F	M	A	M	J	J	A	S	O	N	D
1	0	0	0	1	4	8	5	9	8	3	2

TABLE 5-1. 1972 OBJECTIVE TECHNIQUES VERIFICATION

24-HOUR

	JTWC		XTRP		ARKW		HT7P		HT5P		MH7M		MH5M		TSGB		TYFN	
JTWC	588	117																
	117	0																
XTRP	499	117	499	126														
	126	11	126	0														
ARKW	123	121	115	125	123	136												
	136	15	134	9	136	0												
HT7P	61	117	59	144	30	128	61	264										
	264	148	266	122	268	140	264	0										
HT5P	62	117	58	140	31	131	59	263	62	277								
	277	160	277	137	300	169	270	7	277	0								
MH7M	16	109	14	116	7	98	9	307	10	263	16	206						
	206	97	195	79	251	153	163	-144	166	-97	206	0						
MH5M	20	115	17	140	6	114	13	309	13	284	14	213	20	218				
	218	103	206	65	301	188	177	-131	188	-96	221	8	218	0				
TSGB	465	116	430	128	112	139	57	262	58	282	17	214	18	229	465	138		
	138	22	139	11	161	22	171	-92	172	-110	155	-59	152	-78	138	0		
TYFN	423	118	393	130	110	138	55	260	55	273	16	206	19	218	395	140	423	128
	128	10	127	-3	128	-10	134	-126	139	-133	139	-67	150	-68	128	-11	128	0

NUMBER OF CASES	Y-AXIS TECHNIQUE ERROR
X-AXIS TECHNIQUE ERROR	ERROR DIFFERENCE X-Y

48-HOUR

	JTWC		XTRP		ARKW		HT7P		HT5P		MH7M		MH5M		TSGB		TYFN	
JTWC	401	245																
	245	0																
XTRP	363	245	392	267														
	273	27	267	0														
ARKW	76	257	75	269	79	264												
	260	3	249	-20	264	0												
HT7P	47	243	44	292	27	309	49	522										
	525	281	520	228	564	254	522	0										
HT5P	46	249	42	305	27	334	46	512	48	498								
	499	250	497	192	581	247	482	-30	498	0								
MH7M	12	215	9	164	6	373	10	547	10	465	13	426						
	404	190	406	244	384	11	407	-140	408	-57	426	0						
MH5M	10	218	6	194	3	432	9	541	8	486	8	415	10	403				
	403	185	409	215	317	-115	376	-165	401	-84	398	-17	403	0				
TSGB	332	239	339	264	74	271	46	527	45	514	11	408	8	437	376	307		
	309	70	303	40	381	110	352	-176	363	-151	323	-85	330	-107	307	0		
TYFN	303	244	313	268	73	266	42	512	41	494	13	424	9	373	320	309	341	256
	258	14	255	-13	261	-6	287	-225	310	-184	277	-147	258	-116	255	-54	256	0

JTWC - OFFICIAL JTWC SUBJECTIVE FORECAST
XTRP - EXTRAPOLATION
ARKW - ARAKAWA
HT7P - HATRACK 700 MB PROG
HT5P - HATRACK 500 MB PROG
MH7M - MODIFIED HATRACK 700 MB
MH5M - MODIFIED HATRACK 500 MB
TSGB - TS/GLOBAL BANDS
TYFN - TYFOON (WEIGHTED CLIMO)

72-HOUR

	JTWC		TSGB		TYFN	
JTWC	269	381				
	381	0				
TSGB	51	376	56	412		
	441	66	412	0		
TYFN	201	355	28	497	232	389
	389	35	266	-231	389	0

3. ANNUAL FORECAST VERIFICATION

Forecast positions for the 24-, 48-, and 72-hour forecasts are verified only as long as the best track analysis estimates winds in excess of 35 kt for tropical cyclones which reach typhoon intensity.

In addition to this method of verifying absolute error distance, a computation of closest distance to the best track (right angle error) has been included to indicate the demonstrated ability to forecast the path of motion without regard to speed.

The following tables and figures are presented to graphically depict the distribution of forecasting error in JTWC forecasts.

TABLE 5-2. JTWC ANNUAL AVERAGE FORECAST ERROR

	24 HR	48 HR	72 HR
1950-58	170	---	---
1959	*117	*267	---
1960	177	354	---
1961	136	274	---
1962	144	287	476
1963	127	246	374
1964	133	284	429
1965	151	303	418
1966	136	280	432
1967	125	276	414
1968	105	229	337
1969	111	237	349
1970	98	181	272
1971	99	203	308
1972	116	245	382

*Forecast positions north of 35N were not verified.

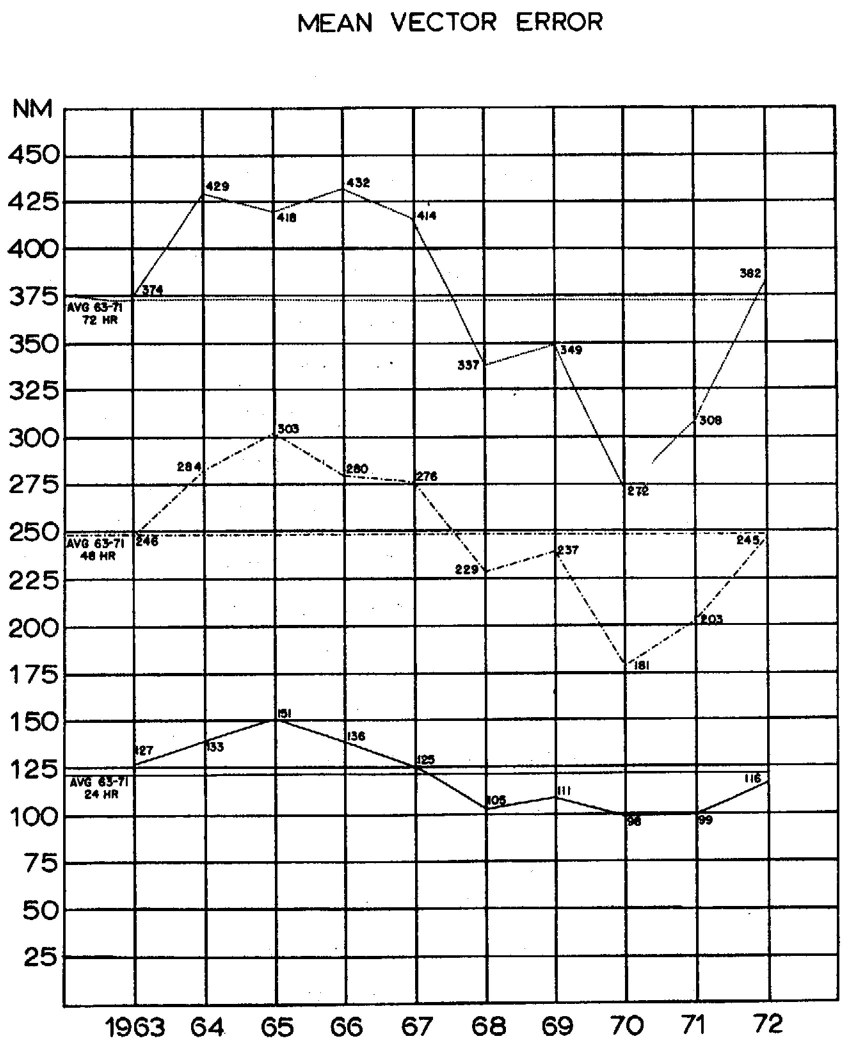


FIGURE 5-1. *Mean vector error.*

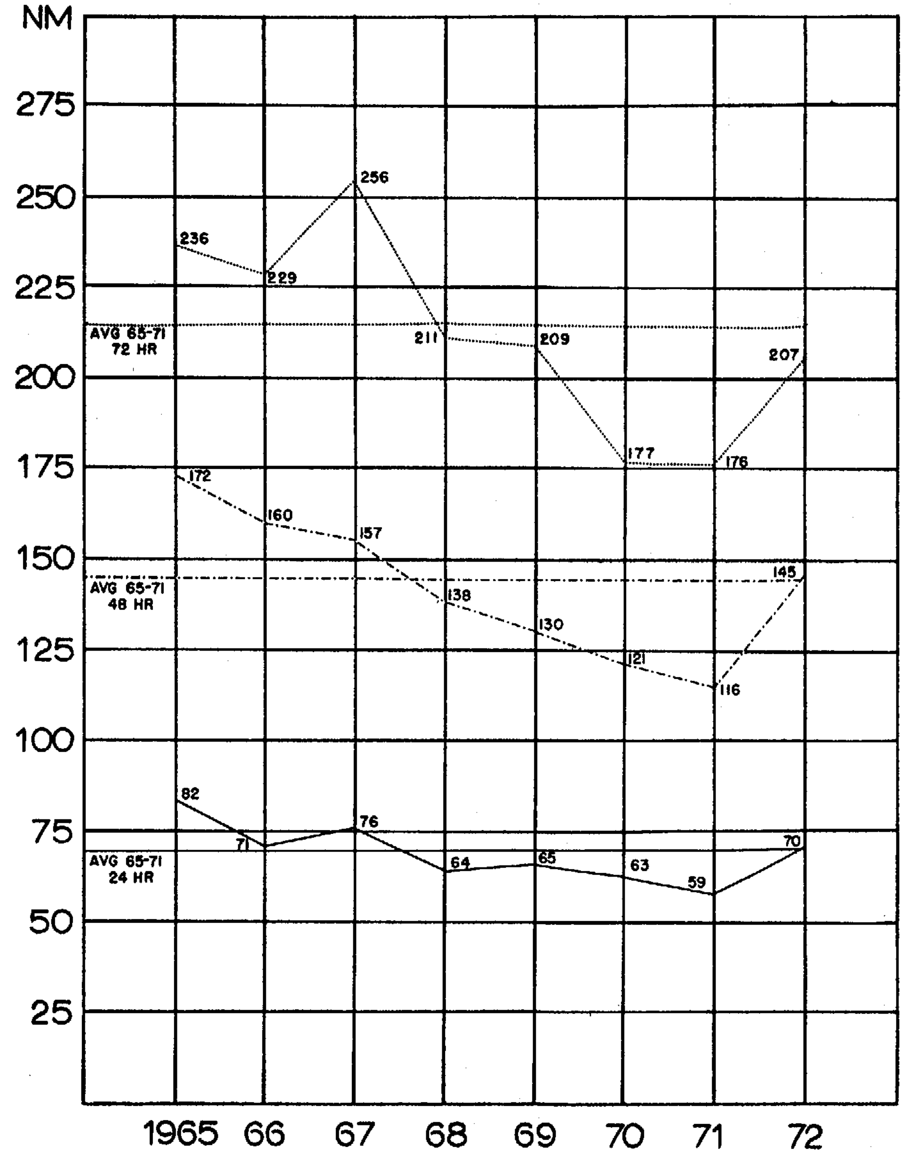


FIGURE 5-2. *Right angle error.*

4. SUMMARY OF INDIVIDUAL TROPICAL STORM VERIFICATION

TABLE 5-3. 1972 JTWC ERROR SUMMARY

(Average errors are given in nautical miles)

	CYCLONE	WARNING POSIT ERROR	WARNING RT ANGLE ERROR	WARNING # WRNGS	24 HOUR FCST ERROR	24 HOUR RT ANGLE ERROR	24 HOUR # CASES	48 HOUR FCST ERROR	48 HOUR RT ANGLE ERROR	48 HOUR # CASES	72 HOUR FCST ERROR	72 HOUR RT ANGLE ERROR	72 HOUR # CASES
1.	TY KIT	29	18	15	114	76	11	218	172	5	---	---	-
2.	TD 02	85	72	5	207	207	1	---	---	--	---	---	--
3.	TY LOLA	19	13	26	127	84	22	356	211	17	784	461	7
4.	TS MAMIE	27	16	5	92	52	1	---	---	--	---	---	--
5.	TS NINA	44	23	3	---	---	--	---	---	--	---	---	--
6.	TY ORA	21	16	19	107	61	15	241	96	8	404	128	4
7.	TY PHYLLIS	23	16	38	137	82	34	331	204	27	524	327	23
8.	TY RITA	20	12	79	118	80	75	260	183	69	386	222	61
9.	TY SUSAN	40	28	29	148	108	25	216	186	13	416	399	2
10.	TY TESS	27	18	64	114	68	60	237	139	47	346	208	43
11.	TS VIOLA	52	35	7	222	151	3	---	---	--	---	---	--
12.	TS WINNIE	29	27	7	107	72	3	---	---	--	---	---	--
13.	TY ALICE	23	14	26	116	48	22	224	78	17	397	132	11
14.	TY BETTY	15	10	35	87	66	31	179	147	24	296	236	20
16.	TY CORA	32	12	15	97	33	11	120	46	6	178	66	2
15.	TS DORIS	25	12	12	118	99	8	---	---	--	---	---	--
17.	TY ELSIE	16	11	16	108	85	12	302	270	6	---	---	--
18.	TY FLOSSIE	20	14	25	75	44	21	99	72	9	125	106	5
19.	TS GRACE	31	17	11	165	96	5	---	---	--	---	---	--
20.	TY HELEN	20	13	15	95	45	11	326	68	6	623	118	2
21.	TD 21	112	70	7	98	66	3	---	---	--	---	---	--
22.	TY IDA	21	9	29	156	68	25	353	121	18	634	207	14
23.	(CENTRAL PACIFIC HURRICANE CENTER)												
24.	TS KATHY	38	19	19	199	109	15	334	194	11	448	279	5
25.	TY LORNA	14	12	8	128	117	4	---	---	--	---	---	--
26.	TY MARIE	22	15	27	122	60	23	255	109	16	289	130	12
27.	TY NANCY	25	14	22	135	98	18	282	197	13	422	246	9
28.	TY OLGA	21	12	30	136	71	26	263	123	22	420	156	18
29.	TY PAMELA	27	15	18	121	86	14	161	104	10	155	48	6
30.	TY RUBY	18	11	23	84	45	19	161	112	15	279	194	11
31.	TY SALLY	21	15	16	90	42	12	178	129	8	287	250	4
32.	TY THERESE	16	10	36	89	60	32	161	84	25	252	126	21
33.	TS VIOLET	36	23	30	83	53	26	193	145	9	330	250	9
ALL FORECASTS		25	16	717	117	72	588	245	146	401	381	210	289
*TYPHOONS		22	14	601	116	70	519	245	145	377	382	207	272

*Includes only forecasts on cyclones that became typhoons and only when verifying best track wind was 35 kt.

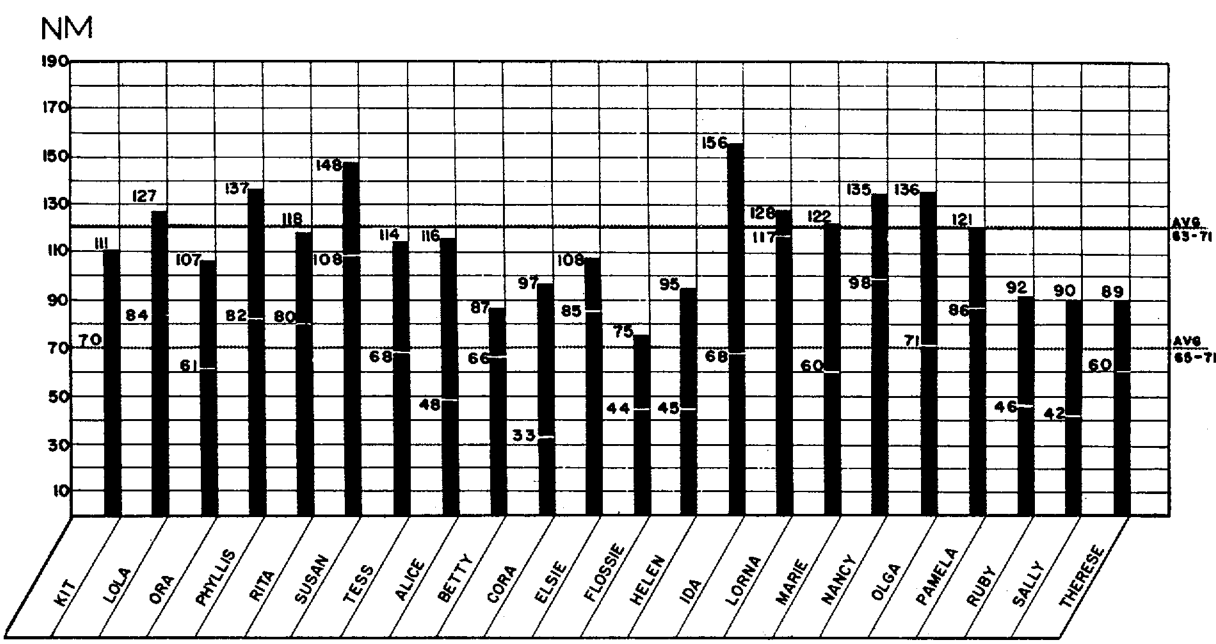


FIGURE 5-3. *1972 average vector and right angle errors of 24-hr forecasts.*

5. TROPICAL STORM AND DEPRESSION DATA

TROPICAL DEPRESSION 02

0000Z 31 MAR TO 0600Z 01 APR

	BEST TRACK POSIT	BEST TRACK WIND	WARNING POSIT	WARNING WIND	WARNING ERRORS DST	WARNING ERRORS WIND	24 HOUR FORECAST POSIT	24 HOUR WIND	24 HOUR ERRORS DST	24 HOUR ERRORS WIND	48 HOUR FORECAST POSIT	48 HOUR WIND	48 HOUR ERRORS DST	48 HOUR ERRORS WIND	72 HOUR FORECAST POSIT	72 HOUR WIND	72 HOUR ERRORS DST	72 HOUR ERRORS WIND
310000Z	4.8N 159.1E	30	4.4N 158.8E	30	30	0	5.8N 155.9E	50	207	30	--.- ---.-	--	--	--	--.- ---.-	--	--	--
311200Z	4.2N 159.9E	30	4.5N 158.7E	30	74	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
311800Z	3.7N 159.6E	25	4.9N 158.9E	30	83	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
010000Z	3.4N 159.1E	25	5.0N 159.0E	30	96	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
010600Z	3.3N 158.3E	20	4.0N 156.0E	20	143	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

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TROPICAL STORM MARIE

0000Z 02 JUN TO 0600Z 03 JUN

	BEST TRACK POSIT	BEST TRACK WIND	WARNING POSIT	WARNING WIND	WARNING ERRORS DST	WARNING ERRORS WIND	24 HOUR FORECAST POSIT	24 HOUR WIND	24 HOUR ERRORS DST	24 HOUR ERRORS WIND	48 HOUR FORECAST POSIT	48 HOUR WIND	48 HOUR ERRORS DST	48 HOUR ERRORS WIND	72 HOUR FORECAST POSIT	72 HOUR WIND	72 HOUR ERRORS DST	72 HOUR ERRORS WIND
020000Z	15.4N 111.1E	45	15.0N 110.5E	40	42	-5	15.3N 107.9E	40	92	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
021200Z	15.6N 109.9E	45	15.5N 109.7E	50	13	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
021800Z	15.9N 108.9E	50	15.7N 109.0E	50	13	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
030000Z	16.3N 107.6E	45	16.1N 108.3E	45	42	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
030600Z	16.5N 106.9E	40	16.5N 107.3E	30	23	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

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TROPICAL STORM NINA

0000Z 04 JUN TO 1200Z 04 JUN

	BEST TRACK POSIT	BEST TRACK WIND	WARNING POSIT	WARNING WIND	WARNING ERRORS DST	WARNING ERRORS WIND	24 HOUR FORECAST POSIT	24 HOUR WIND	24 HOUR ERRORS DST	24 HOUR ERRORS WIND	48 HOUR FORECAST POSIT	48 HOUR WIND	48 HOUR ERRORS DST	48 HOUR ERRORS WIND	72 HOUR FORECAST POSIT	72 HOUR WIND	72 HOUR ERRORS DST	72 HOUR ERRORS WIND
040000Z	10.3N 153.5E	45	10.0N 153.5E	40	18	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
040600Z	10.5N 154.4E	40	10.0N 154.0E	45	38	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
041200Z	11.2N 155.3E	40	10.2N 154.5E	30	76	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

TROPICAL STORM VIOLA

1200Z 24 JUL TO 0000Z 26 JUL

	BEST TRACK POSIT	BEST TRACK WIND	WARNING POSIT	WARNING WIND	WARNING ERRORS DST	WARNING ERRORS WIND	24 HOUR FORECAST POSIT	24 HOUR WIND	24 HOUR ERRORS DST	24 HOUR ERRORS WIND	48 HOUR FORECAST POSIT	48 HOUR WIND	48 HOUR ERRORS DST	48 HOUR ERRORS WIND	72 HOUR FORECAST POSIT	72 HOUR WIND	72 HOUR ERRORS DST	72 HOUR ERRORS WIND
241200Z	23.5N 160.6E	55	23.9N 159.8E	30	50	-25	27.2N 161.7E	50	250	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
241800Z	24.5N 162.1E	60	24.7N 160.1E	40	109	-20	27.9N 162.0E	50	312	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
250000Z	24.7N 163.3E	60	25.3N 163.8E	50	45	-10	30.4N 170.2E	40	103	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
250600Z	25.7N 164.9E	60	25.1N 164.6E	60	39	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
251200Z	27.2N 166.4E	60	27.6N 166.6E	60	26	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
251800Z	29.7N 167.6E	55	28.9N 167.6E	60	49	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
260000Z	31.9N 169.2E	50	32.2N 168.3E	60	49	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

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TROPICAL STORM WINNIE

1200Z 31 JUL TO 0000Z 02 AUG

	BEST TRACK POSIT	BEST TRACK WIND	WARNING POSIT	WARNING WIND	WARNING ERRORS DST	WARNING ERRORS WIND	24 HOUR FORECAST POSIT	24 HOUR WIND	24 HOUR ERRORS DST	24 HOUR ERRORS WIND	48 HOUR FORECAST POSIT	48 HOUR WIND	48 HOUR ERRORS DST	48 HOUR ERRORS WIND	72 HOUR FORECAST POSIT	72 HOUR WIND	72 HOUR ERRORS DST	72 HOUR ERRORS WIND
311200Z	24.1N 127.1E	40	23.7N 128.1E	30	60	-10	26.7N 123.9E	40	124	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
311800Z	24.8N 125.5E	40	25.0N 125.5E	35	12	-5	28.0N 118.6E	25	125	-35	--.- ---.-	--	--	--	--.- ---.-	--	--	--
010000Z	25.3N 124.0E	40	25.6N 124.4E	35	28	-5	28.0N 118.6E	25	72	-20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
010600Z	25.9N 122.7E	45	25.8N 122.4E	35	17	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
011200Z	26.4N 121.6E	55	26.0N 121.0E	35	40	-20	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
011800Z	26.9N 120.8E	60	26.6N 120.3E	35	32	-25	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
020000Z	27.3N 119.9E	45	27.3N 119.6E	40	16	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

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TROPICAL STORM DORIS

0600Z 25 AUG TO 0000Z 28 AUG

	BEST TRACK POSIT	BEST TRACK WIND	WARNING POSIT	WARNING WIND	WARNING ERRORS DST	WARNING ERRORS WIND	24 HOUR FORECAST POSIT	24 HOUR WIND	24 HOUR ERRORS DST	24 HOUR ERRORS WIND	48 HOUR FORECAST POSIT	48 HOUR WIND	48 HOUR ERRORS DST	48 HOUR ERRORS WIND	72 HOUR FORECAST POSIT	72 HOUR WIND	72 HOUR ERRORS DST	72 HOUR ERRORS WIND
250600Z	26.2N 162.9E	25	26.2N 162.8E	30	5	5	28.1N 159.9E	45	81	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
251200Z	27.1N 162.5E	30	27.3N 162.0E	30	29	0	30.8N 158.4E	45	102	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
251800Z	27.8N 161.8E	30	27.8N 161.3E	30	26	0	31.3N 158.1E	45	115	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
260000Z	28.6N 161.1E	35	29.2N 160.2E	40	59	5	34.5N 158.1E	45	231	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
260600Z	29.3N 160.6E	40	29.7N 160.4E	45	26	5	34.4N 159.1E	40	144	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
261200Z	30.1N 160.2E	40	30.1N 160.2E	50	0	10	33.1N 159.3E	40	75	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
261800Z	30.6N 160.2E	40	30.7N 160.2E	50	6	10	34.1N 159.2E	40	110	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
270000Z	31.1N 160.3E	45	31.3N 160.2E	45	13	0	35.4N 160.3E	40	64	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
270600Z	32.3N 160.5E	45	31.7N 160.3E	40	37	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
271200Z	33.1N 160.8E	50	32.8N 160.4E	45	27	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
271800Z	33.9N 161.4E	55	33.9N 160.6E	45	40	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
280000Z	34.6N 161.7E	55	34.6N 161.1E	45	29	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

3

TROPICAL STORM GRACE

0600Z 12 SEP TO 1200Z 17 SEP

	BEST TRACK POSIT	BEST TRACK WIND	WARNING POSIT	WARNING WIND	ERRORS DST	ERRORS WIND	24 HOUR FORECAST POSIT	WIND	ERRORS DST	ERRORS WIND	48 HOUR FORECAST POSIT	WIND	ERRORS DST	ERRORS WIND	72 HOUR FORECAST POSIT	WIND	ERRORS DST	ERRORS WIND
1206002	15.3N 125.8E	45	15.4N 125.7E	30	8	-15	15.9N 123.7E	50	61	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
1212002	15.2N 125.5E	50	15.3N 125.3E	30	13	-20	15.5N 123.0E	50	83	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
1218002	15.2N 124.7E	50	15.3N 124.9E	40	13	-10	15.6N 122.9E	55	123	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
1300002	15.1N 124.4E	45	15.3N 124.4E	45	12	0	15.8N 122.4E	60	214	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
1306002	15.0N 124.2E	45	15.2N 123.9E	45	21	0	15.6N 121.7E	60	344	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
1312002	14.9N 124.3E	40	14.9N 124.4E	45	6	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
1318002	14.9N 124.9E	45	14.9N 123.9E	45	58	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
1400002	14.6N 125.9E	40	14.0N 125.5E	30	43	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
1406002	14.3N 127.5E	40	13.8N 126.6E	30	60	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
1706002	16.3N 127.2E	40	16.2N 127.7E	30	29	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
1712002	16.1N 125.7E	35	16.2N 127.1E	30	81	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
									2									

TROPICAL DEPRESSION 21

0600Z 13 SEP TO 1800Z 14 SEP

	BEST TRACK POSIT	BEST TRACK WIND	WARNING POSIT	WARNING WIND	ERRORS DST	ERRORS WIND	24 HOUR FORECAST POSIT	WIND	ERRORS DST	ERRORS WIND	48 HOUR FORECAST POSIT	WIND	ERRORS DST	ERRORS WIND	72 HOUR FORECAST POSIT	WIND	ERRORS DST	ERRORS WIND
1306002	9.1N 160.3E	25	9.8N 159.9E	30	48	5	10.3N 156.8E	45	73	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
1312002	8.9N 159.5E	25	9.8N 159.3E	30	55	5	10.6N 156.1E	55	97	30	--.- ---.-	--	--	--	--.- ---.-	--	--	--
1318002	8.8N 158.8E	30	9.9N 158.5E	30	68	0	10.3N 155.2E	55	124	30	--.- ---.-	--	--	--	--.- ---.-	--	--	--
1400002	8.9N 157.7E	30	8.8N 157.4E	30	19	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
1406002	9.1N 156.6E	25	8.8N 158.1E	30	90	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
1412002	9.6N 154.8E	25	8.8N 158.1E	30	200	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
1418002	10.1N 153.1E	25	8.8N 158.1E	30	305	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
									2									

TROPICAL STORM KATHY

0000Z 01 OCT TO 1200Z 05 OCT

	BEST TRACK POSIT	BEST TRACK WIND	WARNING POSIT	WARNING WIND	ERRORS DST	ERRORS WIND	24 HOUR FORECAST POSIT	WIND	ERRORS DST	ERRORS WIND	48 HOUR FORECAST POSIT	WIND	ERRORS DST	ERRORS WIND	72 HOUR FORECAST POSIT	WIND	ERRORS DST	ERRORS WIND
0100002	16.3N 155.5E	50	16.2N 155.7E	55	13	5	17.7N 152.2E	75	173	30	19.4N 148.6E	90	181	35	20.9N 146.2E	110	262	50
0106002	16.8N 154.3E	50	16.7N 154.5E	60	13	10	18.4N 150.9E	80	189	25	20.1N 147.6E	95	150	30	21.6N 145.0E	115	306	55
0112002	17.6N 153.1E	50	17.4N 153.0E	60	13	10	19.6N 148.3E	80	63	20	22.1N 144.4E	95	81	15	24.8N 141.2E	115	216	55
0118002	18.7N 151.9E	45	18.7N 151.9E	60	0	15	22.5N 147.9E	80	154	25	25.6N 146.1E	85	345	5	--.- ---.-	--	--	--
0200002	20.1N 150.5E	45	19.7N 150.8E	60	29	15	24.2N 147.4E	80	238	25	28.7N 147.2E	80	559	20	34.3N 153.9E	55	1063	-5
0206002	20.4N 148.3E	55	21.1N 149.3E	60	70	5	26.2N 146.0E	70	343	10	30.7N 148.8E	60	741	00	--.- ---.-	--	--	--
0212002	20.4N 147.1E	60	20.4N 146.3E	60	45	0	20.4N 140.3E	75	208	15	21.2N 136.1E	80	138	20	23.1N 132.9E	80	394	30
0218002	20.4N 146.3E	55	20.4N 146.7E	60	22	5	20.4N 144.2E	75	93	15	20.4N 140.3E	80	268	20	--.- ---.-	--	--	--
0300002	20.5N 145.6E	55	20.4N 145.7E	60	8	5	20.5N 143.2E	75	98	15	20.6N 139.3E	80	394	20	--.- ---.-	--	--	--
0306002	20.7N 145.0E	60	20.5N 145.4E	50	25	-10	20.6N 144.8E	50	300	-10	21.0N 142.1E	55	497	5	--.- ---.-	--	--	--
0312002	20.8N 144.0E	60	21.5N 144.5E	50	50	-05	24.2N 143.2E	60	302	00	28.2N 143.1E	60	316	10	--.- ---.-	--	--	--
0318002	20.8N 142.6E	60	22.1N 144.1E	55	114	-05	24.9N 143.1E	60	353	00	--.- ---.-	--	--	--	--.- ---.-	--	--	--
0400002	20.9N 141.5E	60	20.8N 141.4E	55	8	-05	22.2N 136.6E	55	246	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
0406002	21.5N 139.5E	60	21.6N 140.0E	55	28	00	27.3N 138.1E	55	91	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
0412002	22.8N 137.9E	60	22.7N 138.5E	60	34	00	29.4N 139.1E	50	118	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
0418002	23.5N 136.8E	60	23.5N 137.5E	60	38	00	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
0500002	26.2N 135.5E	60	25.5N 135.2E	60	45	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
0506002	27.5N 136.4E	50	26.0N 135.5E	60	102	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
0512002	26.5N 137.1E	50	28.0N 136.1E	50	61	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
									4				5				2	

TROPICAL STORM VIOLET

1800Z 11 DEC TO 0000Z 19 DEC

	BEST TRACK POSIT	BEST TRACK WIND	WARNING POSIT	WARNING WIND	ERRORS DST	ERRORS WIND	24 HOUR FORECAST POSIT	WIND	ERRORS DST	ERRORS WIND	48 HOUR FORECAST POSIT	WIND	ERRORS DST	ERRORS WIND	72 HOUR FORECAST POSIT	WIND	ERRORS DST	ERRORS WIND
1118002	5.6N 170.6E	25	6.2N 171.6E	30	69	5	7.9N 170.3E	45	59	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
1200002	6.2N 170.2E	25	6.2N 171.6E	30	83	5	7.4N 170.7E	45	70	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
1206002	7.1N 170.0E	25	6.4N 171.5E	30	98	5	8.0N 170.2E	55	57	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
1212002	7.5N 170.6E	25	7.1N 169.8E	30	53	5	8.1N 168.1E	55	143	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
1218002	7.8N 171.3E	30	7.9N 170.0E	30	77	0	9.3N 168.6E	55	83	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
1300002	8.5N 171.1E	35	8.3N 169.9E	30	72	-5	9.7N 168.5E	50	94	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
1306002	8.9N 170.5E	45	9.0N 170.3E	50	13	5	10.5N 169.7E	60	75	25	11.6N 168.1E	65	157	35	12.0N 166.1E	70	228	45
1312002	9.1N 170.3E	55	9.3N 170.3E	50	12	-5	10.2N 170.0E	45	54	10	11.2N 168.9E	55	169	25	11.8N 167.4E	65	198	40
1318002	9.3N 170.0E	55	9.5N 169.9E	50	13	-5	10.2N 168.3E	55	90	20	11.0N 165.6E	65	227	35	11.2N 161.5E	75	367	50
1400002	9.8N 170.1E	45	9.5N 169.9E	50	21	5	9.9N 169.0E	55	25	25	10.8N 166.3E	65	173	40	11.2N 162.3E	75	349	50
1406002	9.4N 170.3E	35	9.5N 169.9E	45	24	10	9.9N 169.2E	50	51	20	10.7N 166.9E	60	140	35	11.1N 163.4E	70	341	40
1412002	9.3N 170.0E	35	9.2N 170.3E	45	19	10	9.9N 169.2E	50	99	20	10.8N 166.2E	65	147	40	11.2N 162.2E	80	386	50
1418002	9.6N 169.7E	35	9.2N 170.3E	40	43	5	9.5N 169.9E	45	135	15	10.2N 168.1E	50	165	25	11.0N 165.9E	55	281	25
1500002	9.6N 169.3E	30	9.3N 169.1E	45	21	15	9.4N 166.7E	65	89	40	10.0N 163.5E	75	249	50	10.7N 160.1E	65	406	55
1506002	9.1N 168.9E	30	9.5N 168.6E	45	30	15	9.7N 166.2E	65	105	40	10.1N 163.1E	75	312	45	10.9N 159.2E	65	416	55
1512002	8.4N 168.5E	30	8.6N 168.7E	30	17	0	8.3N 167.1E	45	12	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
1518002	8.1N 168.1E	30	8.2N 168.2E	30	8	0	8.0N 165.8E	40	55	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
1600002	8.2N 167.6E	25	8.1N 167.8E	30	13	5	8.1N 166.0E	40	63	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
1606002	8.4N 167.4E	25	8.2N 167.2E	25	17	0	8.3N 165.4E	35	139	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
1612002	8.5N 167.1E	25	8.2N 166.8E	25	25	0	8.2N 165.1E	35	139	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
1618002	7.8N 166.7E	25	8.2N 166.6E	30	25	5	8.2N 165.0E	45	131	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
1700002	7.4N 166.8E	25	7.8N 166.5E	30	30	5	7.5N 165.0E	45	84	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
1706002	6.8N 167.2E	30	7.2N 167.0E	30	27	0	7.1N 165.4E	45	97	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
1712002	6.6N 166.8E	30	7.2N 166.7E	30	36	0	7.1N 165.1E	40	101	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
1718002	6.3N 166.1E	30	7.2N 166.3E	30	55	0	7.1N 164.7E	40	88	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
1800002	6.1N 165.2E	30	7.0N 165.0E	30	55	0	7.0N 163.4E	35	21	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
1806002	6.0N 164.2E	30	6.8N 164.0E	30	53	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
1812002	6.3N 163.6E	25	6.7N 164.1E	30	38	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
1818002	6.6N 163.3E	20	6.7N 163.6E	30	19	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
1900002	6.8N 163.1E	20	6.7N 163.1E	30	6	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
									19				6				3	

6. TYPHOON DATA

TYPHOON KIT

1200Z 05 JAN TO 0000Z 09 JAN

	BEST TRACK			WARNING					24 HOUR FORECAST					48 HOUR FORECAST					72 HOUR FORECAST				
	POSIT		WIND	POSIT		WIND	ERRORS DST	ERRORS WIND	POSIT		WIND	ERRORS DST	ERRORS WIND	POSIT		WIND	ERRORS DST	ERRORS WIND	POSIT		WIND	ERRORS DST	ERRORS WIND
051200Z	9.7N	135.2E	40	9.8N	135.4E	30	13	-10	10.5N	129.5E	45	79	-25	--.-	---.-	--	--	--	--.-	---.-	--	--	--
051800Z	9.9N	133.9E	50	9.9N	133.9E	30	0	-20	10.8N	128.1E	45	95	-50	--.-	---.-	--	--	--	--.-	---.-	--	--	--
060000Z	10.2N	132.8E	60	10.2N	132.8E	35	0	-25	11.3N	127.3E	50	54	-70	12.7N	122.3E	30	173	-50	--.-	---.-	--	--	--
060600Z	10.7N	131.8E	65	10.5N	132.0E	35	17	-30	11.8N	127.6E	50	39	-55	13.4N	123.4E	40	155	-30	--.-	---.-	--	--	--
061200Z	11.1N	130.7E	70	11.3N	130.9E	40	17	-30	13.3N	126.5E	50	111	-40	15.1N	122.4E	45	258	-10	--.-	---.-	--	--	--
061800Z	11.4N	129.6E	95	11.7N	129.9E	45	25	-50	13.6N	125.7E	50	145	-35	15.5N	121.7E	40	278	0	--.-	---.-	--	--	--
070000Z	11.5N	128.2E	120	11.5N	128.4E	95	12	-25	12.9N	123.5E	75	133	-5	13.8N	118.3E	60	226	30	--.-	---.-	--	--	--
070600Z	11.5N	127.0E	105	12.0N	126.9E	125	30	20	13.4N	121.6E	75	209	5	--.-	---.-	--	--	--	--.-	---.-	--	--	--
071200Z	11.5N	126.0E	90	11.7N	126.0E	125	12	35	12.6N	121.0E	60	180	5	--.-	---.-	--	--	--	--.-	---.-	--	--	--
071800Z	11.2N	125.3E	85	11.1N	125.2E	90	8	5	10.5N	121.4E	50	63	10	--.-	---.-	--	--	--	--.-	---.-	--	--	--
080000Z	11.0N	124.7E	80	10.5N	124.3E	75	38	-5	9.9N	120.0E	50	147	20	--.-	---.-	--	--	--	--.-	---.-	--	--	--
080600Z	10.9N	124.1E	70	10.5N	123.8E	60	30	-10	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
081200Z	10.9N	123.4E	55	11.0N	124.5E	50	65	-5	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
081800Z	10.9N	122.4E	40	11.0N	124.5E	40	123	0	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
090000Z	11.8N	121.6E	30	11.2N	121.4E	30	38	0	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	28NM	111NM	216NM	0NM	29NM	114NM	218NM	0NM
AVERAGE RIGHT ANGLE ERROR	17NM	70NM	158NM	0NM	18NM	76NM	172NM	0NM
AVERAGE MAGNITUDE OF WIND ERROR	19KTS	30KTS	23KTS	0KTS	18KTS	29KTS	24KTS	0KTS
AVERAGE BIAS OF WIND ERROR	-11KTS	-26KTS	-23KTS	0KTS	-10KTS	-22KTS	-12KTS	0KTS
NUMBER OF FORECASTS	14	10	4	0	15	11	5	0
						5	2	

TYPHOON LULA

0000Z 30 MAY TO 0600Z 05 JUN

	BEST TRACK			WARNING					24 HOUR FORECAST					48 HOUR FORECAST					72 HOUR FORECAST				
	POSIT		WIND	POSIT		WIND	ERRORS DST	ERRORS WIND	POSIT		WIND	ERRORS DST	ERRORS WIND	POSIT		WIND	ERRORS DST	ERRORS WIND	POSIT		WIND	ERRORS DST	ERRORS WIND
300000Z	8.3N	159.7E	45	8.2N	160.1E	30	24	-15	8.8N	157.8E	60	85	0	--.-	---.-	--	--	--	--.-	---.-	--	--	--
300600Z	8.3N	159.5E	45	8.3N	159.5E	40	0	-5	9.1N	156.8E	60	119	-5	10.1N	152.8E	75	271	-10	--.-	---.-	--	--	--
301200Z	8.5N	159.4E	55	8.5N	159.2E	45	12	-10	9.2N	156.7E	60	109	-15	10.0N	153.2E	75	253	-20	11.1N	149.3E	85	580	-20
301800Z	9.0N	159.4E	60	9.0N	159.2E	50	12	-10	10.1N	157.0E	65	67	-15	10.2N	153.8E	75	251	-20	--.-	---.-	--	--	--
310000Z	9.6N	159.0E	60	9.8N	158.8E	50	17	-10	11.2N	156.3E	65	70	-20	11.5N	152.7E	75	297	-30	12.2N	148.7E	85	654	-5
310600Z	9.8N	158.7E	65	9.8N	159.2E	50	29	-15	11.0N	158.3E	65	97	-20	11.6N	155.9E	75	277	-30	--.-	---.-	--	--	--
311200Z	9.9N	158.4E	75	9.9N	158.4E	60	0	-15	10.8N	156.4E	80	108	-15	11.4N	153.6E	85	366	-20	12.1N	150.5E	90	739	10
311800Z	10.4N	158.1E	80	10.2N	158.0E	65	13	-15	11.2N	156.1E	85	130	-10	11.7N	153.4E	95	412	5	--.-	---.-	--	--	--
010000Z	11.2N	157.5E	85	11.1N	157.5E	70	6	-15	12.0N	154.8E	90	179	-15	12.6N	151.7E	95	496	5	13.1N	148.5E	95	914	30
010600Z	12.0N	157.0E	85	12.0N	156.9E	70	6	-15	13.2N	153.7E	80	282	-25	13.7N	149.7E	85	632	0	--.-	---.-	--	--	--
011200Z	12.6N	156.6E	95	12.6N	156.4E	80	12	-15	14.4N	153.5E	90	276	-15	15.7N	150.1E	90	631	10	16.4N	146.4E	90	1002	35
011800Z	13.3N	156.7E	95	13.1N	156.2E	85	31	-10	15.0N	153.5E	90	294	0	16.1N	150.6E	90	658	20	16.8N	147.4E	90	986	45
020000Z	14.0N	157.1E	105	14.0N	157.1E	90	0	-15	16.4N	157.6E	75	93	-15	18.1N	155.9E	70	396	5	19.3N	153.9E	70	618	25
020600Z	15.9N	157.7E	105	15.0N	157.6E	100	54	-05	17.7N	158.0E	90	108	5	19.8N	155.4E	90	420	30	--.-	---.-	--	--	--
021200Z	15.7N	158.1E	105	15.8N	158.2E	95	8	-10	18.6N	160.1E	85	102	5	21.3N	161.9E	80	191	25	--.-	---.-	--	--	--
021800Z	16.7N	158.3E	90	16.3N	158.4E	90	25	0	19.0N	160.4E	85	156	15	21.6N	162.5E	80	239	35	--.-	---.-	--	--	--
030000Z	17.7N	158.5E	90	17.9N	159.1E	90	36	0	21.9N	161.7E	80	45	15	25.7N	164.7E	80	108	35	--.-	---.-	--	--	--
030600Z	19.1N	159.2E	85	18.8N	159.0E	85	21	0	22.4N	160.8E	75	92	15	25.2N	163.7E	55	161	10	--.-	---.-	--	--	--
031200Z	20.3N	160.1E	80	20.0N	160.0E	80	19	0	23.8N	162.9E	40	60	-15	--.-	---.-	--	--	--	--.-	---.-	--	--	--
031800Z	21.6N	160.7E	70	21.3N	160.7E	70	18	0	25.2N	164.8E	40	132	-5	--.-	---.-	--	--	--	--.-	---.-	--	--	--
040000Z	22.5N	161.2E	65	22.5N	161.2E	55	0	-10	25.8N	165.4E	30	145	-15	--.-	---.-	--	--	--	--.-	---.-	--	--	--
040600Z	23.7N	161.7E	60	23.6N	161.5E	55	12	-5	27.6N	164.6E	30	51	-15	--.-	---.-	--	--	--	--.-	---.-	--	--	--
041200Z	24.5N	162.1E	55	24.4N	161.9E	45	12	-10	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
041800Z	25.6N	162.4E	45	25.5N	162.5E	40	8	-5	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
050000Z	26.7N	162.7E	45	27.0N	162.5E	40	78	-5	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
050600Z	27.9N	163.7E	45	28.3N	162.9E	35	48	-10	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	19NM	127NM	356NM	784NM	19NM	127NM	356NM	784NM
AVERAGE RIGHT ANGLE ERROR	13NM	84NM	211NM	461NM	13NM	84NM	211NM	461NM
AVERAGE MAGNITUDE OF WIND ERROR	9KTS	13KTS	19KTS	24KTS	9KTS	13KTS	19KTS	24KTS
AVERAGE BIAS OF WIND ERROR	-9KTS	-6KTS	3KTS	17KTS	-9KTS	-8KTS	3KTS	17KTS
NUMBER OF FORECASTS	26	22	17	7	26	22	17	7
						9	3	6

TYPHOON ORA

0000Z 23 JUN TO 1200Z 27 JUN

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
230000Z	11.0N 131.3E	35	10.4N 131.2E	30	36	-5	11.0N 127.7E	50	26	-25	--.- ---.-	--	--	--	--.- ---.-	--	--	--
230600Z	10.9N 130.3E	40	10.9N 130.3E	30	0	-10	12.2N 126.7E	55	34	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
231200Z	10.9N 129.1E	45	11.2N 129.2E	30	19	-15	12.4N 125.5E	55	39	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
231800Z	10.9N 128.1E	60	11.2N 128.2E	40	19	-20	12.6N 124.4E	55	72	-10	14.1N 120.2E	50	250	-25	15.2N 117.1E	55	396	00
240000Z	11.2N 127.3E	75	11.2N 127.4E	75	6	00	11.9N 123.3E	70	155	10	13.4N 119.1E	70	340	-10	14.5N 116.0E	80	444	35
240600Z	11.9N 126.2E	70	11.4N 126.1E	80	30	10	12.5N 121.5E	70	179	25	14.0N 117.4E	75	333	00	15.4N 114.0E	65	408	45
241200Z	12.7N 124.9E	70	12.3N 124.8E	70	25	00	13.7N 119.8E	70	157	10	15.0N 115.5E	85	292	15	16.4N 112.0E	85	368	50
241800Z	13.3N 123.4E	65	13.2N 123.2E	70	13	05	14.7N 117.8E	80	133	5	16.2N 113.5E	85	229	30	--.- ---.-	--	--	--
250000Z	14.1N 121.9E	60	13.9N 121.8E	70	13	10	15.5N 116.8E	80	159	00	17.3N 112.2E	85	205	40	--.- ---.-	--	--	--
250600Z	15.3N 120.4E	45	15.1N 120.5E	65	13	20	16.5N 115.7E	80	157	05	18.2N 112.0E	85	214	45	--.- ---.-	--	--	--
251200Z	16.1N 118.7E	60	16.0N 119.3E	70	35	10	19.0N 114.3E	80	91	10	21.9N 111.5E	65	63	30	--.- ---.-	--	--	--
251800Z	16.7N 116.8E	75	16.6N 116.8E	65	6	-10	18.5N 111.1E	75	96	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
260000Z	17.6N 115.1E	80	17.9N 115.2E	75	19	-05	21.3N 109.5E	60	128	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
260600Z	18.3N 113.7E	75	18.6N 114.2E	80	34	05	21.3N 109.4E	60	103	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
261200Z	19.1N 112.7E	70	19.1N 113.2E	80	28	10	21.3N 109.8E	60	76	25	--.- ---.-	--	--	--	--.- ---.-	--	--	--
261800Z	19.8N 112.1E	55	20.0N 111.8E	70	21	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
270000Z	20.7N 111.7E	45	20.8N 111.0E	60	40	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
270600Z	21.7N 111.2E	40	21.5N 111.3E	85	13	45	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
271200Z	22.4N 110.5E	35	22.2N 110.9E	35	25	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	21NM	107NM	241NM	404NM	21NM	107NM	241NM	404NM
AVERAGE RIGHT ANGLE ERROR	16NM	61NM	96NM	128NM	16NM	61NM	96NM	128NM
AVERAGE MAGNITUDE OF WIND ERROR	12KTS	12KTS	25KTS	34KTS	12KTS	12KTS	25KTS	34KTS
AVERAGE BIAS OF WIND ERROR	6KTS	7KTS	19KTS	34KTS	6KTS	7KTS	19KTS	34KTS
NUMBER OF FORECASTS	19	15	8	4	19	15	8	4

7 1 0

TYPHOON PHYLLIS

0600Z 06 JUL TO 1200Z 15 JUL

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
060600Z	7.3N 158.9E	35	7.0N 158.2E	25	45	-10	7.2N 154.9E	40	136	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
061200Z	7.8N 158.1E	40	7.2N 157.8E	25	40	-15	7.5N 155.0E	40	129	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
061800Z	8.3N 157.1E	40	7.8N 156.8E	30	35	-10	8.4N 153.7E	45	134	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
070000Z	8.9N 156.2E	40	9.1N 156.2E	45	12	5	10.8N 153.7E	60	91	10	12.1N 150.1E	70	275	5	13.0N 146.2E	80	454	-20
070600Z	9.3N 155.8E	40	9.3N 155.9E	45	6	5	10.9N 153.4E	60	88	5	12.2N 149.8E	70	284	5	13.1N 145.8E	80	471	-25
071200Z	9.6N 155.5E	45	9.6N 155.5E	50	0	5	11.1N 152.9E	60	112	5	12.3N 149.3E	70	307	-5	13.2N 145.3E	80	506	-30
071800Z	10.0N 155.3E	50	10.0N 154.8E	50	29	0	11.3N 152.3E	60	156	0	12.5N 148.7E	70	329	-15	13.2N 144.7E	80	541	-35
080000Z	10.4N 155.2E	50	10.5N 154.3E	50	53	0	11.7N 151.5E	60	199	-5	12.8N 147.5E	70	379	-30	13.4N 143.2E	80	622	-40
080600Z	10.8N 154.9E	55	10.8N 155.0E	50	6	-5	12.3N 153.8E	50	63	-15	13.3N 150.7E	60	186	-45	13.9N 146.7E	75	427	-35
081200Z	11.2N 154.8E	55	11.3N 154.4E	50	24	-5	12.5N 151.7E	50	167	-25	13.4N 147.8E	65	360	-45	14.3N 143.4E	85	613	-20
081800Z	11.9N 154.9E	60	11.6N 154.1E	55	50	-5	12.7N 151.4E	65	171	-20	13.5N 147.5E	75	378	-40	14.4N 143.1E	90	607	-15
090000Z	12.5N 154.8E	65	12.4N 154.6E	55	13	-10	14.3N 151.8E	65	144	-35	15.7N 147.9E	75	358	-45	17.8N 144.1E	85	483	-20
090600Z	13.0N 154.6E	65	13.1N 154.3E	60	18	-5	14.8N 151.3E	70	175	-35	16.3N 147.1E	80	404	-30	18.7N 143.2E	85	459	-20
091200Z	13.1N 154.5E	75	13.3N 154.4E	60	13	-15	15.1N 153.2E	70	106	-40	16.8N 150.3E	80	213	-25	18.3N 146.5E	85	228	-15
091800Z	13.2N 154.3E	85	13.5N 154.4E	60	19	-25	15.0N 153.3E	70	88	-45	16.5N 150.9E	80	140	-25	17.9N 147.4E	85	217	-10
100000Z	13.2N 154.0E	100	13.2N 154.2E	80	12	-20	13.5N 152.1E	100	112	-20	14.5N 148.9E	110	306	5	16.5N 145.4E	120	366	30
100600Z	13.3N 153.9E	105	13.2N 154.1E	100	13	-5	13.5N 152.1E	130	142	20	14.6N 149.0E	140	313	35	16.5N 145.4E	145	426	50
101200Z	13.5N 154.0E	110	13.6N 153.8E	115	13	5	14.1N 152.3E	135	142	30	14.7N 149.5E	145	347	45	15.5N 145.6E	150	577	40
101800Z	13.7N 154.0E	115	13.7N 153.8E	120	12	5	14.3N 152.2E	140	173	35	14.8N 148.7E	150	403	55	15.8N 145.0E	150	637	60
110000Z	14.2N 153.9E	120	14.1N 154.1E	120	13	0	15.0N 152.8E	140	191	35	15.4N 149.0E	150	481	60	16.0N 146.0E	150	739	70
110600Z	15.0N 154.0E	110	15.1N 153.9E	120	8	10	16.3N 152.6E	130	202	25	17.2N 150.1E	140	491	45	17.8N 146.9E	140	770	70
111200Z	15.9N 153.9E	105	16.0N 153.7E	120	13	15	17.8N 152.2E	110	211	10	16.7N 149.8E	100	520	05	19.4N 147.0E	90	763	25
111800Z	17.0N 153.3E	105	16.7N 153.4E	100	19	-5	18.5N 151.9E	90	287	-5	19.4N 149.5E	80	575	-10	20.1N 146.5E	70	774	05
120000Z	18.2N 152.6E	105	17.8N 152.0E	100	42	-5	19.9N 147.1E	100	171	10	21.2N 142.0E	90	376	10	22.9N 138.1E	90	514	30
120600Z	19.4N 151.2E	105	19.2N 151.3E	100	13	-5	22.4N 146.5E	95	127	00	24.6N 142.7E	90	292	20	27.1N 139.6E	85	389	30
121200Z	20.5N 149.8E	100	19.8N 150.5E	100	57	0	22.6N 146.0E	95	206	00	25.2N 142.2E	90	326	25	27.5N 139.3E	85	474	45
121800Z	21.5N 147.9E	95	21.7N 147.8E	100	13	5	24.9N 142.5E	90	77	00	27.9N 138.8E	85	158	20	--.- ---.-	--	--	--
130000Z	22.6N 146.1E	90	22.7N 146.0E	90	8	0	26.2N 140.7E	80	72	00	28.6N 137.0E	75	176	15	--.- ---.-	--	--	--
130600Z	23.6N 144.6E	95	23.7N 144.6E	95	6	00	27.0N 139.4E	85	102	15	29.2N 136.3E	80	274	25	--.- ---.-	--	--	--
131200Z	24.9N 143.2E	95	24.9N 142.8E	95	22	00	28.3N 137.6E	90	83	25	30.4N 134.9E	85	293	45	--.- ---.-	--	--	--
131800Z	26.1N 142.0E	90	25.7N 141.9E	95	24	05	29.0N 137.0E	90	93	25	--.- ---.-	--	--	--	--.- ---.-	--	--	--
140000Z	27.4N 140.8E	80	27.6N 140.6E	95	16	15	33.7N 138.8E	90	145	30	--.- ---.-	--	--	--	--.- ---.-	--	--	--
140600Z	28.7N 139.4E	70	28.7N 139.7E	85	16	15	33.8N 138.9E	75	39	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
141200Z	29.5N 138.4E	65	29.8N 138.5E	80	19	15	35.0N 139.1E	70	122	30	--.- ---.-	--	--	--	--.- ---.-	--	--	--
141800Z	30.4N 137.8E	65	30.5N 137.5E	75	17	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
150000Z	31.5N 137.6E	60	31.2N 137.4E	70	21	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
150600Z	33.5N 138.2E	55	31.8N 137.3E	70	111	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
151200Z	35.1N 136.6E	40	35.1N 137.1E	30	24	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	23NM	137NM	331NM	524NM	23NM	137NM	331NM	524NM
AVERAGE RIGHT ANGLE ERROR	16NM	82NM	204NM	327NM	16NM	82NM	204NM	327NM
AVERAGE MAGNITUDE OF WIND ERROR	8KTS	18KTS	27KTS	30KTS	8KTS	18KTS	27KTS	30KTS
AVERAGE BIAS OF WIND ERROR	-2KTS	0KTS	1KTS	5KTS	-2KTS	0KTS	1KTS	5KTS
NUMBER OF FORECASTS	38	34	27	23	38	34	27	23

9 4 2

TYPHOON RITA

0000Z 07 JUL TO 1200Z 26 JUL

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
070000Z	10.4N 144.9E	35	10.3N 144.7E	30	13	-5	10.5N 141.8E	45	36	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
070600Z	10.4N 144.2E	45	10.1N 143.5E	30	45	-15	10.3N 140.7E	50	88	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
071200Z	10.4N 143.4E	55	10.7N 143.5E	50	19	-5	10.8N 140.5E	65	77	-10	11.4N 136.6E	75	240	-35	12.7N 132.7E	85	306	-55
071800Z	10.6N 142.6E	60	10.7N 142.7E	60	8	0	11.1N 139.3E	80	119	-10	11.9N 135.2E	95	273	-30	13.3N 130.9E	110	328	-30
080000Z	11.1N 141.8E	60	10.8N 141.8E	60	18	0	11.2N 138.3E	80	155	-20	12.2N 134.1E	90	297	-40	13.7N 129.9E	100	340	-45
080600Z	11.6N 141.4E	65	11.4N 141.4E	70	12	5	12.6N 138.2E	90	118	-10	14.1N 134.4E	100	190	-35	15.9N 130.1E	110	238	-30
081200Z	12.0N 141.0E	75	11.9N 140.9E	80	8	5	13.5N 137.7E	100	100	-10	15.1N 134.0E	110	144	-30	16.9N 129.8E	110	207	-35
081800Z	12.7N 140.5E	90	12.5N 140.6E	95	13	5	14.3N 138.2E	115	72	-10	15.6N 134.7E	120	108	-20	17.2N 130.4E	120	157	-20
090000Z	13.2N 140.0E	100	13.3N 139.8E	110	13	10	14.9N 136.4E	130	87	00	16.5N 132.2E	150	138	05	18.5N 128.2E	150	262	25
090600Z	14.2N 139.4E	100	14.0N 139.0E	110	26	10	15.8N 135.0E	130	92	-05	17.4N 130.7E	150	173	10	19.5N 126.2E	150	371	30
091200Z	14.8N 138.8E	110	14.9N 136.7E	120	8	10	17.5N 135.8E	140	33	0	19.7N 131.7E	150	128	05	21.7N 128.0E	135	332	25
091800Z	15.5N 138.1E	125	15.5N 137.7E	130	23	5	17.9N 134.2E	150	41	10	20.0N 130.2E	150	195	10	22.6N 126.3E	135	447	35
100000Z	16.0N 137.4E	130	15.9N 137.4E	135	6	05	18.0N 134.2E	150	12	05	24.1N 130.0E	150	198	25	22.2N 125.9E	135	456	35
100600Z	16.7N 136.3E	135	16.5N 136.6E	140	21	05	18.5N 132.9E	150	58	10	20.6N 128.9E	150	256	30	22.7N 124.9E	135	529	40
101200Z	17.1N 135.4E	140	17.3N 135.3E	140	13	0	19.3N 131.6E	150	115	05	21.4N 127.4E	135	347	25	23.6N 123.4E	120	637	25
101800Z	17.4N 134.7E	140	17.7N 134.5E	140	21	00	19.5N 130.8E	150	150	10	21.5N 126.6E	135	395	35	24.0N 122.7E	120	693	25
110000Z	17.8N 134.2E	145	17.6N 134.2E	145	12	00	18.6N 131.2E	150	95	25	20.5N 128.0E	135	304	35	22.8N 124.2E	120	609	30
110600Z	17.9N 133.7E	140	17.8N 133.4E	145	18	05	18.9N 130.3E	140	139	20	20.7N 127.1E	130	367	35	23.6N 123.5E	120	673	35
111200Z	18.1N 133.2E	145	18.0N 132.8E	145	23	00	19.2N 129.8E	140	164	30	21.1N 126.6E	130	415	35	23.8N 123.0E	120	712	40
111800Z	18.1N 133.0E	140	18.3N 133.0E	140	12	0	19.6N 131.6E	130	124	30	22.6N 129.9E	120	314	25	25.6N 128.8E	110	472	25
120000Z	18.1N 132.8E	125	18.2N 132.6E	135	13	10	19.6N 130.8E	125	144	25	22.3N 129.0E	115	349	25	25.4N 128.3E	110	469	25
120600Z	18.1N 132.6E	120	18.4N 132.6E	135	18	15	19.5N 131.4E	125	120	30	21.4N 129.8E	115	302	30	24.3N 128.4E	110	430	25
121200Z	18.0N 132.4E	110	18.2N 132.4E	130	12	20	18.9N 131.3E	120	126	25	20.7N 129.7E	115	319	35	23.6N 128.3E	110	408	30
121800Z	17.9N 132.5E	100	18.2N 132.5E	120	18	20	18.5N 132.2E	115	99	20	19.4N 130.8E	110	296	25	21.4N 129.3E	100	312	30
130000Z	18.0N 132.7E	100	17.9N 132.5E	115	13	15	18.2N 132.1E	105	156	15	18.5N 131.2E	100	265	15	20.5N 129.5E	95	283	30
130600Z	18.3N 133.1E	95	18.1N 132.5E	105	36	10	18.4N 132.1E	100	189	15	19.2N 131.2E	95	257	10	20.7N 129.8E	90	283	25
131200Z	18.6N 133.5E	95	18.1N 132.5E	110	64	15	18.4N 132.1E	100	228	20	19.2N 131.2E	95	234	15	20.7N 129.8E	90	274	25
131800Z	18.9N 133.9E	95	19.2N 134.4E	100	33	5	21.1N 135.7E	90	8	5	23.5N 135.7E	85	179	15	26.5N 133.6E	80	260	15
140000Z	19.5N 134.5E	90	20.1N 134.7E	90	38	0	23.7N 136.4E	80	160	-5	26.8N 137.2E	75	352	10	30.0N 137.3E	70	472	5
140600Z	20.0N 135.0E	85	20.4N 135.2E	85	26	0	23.2N 136.2E	75	144	-10	26.3N 135.4E	65	269	0	29.5N 135.1E	55	400	-10
141200Z	20.6N 135.4E	80	21.0N 135.5E	80	25	00	24.0N 136.1E	70	201	-10	27.1N 135.1E	60	324	-5	30.3N 135.5E	55	434	-15
141800Z	21.0N 135.8E	85	21.0N 135.8E	80	0	-5	22.3N 136.5E	70	118	0	24.7N 135.9E	60	173	-5	27.8N 135.1E	55	271	-15
150000Z	21.1N 135.7E	85	21.1N 135.6E	80	6	-5	21.6N 136.0E	70	64	5	24.0N 136.1E	65	134	0	27.1N 135.2E	60	209	-20
150600Z	20.9N 135.4E	85	21.2N 135.6E	80	21	-5	21.9N 136.2E	70	81	5	23.8N 135.7E	65	117	00	26.1N 133.8E	60	120	-30
151200Z	20.8N 135.0E	80	20.9N 134.8E	80	13	0	21.3N 135.8E	70	71	5	23.1N 136.1E	65	126	-5	25.4N 134.4E	60	30	-35
151800Z	21.0N 134.9E	70	20.8N 135.1E	80	16	10	21.0N 135.5E	70	98	5	21.5N 136.4E	65	179	-5	24.6N 135.1E	60	60	-25
160000Z	21.3N 134.9E	65	20.5N 133.7E	75	82	10	21.4N 131.4E	65	171	0	22.6N 129.2E	55	268	-25	24.2N 126.7E	55	437	-25
160600Z	21.5N 134.8E	65	21.2N 135.4E	70	38	5	21.6N 135.6E	60	126	-05	23.2N 135.5E	55	98	-35	25.7N 134.0E	50	72	-35
161200Z	21.7N 134.6E	65	21.8N 134.8E	65	13	0	23.0N 134.0E	55	16	-15	24.8N 133.3E	50	60	-45	27.7N 133.1E	50	28	-35
161800Z	22.2N 134.3E	65	22.1N 133.6E	65	39	0	23.7N 132.1E	55	100	-15	26.0N 131.5E	50	169	-35	28.4N 131.6E	50	67	-30
170000Z	22.6N 134.2E	65	22.7N 134.0E	65	13	0	24.9N 133.0E	55	82	-25	27.3N 132.7E	50	120	-30	30.1N 133.2E	50	148	-25
170600Z	22.9N 133.8E	65	23.1N 133.7E	70	13	05	25.4N 132.8E	70	101	-20	27.7N 132.7E	65	88	-20	30.1N 133.2E	60	173	-15
171200Z	23.2N 133.8E	70	23.1N 133.7E	70	8	0	23.1N 133.7E	70	114	-25	24.2N 133.1E	65	192	-20	26.1N 132.7E	60	218	-10
171800Z	23.4N 133.9E	70	23.7N 133.8E	75	19	5	24.9N 133.5E	70	69	-15	26.1N 133.2E	65	101	-15	28.1N 133.0E	60	225	-5
180000Z	23.8N 133.9E	80	23.5N 133.9E	75	18	-5	23.5N 133.9E	70	159	-10	24.6N 133.5E	65	225	-10	26.6N 133.1E	60	300	-5
180600Z	24.1N 134.0E	90	24.1N 134.0E	75	0	-15	24.5N 133.9E	70	144	-15	25.5N 133.2E	65	217	-10	27.5N 133.0E	60	298	-5
181200Z	24.9N 134.4E	95	24.3N 133.9E	75	45	-20	24.8N 133.6E	70	155	-15	25.9N 133.2E	65	246	-5	27.8N 133.0E	60	313	-5
181800Z	25.5N 134.6E	85	25.5N 134.5E	75	5	-10	28.1N 134.3E	70	93	-10	30.4N 134.8E	65	328	0	33.4N 136.0E	60	577	-10
190000Z	26.1N 134.5E	80	26.3N 134.5E	75	12	-5	29.7N 134.1E	70	161	-5	34.6N 134.7E	60	485	-5	--.- ---.-	--	--	--
190600Z	26.9N 134.1E	85	26.9N 134.1E	75	0	-10	29.8N 133.0E	70	154	-5	34.2N 133.7E	60	456	-5	--.- ---.-	--	--	--
191200Z	27.4N 133.5E	85	27.5N 133.3E	75	12	-10	30.4N 131.8E	70	161	0	34.4N 131.9E	60	429	-5	--.- ---.-	--	--	--
191800Z	27.7N 132.6E	80	27.6N 132.5E	75	8	-5	29.8N 130.2E	70	98	5	33.8N 129.7E	60	376	-10	--.- ---.-	--	--	--
200000Z	28.0N 131.7E	75	27.9N 131.6E	75	8	0	30.2N 130.1E	70	138	5	33.8N 129.8E	60	413	-25	38.2N 131.9E	40	827	-45
200600Z	28.3N 130.6E	75	28.5N 130.7E	75	13	0	30.5N 127.9E	70	110	5	32.9N 126.2E	65	336	-20	37.0N 126.4E	60	713	-15
201200Z	28.5N 129.6E	70	28.6N 129.5E	75	8	5	30.7N 126.5E	65	135	0	33.3N 125.4E	60	394	-25	39.0N 128.0E	30	857	-50
201800Z	28.7N 128.8E	65	28.9N 128.7E	75	13	10	31.4N 126.0E	65	200	-05	33.7N 125.3E	60	454	-25	39.0N 128.0E	30	847	-55
210000Z	28.8N 128.0E	65	28.9N 128.2E	70	12	5	30.6N 126.2E	65	174	-20	33.7N 125.0E	55	484	-30	38.2N 126.0E	40	760	-50
210600Z	28.7N 127.5E	65	28.8N 127.4E	70	8	5	29.7N 124.9E	60	148	-25	32.7N 123.6E	50	462	-25	36.4N 124.7E	40	630	-40
211200Z	28.5N 127.1E	65	28.8N 126.9E	65	21	0	29.5N 124.8E	60	169	-25	32.4N 123.6E	50	466	-30	36.9N 125.0E	40	612	-40
211800Z	28.1N 126.6E	70	27.8N 126.6E	65	18	-05	26.7N 127.1E	60	113	-25	26.9N 128.4E	60	164	-25	28.2N 129.2E	60	82	-20
220000Z	27.7N 126.0E	85	27.6N 126.0E	65	6	-20	26.1N 126.8E	60	96	-25	25.6N 128.8E	60	97	-30	27.1N 130.0E	60	135	-20
220600Z	27.3N 125.6E	85	27.3N 125.5E	70	5	-15	25.5N 125.8E	65	40	-10	24.9N 128.3E	65	87	-15	26.1N 130.3E	65	235	-10
221200Z	26.7N 125.3E	85	27.0N 125.4E	70	19	-15	25.4N 126.0E	65	42	-15	25.8N 128.5E	65	81	-15	26.1N 130.4E	65	324	-5
221800Z	26.1N 125.1E	85	26.2N 125.0E	70	8	-15	24.9N 125.7E	65	33	-20	24.2N 128.3E	65	205	-15	25.2N 130.2E	65	457	-10
230000Z	25.6N 125.1E	85	25.5N 125.3E	70	12	-15	24.9N 127.8E	70	56	-20	26.7N 129.8E	70	143	-10	28.7N 129.7E	65	425	-10
230600Z	25.1N 125.2E	75	25.3N 125.2E	70	12	-5	24.8N 126.8E	70	84	-10	26.1N 129.4E	65	211	-10	28.7N 129.7E	65	601	0
231200Z	24.8N 125.6E	80	24.8N 125.7E	70	5	-10	25.0N 128.2E	70	118	-10	27.4N 129.7E	65	239	-5	29.8N 129.4E	65	656	10
231800Z	24.9N 126.3E	85	24.6N 126.1E	70	21	-15	25.2N 128.4E	70	147	-10	27.7N 129.8E	65	317	-10	--.- ---.-	--	--	--
240000Z	25.5N 127.0E	90	25.8N 127.5E	75	32	-15	30.2N 129.9E	70	150	-10	33.3N 129.9E	65	247	-10	--.- ---.-	--	--	--
240600Z	26.1N 127.4E	80	26.0N 127.3E	85	8	5	28.3N 129.4E	80	107	5	31.9N 129.8E	70	453	5	--.- ---.-	--	--	--
241200Z	26.9N 127.6E	80	26.7N 127.7E	85	13	5	29.8N 128.9E	65	116	-5	34.2N 129.2E	50	464	-5	--.- ---.-	--	--	--
241800Z	27.6N 127.8E	80	27.6N 128.0E	80	11	0	31.0N 128.3E	65	122	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
250000Z	28.4N 127.9E	80	28.1N 127.5E	75	28	-5	30.9N 127.5E	60	255	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
250600Z	29.3N 127.7E	75	29.4N 127.6E	65	8	-10	34.8N 127.6E	50	257	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
251200Z	30.5N 126.8E	70	30.6N 126.7E	65	8	-5	38.2N 126.2E	40	244	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
251800Z	32.0N 126.2E	75	31.8N 126.0E	60	16	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
260000Z	34.7N 125.2E	75	34.0N 126.1E	80	61	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
260600Z	37.1N 123.1E	65	37.8N 123.3E	60	43	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
261200Z	38.3N 121.0E	55	40.7N 122.4E	40	157	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	20NM	118NM	200NM	386NM	20NM	118NM	260NM	386NM
AVERAGE RIGHT ANGLE ERROR	12NM	80NM	183NM	222NM	12NM	80NM	183NM	222NM
AVERAGE MAGNITUDE OF WIND ERROR	7KTS	12KTS	18KTS	25KTS	7KTS	12KTS	18KTS	25KTS
AVERAGE BIAS OF WIND ERROR	-1KTS	-4KTS	-6KTS	-6KTS	-1KTS	-4KTS	-6KTS	-6KTS
NUMBER OF FORECASTS	79	75	69	61	79	75	69	61
						30	26	25

TYPHOON SUSAN

0600Z 07 JUL TO 0600Z 14 JUL

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
070600Z	16.6N 119.8E	35	17.1N 119.2E	30	45	-05	17.8N 115.1E	50	126	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
071200Z	17.0N 118.5E	40	17.2N 117.8E	30	42	-10	18.3N 113.8E	50	230	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
071800Z	17.4N 117.2E	40	17.4N 116.8E	30	23	-10	18.6N 112.9E	50	275	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
080000Z	17.6N 117.0E	45	17.6N 115.5E	30	85	-15	19.1N 111.4E	50	346	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
080600Z	18.1N 117.3E	55	17.7N 115.1E	45	127	-10	18.4N 112.1E	55	300	0	19.5N 109.4E	50	379	-5	20.7N 106.6E	55	559	-10
081200Z	19.0N 117.8E	60	19.0N 118.0E	60	11	0	20.8N 116.1E	60	33	5	22.7N 113.9E	45	168	-10	--.- ---.-	--	--	--
081800Z	19.4N 117.7E	60	19.5N 117.6E	60	8	0	21.1N 116.1E	60	30	5	22.9N 113.8E	45	191	-20	--.- ---.-	--	--	--
090000Z	19.7N 117.5E	55	20.3N 116.7E	60	57	5	22.7N 114.1E	50	178	-5	24.6N 112.7E	25	300	-40	--.- ---.-	--	--	--
090600Z	20.1N 117.1E	55	20.2N 116.4E	60	40	5	21.9N 114.8E	55	155	0	23.3N 112.3E	25	261	-40	--.- ---.-	--	--	--
091200Z	20.5N 116.6E	55	20.8N 116.0E	60	18	5	22.4N 114.2E	55	163	0	24.0N 112.3E	25	283	-35	--.- ---.-	--	--	--
091800Z	20.6N 116.2E	55	21.2N 116.0E	50	38	-5	22.8N 113.6E	30	195	-35	23.6N 112.7E	25	255	-30	--.- ---.-	--	--	--
100000Z	20.3N 116.0E	55	20.2N 116.3E	50	18	-5	20.4N 114.9E	60	96	-5	20.5N 113.4E	60	220	10	21.7N 111.2E	45	272	0
100600Z	20.2N 116.1E	55	20.4N 115.6E	55	30	0	21.5N 112.8E	45	211	-20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
101200Z	20.4N 116.2E	55	20.2N 116.0E	70	16	15	20.5N 115.4E	60	106	0	21.5N 113.6E	50	162	5	--.- ---.-	--	--	--
101800Z	20.6N 116.2E	65	20.2N 116.0E	65	26	0	20.5N 115.4E	60	126	5	21.5N 113.6E	50	145	5	--.- ---.-	--	--	--
110000Z	21.0N 116.5E	65	20.4N 116.0E	65	45	0	20.8N 115.4E	50	126	0	21.9N 113.7E	50	133	5	--.- ---.-	--	--	--
110600Z	21.5N 116.6E	65	21.6N 116.6E	65	6	0	23.0N 117.5E	50	68	0	25.7N 118.2E	25	247	-15	--.- ---.-	--	--	--
111200Z	21.7N 116.8E	60	21.8N 116.7E	60	8	0	23.9N 117.9E	45	147	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
111800Z	22.0N 117.0E	55	22.6N 117.3E	60	39	5	24.9N 118.2E	25	220	-20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
120000Z	22.2N 117.1E	50	23.3N 117.8E	45	76	-5	25.4N 117.8E	25	229	-20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
120600Z	22.0N 116.9E	50	22.3N 117.0E	45	19	-5	23.1N 117.4E	40	93	0	24.2N 117.7E	40	49	-5	--.- ---.-	--	--	--
121200Z	21.8N 116.5E	45	22.5N 117.0E	45	50	0	23.2N 117.4E	40	70	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
121800Z	21.7N 116.2E	45	22.8N 117.2E	45	86	0	23.5N 117.3E	40	51	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
130000Z	21.9N 116.1E	45	22.2N 116.2E	50	19	5	22.2N 116.2E	45	60	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
130600Z	22.0N 116.2E	40	22.4N 116.2E	50	24	10	23.4N 116.5E	45	55	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
131200Z	22.3N 116.6E	45	22.6N 116.2E	50	28	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
131800Z	22.7N 117.0E	50	22.8N 116.3E	50	39	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
140000Z	22.6N 117.5E	50	23.1N 116.2E	35	74	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
140600Z	23.4N 117.5E	45	23.4N 116.2E	30	71	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	40NM	148NM	216NM	416NM	40NM	148NM	216NM	416NM
AVERAGE RIGHT ANGLE ERROR	28NM	108NM	186NM	399NM	28NM	108NM	186NM	399NM
AVERAGE MAGNITUDE OF WIND ERROR	6KTS	7KTS	17KTS	5KTS	6KTS	7KTS	17KTS	5KTS
AVERAGE BIAS OF WIND ERROR	-2KTS	-6KTS	-13KTS	-5KTS	-2KTS	-6KTS	-13KTS	-5KTS
NUMBER OF FORECASTS	29	25	13	2	29	25	13	2
						9	6	1

TYPHOON TESS

0000Z 08 JUL TO 1800Z 23 JUL

	BEST TRACK		WARNING				24 HOUR FORECAST				48 HOUR FORECAST				72 HOUR FORECAST			
	POSIT	WIND	POSIT	WIND	ERRORS DST	ERRORS WIND	POSIT	WIND	ERRORS DST	ERRORS WIND	POSIT	WIND	ERRORS DST	ERRORS WIND	POSIT	WIND	ERRORS DST	ERRORS WIND
080000Z	12.7N 169.4E	50	13.1N 169.6E	30	27	-20	14.1N 165.8E	60	160	15	---.- ----.-	--	--	--	---.- ----.-	--	--	--
080600Z	12.8N 169.1E	55	13.5N 168.5E	30	54	-25	15.5N 164.8E	60	220	20	---.- ----.-	--	--	--	---.- ----.-	--	--	--
081200Z	12.6N 168.6E	50	13.9N 167.5E	30	101	-20	16.0N 164.0E	60	237	25	---.- ----.-	--	--	--	---.- ----.-	--	--	--
081800Z	12.5N 168.5E	55	13.3N 168.7E	40	49	-15	14.2N 167.2E	50	45	15	15.5N 165.7E	55	119	10	17.9N 165.2E	60	220	0
090000Z	12.5N 168.0E	45	13.5N 168.5E	45	66	0	14.3N 166.7E	55	42	20	16.3N 165.4E	60	170	10	19.1N 165.3E	60	281	0
090600Z	12.9N 167.5E	40	13.7N 168.2E	30	63	-10	14.9N 166.2E	25	75	-15	---.- ----.-	--	--	--	---.- ----.-	--	--	--
091200Z	13.4N 167.1E	35	14.1N 167.6E	30	51	-5	15.3N 165.6E	25	112	-20	---.- ----.-	--	--	--	---.- ----.-	--	--	--
091800Z	13.5N 166.9E	35	14.2N 167.4E	30	51	-5	15.4N 165.5E	30	120	-15	---.- ----.-	--	--	--	---.- ----.-	--	--	--
100000Z	13.6N 166.8E	35	14.4N 167.3E	30	56	-5	15.2N 166.2E	45	93	-5	---.- ----.-	--	--	--	---.- ----.-	--	--	--
100600Z	13.7N 166.6E	40	13.6N 167.2E	30	35	-10	14.0N 166.2E	40	43	-10	---.- ----.-	--	--	--	---.- ----.-	--	--	--
101200Z	13.7N 166.6E	45	14.0N 166.9E	30	25	-15	14.8N 166.0E	40	43	-15	---.- ----.-	--	--	--	---.- ----.-	--	--	--
101800Z	13.7N 166.6E	45	14.3N 166.7E	45	36	0	15.3N 165.5E	50	72	-10	16.1N 164.3E	55	122	-15	16.7N 162.8E	60	270	-40
110000Z	13.7N 166.6E	50	13.7N 165.8E	45	46	-5	14.2N 164.2E	50	76	-10	14.8N 162.7E	55	70	-20	15.4N 161.2E	60	160	-45
110600Z	13.9N 166.4E	50	13.8N 165.5E	50	53	0	14.4N 163.6E	55	69	-5	15.0N 162.4E	55	108	-30	15.5N 161.0E	60	210	-55
111200Z	14.1N 166.2E	55	13.8N 165.5E	50	44	-5	13.8N 165.5E	55	60	-5	14.3N 164.4E	55	193	-40	14.8N 162.6E	60	287	-60
111800Z	14.2N 166.0E	60	13.8N 165.5E	50	38	-10	14.2N 164.4E	55	30	-15	14.6N 162.9E	60	192	-40	15.3N 161.4E	60	270	-65
120000Z	14.4N 165.5E	60	14.3N 165.7E	55	13	-5	14.8N 165.2E	55	138	-20	15.1N 164.8E	60	331	-45	15.4N 164.1E	60	459	-60
120600Z	14.4N 165.0E	60	14.5N 165.4E	55	24	-5	15.2N 164.5E	55	175	-30	15.8N 163.6E	60	334	-55	16.0N 162.6E	65	392	-55
121200Z	14.3N 164.6E	60	14.6N 164.8E	55	21	-5	15.0N 164.0E	60	196	-35	15.7N 163.0E	60	323	-60	16.4N 161.6E	65	353	-60
121800Z	14.1N 163.9E	70	14.4N 163.9E	70	18	0	15.2N 161.6E	80	165	-20	16.6N 159.8E	80	261	-45	18.8N 157.7E	80	207	-45
130000Z	13.7N 163.1E	75	14.1N 163.2E	70	25	-5	14.6N 161.0E	80	141	-25	15.3N 159.7E	85	208	-35	16.1N 158.2E	90	235	-35
130600Z	13.2N 162.3E	85	13.3N 162.5E	75	13	-10	12.3N 159.8E	85	63	-30	12.1N 157.3E	90	161	-30	12.7N 155.1E	95	350	-30
131200Z	12.9N 161.4E	95	13.1N 161.1E	80	21	-15	12.5N 157.0E	90	78	-30	12.4N 153.4E	95	232	-30	12.8N 149.8E	100	430	-15
131800Z	12.7N 160.4E	100	12.7N 160.8E	85	23	-15	11.8N 157.6E	95	94	-30	11.5N 154.9E	100	305	-25	11.8N 152.0E	100	508	-10
140000Z	12.6N 159.7E	105	12.5N 159.4E	95	18	-10	12.1N 156.1E	115	109	-5	12.3N 152.8E	130	330	5	12.7N 149.6E	145	520	50
140600Z	12.7N 158.8E	115	12.5N 158.4E	95	26	-20	11.8N 154.8E	115	190	-05	11.8N 151.1E	130	422	5	12.4N 147.5E	145	569	50
141200Z	12.8N 158.3E	120	12.8N 158.2E	105	6	-15	12.8N 155.3E	125	174	0	12.8N 152.9E	135	400	20	13.0N 150.4E	140	538	45
141800Z	13.3N 157.1E	125	12.8N 157.5E	115	38	-10	12.8N 154.6E	130	228	05	12.9N 152.3E	135	442	25	13.1N 149.8E	140	563	45
150000Z	13.9N 156.4E	120	13.7N 156.1E	130	21	10	14.5N 152.5E	140	215	15	15.2N 148.5E	145	399	50	15.6N 144.4E	150	548	60
150600Z	14.8N 155.9E	120	14.8N 155.7E	130	12	10	17.0N 152.2E	140	119	15	18.3N 149.1E	145	230	50	19.3N 145.9E	150	335	60
151200Z	15.7N 155.5E	125	15.3N 155.5E	130	24	5	17.0N 153.7E	140	156	25	18.1N 151.1E	145	233	50	19.2N 148.6E	150	276	60
151800Z	16.6N 154.9E	125	16.2N 155.3E	135	33	10	19.3N 153.5E	145	99	35	21.0N 151.0E	150	92	55	22.9N 148.5E	150	108	65
160000Z	17.6N 154.4E	125	17.8N 154.4E	140	12	15	20.8N 151.4E	135	26	40	23.2N 148.0E	125	128	35	25.4N 144.9E	110	238	30
160600Z	18.4N 153.7E	125	18.4N 153.5E	135	11	10	21.5N 150.1E	120	61	25	24.1N 146.8E	110	180	20	26.3N 143.7E	100	271	25
161200Z	19.5N 152.9E	115	19.6N 153.0E	125	8	10	22.8N 149.1E	115	110	20	25.3N 145.7E	105	247	15	27.8N 142.8E	95	310	20
161800Z	20.3N 152.1E	110	20.5N 151.8E	115	21	5	23.6N 147.8E	105	167	10	26.5N 144.1E	95	322	10	29.6N 141.1E	85	414	10
170000Z	21.2N 151.6E	95	21.1N 151.7E	110	8	15	24.3N 148.3E	100	138	10	27.5N 144.7E	90	262	10	30.2N 142.3E	80	337	10
170600Z	21.6N 151.2E	95	22.0N 150.7E	110	37	15	25.2N 147.1E	100	191	10	28.2N 144.1E	90	287	15	31.1N 141.6E	80	355	15
171200Z	22.0N 150.9E	95	22.0N 150.8E	110	6	15	24.1N 148.7E	100	70	10	26.7N 146.0E	90	128	15	29.7N 143.0E	80	209	5
171800Z	22.5N 150.6E	95	22.3N 150.5E	105	13	10	24.4N 148.4E	95	65	10	26.8N 145.9E	85	128	10	29.2N 143.5E	75	149	-5
180000Z	22.9N 150.3E	90	23.0N 150.0E	105	18	15	25.2N 148.1E	95	65	15	27.6N 145.2E	85	144	15	30.3N 142.5E	75	190	5
180600Z	23.4N 150.0E	90	23.3N 150.0E	105	6	15	25.4N 147.7E	95	57	20	27.9N 144.9E	85	122	20	30.6N 142.3E	75	153	0
181200Z	23.7N 149.9E	90	23.7N 149.7E	90	11	0	25.5N 147.9E	80	42	5	27.9N 145.5E	75	53	0	30.3N 143.0E	75	60	0
181800Z	24.4N 149.6E	85	24.4N 149.5E	95	5	10	26.5N 148.5E	85	21	10	28.9N 147.3E	80	76	0	31.3N 146.1E	75	282	0
190000Z	25.2N 149.3E	80	25.1N 149.4E	90	8	10	27.6N 148.3E	80	24	10	29.8N 147.2E	75	118	5	31.9N 146.0E	70	371	0
190600Z	25.7N 148.7E	75	26.2N 149.0E	90	34	15	30.0N 147.0E	80	138	15	33.1N 145.7E	75	258	0	36.0N 145.7E	70	538	5
191200Z	26.1N 148.3E	75	26.3N 148.5E	85	16	10	29.2N 146.7E	75	72	0	32.6N 145.2E	70	227	-5	35.9N 145.0E	65	535	0
191800Z	26.8N 148.3E	75	26.5N 147.6E	80	41	5	28.3N 145.1E	75	53	-5	30.4N 143.1E	70	122	-5	33.3N 141.2E	65	328	0
200000Z	27.4N 147.9E	70	27.5N 147.3E	80	32	10	29.9N 145.0E	75	88	5	32.0N 143.1E	70	249	0	34.6N 142.8E	65	478	-5
200600Z	27.7N 147.2E	65	28.2N 146.7E	80	40	15	30.8N 144.2E	75	115	0	33.2N 142.3E	70	302	5	35.9N 141.7E	65	497	0
201200Z	28.0N 146.5E	75	28.1N 146.5E	80	6	5	30.1N 144.6E	70	96	-5	32.0N 143.0E	65	323	0	34.3N 141.8E	60	506	10
201800Z	28.2N 146.1E	80	28.4N 145.4E	80	39	0	29.9N 143.0E	70	102	-5	31.7N 141.4E	65	302	0	34.1N 140.8E	60	494	15
210000Z	28.5N 145.5E	70	28.6N 144.9E	75	32	5	30.0N 142.7E	65	173	-5	32.0N 141.2E	60	356	-10	---.- ----.-	--	--	--
210600Z	28.9N 144.5E	75	28.7N 144.7E	75	16	0	29.8N 142.6E	70	219	5	31.7N 140.9E	65	406	0	---.- ----.-	--	--	--
211200Z	29.3N 143.0E	75	29.1N 143.1E	75	13	0	30.7N 140.3E	70	166	5	32.7N 138.8E	60	357	10	---.- ----.-	--	--	--
211800Z	29.2N 141.2E	75	29.5N 141.9E	75	41	0	32.4N 139.0E	70	206	5	35.1N 137.5E	60	332	15	---.- ----.-	--	--	--
220000Z	29.2N 139.5E	70	29.1N 139.5E	75	6	5	29.8N 133.0E	75	98	5	---.- ----.-	--	--	--	---.- ----.-	--	--	--
220600Z	29.4N 138.4E	65	29.4N 138.6E	70	10	5	30.1N 133.6E	70	113	5	---.- ----.-	--	--	--	---.- ----.-	--	--	--
221200Z	29.7N 137.3E	65	29.6N 137.3E	70	6	5	30.3N 132.3E	70	176	20	---.- ----.-	--	--	--	---.- ----.-	--	--	--
221800Z	30.4N 135.7E	65	30.1N 135.9E	70	21	5	31.6N 131.0E	65	162	20	---.- ----.-	--	--	--	---.- ----.-	--	--	--
230000Z	31.0N 134.3E	70	31.1N 134.3E	65	6	-5	---.- ----.-	--	--	--	---.- ----.-	--	--	--	---.- ----.-	--	--	--
230600Z	31.9N 132.9E	65	31.8N 132.9E	65	6	0	---.- ----.-	--	--	--	---.- ----.-	--	--	--	---.- ----.-	--	--	--
231200Z	33.2N 131.7E	50	33.0N 131.8E	65	13	15	---.- ----.-	--	--	--	---.- ----.-	--	--	--	---.- ----.-	--	--	--
231800Z	34.3N 130.8E	45	34.6N 130.3E	55	30	10	---.- ----.-	--	--	--	---.- ----.-	--	--	--	---.- ----.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	27NM	114NM	237NM	346NM	27NM	114NM	237NM	346NM
AVERAGE RIGHT ANGLE ERROR	18NM	68NM	139NM	208NM	18NM	68NM	139NM	208NM
AVERAGE MAGNITUDE OF WIND ERROR	9KTS	14KTS	21KTS	27KTS	9KTS	14KTS	21KTS	27KTS
AVERAGE BIAS OF WIND ERROR	0KTS	2KTS	-0KTS	0KTS	0KTS	2KTS	-0KTS	0KTS
NUMBER OF FORECASTS	64	60	47	43	64	60	47	43
						29	19	19

TYPHOON ALICE

0000Z 01 AUG TO 0600Z 07 AUG

	BEST TRACK POSIT	BEST TRACK WIND	WARNING POSIT	WARNING WIND	WARNING ERRORS DST	WARNING ERRORS WIND	24 HOUR FORECAST POSIT	24 HOUR WIND	24 HOUR ERRORS DST	24 HOUR ERRORS WIND	48 HOUR FORECAST POSIT	48 HOUR WIND	48 HOUR ERRORS DST	48 HOUR ERRORS WIND	72 HOUR FORECAST POSIT	72 HOUR WIND	72 HOUR ERRORS DST	72 HOUR ERRORS WIND
010000Z	15.6N 158.8E	55	17.0N 159.2E	30	87	-25	21.1N 156.7E	60	217	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
010600Z	16.1N 158.3E	55	16.0N 158.5E	45	13	-10	19.8N 156.2E	75	120	5	22.8N 154.6E	85	103	00	25.7N 153.8E	90	141	5
011200Z	16.4N 157.9E	55	16.3N 158.0E	55	8	0	19.0N 155.9E	75	53	5	21.9N 154.5E	85	20	0	24.6N 153.8E	90	184	5
011800Z	17.0N 157.6E	65	17.0N 157.5E	55	6	-10	19.7N 155.8E	65	25	-20	22.4N 154.5E	75	78	-10	24.9N 153.9E	65	243	5
020000Z	17.5N 157.2E	70	17.4N 157.3E	60	8	-10	19.8N 155.6E	80	32	-10	22.3N 154.5E	85	158	-5	25.0N 153.8E	90	299	15
020600Z	17.9N 156.9E	70	18.2N 156.8E	65	19	-5	20.8N 155.2E	85	25	00	23.4N 154.2E	90	164	5	26.2N 153.7E	90	342	20
021200Z	18.4N 156.6E	70	18.5N 156.4E	80	13	10	20.2N 155.5E	90	135	5	22.0N 154.7E	95	303	10	24.0N 154.0E	95	494	30
021800Z	19.4N 156.1E	85	18.8N 156.2E	80	36	-5	20.6N 155.2E	90	183	5	22.4N 154.2E	95	334	15	24.2N 153.3E	95	522	30
030000Z	20.3N 155.6E	90	20.0N 155.6E	90	18	00	22.5N 154.1E	95	133	5	24.7N 153.1E	95	273	20	26.6N 152.5E	85	493	15
030600Z	21.1N 154.9E	85	21.1N 155.0E	90	6	05	24.3N 153.5E	95	110	10	26.5N 152.6E	85	280	15	28.5N 152.3E	75	517	5
031200Z	22.1N 154.2E	85	21.5N 154.8E	90	49	5	24.2N 153.4E	90	170	5	26.5N 152.5E	85	353	20	28.5N 152.3E	75	582	5
031800Z	23.1N 153.3E	85	22.4N 154.2E	90	65	5	25.3N 152.3E	85	153	5	26.0N 151.6E	80	342	15	30.4N 151.5E	75	548	5
040000Z	24.0N 152.3E	90	24.3N 152.5E	90	21	0	27.7N 149.7E	75	68	0	30.6N 148.4E	60	236	-10	--.- ---.-	--	--	--
040600Z	24.6N 151.5E	85	24.6N 151.3E	65	11	0	27.3N 148.5E	75	58	5	30.0N 147.6E	65	257	-5	--.- ---.-	--	--	--
041200Z	25.3N 150.5E	85	25.3N 150.3E	65	11	0	27.8N 147.2E	75	64	10	30.3N 145.6E	70	219	0	--.- ---.-	--	--	--
041800Z	26.1N 149.6E	80	25.9N 149.5E	85	13	5	28.4N 146.8E	75	94	10	30.9N 145.5E	70	250	0	--.- ---.-	--	--	--
050000Z	27.0N 148.7E	75	26.8N 148.7E	85	12	10	29.7N 146.0E	75	109	5	32.3N 144.8E	70	220	5	--.- ---.-	--	--	--
050600Z	27.7N 147.5E	70	27.8N 147.4E	80	8	10	30.4N 144.6E	70	101	0	32.5N 143.4E	65	212	5	--.- ---.-	--	--	--
051200Z	28.4N 146.2E	65	28.4N 146.2E	80	0	15	30.1N 141.3E	75	104	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
051800Z	29.1N 145.2E	65	28.8N 145.2E	80	18	15	30.3N 140.3E	70	155	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
060000Z	29.9N 143.9E	70	30.2N 144.2E	75	24	5	32.3N 139.2E	65	132	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
060600Z	30.8N 142.7E	70	30.7N 142.1E	70	31	0	32.6N 136.1E	60	313	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
061200Z	31.8N 141.7E	70	31.1N 142.0E	70	45	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
061800Z	32.8N 141.1E	70	33.0N 140.7E	65	23	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
070000Z	34.0N 140.9E	65	33.7N 140.3E	65	35	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
070600Z	35.6N 141.3E	60	35.8N 141.0E	60	19	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS WARNING	24-HR	48-HR	72-HR	ALL FORECASTS WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	23NM	116NM	224NM	397NM	23NM	116NM	224NM	397NM
AVERAGE RIGHT ANGLE ERROR	14NM	48NM	78NM	132NM	14NM	48NM	78NM	132NM
AVERAGE MAGNITUDE OF WIND ERROR	6KTS	6KTS	9KTS	13KTS	6KTS	6KTS	9KTS	13KTS
AVERAGE BIAS OF WIND ERROR	0KTS	1KTS	4KTS	13KTS	0KTS	1KTS	4KTS	13KTS
NUMBER OF FORECASTS	26	22	17	11	26	22	17	11
						8	5	4

TYPHOON BETTY

0000Z 09 AUG TO 1200Z 17 AUG

	BEST TRACK POSIT	BEST TRACK WIND	WARNING POSIT	WARNING WIND	WARNING ERRORS DST	WARNING ERRORS WIND	24 HOUR FORECAST POSIT	24 HOUR WIND	24 HOUR ERRORS DST	24 HOUR ERRORS WIND	48 HOUR FORECAST POSIT	48 HOUR WIND	48 HOUR ERRORS DST	48 HOUR ERRORS WIND	72 HOUR FORECAST POSIT	72 HOUR WIND	72 HOUR ERRORS DST	72 HOUR ERRORS WIND
090000Z	11.9N 149.8E	30	11.8N 149.5E	30	19	0	12.5N 147.4E	50	125	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
090600Z	12.4N 149.0E	30	12.2N 149.3E	30	21	0	12.9N 147.2E	50	160	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
091200Z	13.0N 148.5E	40	13.1N 148.4E	30	8	-10	15.4N 145.6E	55	54	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
091800Z	13.7N 148.2E	50	13.4N 148.1E	45	19	-5	14.8N 146.2E	85	138	25	16.7N 145.1E	100	221	30	18.8N 142.2E	100	328	10
100000Z	14.6N 147.4E	50	14.5N 147.5E	60	8	10	17.1N 145.6E	90	82	25	15.3N 143.2E	100	202	25	22.0N 141.3E	100	379	-5
100600Z	15.5N 146.5E	55	15.4N 146.5E	60	6	5	18.8N 143.4E	90	62	25	22.3N 141.5E	100	266	20	25.4N 140.5E	90	506	-15
101200Z	16.3N 145.7E	55	16.4N 145.6E	65	8	10	20.0N 142.7E	85	119	20	23.7N 141.0E	110	355	30	26.8N 140.2E	115	581	10
101800Z	16.8N 145.0E	60	17.2N 144.5E	70	37	10	21.3N 141.5E	90	173	20	25.0N 140.1E	115	423	25	28.0N 139.7E	115	646	10
110000Z	17.4N 144.2E	65	17.6N 144.0E	65	17	0	21.0N 141.3E	85	169	10	24.4N 140.0E	95	416	-10	27.1N 139.7E	100	627	-10
110600Z	17.8N 143.1E	65	17.7N 143.7E	65	35	0	20.1N 141.6E	85	184	5	22.6N 140.3E	95	389	-10	25.4N 139.8E	100	591	-15
111200Z	18.2N 141.8E	65	18.0N 141.8E	65	12	0	20.1N 138.2E	75	90	-5	22.6N 136.1E	85	246	-20	24.9N 135.2E	85	401	-40
111800Z	18.5N 140.7E	70	18.7N 140.7E	70	12	0	21.6N 137.3E	90	175	0	24.3N 135.6E	110	337	5	26.9N 134.7E	110	485	-15
120000Z	18.6N 139.7E	75	19.1N 139.4E	70	34	-5	21.2N 135.0E	90	139	-15	23.5N 132.2E	110	235	0	25.7N 130.3E	110	302	-15
120600Z	18.7N 138.7E	80	18.6N 138.7E	80	6	0	19.1N 134.3E	105	13	0	20.7N 131.4E	115	54	0	23.3N 129.3E	115	166	-10
121200Z	18.8N 137.4E	80	18.7N 137.4E	85	6	5	19.3N 133.1E	105	29	0	20.9N 129.7E	115	30	-10	23.4N 127.5E	115	97	-15
121800Z	18.8N 136.4E	90	19.0N 136.2E	100	16	10	20.0N 131.9E	120	53	15	22.2N 128.7E	120	78	-5	24.8N 126.8E	110	131	-25
130000Z	18.9N 135.4E	105	18.9N 135.4E	105	0	0	19.3N 131.8E	130	19	20	21.0N 127.5E	125	21	0	23.5N 123.6E	120	76	-5
130600Z	19.0N 134.5E	105	19.0N 134.4E	110	6	5	19.5N 130.2E	130	45	15	21.3N 126.4E	125	39	0	23.5N 123.4E	120	82	15
131200Z	19.2N 133.6E	105	19.0N 133.7E	120	13	15	19.5N 130.1E	135	56	10	21.6N 125.9E	125	46	-5	24.3N 122.3E	115	74	15
131800Z	19.4N 132.6E	105	19.1N 132.7E	125	19	20	19.5N 128.9E	135	84	10	21.0N 125.0E	125	116	-10	23.4N 121.7E	115	139	15
140000Z	19.6N 131.7E	110	19.3N 131.6E	130	19	20	20.2N 127.6E	130	61	5	22.2N 123.9E	120	108	-5	24.7N 120.8E	110	112	30
140600Z	20.0N 130.8E	115	20.0N 131.0E	130	11	15	21.9N 128.0E	130	58	5	23.9N 124.3E	120	42	15	25.6N 120.3E	90	88	15
141200Z	20.4N 129.8E	125	20.4N 130.0E	130	11	5	22.4N 126.5E	120	25	-10	24.6N 122.9E	105	43	05	26.0N 118.7E	50	107	-10
141800Z	20.9N 128.7E	125	20.8N 128.9E	130	13	5	22.8N 125.2E	115	33	-20	24.4N 121.3E	100	89	00	--.- ---.-	--	--	--
150000Z	21.2N 127.8E	125	21.4N 127.8E	125	12	0	23.6N 123.4E	105	88	-20	25.3N 119.4E	65	129	-15	--.- ---.-	--	--	--
150600Z	21.4N 127.1E	125	21.2N 126.6E	125	30	0	23.0N 122.2E	105	149	0	25.1N 117.8E	45	197	-30	--.- ---.-	--	--	--
151200Z	22.0N 126.6E	130	21.6N 126.1E	125	37	-5	23.4N 122.2E	105	124	05	24.4N 117.9E	60	211	0	--.- ---.-	--	--	--
151800Z	22.8N 125.8E	135	22.9N 125.8E	125	6	-10	26.2N 122.0E	105	30	05	--.- ---.-	--	--	--	--.- ---.-	--	--	--
160000Z	23.7N 125.0E	125	23.7N 125.0E	120	0	-5	26.8N 121.2E	90	21	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
160600Z	24.6N 124.3E	105	24.7N 124.1E	100	12	-5	28.3N 119.9E	45	91	-30	--.- ---.-	--	--	--	--.- ---.-	--	--	--
161200Z	25.3N 123.1E	100	25.5N 123.4E	90	20	-10	28.3N 119.9E	45	48	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
161800Z	25.7N 122.1E	100	25.9N 121.9E	80	16	-20	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
170000Z	26.5N 121.4E	80	26.1N 121.2E	65	26	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
170600Z	27.0N 120.8E	75	27.2N 120.8E	55	12	-20	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
171200Z	27.5N 119.8E	60	27.6N 119.7E	40	8	-20	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS WARNING	24-HR	48-HR	72-HR	ALL FORECASTS WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	15NM	87NM	179NM	296NM	15NM	87NM	179NM	296NM
AVERAGE RIGHT ANGLE ERROR	10NM	66NM	147NM	236NM	10NM	66NM	147NM	236NM
AVERAGE MAGNITUDE OF WIND ERROR	7KTS	12KTS	12KTS	16KTS	7KTS	12KTS	12KTS	16KTS
AVERAGE BIAS OF WIND ERROR	1KTS	4KTS	2KTS	-2KTS	1KTS	4KTS	2KTS	-2KTS
NUMBER OF FORECASTS	33	31	24	20	35	31	24	20
						20	13	10

TYPHOON CORA

0600Z 25 AUG TO 1800Z 28 AUG

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
250600Z	19.0N 116.1E	45	19.2N 116.5E	30	26	-15	20.0N 116.0E	45	99	-05	--.- ---.-	--	--	--	--.- ---.-	--	--	--
251200Z	18.9N 116.0E	45	19.2N 116.5E	55	33	10	19.9N 115.1E	60	88	5	20.4N 113.1E	60	98	-05	20.5N 110.9E	55	151	0
251800Z	18.9N 115.6E	45	19.3N 116.3E	55	46	10	20.0N 114.9E	60	115	0	20.4N 112.8E	60	98	-05	20.5N 110.7E	55	205	5
260000Z	18.9N 115.3E	45	18.8N 115.0E	55	18	10	18.8N 112.8E	60	18	-5	19.1N 110.4E	55	21	-15	--.- ---.-	--	--	--
260600Z	18.8N 114.8E	50	18.8N 114.8E	55	17	05	18.8N 112.4E	60	11	-5	19.2N 109.9E	50	54	-5	--.- ---.-	--	--	--
261200Z	18.7N 114.2E	55	18.8N 114.5E	55	18	0	18.8N 113.4E	60	69	-05	18.9N 111.3E	60	202	5	--.- ---.-	--	--	--
261800Z	18.7N 113.4E	60	18.8N 114.5E	55	63	-5	18.8N 112.9E	60	84	-05	19.0N 110.8E	60	246	10	--.- ---.-	--	--	--
270000Z	18.7N 113.1E	65	18.7N 113.2E	60	6	-5	18.8N 110.9E	60	40	-05	--.- ---.-	--	--	--	--.- ---.-	--	--	--
270600Z	18.8N 112.6E	65	18.6N 113.1E	65	31	0	18.6N 111.2E	65	132	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
271200Z	19.0N 112.2E	65	18.6N 112.7E	65	37	00	18.6N 110.8E	65	189	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
271800Z	19.3N 111.5E	65	18.7N 112.2E	65	53	00	18.9N 110.3E	60	226	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
280000Z	19.4N 110.6E	65	19.2N 111.5E	70	52	05	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
280600Z	19.9N 109.3E	55	20.0N 109.7E	60	23	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
281200Z	20.6N 108.2E	55	20.2N 108.7E	55	37	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
281800Z	21.2N 107.1E	50	20.8N 107.2E	50	25	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	32NM	97NM	120NM	178NM	32NM	97NM	120NM	178NM
AVERAGE RIGHT ANGLE ERROR	12NM	33NM	46NM	66NM	12NM	33NM	46NM	66NM
AVERAGE MAGNITUDE OF WIND ERROR	1KTS	1KTS	-3KTS	3KTS	1KTS	1KTS	-3KTS	3KTS
AVERAGE BIAS OF WIND ERROR	-3KTS	-2KTS	-5KTS	3KTS	-3KTS	-2KTS	-5KTS	3KTS
NUMBER OF FORECASTS	15	11	6	2	15	11	6	2
						7	4	2

TYPHOON ELSIE

1200Z 31 AUG TO 0600Z 04 SEP

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
311200Z	13.5N 117.2E	40	13.1N 117.3E	30	25	-10	14.3N 113.9E	50	98	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
311800Z	14.4N 115.8E	50	13.7N 116.5E	30	58	-20	15.0N 113.3E	50	75	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
010000Z	14.9N 114.7E	55	14.9N 114.9E	45	12	-10	17.6N 110.5E	60	101	-15	19.3N 106.2E	50	322	-15	--.- ---.-	--	--	--
010600Z	15.5N 113.7E	60	15.5N 113.8E	65	6	5	17.7N 108.9E	65	162	-10	19.2N 103.7E	25	412	-50	--.- ---.-	--	--	--
011200Z	15.7N 113.0E	65	15.9N 113.0E	75	12	10	17.9N 108.6E	75	182	5	19.0N 104.4E	30	363	-45	--.- ---.-	--	--	--
011800Z	15.9N 112.4E	65	16.0N 112.6E	70	13	5	17.3N 109.4E	65	120	0	18.3N 106.0E	55	256	-15	--.- ---.-	--	--	--
020000Z	16.2N 111.5E	75	16.5N 111.3E	70	21	-5	18.0N 107.5E	55	215	-10	19.3N 103.9E	25	368	-45	--.- ---.-	--	--	--
020600Z	16.0N 111.1E	75	15.9N 111.3E	65	13	-10	16.0N 110.3E	65	41	-10	16.6N 107.8E	55	92	0	--.- ---.-	--	--	--
021200Z	15.8N 110.9E	70	15.8N 111.0E	65	6	-5	16.0N 110.0E	65	38	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
021800Z	15.6N 110.5E	65	15.9N 110.2E	70	25	5	17.2N 106.6E	40	190	-30	--.- ---.-	--	--	--	--.- ---.-	--	--	--
030000Z	15.5N 110.2E	65	15.7N 110.3E	65	13	0	15.8N 109.3E	65	33	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
030600Z	15.5N 109.8E	75	15.5N 109.9E	85	6	10	15.7N 108.3E	65	36	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
031200Z	15.5N 109.6E	75	15.4N 109.5E	85	8	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
031800Z	15.5N 109.4E	70	15.2N 109.4E	65	18	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
040000Z	15.4N 108.9E	70	15.2N 109.1E	65	17	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
040600Z	15.1N 108.2E	55	15.2N 108.2E	35	6	-20	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	16NM	108NM	302NM	0NM	16NM	108NM	302NM	0NM
AVERAGE RIGHT ANGLE ERROR	11NM	85NM	270NM	0NM	11NM	85NM	270NM	0NM
AVERAGE MAGNITUDE OF WIND ERROR	8KTS	11KTS	28KTS	0KTS	8KTS	11KTS	28KTS	0KTS
AVERAGE BIAS OF WIND ERROR	-3KTS	-9KTS	-28KTS	0KTS	-3KTS	-9KTS	-28KTS	0KTS
NUMBER OF FORECASTS	16	12	6	0	16	12	6	0
						6	1	

TYPHOON FLOSSIE

0000Z 10 SEP TO 0000Z 16 SEP

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
100000Z	14.8N 122.0E	45	14.6N 122.1E	30	13	-15	15.7N 118.1E	45	83	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
100600Z	14.8N 121.5E	45	14.9N 120.9E	30	35	-15	15.9N 117.2E	50	95	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
101200Z	14.8N 120.9E	40	15.8N 120.2E	30	72	-10	16.9N 116.8E	50	130	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
101800Z	14.7N 120.1E	35	16.3N 119.2E	30	109	-5	17.7N 115.8E	55	192	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
110000Z	14.7N 119.1E	35	14.4N 119.6E	30	34	-5	14.8N 116.8E	55	35	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
110600Z	14.8N 118.4E	35	14.8N 118.5E	30	6	-5	15.6N 114.7E	55	78	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
111200Z	14.9N 117.7E	35	15.2N 117.5E	30	21	-5	16.2N 114.0E	45	104	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
111800Z	14.7N 117.0E	40	15.0N 117.2E	30	21	-10	15.8N 114.1E	45	62	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
120000Z	14.8N 116.2E	45	14.7N 115.8E	35	24	-10	15.0N 112.2E	45	119	0	15.6N 109.4E	50	197	-15	16.4N 106.6E	25	250	-45
120600Z	15.0N 115.9E	50	15.0N 115.9E	35	0	-15	15.2N 113.6E	45	30	-5	15.4N 111.6E	50	48	-15	15.8N 109.5E	55	64	-10
121200Z	15.0N 115.3E	50	15.0N 115.2E	35	6	-15	15.1N 112.9E	45	35	-10	15.5N 110.9E	50	55	-25	15.9N 108.9E	55	82	-15
121800Z	15.1N 114.9E	45	15.0N 114.7E	35	13	-10	15.3N 112.3E	45	42	-10	15.6N 110.3E	50	58	-25	16.1N 108.2E	55	106	-15
130000Z	15.5N 114.2E	45	15.3N 114.4E	35	17	-10	15.9N 112.4E	45	43	-20	16.2N 110.3E	50	75	-20	16.5N 108.3E	55	122	0
130600Z	15.7N 113.7E	50	15.0N 113.8E	35	8	-15	16.3N 111.9E	45	72	-20	16.8N 109.9E	50	114	-15	--.- ---.-	--	--	--
131200Z	15.6N 113.2E	55	15.9N 113.2E	35	18	-20	16.6N 110.4E	45	121	-30	17.1N 108.0E	50	170	-20	--.- ---.-	--	--	--
131800Z	15.5N 113.0E	55	15.7N 112.8E	40	17	-15	16.1N 110.3E	50	80	-25	16.6N 108.3E	50	132	-20	--.- ---.-	--	--	--
140000Z	15.3N 112.8E	65	15.3N 112.7E	50	6	-15	14.8N 111.3E	65	37	-5	15.0N 109.3E	65	46	10	--.- ---.-	--	--	--
140600Z	15.2N 112.4E	65	15.2N 112.1E	65	17	0	15.1N 111.0E	75	53	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
141200Z	15.0N 111.7E	75	15.0N 111.8E	75	6	0	15.1N 111.0E	85	84	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
141800Z	15.0N 111.1E	75	15.0N 111.0E	75	6	0	15.1N 108.6E	70	43	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
150000Z	15.0N 110.7E	70	15.0N 110.7E	80	0	10	15.1N 108.6E	75	36	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
150600Z	14.9N 110.1E	65	15.0N 110.2E	80	8	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
151200Z	14.7N 109.6E	70	14.8N 109.6E	80	6	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
151800Z	14.5N 109.0E	70	14.8N 109.0E	80	18	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
160000Z	14.5N 108.7E	55	14.7N 108.5E	50	17	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	20NM	75NM	99NM	125NM	20NM	75NM	99NM	125NM
AVERAGE RIGHT ANGLE ERROR	14NM	44NM	72NM	106NM	14NM	44NM	72NM	106NM
AVERAGE MAGNITUDE OF WIND ERROR	10KTS	12KTS	18KTS	17KTS	10KTS	12KTS	18KTS	17KTS
AVERAGE BIAS OF WIND ERROR	-6KTS	-1KTS	-16KTS	-17KTS	-6KTS	-1KTS	-16KTS	-17KTS
NUMBER OF FORECASTS	25	21	9	5	25	21	9	5
						16	9	5

TYPHOON HELEN

0000Z 13 SEP TO 1200Z 16 SEP

DTG	BEST TRACK POSIT	BEST TRACK WIND	WARNING POSIT	WARNING WIND	WARNING ERRORS DST	WARNING ERRORS WIND	24 HOUR FORECAST POSIT	24 HR WIND	24 HR ERRORS DST	24 HR ERRORS WIND	48 HOUR FORECAST POSIT	48 HR WIND	48 HR ERRORS DST	48 HR ERRORS WIND	72 HOUR FORECAST POSIT	72 HR WIND	72 HR ERRORS DST	72 HR ERRORS WIND
130000Z	15.0N 136.9E	30	15.1N 136.2E	30	41	0	16.1N 134.0E	50	143	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
130600Z	15.4N 136.6E	40	16.0N 136.0E	60	50	20	18.4N 133.2E	80	60	10	20.8N 131.0E	90	173	10	23.1N 129.2E	100	603	00
131200Z	16.7N 135.5E	50	16.7N 135.5E	65	0	15	19.7N 133.3E	80	56	10	22.3N 131.4E	90	170	10	24.9N 130.2E	100	642	35
131800Z	17.6N 134.7E	50	17.5N 134.9E	65	13	15	20.4N 132.7E	80	57	10	23.2N 131.9E	90	229	05	--.- ---.-	--	--	--
140000Z	18.5N 133.9E	55	18.3N 134.1E	65	16	10	21.7N 131.8E	75	24	0	24.4N 130.4E	100	336	10	--.- ---.-	--	--	--
140600Z	19.4N 133.1E	70	19.5N 133.3E	70	13	0	22.7N 131.2E	90	63	10	25.3N 130.0E	100	468	00	--.- ---.-	--	--	--
141200Z	20.1N 132.4E	70	20.0N 132.5E	80	8	10	23.1N 130.5E	95	145	15	26.1N 129.7E	100	592	35	--.- ---.-	--	--	--
141800Z	21.1N 132.0E	70	21.0N 131.8E	90	13	20	24.5N 130.3E	95	191	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
150000Z	22.1N 131.8E	75	22.6N 131.0E	90	53	15	29.2N 132.0E	75	78	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
150600Z	23.6N 131.8E	80	23.7N 131.6E	90	12	10	30.4N 133.6E	75	109	-25	--.- ---.-	--	--	--	--.- ---.-	--	--	--
151200Z	25.1N 132.0E	80	25.3N 131.9E	90	13	10	32.4N 135.8E	70	120	05	--.- ---.-	--	--	--	--.- ---.-	--	--	--
151800Z	27.0N 132.5E	85	27.2N 132.4E	90	13	05	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
160000Z	29.3N 133.5E	90	29.0N 133.3E	85	21	-05	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
160600Z	31.9N 134.8E	100	31.8N 134.8E	90	6	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
161200Z	34.4N 136.0E	65	34.7N 136.3E	65	23	00	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS WARNING	24-HR	48-HR	72-HR	ALL FORECASTS WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	18NM	95NM	328NM	623NM	20NM	95NM	328NM	623NM
AVERAGE RIGHT ANGLE ERROR	12NM	45NM	68NM	118NM	13NM	45NM	68NM	118NM
AVERAGE MAGNITUDE OF WIND ERROR	12KTS	7KTS	19KTS	28KTS	11KTS	7KTS	19KTS	28KTS
AVERAGE BIAS OF WIND ERROR	11KTS	6KTS	19KTS	28KTS	11KTS	6KTS	19KTS	28KTS
NUMBER OF FORECASTS	14	11	6	2	15	11	6	2
						6	2	0

TYPHOON IDA

0600Z 17 SEP TO 0600Z 24 SEP

DTG	BEST TRACK POSIT	BEST TRACK WIND	WARNING POSIT	WARNING WIND	WARNING ERRORS DST	WARNING ERRORS WIND	24 HOUR FORECAST POSIT	24 HR WIND	24 HR ERRORS DST	24 HR ERRORS WIND	48 HOUR FORECAST POSIT	48 HR WIND	48 HR ERRORS DST	48 HR ERRORS WIND	72 HOUR FORECAST POSIT	72 HR WIND	72 HR ERRORS DST	72 HR ERRORS WIND
170600Z	17.1N 155.1E	30	17.2N 155.0E	30	8	00	17.9N 153.0E	45	289	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
171200Z	16.9N 155.6E	30	17.0N 155.1E	30	29	0	17.6N 154.2E	50	266	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
171800Z	16.5N 156.5E	35	16.3N 156.7E	30	17	-5	15.5N 159.0E	55	52	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
180000Z	16.3N 157.0E	45	16.5N 156.7E	50	21	5	16.5N 156.7E	65	87	-25	17.4N 156.2E	75	132	15	18.0N 155.1E	85	415	-5
180600Z	15.9N 157.6E	50	15.8N 157.9E	55	18	5	15.6N 159.6E	65	144	-15	16.2N 162.4E	75	539	5	18.0N 165.7E	75	1074	-15
181200Z	15.5N 158.3E	55	15.5N 158.4E	60	6	5	15.5N 161.4E	70	283	10	17.2N 164.3E	75	747	0	19.2N 167.3E	70	1200	-20
181800Z	15.4N 158.1E	65	15.3N 159.0E	60	52	-5	15.3N 160.6E	70	296	20	15.9N 162.3E	75	740	-5	17.0N 164.1E	70	1101	-25
190000Z	15.6N 157.9E	90	15.3N 158.7E	75	49	-15	15.2N 160.0E	90	340	30	15.6N 161.7E	90	807	0	16.6N 163.5E	85	1139	-10
190600Z	15.8N 157.1E	80	15.8N 157.3E	90	11	10	15.8N 157.3E	100	254	30	16.0N 158.6E	100	687	10	16.3N 159.8E	100	991	5
191200Z	15.9N 156.5E	60	15.8N 156.7E	90	13	30	15.9N 154.7E	110	217	35	16.4N 151.8E	125	375	35	17.7N 148.8E	135	478	35
191800Z	15.9N 155.5E	50	15.8N 156.2E	95	41	45	15.9N 154.2E	115	289	35	16.6N 151.4E	130	437	35	18.0N 148.3E	140	527	30
200000Z	16.3N 154.2E	60	15.9N 155.0E	100	52	40	16.3N 152.2E	120	271	30	17.4N 149.0E	130	377	35	19.3N 145.8E	140	465	35
200600Z	16.8N 153.0E	70	16.8N 153.0E	85	0	15	20.2N 147.5E	80	120	-10	23.4N 144.3E	80	82	-15	27.7N 143.3E	70	88	-30
201200Z	17.3N 151.2E	75	17.2N 151.8E	80	35	5	19.8N 147.8E	80	104	-10	22.7N 144.8E	80	121	20	25.7N 143.2E	75	185	-25
201800Z	17.7N 149.5E	80	17.7N 149.5E	80	0	0	20.2N 143.8E	90	73	-5	23.0N 140.7E	90	119	20	26.0N 139.5E	80	299	-10
210000Z	18.0N 147.8E	90	18.0N 148.2E	90	23	0	20.0N 142.6E	100	123	5	23.0N 139.2E	100	241	5	26.5N 138.3E	95	418	10
210600Z	18.3N 146.8E	90	18.3N 146.3E	95	28	5	20.1N 140.8E	100	196	5	23.9N 138.4E	100	270	0	27.8N 138.1E	95	501	15
211200Z	19.4N 146.0E	90	19.1N 146.1E	95	19	5	21.8N 143.2E	100	94	00	24.4N 141.5E	100	245	0	--.- ---.-	--	--	--
211800Z	20.7N 145.0E	95	20.3N 145.2E	95	26	0	23.7N 143.0E	100	77	10	26.2N 141.8E	100	257	10	--.- ---.-	--	--	--
220000Z	21.6N 144.0E	95	21.8N 143.9E	90	13	-5	27.2N 142.2E	85	62	-20	34.2N 143.3E	75	116	-10	--.- ---.-	--	--	--
220600Z	22.3N 143.4E	95	22.6N 143.3E	105	19	10	27.2N 142.2E	105	27	5	34.0N 143.2E	85	57	5	--.- ---.-	--	--	--
221200Z	23.3N 142.7E	100	23.5N 142.9E	110	16	10	28.0N 142.2E	95	40	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
221800Z	24.6N 142.0E	110	24.3N 142.3E	110	24	00	28.9N 141.8E	90	96	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
230000Z	26.2N 141.9E	105	26.2N 142.0E	110	5	05	32.2N 142.6E	90	12	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
230600Z	27.3N 141.7E	100	27.4N 141.7E	110	6	10	33.7N 142.4E	90	101	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
231200Z	28.5N 141.7E	100	28.3N 141.8E	110	13	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
231800Z	30.5N 142.0E	90	30.1N 141.8E	110	26	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
240000Z	32.3N 142.8E	85	32.3N 142.3E	95	25	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
240600Z	34.3N 144.3E	80	34.0N 144.0E	100	23	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS WARNING	24-HR	48-HR	72-HR	ALL FORECASTS WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	22NM	156NM	353NM	634NM	21NM	156NM	353NM	634NM
AVERAGE RIGHT ANGLE ERROR	10NM	68NM	121NM	207NM	9NM	68NM	121NM	207NM
AVERAGE MAGNITUDE OF WIND ERROR	12KTS	14KTS	11KTS	21KTS	11KTS	14KTS	11KTS	21KTS
AVERAGE BIAS OF WIND ERROR	10KTS	5KTS	6KTS	1KTS	9KTS	5KTS	6KTS	1KTS
NUMBER OF FORECASTS	27	25	18	14	29	25	18	14
						10	6	3

TYPHOON LORNA

0600Z 01 OCT TO 0000Z 03 OCT

DTG	BEST TRACK POSIT	BEST TRACK WIND	WARNING POSIT	WARNING WIND	WARNING ERRORS DST	WARNING ERRORS WIND	24 HOUR FORECAST POSIT	24 HR WIND	24 HR ERRORS DST	24 HR ERRORS WIND	48 HOUR FORECAST POSIT	48 HR WIND	48 HR ERRORS DST	48 HR ERRORS WIND	72 HOUR FORECAST POSIT	72 HR WIND	72 HR ERRORS DST	72 HR ERRORS WIND
010600Z	17.4N 113.6E	60	16.8N 113.7E	55	36	-5	15.6N 108.5E	85	156	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
011200Z	17.4N 112.0E	65	17.2N 112.2E	70	17	5	17.2N 106.8E	85	66	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
011800Z	17.9N 110.7E	65	18.0N 110.6E	70	8	5	20.5N 105.5E	30	148	-35	--.- ---.-	--	--	--	--.- ---.-	--	--	--
020000Z	18.0N 109.5E	65	18.0N 109.7E	65	11	0	20.1N 106.6E	50	143	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
020600Z	18.2N 108.2E	75	18.2N 108.1E	65	6	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
021200Z	18.2N 107.3E	75	18.3N 107.1E	65	13	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
021800Z	18.2N 106.5E	65	18.3N 106.4E	65	8	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
030000Z	18.0N 105.4E	45	18.2N 105.2E	35	16	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS WARNING	24-HR	48-HR	72-HR	ALL FORECASTS WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	14NM	128NM	0NM	0NM	14NM	128NM	0NM	0NM
AVERAGE RIGHT ANGLE ERROR	12NM	117NM	0NM	0NM	12NM	117NM	0NM	0NM
AVERAGE MAGNITUDE OF WIND ERROR	6KTS	15KTS	0KTS	0KTS	6KTS	15KTS	0KTS	0KTS
AVERAGE BIAS OF WIND ERROR	-3KTS	-3KTS	0KTS	0KTS	-3KTS	-3KTS	0KTS	0KTS
NUMBER OF FORECASTS	8	4	0	0	8	4	0	0
						1		

TYPHOON MARIE

0600Z 05 OCT TO 1800Z 11 OCT

	BEST TRACK POSIT	BEST TRACK WIND	WARNING POSIT	WARNING WIND	WARNING ERRORS DST	WARNING ERRORS WIND	24 HOUR FORECAST POSIT	24 HOUR FORECAST WIND	24 HOUR ERRORS DST	24 HOUR ERRORS WIND	48 HOUR FORECAST POSIT	48 HOUR FORECAST WIND	48 HOUR ERRORS DST	48 HOUR ERRORS WIND	72 HOUR FORECAST POSIT	72 HOUR FORECAST WIND	72 HOUR ERRORS DST	72 HOUR ERRORS WIND
050600Z	14.1N 167.8E	45	14.4N 167.9E	30	19	-15	15.2N 164.9E	50	80	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
051200Z	14.1N 167.1E	50	14.5N 167.0E	30	25	-20	15.0N 164.2E	50	76	-25	--.- ---.-	--	--	--	--.- ---.-	--	--	--
051800Z	14.1N 166.1E	50	14.7N 166.3E	30	38	-20	15.2N 163.4E	55	112	-30	--.- ---.-	--	--	--	--.- ---.-	--	--	--
060000Z	14.0N 165.4E	50	14.1N 166.7E	45	76	-5	14.2N 164.8E	55	275	-35	14.2N 162.7E	65	570	-30	14.4N 159.8E	75	744	-35
060600Z	14.0N 164.3E	55	13.9N 164.3E	60	6	5	13.9N 160.6E	85	149	-10	14.4N 157.0E	95	347	10	15.5N 153.5E	105	443	0
061200Z	14.3N 163.1E	75	14.3N 163.2E	75	6	0	15.0N 158.5E	95	115	00	16.3N 153.3E	120	202	25	18.4N 149.3E	130	221	25
061800Z	14.5N 161.6E	85	14.3N 161.9E	75	21	-10	14.9N 157.0E	95	148	-05	17.0N 154.0E	120	208	5	19.2N 148.0E	130	203	20
070000Z	14.9N 160.1E	90	14.8N 160.1E	85	6	-5	16.1N 154.7E	115	95	20	17.8N 150.4E	130	171	20	20.2N 146.5E	130	136	25
070600Z	15.2N 158.4E	95	15.2N 158.8E	90	23	-05	16.8N 153.5E	120	109	35	19.1N 149.6E	130	177	25	22.0N 146.0E	130	115	25
071200Z	15.6N 156.6E	95	15.2N 156.5E	95	25	00	16.8N 150.7E	125	58	30	19.7N 148.8E	130	77	25	22.9N 143.6E	125	25	25
071800Z	16.0N 154.7E	100	15.4N 155.3E	95	50	-05	17.4N 150.0E	125	91	10	20.3N 145.5E	130	114	20	23.8N 143.9E	125	13	30
080000Z	16.5N 153.1E	95	16.3N 152.8E	100	21	05	19.4N 147.1E	130	79	20	22.5N 143.2E	130	124	25	25.1N 139.9E	120	218	30
080600Z	17.0N 151.6E	85	17.0N 151.9E	100	17	15	20.3N 146.4E	130	96	25	23.1N 142.4E	130	130	25	25.9N 139.3E	120	295	25
081200Z	17.5N 150.0E	95	17.5N 150.0E	100	0	5	20.7N 144.7E	130	95	25	23.3N 140.9E	125	174	25	26.2N 138.4E	115	459	25
081800Z	17.5N 148.4E	115	17.7N 148.2E	100	17	-15	20.9N 142.8E	130	109	20	23.8N 139.3E	125	246	30	26.8N 137.1E	115	594	35
090000Z	18.1N 147.4E	110	17.9N 146.8E	110	36	0	20.6N 141.8E	130	129	25	23.5N 138.5E	120	310	30	--.- ---.-	--	--	--
090600Z	18.7N 146.5E	105	18.7N 146.6E	115	6	10	21.4N 143.5E	130	28	25	24.2N 140.9E	120	280	25	--.- ---.-	--	--	--
091200Z	19.3N 145.5E	105	19.3N 145.4E	115	6	10	21.9N 142.2E	130	110	30	24.8N 140.2E	120	429	30	--.- ---.-	--	--	--
091800Z	20.0N 144.5E	110	19.7N 144.7E	115	21	5	22.5N 141.6E	130	150	35	25.8N 139.8E	120	520	40	--.- ---.-	--	--	--
100000Z	20.6N 144.1E	105	20.7N 143.6E	115	29	10	24.4N 141.2E	110	163	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
100600Z	21.5N 144.0E	105	21.7N 143.3E	110	41	5	25.5N 141.4E	100	208	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
101200Z	22.7N 144.0E	100	22.4N 143.8E	110	21	10	27.2N 143.3E	100	209	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
101800Z	24.0N 143.8E	95	24.1N 143.8E	110	6	15	30.7N 144.9E	100	125	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
110000Z	25.6N 143.9E	90	25.3N 143.9E	100	18	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
110600Z	27.6N 144.5E	95	27.3N 144.2E	95	24	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
111200Z	29.6N 146.2E	90	29.2N 146.4E	95	26	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
111800Z	31.9N 146.9E	80	31.7N 146.9E	90	12	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS WARNING	24-HR	48-HR	72-HR	ALL FORECASTS WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	22NM	122NM	255NM	289NM	22NM	122NM	255NM	289NM
AVERAGE RIGHT ANGLE ERROR	15NM	60NM	109NM	130NM	15NM	60NM	109NM	130NM
AVERAGE MAGNITUDE OF WIND ERROR	9KTS	21KTS	25KTS	25KTS	9KTS	21KTS	25KTS	25KTS
AVERAGE BIAS OF WIND ERROR	-1KTS	9KTS	20KTS	19KTS	-1KTS	9KTS	20KTS	19KTS
NUMBER OF FORECASTS	27	23	16	12	27	23	16	12
						9	7	8

TYPHOON NANCY

0600Z 16 OCT TO 1200Z 21 OCT

	BEST TRACK POSIT	BEST TRACK WIND	WARNING POSIT	WARNING WIND	WARNING ERRORS DST	WARNING ERRORS WIND	24 HOUR FORECAST POSIT	24 HOUR FORECAST WIND	24 HOUR ERRORS DST	24 HOUR ERRORS WIND	48 HOUR FORECAST POSIT	48 HOUR FORECAST WIND	48 HOUR ERRORS DST	48 HOUR ERRORS WIND	72 HOUR FORECAST POSIT	72 HOUR FORECAST WIND	72 HOUR ERRORS DST	72 HOUR ERRORS WIND
160600Z	15.7N 169.6E	35	15.8N 169.4E	30	13	-5	17.3N 167.0E	55	120	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
161200Z	15.8N 169.0E	35	15.9N 169.2E	40	13	5	17.0N 166.9E	55	148	-20	18.0N 163.7E	60	216	-40	19.0N 160.0E	70	191	-25
161800Z	15.8N 167.8E	50	16.2N 168.4E	40	42	-10	17.1N 166.0E	55	182	-30	18.3N 162.6E	60	229	-40	19.2N 159.1E	70	192	-20
170000Z	15.8N 166.5E	60	15.7N 166.8E	70	18	10	16.0N 163.1E	90	93	0	17.3N 158.8E	100	146	-05	19.0N 155.0E	100	313	15
170600Z	15.9N 165.5E	70	15.9N 165.7E	75	11	5	16.6N 161.6E	85	66	-10	17.7N 157.8E	95	191	-05	18.8N 155.0E	95	368	20
171200Z	16.1N 164.5E	75	16.0N 164.5E	80	6	5	17.0N 160.2E	90	68	-10	18.2N 156.4E	95	222	0	19.4N 153.8E	95	423	30
171800Z	16.4N 162.9E	85	16.5N 162.9E	80	6	-5	18.0N 158.5E	90	56	-10	19.3N 154.7E	95	265	5	20.1N 151.8E	95	519	35
180000Z	16.8N 161.7E	90	16.9N 161.6E	85	8	-5	18.4N 156.8E	95	115	-10	20.1N 153.3E	95	340	10	21.3N 151.0E	95	567	35
180600Z	17.4N 160.8E	95	17.3N 160.6E	115	13	20	19.2N 155.9E	120	156	20	20.5N 152.5E	110	407	35	21.7N 150.4E	100	641	40
181200Z	18.1N 159.9E	100	18.0N 160.0E	120	8	20	20.2N 156.8E	130	107	35	22.0N 154.0E	120	324	55	23.7N 152.0E	110	585	55
181800Z	18.9N 158.8E	100	19.0N 158.9E	120	8	20	21.3N 155.5E	130	161	40	23.2N 152.8E	120	390	60	--.- ---.-	--	--	--
190000Z	19.7N 158.3E	105	19.6N 157.5E	120	45	15	21.9N 153.9E	115	264	30	23.6N 151.5E	105	501	45	--.- ---.-	--	--	--
190600Z	20.9N 158.0E	100	20.6N 158.0E	120	18	20	23.5N 157.3E	110	94	35	26.5N 158.2E	95	196	35	--.- ---.-	--	--	--
191200Z	21.6N 158.0E	95	21.6N 157.6E	115	22	20	24.3N 157.3E	100	115	35	28.7N 160.1E	80	233	25	--.- ---.-	--	--	--
191800Z	22.3N 158.2E	90	22.6N 157.5E	110	43	20	25.9N 158.3E	90	116	30	--.- ---.-	--	--	--	--.- ---.-	--	--	--
200000Z	23.1N 158.5E	85	23.0N 158.1E	100	23	15	25.7N 158.6E	80	121	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
200600Z	23.7N 159.0E	75	23.1N 158.1E	95	61	20	24.7N 158.3E	75	175	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
201200Z	24.2N 159.4E	65	24.7N 159.9E	85	40	20	28.7N 166.3E	60	274	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
201800Z	24.5N 159.8E	60	25.3N 160.7E	75	68	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
210000Z	24.8N 160.6E	60	24.8N 160.0E	80	33	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
210600Z	25.1N 161.5E	60	25.1N 160.8E	75	38	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
211200Z	25.5N 162.6E	55	25.5N 162.8E	65	11	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS WARNING	24-HR	48-HR	72-HR	ALL FORECASTS WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	25NM	135NM	282NM	422NM	25NM	135NM	282NM	422NM
AVERAGE RIGHT ANGLE ERROR	14NM	98NM	197NM	246NM	14NM	98NM	197NM	246NM
AVERAGE MAGNITUDE OF WIND ERROR	16KTS	22KTS	28KTS	31KTS	16KTS	22KTS	28KTS	31KTS
AVERAGE BIAS OF WIND ERROR	14KTS	12KTS	18KTS	21KTS	14KTS	12KTS	18KTS	21KTS
NUMBER OF FORECASTS	22	18	13	9	22	18	13	9
						5	3	2

TYPHOON OLGA

0000Z 22 OCT TO 0600Z 29 OCT

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
220000Z	8.1N 174.1E	60	8.0N 174.3E	70	13	10	8.5N 171.0E	100	85	40	9.6N 167.6E	115	104	55	11.0N 164.3E	125	138	70
220600Z	8.2N 174.0E	60	8.2N 173.6E	75	24	15	8.8N 170.3E	100	81	45	10.0N 166.9E	115	108	60	11.8N 163.8E	125	182	70
221200Z	8.6N 173.8E	65	8.2N 173.9E	75	25	10	8.6N 171.8E	100	113	45	9.3N 168.8E	115	255	65	10.8N 165.4E	125	396	70
221800Z	9.1N 173.1E	65	8.9N 173.5E	65	26	0	9.7N 171.6E	70	136	10	10.5N 168.6E	75	288	20	11.9N 165.3E	85	446	20
230000Z	9.3N 172.2E	60	9.3N 172.1E	65	6	05	10.6N 168.3E	70	36	10	11.6N 164.3E	75	116	20	12.5N 160.2E	85	212	10
230600Z	9.6N 171.4E	55	9.6N 171.7E	65	18	10	10.7N 168.5E	60	105	05	11.9N 165.1E	70	247	15	12.5N 161.1E	85	346	0
231200Z	9.9N 170.4E	55	9.8N 171.0E	65	36	10	11.0N 167.7E	60	142	10	12.2N 164.2E	70	301	15	12.6N 160.2E	85	411	10
231800Z	10.4N 169.4E	60	10.5N 169.4E	65	6	5	12.0N 165.9E	60	112	5	13.3N 162.5E	70	269	5	14.7N 158.6E	85	415	5
240000Z	11.2N 168.3E	60	11.0N 168.5E	65	17	5	11.9N 164.3E	80	108	25	13.0N 160.0E	95	190	20	13.8N 155.6E	110	392	20
240600Z	11.8N 167.1E	55	11.4N 167.8E	45	47	-10	12.6N 165.2E	60	239	05	13.6N 161.6E	65	358	-20	14.4N 157.5E	85	587	-20
241200Z	12.2N 165.6E	50	12.4N 165.7E	50	13	00	14.0N 161.4E	60	122	5	14.1N 156.0E	75	151	0	14.0N 150.6E	90	352	-15
241800Z	12.2N 164.0E	55	11.7N 163.9E	50	30	-5	11.0N 157.8E	75	167	10	11.2N 152.7E	90	289	10	11.9N 147.5E	105	467	00
250000Z	12.6N 162.6E	55	12.3N 162.6E	50	18	-5	12.2N 156.6E	60	109	-15	12.6N 150.6E	75	241	-15	13.9N 145.1E	95	396	-5
250600Z	13.5N 161.2E	55	13.1N 161.0E	50	27	-05	13.2N 154.6E	60	94	-25	13.6N 148.2E	75	234	-30	15.0N 142.8E	95	397	-5
251200Z	13.8N 159.3E	55	14.1N 159.2E	55	19	0	15.0N 151.9E	65	98	-10	16.0N 145.0E	80	159	-25	17.6N 139.1E	100	389	0
251800Z	13.8N 157.9E	65	13.7N 158.0E	55	8	-10	14.1N 151.2E	65	109	-15	14.6N 144.6E	80	289	-25	15.9N 138.6E	100	586	10
260000Z	14.0N 156.9E	75	13.8N 156.6E	65	21	-10	14.2N 150.7E	75	165	-15	15.2N 144.8E	85	318	-15	17.4N 140.9E	95	619	10
260600Z	14.5N 155.5E	85	14.1N 155.7E	80	27	-5	14.8N 150.1E	100	208	-5	15.3N 144.5E	110	392	10	17.0N 140.3E	110	829	30
261200Z	15.1N 153.6E	75	14.9N 153.7E	85	13	10	16.6N 147.8E	100	129	-5	18.4N 142.3E	110	280	10	--.- ---.-	--	--	--
261800Z	15.9N 151.5E	80	15.9N 150.7E	100	46	20	18.2N 142.2E	115	184	10	20.5N 137.5E	100	406	10	--.- ---.-	--	--	--
270000Z	16.7N 149.5E	90	16.5N 149.6E	100	21	10	19.1N 143.9E	110	85	10	21.8N 140.8E	95	377	10	--.- ---.-	--	--	--
270600Z	17.5N 147.8E	105	17.4N 147.6E	110	13	5	20.9N 141.8E	110	114	10	24.4N 140.6E	85	420	5	--.- ---.-	--	--	--
271200Z	18.3N 146.4E	105	18.1N 146.3E	115	13	10	21.6N 141.4E	100	134	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
271800Z	19.4N 145.2E	105	19.5N 145.0E	115	13	10	24.1N 141.2E	85	120	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
280000Z	20.5N 144.2E	100	20.4N 144.0E	115	13	15	24.6N 141.2E	90	228	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
280600Z	21.8N 143.6E	100	21.7N 143.6E	110	6	10	25.3N 142.8E	85	317	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
281200Z	23.0N 143.3E	100	23.2N 143.2E	105	13	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
281800Z	24.7N 143.3E	=90	24.7N 143.4E	100	5	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
290000Z	27.3N 144.2E	85	26.5N 143.6E	90	57	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
290600Z	30.0N 145.6E	80	29.5N 145.5E	85	30	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	21NM	136NM	263NM	420NM	21NM	136NM	263NM	420NM
AVERAGE RIGHT ANGLE ERROR	12NM	71NM	123NM	156NM	12NM	71NM	123NM	156NM
AVERAGE MAGNITUDE OF WIND ERROR	9KTS	14KTS	21KTS	21KTS	9KTS	14KTS	21KTS	21KTS
AVERAGE BIAS OF WIND ERROR	6KTS	7KTS	10KTS	16KTS	6KTS	7KTS	10KTS	16KTS
NUMBER OF FORECASTS	30	26	22	18	30	26	22	18
						6	6	3

TYPHOON PAMELA

0600Z 04 NOV TO 1200Z 08 NOV

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
040600Z	13.0N 129.8E	50	12.9N 130.0E	55	13	05	13.1N 124.0E	70	71	-5	14.5N 118.2E	65	74	-10	15.8N 114.4E	75	109	-25
041200Z	12.8N 128.0E	65	12.8N 128.5E	60	29	-05	13.4N 122.4E	65	71	00	14.7N 117.4E	70	88	-05	16.1N 113.8E	80	137	-20
041800Z	12.5N 126.5E	75	12.8N 126.3E	60	21	-15	13.9N 119.8E	55	54	-10	15.6N 114.9E	70	60	-20	17.1N 111.5E	80	42	-30
050000Z	12.3N 124.8E	75	12.7N 124.8E	70	24	-05	14.2N 118.7E	65	60	00	15.5N 113.8E	75	66	-20	17.2N 112.0E	80	115	-20
050600Z	12.2N 123.2E	75	12.4N 123.0E	70	17	-5	14.6N 112.5E	75	304	00	15.8N 114.2E	80	92	-20	16.3N 110.9E	80	203	0
051200Z	12.6N 121.5E	65	13.1N 121.4E	65	30	00	15.1N 116.3E	75	78	00	16.1N 112.9E	80	88	-20	16.4N 109.7E	80	327	15
051800Z	13.0N 119.7E	65	13.0N 120.0E	65	17	0	15.2N 114.9E	80	36	-10	16.3N 111.7E	85	85	-25	--.- ---.-	--	--	--
060000Z	13.2N 118.7E	65	13.3N 117.8E	70	53	05	14.6N 112.1E	80	99	-15	15.3N 108.3E	65	237	-35	--.- ---.-	--	--	--
060600Z	13.4N 117.6E	75	13.5N 116.6E	70	58	-05	14.5N 111.3E	80	112	-20	15.0N 107.5E	35	335	-45	--.- ---.-	--	--	--
061200Z	13.8N 116.2E	75	13.8N 115.4E	85	46	10	14.8N 110.5E	95	127	-5	15.0N 106.8E	25	481	-40	--.- ---.-	--	--	--
061800Z	14.6N 114.8E	90	14.4N 114.6E	90	17	00	15.5N 110.0E	95	130	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
070000Z	15.2N 113.7E	95	15.1N 113.5E	95	13	00	16.4N 109.2E	100	154	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
070600Z	15.9N 112.6E	100	15.8N 112.5E	105	8	5	18.0N 108.5E	105	161	25	--.- ---.-	--	--	--	--.- ---.-	--	--	--
071200Z	16.7N 111.5E	100	16.6N 111.5E	110	6	10	19.6N 108.0E	90	241	25	--.- ---.-	--	--	--	--.- ---.-	--	--	--
071800Z	17.5N 110.9E	110	17.5N 110.5E	110	23	00	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
080000Z	18.6N 110.6E	=100	18.9N 110.5E	90	19	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
080600Z	19.7N 110.7E	80	19.7N 110.5E	80	11	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
081200Z	21.5N 111.8E	65	21.0N 110.6E	70	73	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	27NM	121NM	161NM	155NM	27NM	121NM	161NM	155NM
AVERAGE RIGHT ANGLE ERROR	15NM	86NM	104NM	48NM	15NM	86NM	104NM	48NM
AVERAGE MAGNITUDE OF WIND ERROR	7KTS	11KTS	26KTS	18KTS	7KTS	11KTS	26KTS	18KTS
AVERAGE BIAS OF WIND ERROR	-4KTS	-4KTS	-26KTS	-13KTS	-4KTS	-4KTS	-26KTS	-13KTS
NUMBER OF FORECASTS	18	14	10	6	18	14	10	6
						7	7	5

TYPHOON RUBY

1200Z 14 NOV TO 0000Z 20 NOV

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
141200Z	12.3N 178.4E	65	12.2N 179.1E	70	41	5	13.8N 175.6E	80	77	10	15.1N 172.4E	85	104	-05	16.3N 169.3E	90	195	25
141800Z	12.8N 177.4E	65	12.8N 178.0E	70	35	5	14.3N 174.5E	80	81	-10	15.6N 171.3E	85	86	-15	16.8N 168.1E	90	215	40
150000Z	13.3N 176.3E	70	13.2N 177.1E	75	47	05	14.7N 173.5E	85	70	-25	15.8N 170.2E	90	86	-10	17.2N 167.1E	90	257	50
150600Z	13.7N 175.3E	75	13.7N 175.0E	75	17	0	15.4N 170.8E	85	42	-10	17.3N 167.6E	90	73	15	19.2N 165.2E	95	306	55
151200Z	14.1N 174.3E	70	14.2N 173.9E	80	24	10	15.9N 169.2E	90	88	00	17.6N 164.7E	95	104	30	19.1N 160.7E	100	221	60
151800Z	14.3N 173.1E	90	14.6N 173.6E	80	34	-10	16.2N 169.5E	90	40	-10	17.5N 166.0E	95	120	45	18.7N 163.1E	100	281	65
160000Z	14.6N 172.3E	110	14.6N 172.1E	100	12	-10	15.9N 167.3E	120	81	20	17.5N 163.5E	125	113	85	19.3N 160.2E	120	220	85
160600Z	15.0N 171.4E	95	14.9N 171.4E	120	6	25	15.9N 167.2E	140	17	65	17.8N 163.0E	135	164	95	19.6N 159.8E	120	261	85
161200Z	15.3N 170.6E	90	15.6N 170.4E	120	21	30	17.5N 166.9E	130	92	65	19.3N 163.7E	130	296	90	21.2N 160.3E	120	371	90
161800Z	15.6N 169.8E	100	15.7N 169.9E	120	8	20	17.6N 166.7E	130	156	80	19.4N 163.5E	130	326	95	21.1N 160.6E	120	394	90
170000Z	15.8N 168.7E	100	15.7N 168.8E	130	8	30	16.8N 165.3E	125	153	85	18.6N 162.0E	115	256	80	20.7N 159.0E	100	337	75
170600Z	16.1N 167.4E	75	16.4N 167.5E	100	19	25	18.7N 163.3E	70	220	30	20.7N 159.9E	70	316	35	--.- ---.-	--	--	--
171200Z	16.3N 165.9E	65	16.3N 165.7E	75	11	10	17.0N 160.1E	65	98	25	17.8N 155.2E	70	90	40	--.- ---.-	--	--	--
171800Z	16.2N 164.4E	50	16.2N 164.5E	75	6	25	16.9N 159.1E	65	87	30	18.1N 154.3E	70	96	40	--.- ---.-	--	--	--
180000Z	15.7N 162.9E	40	16.0N 162.8E	65	19	25	16.8N 157.0E	70	109	35	19.0N 151.9E	70	190	45	--.- ---.-	--	--	--
180600Z	15.4N 161.6E	40	15.4N 161.5E	45	6	05	15.7N 156.0E	35	58	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
181200Z	15.4N 160.5E	40	15.3N 160.6E	30	8	-10	15.6N 156.4E	30	58	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
181800Z	15.5N 159.5E	35	15.5N 159.4E	30	6	-05	16.5N 155.2E	30	19	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
190000Z	15.8N 158.6E	35	15.6N 158.5E	30	13	-05	16.1N 154.6E	50	54	25	--.- ---.-	--	--	--	--.- ---.-	--	--	--
190600Z	16.3N 156.8E	35	16.4N 157.4E	30	35	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
191200Z	16.5N 156.0E	30	16.5N 156.3E	30	17	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
191800Z	16.8N 155.3E	30	16.7N 155.5E	30	13	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
200000Z	17.0N 154.5E	25	17.2N 154.4E	20	13	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	19NM	92NM	170NM	245NM	18NM	84NM	161NM	279NM
AVERAGE RIGHT ANGLE ERROR	12NM	46NM	115NM	146NM	11NM	45NM	112NM	194NM
AVERAGE MAGNITUDE OF WIND ERROR	13KTS	25KTS	41KTS	46KTS	11KTS	22KTS	41KTS	57KTS
AVERAGE BIAS OF WIND ERROR	5KTS	20KTS	38KTS	46KTS	4KTS	18KTS	39KTS	57KTS
NUMBER OF FORECASTS	20	16	12	8	23	19	15	11
						15	11	7

TYPHOON SALLY

0600Z 01 DEC TO 0000Z 05 DEC

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
010600Z	6.8N 109.1E	60	7.1N 109.6E	50	35	-10	7.1N 105.2E	60	24	-20	7.9N 100.9E	60	88	-5	9.8N 97.0E	40	218	-20
011200Z	6.7N 107.8E	75	6.4N 107.6E	55	21	-20	6.6N 102.4E	60	144	-10	7.9N 98.6E	40	198	-20	10.4N 95.4E	50	271	-5
011800Z	6.8N 106.7E	75	6.8N 106.8E	65	6	-10	8.4N 102.0E	65	115	-5	10.6N 98.7E	40	185	-20	13.9N 96.1E	50	306	5
020000Z	7.1N 105.7E	80	7.1N 105.6E	65	6	-15	9.0N 101.0E	65	132	-5	11.3N 98.0E	40	208	-20	14.7N 95.6E	50	351	10
020600Z	7.5N 105.2E	80	7.7N 105.0E	70	17	-10	10.4N 100.8E	75	149	10	11.1N 97.8E	45	251	-15	--.- ---.-	--	--	--
021200Z	7.8N 104.5E	70	7.9N 104.9E	65	24	-5	9.5N 102.3E	65	46	5	11.8N 99.0E	45	122	-10	--.- ---.-	--	--	--
021800Z	8.0N 103.9E	70	8.4N 104.0E	65	25	-5	10.2N 101.3E	65	61	5	12.7N 98.1E	45	181	0	--.- ---.-	--	--	--
030000Z	8.0N 103.0E	70	8.1N 103.3E	75	19	5	9.7N 100.4E	75	42	15	12.8N 97.8E	40	186	0	--.- ---.-	--	--	--
030600Z	8.4N 102.3E	65	8.1N 102.1E	75	21	10	9.8N 98.9E	60	107	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
031200Z	8.9N 101.8E	60	8.8N 101.5E	75	19	15	10.9N 98.5E	50	103	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
031800Z	9.2N 101.5E	60	9.2N 101.2E	65	18	5	11.3N 98.8E	50	88	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
040000Z	9.6N 101.1E	60	9.6N 101.2E	65	6	5	11.1N 99.7E	65	72	25	--.- ---.-	--	--	--	--.- ---.-	--	--	--
040600Z	10.0N 100.7E	60	10.1N 100.3E	55	24	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
041200Z	10.0N 100.0E	55	10.1N 100.4E	55	24	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
041800Z	10.0N 99.5E	45	10.0N 98.6E	40	53	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
050000Z	10.0N 99.2E	40	9.9N 98.9E	30	19	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	21NM	90NM	178NM	287NM	21NM	90NM	178NM	287NM
AVERAGE RIGHT ANGLE ERROR	15NM	42NM	129NM	250NM	15NM	42NM	129NM	250NM
AVERAGE MAGNITUDE OF WIND ERROR	8KTS	9KTS	11KTS	10KTS	8KTS	9KTS	11KTS	10KTS
AVERAGE BIAS OF WIND ERROR	-3KTS	2KTS	-11KTS	-3KTS	-3KTS	2KTS	-11KTS	-3KTS
NUMBER OF FORECASTS	16	12	8	4	16	12	8	4
						6	6	2

TYPHOON THERESE

0600Z 01 DEC TO 0000Z 10 DEC

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
010600Z	7.0N 137.3E	30	6.8N 137.2E	30	13	0	7.8N 132.0E	55	30	-05	--.- ---.-	--	--	--	--.- ---.-	--	--	--
011200Z	7.3N 136.2E	35	7.2N 136.3E	30	8	-5	8.8N 131.7E	50	94	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
011800Z	7.3N 134.9E	45	7.7N 135.0E	30	25	-15	9.6N 130.4E	50	134	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
020000Z	7.3N 133.7E	55	7.4N 133.7E	55	6	0	9.0N 128.4E	75	72	05	10.8N 123.4E	50	95	5	11.1N 118.0E	55	114	0
020600Z	7.4N 132.3E	60	7.3N 132.6E	60	19	00	8.3N 127.9E	75	95	00	10.7N 122.7E	50	88	0	11.0N 117.5E	55	131	-5
021200Z	7.5N 130.8E	65	7.5N 130.8E	60	0	-5	9.5N 125.9E	75	69	15	11.0N 120.5E	50	17	-5	11.0N 115.7E	60	224	-5
021800Z	7.7N 129.2E	65	7.9N 129.7E	60	32	-5	10.0N 124.7E	60	71	15	11.2N 119.5E	50	54	-5	12.0N 114.8E	65	252	-5
030000Z	8.1N 127.6E	70	8.1N 127.3E	70	18	00	9.5N 121.1E	60	78	15	10.5N 116.0E	75	234	20	11.3N 112.0E	60	397	5
030600Z	8.5N 126.3E	75	8.1N 125.9E	65	34	-10	9.2N 119.6E	60	134	10	10.4N 114.9E	70	282	10	11.8N 111.2E	80	422	-10
031200Z	9.1N 124.8E	60	8.3N 124.3E	55	56	-05	9.5N 118.2E	65	179	10	10.5N 113.7E	75	338	10	12.3N 110.0E	80	467	-15
031800Z	10.0N 123.5E	45	10.2N 122.2E	55	77	10	13.2N 116.4E	70	237	15	14.9N 112.3E	80	424	10	16.0N 108.2E	80	576	-20
040000Z	10.6N 121.8E	45	10.2N 122.3E	55	38	10	13.7N 117.0E	75	176	20	15.9N 113.6E	75	362	0	17.9N 110.5E	75	483	-25
040600Z	10.8N 121.2E	50	10.8N 121.2E	55	0	5	13.1N 116.6E	75	164	15	15.5N 113.0E	75	361	-15	17.8N 110.2E	75	455	-25
041200Z	11.2N 120.7E	55	11.4N 119.9E	50	48	-5	14.1N 115.6E	60	241	-5	16.1N 112.6E	60	376	-35	18.0N 110.0E	60	441	-45
041800Z	11.8N 120.2E	55	11.7N 120.1E	50	8	-5	13.8N 116.8E	60	161	-10	15.7N 114.2E	60	262	-40	17.3N 111.8E	60	303	-45
050000Z	12.2N 119.6E	55	12.4N 119.3E	55	21	0	14.9N 115.8E	65	225	-10	16.7N 113.1E	65	324	-35	18.2N 110.7E	65	352	-40
050600Z	12.3N 119.3E	60	12.5N 119.0E	55	21	-5	14.2N 116.4E	60	154	-30	15.7N 113.5E	55	229	-45	16.7N 110.8E	50	258	-50
051200Z	12.3N 119.3E	65	12.4N 119.3E	55	6	-10	12.8N 118.8E	55	48	-40	13.5N 117.1E	60	64	-45	14.1N 114.5E	60	54	-40
051800Z	12.3N 119.1E	70	12.4N 119.0E	65	8	-5	12.7N 118.2E	65	35	-35	13.3N 116.6E	65	68	-40	13.8N 114.0E	65	47	-30
060000Z	12.4N 118.7E	75	12.4N 118.8E	75	6	0	12.5N 118.0E	75	58	-25	12.9N 116.3E	70	101	-35	13.5N 114.0E	65	96	-25
060600Z	12.5N 118.4E	90	12.5N 118.4E	85	0	-5	12.7N 116.9E	105	38	5	12.9N 115.5E	100	62	0	13.3N 111.6E	95	36	5
061200Z	12.6N 118.0E	95	12.6N 118.1E	95	6	0	12.8N 116.7E	110	54	5	13.1N 114.7E	105	80	5	13.5N 111.8E	95	57	0
061800Z	12.8N 117.6E	100	12.7N 117.6E	95	6	-5	12.9N 116.2E	110	63	5	13.2N 114.2E	105	72	10	13.6N 111.3E	95	79	-5
070000Z	12.9N 117.1E	100	12.8N 117.0E	95	8	-5	13.1N 115.0E	110	48	5	13.5N 112.5E	105	25	15	13.8N 109.8E	95	44	0
070600Z	13.2N 116.5E	100	13.0N 116.5E	100	12	0	13.3N 114.0E	110	38	10	13.5N 111.2E	100	30	10	--.- ---.-	--	--	--
071200Z	13.4N 116.0E	105	13.3N 116.0E	105	6	0	13.9N 113.5E	110	6	10	13.8N 110.6E	100	18	5	--.- ---.-	--	--	--
071800Z	13.7N 115.5E	105	13.6N 115.4E	105	8	0	14.3N 113.1E	90	25	-5	14.3N 110.2E	75	21	-25	--.- ---.-	--	--	--
080000Z	13.9N 114.9E	105	13.8N 115.0E	105	8	0	14.3N 112.4E	90	24	0	14.2N 109.6E	75	30	-20	--.- ---.-	--	--	--
080600Z	13.9N 114.2E	100	14.1N 114.2E	100	12	0	14.3N 111.1E	85	33	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
081200Z	13.9N 113.6E	100	14.0N 113.8E	100	13	0	13.9N 111.1E	85	12	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
081800Z	13.9N 113.2E	95	14.0N 112.9E	95	18	0	13.9N 109.8E	80	13	-20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
090000Z	13.9N 112.4E	90	13.8N 112.3E	90	8	0	13.5N 109.7E	70	50	-25	--.- ---.-	--	--	--	--.- ---.-	--	--	--
090600Z	13.9N 111.5E	90	14.0N 111.3E	100	13	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
091200Z	13.9N 110.9E	95	14.0N 110.8E	100	8	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
091800Z	14.0N 110.0E	100	14.0N 109.8E	100	12	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
100000Z	14.1N 109.1E	95	14.1N 109.0E	85	6	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	16NM	89NM	161NM	252NM	16NM	89NM	161NM	252NM
AVERAGE RIGHT ANGLE ERROR	9NM	60NM	84NM	126NM	10NM	60NM	84NM	126NM
AVERAGE MAGNITUDE OF WIND ERROR	4KTS	14KTS	18KTS	19KTS	4KTS	14KTS	18KTS	19KTS
AVERAGE BIAS OF WIND ERROR	-1KTS	-2KTS	-10KTS	-18KTS	-1KTS	-2KTS	-10KTS	-18KTS
NUMBER OF FORECASTS	35	32	25	21	36	32	25	21
						22	15	12

ANNEX A

SUMMARY OF TROPICAL CYCLONES IN THE EASTERN NORTH PACIFIC

1. EASTERN PACIFIC RESUME

During the 1972 EASTPAC tropical cyclone season, Fleet Weather Facility, Alameda, issued a total of 347 tropical warnings on eight hurricanes, three tropical storms, and three tropical depressions. Three of these tropical disturbances moved out of Alameda's area of responsibility.

The 1972 total of fourteen tropical cyclones was the lowest in more than five years. Of the eight hurricanes during the 1972 season, six occurred in August.

On 1 November 1972, Fleet Weather Central, Pearl Harbor, assumed forecasting responsibility for the United States Navy in the Eastern Pacific. Two short-lived cyclones, Liza and Tropical Depression #16, developed and dissipated in the Eastern Pacific without making landfall.

In accordance with the National Hurricane Operations Plan, tropical cyclone issuances for the Eastern Pacific Ocean east of longitude 140°W and north of the Equator are prepared by the National Weather Service's Eastern Pacific Hurricane Center, San Francisco (EPHC-SFO).

Fleet Weather Facility, Alameda, relayed these tropical cyclone forecasts to the Department of Defense.

Information provided regarding tropical cyclones of the 1972 season is based upon data provided by EPHC-SFO.

TABLE A-1. COMPARISON OF EAST PACIFIC ANNUAL WARNING AND CLIMATOLOGY DATA

	1968	1969	1970	1971	1972
TOTAL NUMBER OF WARNINGS	531	219	350	410	347
CALENDAR DAYS OF WARNING	126	67	98	89	85
TROPICAL DEPRESSIONS	6	5	3	3	3
TROPICAL STORMS	13	6	15	8	3
HURRICANES	6	4	3	11	8
TOTAL	25	15	21	22	14

2. CENTRAL PACIFIC RESUME

Fleet Weather Central, Pearl Harbor, issued warnings on six tropical cyclones in 1972.

Total Number of Warnings....99
Calendar Days of Warnings...25
Tropical Depressions........ 1
Tropical Storms............. 4
Hurricanes.................. 1
Total Tropical Cyclones..... 6

All warnings were coordinated with the Central Pacific Hurricane Center, Honolulu, and the Eastern Pacific Hurricane Center, San Francisco, in accordance with the National Hurricane Operations Plan.

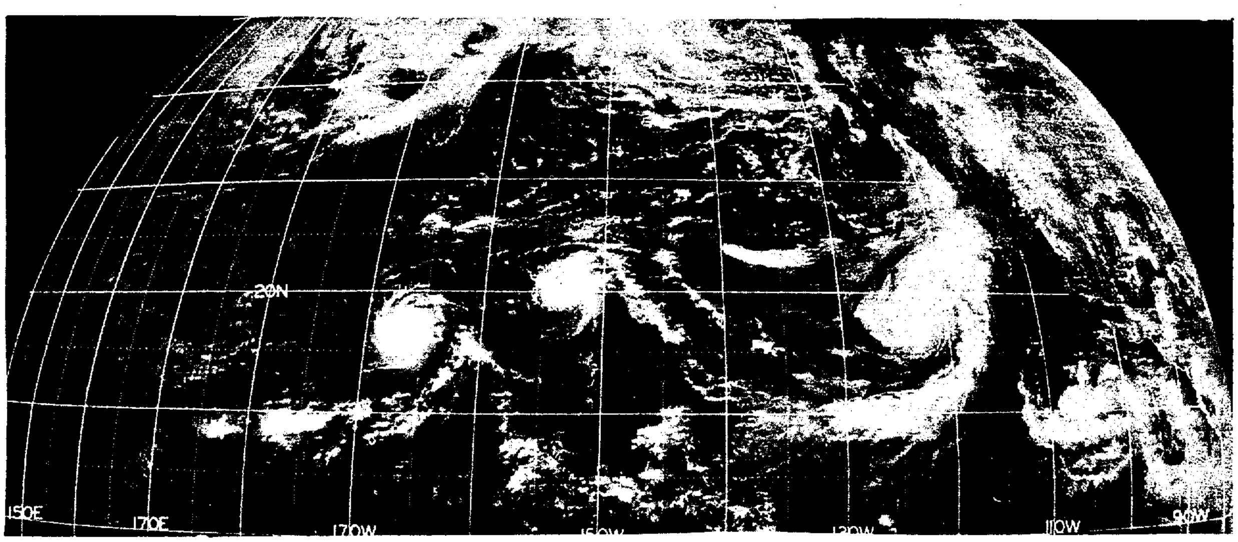


FIGURE A-1. *ATS-1 satellite picture of the eastern North Pacific, 18 August 1972, depicting hurricanes Celeste, Diana, Tropical Storm Estelle and a tropical depression which became Fernanda the following day.*

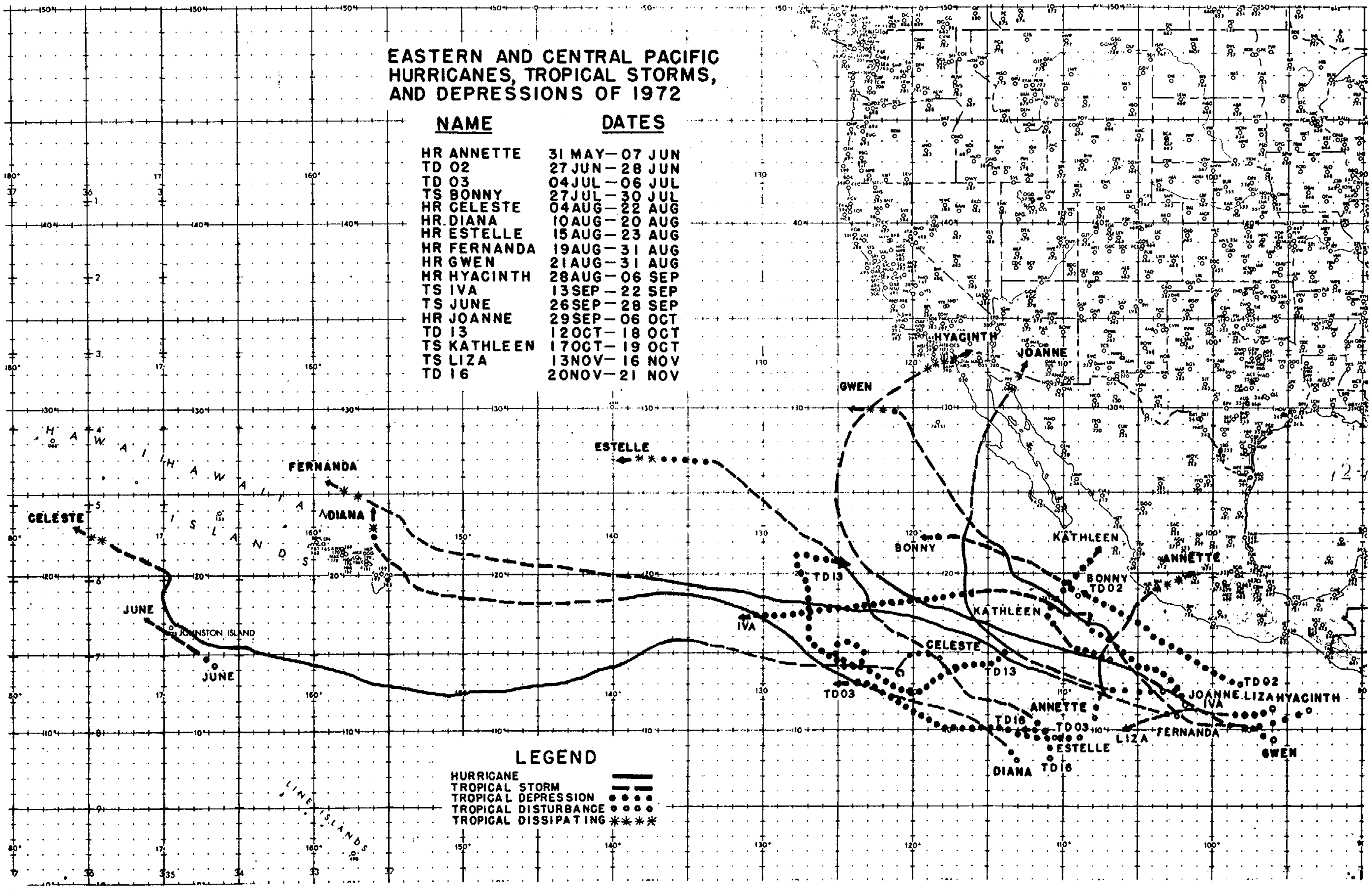

EASTERN AND CENTRAL PACIFIC HURRICANES, TROPICAL STORMS, AND DEPRESSIONS OF 1972
NAME DATES
HR ANNETTE 31 MAY—07 JUN
TD 02 27 JUN—28 JUN
TD 03 04 JUL—06 JUL
TS BONNY 27 JUL—30 JUL
HR CELESTE 04 AUG—22 AUG
HR DIANA 10 AUG—20 AUG
HR ESTELLE 15 AUG—23 AUG
HR FERNANDA 19 AUG—31 AUG
HR GWEN 21 AUG—31 AUG
HR HYACINTH 28 AUG—06 SEP
TS IVA 13 SEP—22 SEP
TS JUNE 26 SEP—28 SEP
HR JOANNE 29 SEP—06 OCT
TD 13 12 OCT—18 OCT
TS KATHLEEN 17 OCT—19 OCT
TS LIZA 13 NOV—16 NOV
TD 16 20 NOV—21 NOV
LEGEND
HURRICANE
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
TROPICAL DISSIPATING
HAWAIIAN ISLANDS
JOHNSTON ISLAND
LINE ISLANDS
CELESTE
JUNE
FERNANDA
DIANA
ESTELLE
GWEN
HYACINTH
JOANNE
BONNY
KATHLEEN
ANNETTE
TD02
TD13
IVA
CELESTE
TD03
ANNETTE
TD16
LIZA
FERNANDA
ESTELLE
DIANA
GWEN

TABLE A-2. 1972 EASTERN PACIFIC TROPICAL CYCLONES

	CYCLONE	TYPE	NAME	INCLUSIVE DATES	MAX SFC WIND	MIN OBS SLP	WARNINGS TOTAL	WARNINGS NO. AS HURRICANE	WARNINGS DISTANCE TRAVELED
	01	HR	ANNETTE	31 MAY - 07 JUN	75	993	31	5	795
	02	TD	TD 02	27 JUN - 28 JUN	---	---	--	--	615
	03	TD	TD 03	04 JUL - 06 JUL	---	---	--	--	930
	04	TS	BONNY	27 JUL - 30 JUL	---	---	--	--	570
	05	HR	CELESTE	04 AUG - 22 AUG	120	943	71	42	3600
(a)	06	HR	DIANA	10 AUG - 20 AUG	100	968	24	16	1680
	07	HR	ESTELLE	15 AUG - 23 AUG	75	---	32	4	1884
(b)	08	HR	FERNANDA	19 AUG - 31 AUG	100	950	29	18	2040
	09	HR	GWEN	21 AUG - 31 AUG	110	962	39	18	1980
	10	HR	HYACINTH	28 AUG - 06 SEP	110	962	36	16	2640
	11	TS	IVA	13 SEP - 22 SEP	---	---	--	--	1900
(c)	23	TS	JUNE	26 SEP - 28 SEP	---	---	--	--	280
	12	HR	JOANNE	29 SEP - 06 OCT	85	971	28	14	1500
	13	TD	TD 13	12 OCT - 18 OCT	---	---	--	--	1440
	14	TS	KATHLEEN	17 OCT - 19 OCT	---	---	--	--	600
	15	TS	LIZA	13 NOV - 16 NOV	---	---	--	--	510
	16	TD	TD 16	20 NOV - 21 NOV	---	---	--	--	110

(a) TS from 16 AUG - 20 AUG - data not available
(b) TS from 27 AUG - 31 AUG - data not available
(c) Name and number given by FWC/JTWC Guam

3. CENTRAL PACIFIC - INDIVIDUAL CASES[1]

1972 was the Central Pacific's most active hurricane season in recorded history. In all, one hurricane (Celeste), three tropical storms (Diana, Fernanda, and June) and an unnamed tropical cyclone of lesser intensity entered or formed within an area bounded by latitudes 10° and 20°N, and by longitudes 140° and 170°W. Of these, three straddled the Hawaiian Islands, while two took more southerly paths and came very close to Johnston Island. All occurred during the period August through October.

In life cycle and track, Hurricane Celeste and tropical storms Diana and Fernanda were reminiscent of Lorraine and Maggie in August 1970 and Denise and Elenor in July 1971. All formed off Mexico and Central America, failed to undergo the usual northward recurvature in the eastern Pacific, and then drifted thousands of miles westward toward Hawaii along the southern periphery of strong high pressure areas. Tropical Storm June, on the other hand, began her short-lived career in a very active equatorial trough about 600 miles south-southwest of Hawaii Island.

On the morning of August 19, Celeste passed about 25 miles northeast of Johnston Island, whose entire population had been evacuated as a precaution against the possible escape of stored toxic gases.

The weather station itself lost about a third of its roof and ceiling tiles, but interiors and equipment were virtually unscathed. Instruments that remained in operation throughout the storm recorded hurricane-force winds from 3:54 a.m. to 9:18 a.m. on the 19th, a fastest-mile of 105 miles an hour from the northwest (the gust recorder was inoperative), a minimum sea-level pressure of 29.04 inches and a total rainfall of 6.21 inches. Since the funnel of the gage was partially plugged with coral, the latter may be an underestimate.

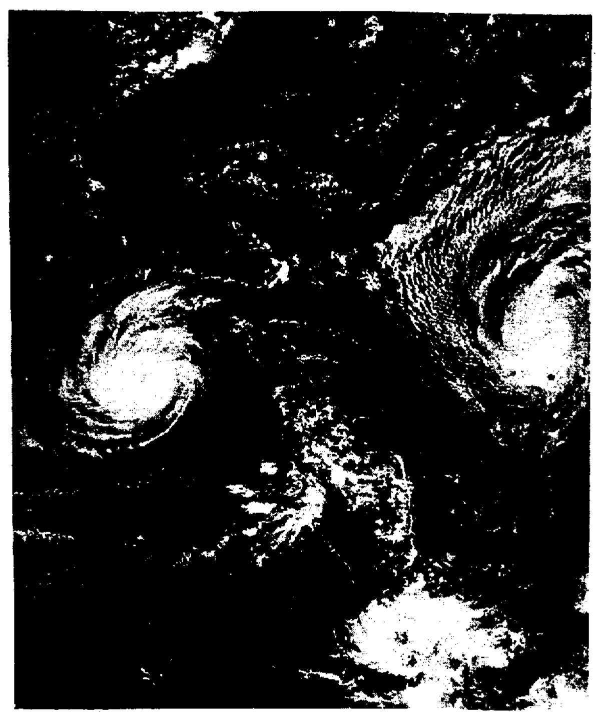


FIGURE A-2. *Hurricane Celeste (left) 400 nm south of Oahu, Hawaii. Tropical Storm Diana (right) some 700 nm east of Hilo, Hawaii, appears on edge of photo, 16 August 1972, 2059 GMT. (DAPP data)*

[1]Report submitted by Regional Climatologist, NWS Pacific Region, Honolulu, Hawaii.

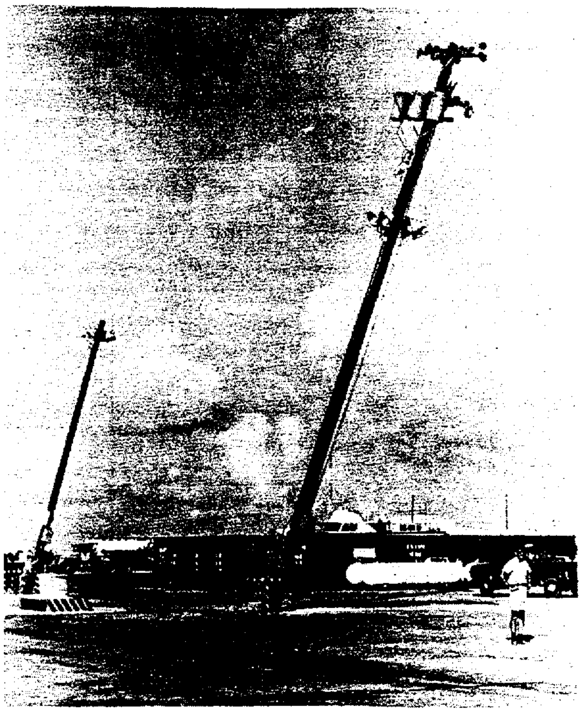


FIGURE A-3. *Effects of Celeste on Johnston Island.*

FIGURE A-4. *Celeste damage on Johnston Island.*

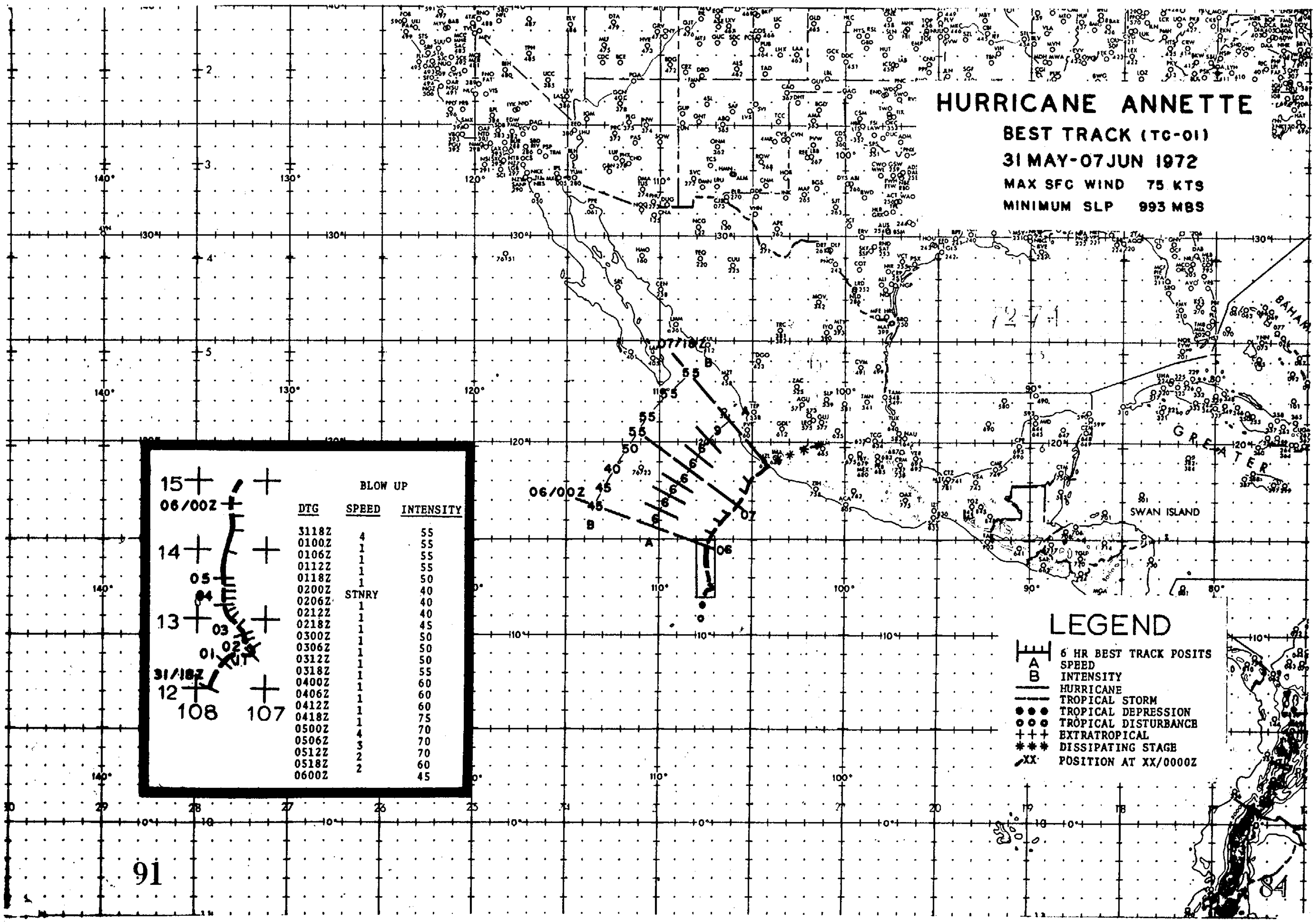
Celeste was the first true hurricane ever known to have affected Johnston. The Mariners Weather Log (January 1973) makes the following observations on this storm: "Celeste was of considerable meteorological interest. The central Pacific sees relatively few tropical storms each year. Much rarer is a hurricane that forms off Mexico and moves west across the central Pacific while maintaining hurricane intensity. Also interesting was the fact that Celeste moved with few sudden changes of direction, intensity or shape."

On the morning of August 18, waves judged to be up to 30 feet high from Tropical Storm Diana swept four homes off their foundations on Hawaii Island's Puna coast, extensively damaging one of them, for a loss estimated at $75,000, excluding furnishings. Continuing northwestward, the storm's center came within 60 miles northeast of Hilo before dissipating, her nearest landfall.

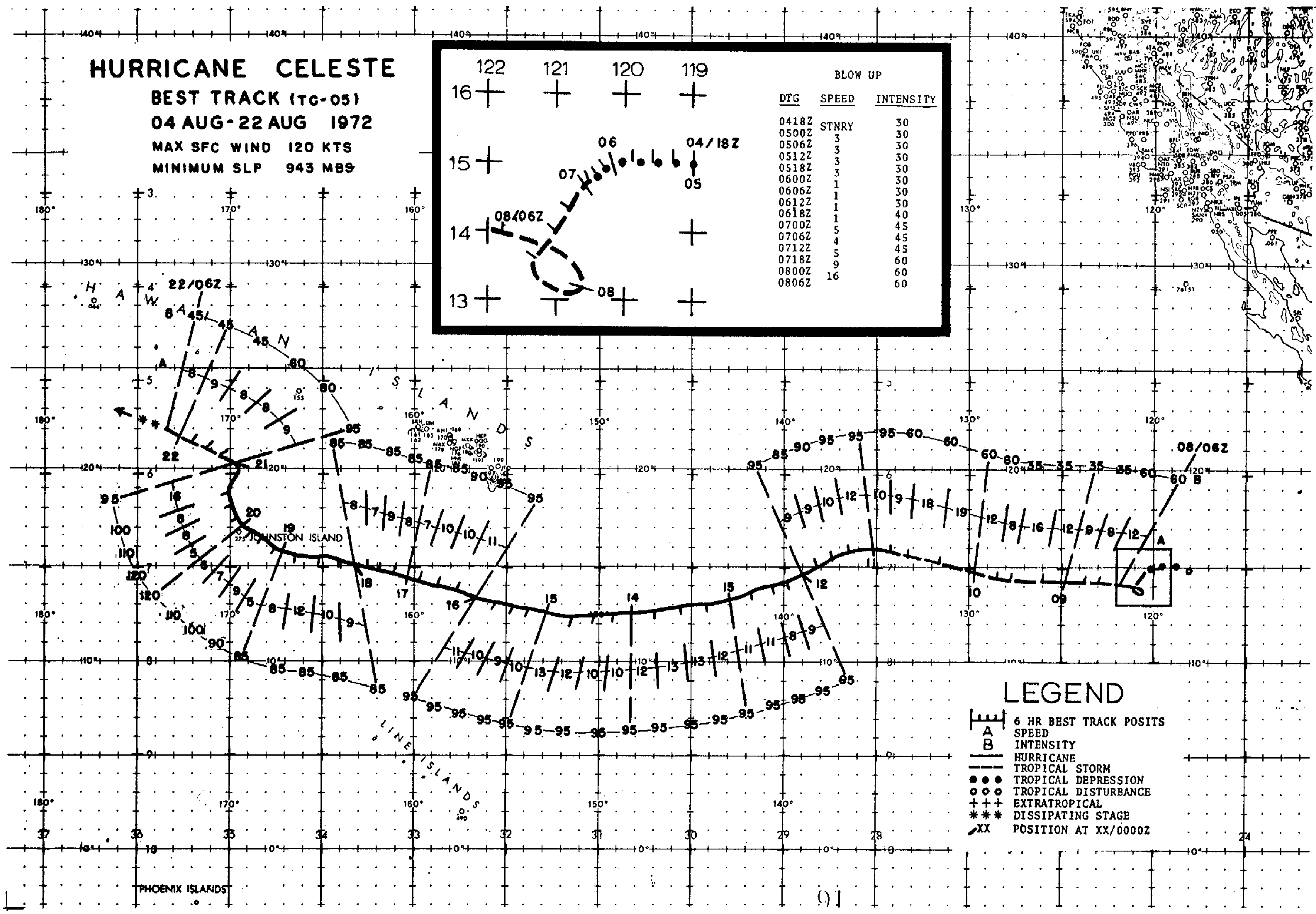
On the morning of August 29, Fernanda, moving northwestward and weakening rapidly, passed within 220 miles northeast of Hilo, her closest approach to the islands. While the state experienced no severe weather directly attributable to Fernanda, a possible aftermath was a flash flood from rains in Hawaii Island's Kohala Mountains that overtopped Waipio Stream on the afternoon of the 31st, damaging a farmer's pickup truck and destroying his load of taro.

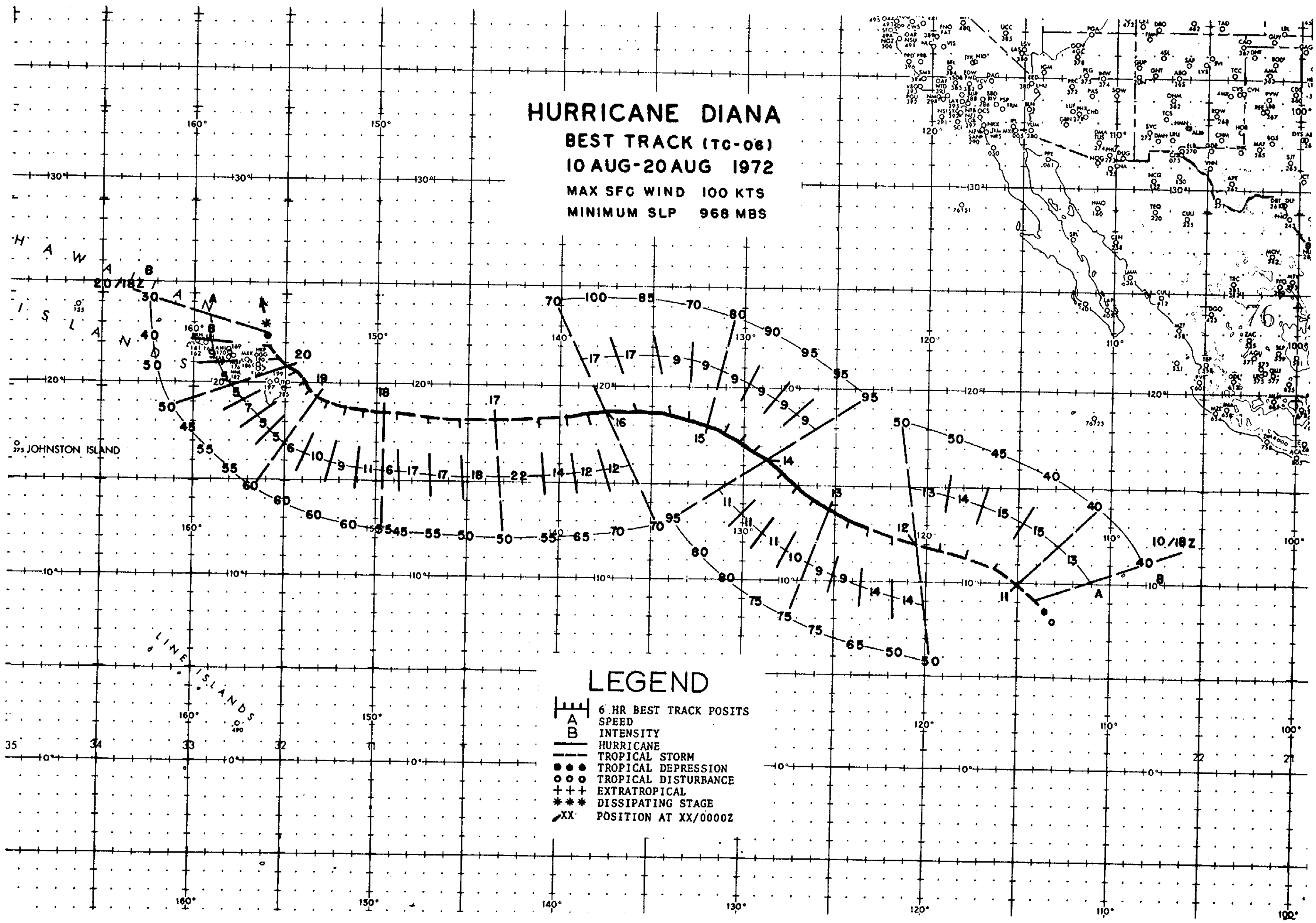
Tropical Storm June passed within 50 miles to the south of Johnston Island on the morning of September 27, but was too weak to do any damage. The peak gust recorded at the weather station was 42 knots.

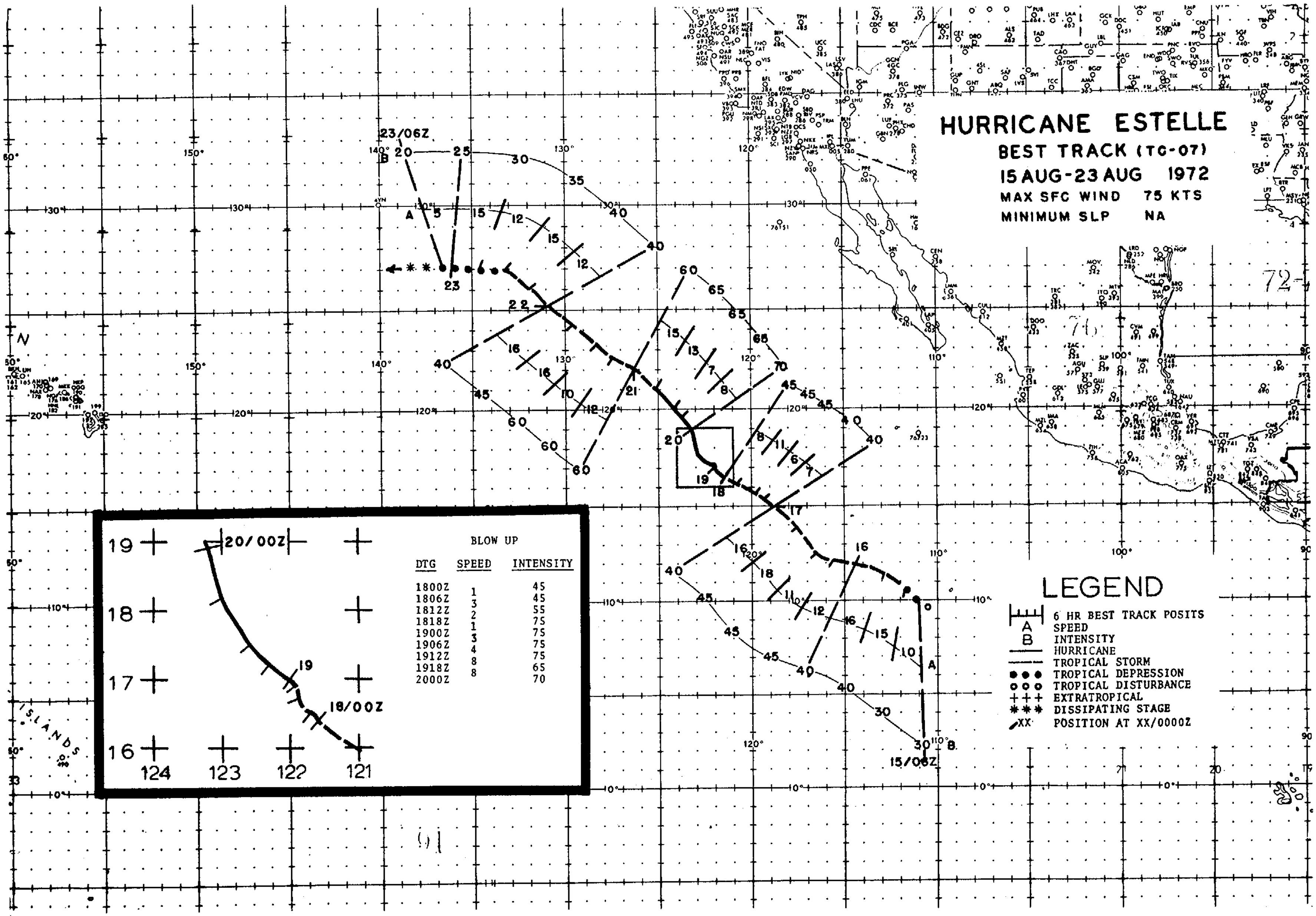
The final storm of the 1972 season was a tropical cyclone that formed near 16°N 130°W on September 28 and traveled westward to about 150 miles south of South Point, giving Hawaii Island's eastern slopes up to 10-1/2 inches of rain within the space of a few hours on the afternoon of October 3.

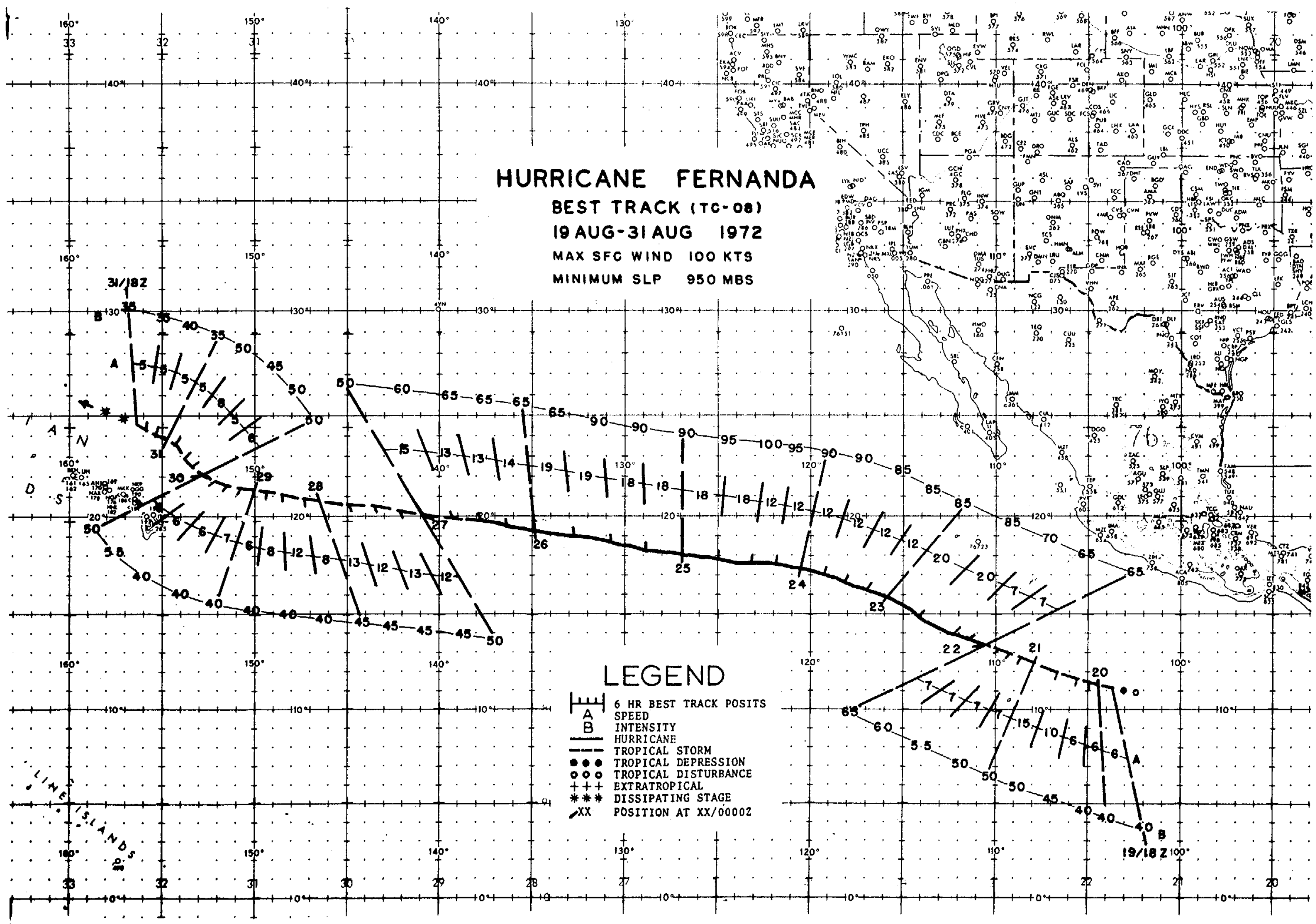


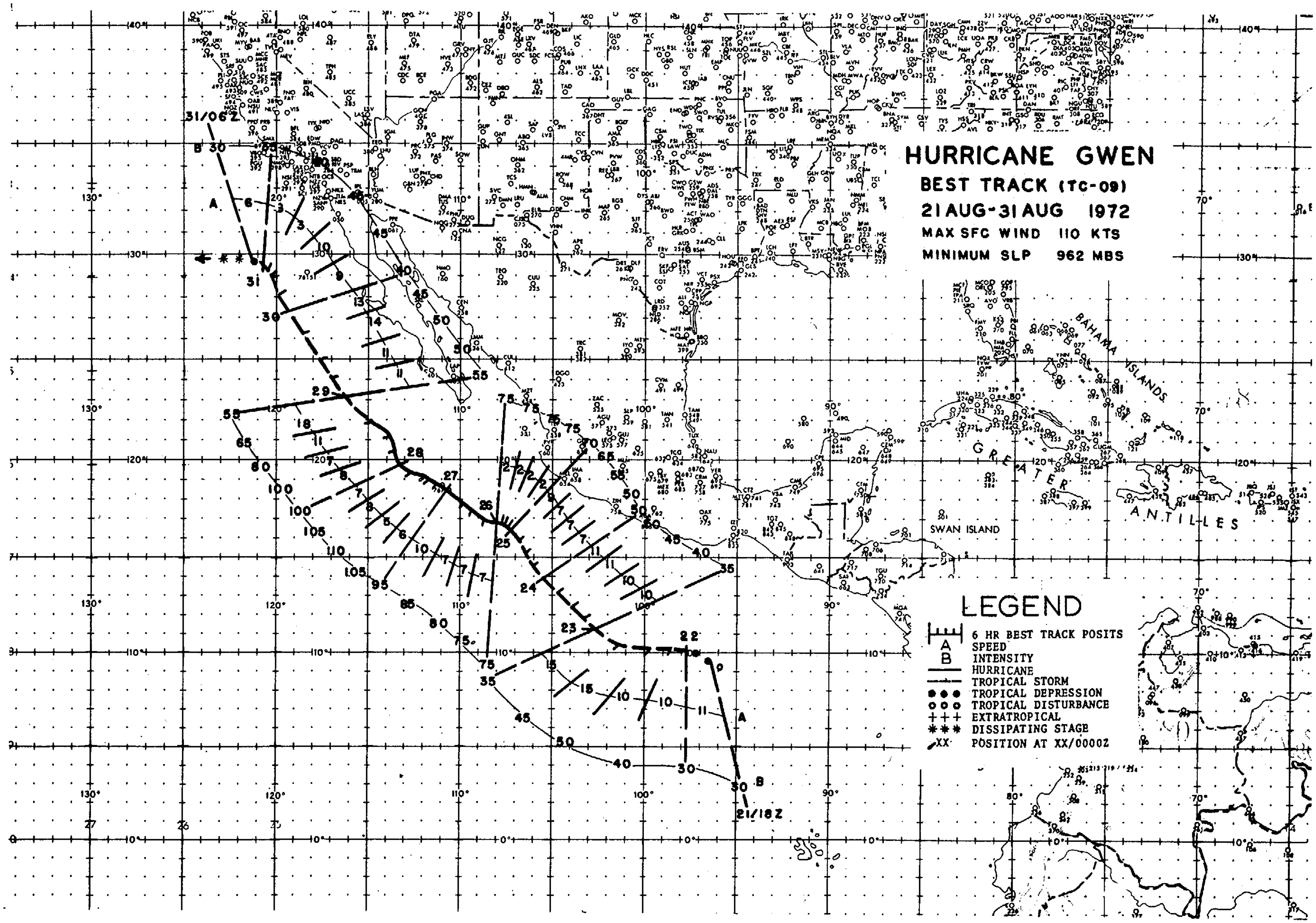
DTG	SPEED	INTENSITY
3118Z	4	55
0100Z	1	55
0106Z	1	55
0112Z	1	55
0118Z	1	50
0200Z	STNRY	40
0206Z	1	40
0212Z	1	40
0218Z	1	45
0300Z	1	50
0306Z	1	50
0312Z	1	50
0318Z	1	55
0400Z	1	60
0406Z	1	60
0412Z	1	60
0418Z	1	75
0500Z	4	70
0506Z	3	70
0512Z	2	70
0518Z	2	60
0600Z		45

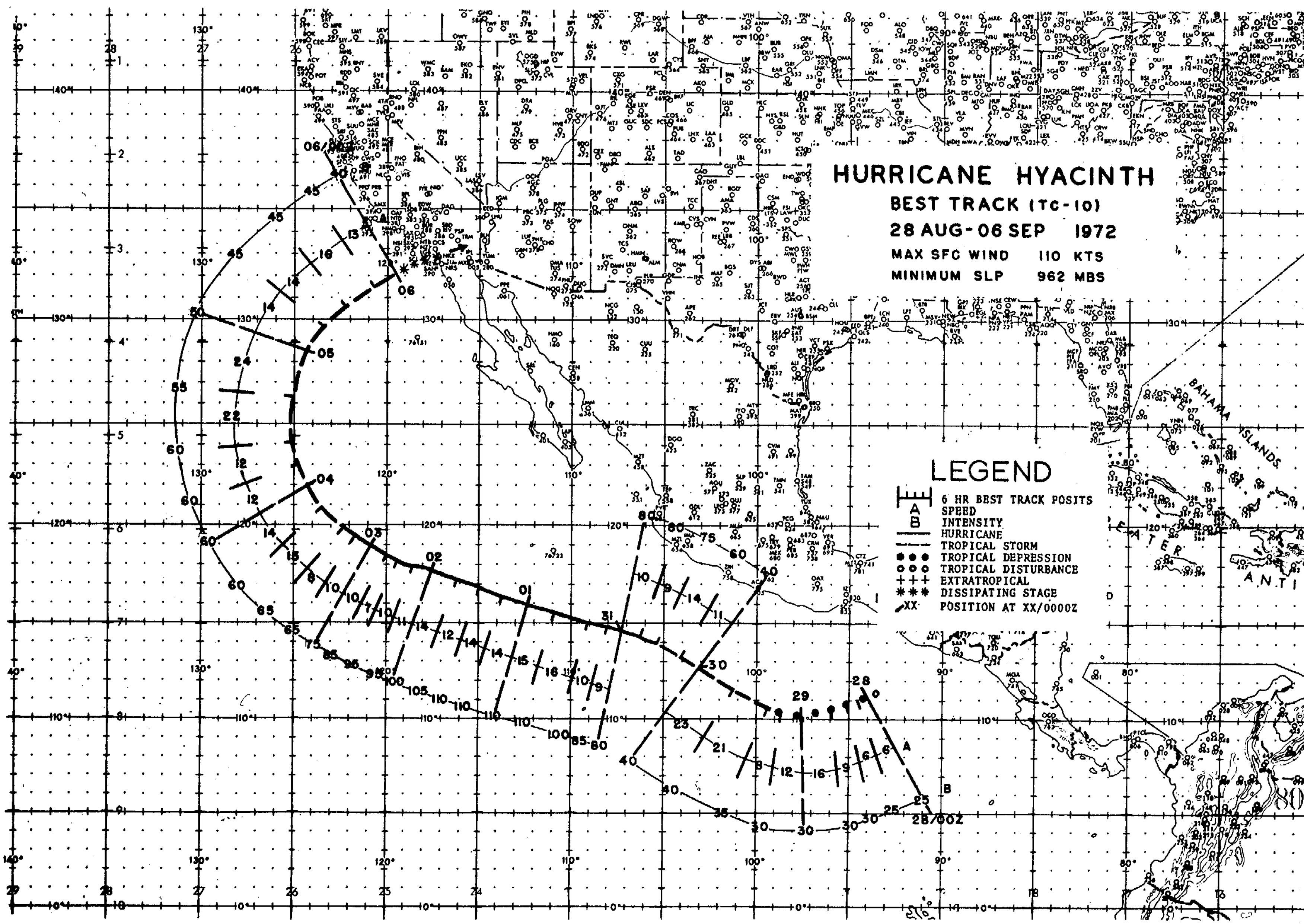

HURRICANE CELESTE
BEST TRACK (TC-05)
04 AUG - 22 AUG 1972
MAX SFC WIND 120 KTS
MINIMUM SLP 943 MBS
BLOW UP
DTG SPEED INTENSITY
0418Z STNRY 30
0500Z 3 30
0506Z 3 30
0512Z 3 30
0518Z 3 30
0600Z 1 30
0606Z 1 30
0612Z 1 30
0618Z 1 40
0700Z 5 45
0706Z 4 45
0712Z 5 45
0718Z 9 60
0800Z 16 60
0806Z 60
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
HURRICANE
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
POSITION AT XX/0000Z
HAWAIIAN ISLANDS
JOHNSTON ISLAND
LINE ISLANDS
PHOENIX ISLANDS

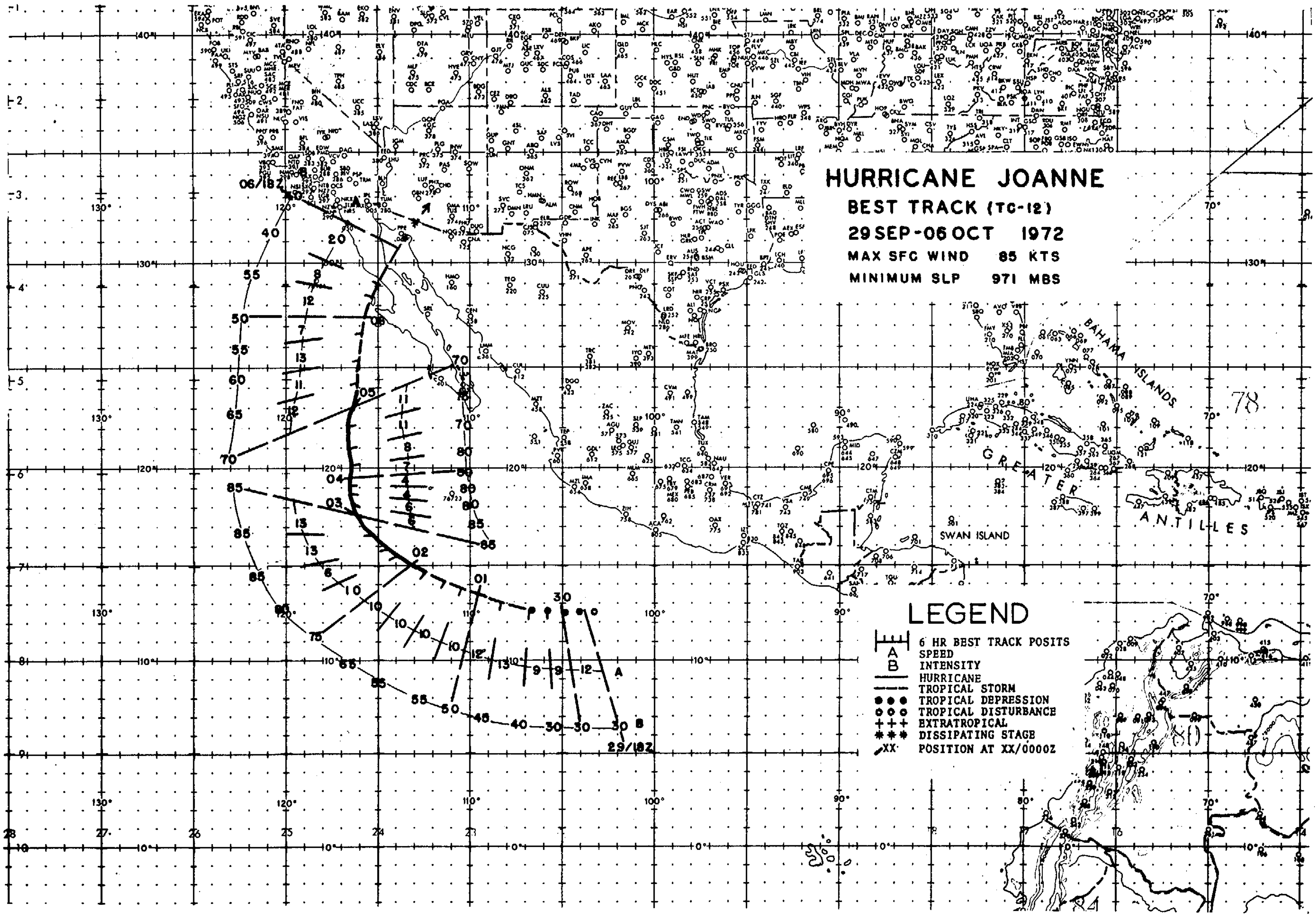

HURRICANE DIANA
BEST TRACK (TC-06)
10 AUG-20 AUG 1972
MAX SFC WIND 100 KTS
MINIMUM SLP 968 MBS
HAWAIIAN ISLANDS
JOHNSTON ISLAND
LINE ISLANDS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
HURRICANE
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
POSITION AT XX/0000Z
10/18Z
20/18Z


HURRICANE ESTELLE
BEST TRACK (TC-07)
15 AUG-23 AUG 1972
MAX SFC WIND 75 KTS
MINIMUM SLP NA
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
HURRICANE
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
XX POSITION AT XX/0000Z
23/06Z
15/06Z
20/00Z
18/00Z
BLOW UP
DTG SPEED INTENSITY
1800Z 45
1806Z 45
1812Z 55
1818Z 75
1900Z 75
1906Z 75
1912Z 75
1918Z 65
2000Z 70
1 3 2 1 3 4 8 8
ISLANDS


HURRICANE FERNANDA
BEST TRACK (TC-08)
19 AUG-31 AUG 1972
MAX SFC WIND 100 KTS
MINIMUM SLP 950 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
HURRICANE
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
POSITION AT XX/0000Z
31/18Z
19/18 Z
LINE ISLANDS


HURRICANE GWEN
BEST TRACK (TC-09)
21 AUG-31 AUG 1972
MAX SFC WIND 110 KTS
MINIMUM SLP 962 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
HURRICANE
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
POSITION AT XX/0000Z
31/06Z
21/18Z
SWAN ISLAND
BAHAMA ISLANDS
GREATER ANTILLES


HURRICANE HYACINTH
BEST TRACK (TC-10)
28 AUG-06 SEP 1972
MAX SFC WIND 110 KTS
MINIMUM SLP 962 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
HURRICANE
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
XX POSITION AT XX/0000Z
BAHAMA ISLANDS
28/00Z
06/00Z


HURRICANE JOANNE
BEST TRACK (TC-12)
29 SEP-06 OCT 1972
MAX SFC WIND 85 KTS
MINIMUM SLP 971 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
HURRICANE
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
XX POSITION AT XX/0000Z
BAHAMA ISLANDS
GREATER ANTILLES
SWAN ISLAND
06/18Z
29/18Z

5. CENTER FIX DATA - HURRICANES

EYE FIXES, HURRICANE ANNETTE 31 MAY - 06 JUN 72

FIX NO.	TIME	POSIT	FIX CAT	ACC	OBS (EST) SFC WND	EYE FORM	EYE DIAM
1	312217Z	12.0N 106.0W	SAT	STG C	---------	----	----
2	012125Z	12.5N 106.5W	SAT	STG B	---------	----	----
3	021815Z	13.4N 107.9W	P	30NM	30	CIRC	22
4	022219Z	13.5N 107.3W	SAT	STG X	DIA 3.0	CAT 2.0	----
5	032127Z	12.5N 108.3W	SAT	STG X	DIA 2.0	CAT 3.0	----
6	042221Z	12.8N 109.0W	SAT	STG X	DIA 2.0	CAT 2.5	----
7	051710Z	13.5N 110.0W	P	20NM	30	CIRC	15
8	052129Z	14.5N 108.5W	SAT	STG X	DIA 2.0	CAT 2.0	----
9	061805Z	15.3N 106.3W	P	5NM	55	CIRC	25
10	062227Z	17.0N 106.0W	SAT	STG X	DIA 2.0	CAT 2.0	----

EYE FIXES, HURRICANE CELESTE 12 AUG - 22 AUG 72

FIX NO.	TIME	POSIT	FIX CAT	FLT LVL	FLT LVL WND	OBS SFC WND	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	EYE DIA
1	042231Z	14.5N 119.5W	SAT	STG C	---	---	---	-----	-----	----	----
2	052329Z	14.0N 119.5W	SAT	STG C	---	---	---	-----	-----	----	----
3	062233Z	14.0N 120.5W	SAT	STG X	DIA 2.5		CAT 2.5	-----	-----	----	----
4	072327Z	14.0N 122.5W	SAT	STG X	DIA 3.0		CAT 3.0	-----	-----	----	----
5	082234Z	14.5N 125.5W	SAT	STG X	DIA 1.5		CAT 2.0	-----	-----	----	----
6	092333Z	15.0N 129.0W	SAT	STG X	DIA 1.5		CAT 3.0	-----	-----	----	----
7	110027Z	15.0N 133.4W	SAT	STG X	DIA 3.0		CAT 3.5	-----	-----	----	----
8	112015Z	15.2N 137.2W	---	-----	---	90	---	-----	-----	CIRC	11
9	112334Z	15.0N 138.0W	SAT	STG X	DIA 1.0		CAT 3.0	-----	-----	----	----
10	130034Z	15.0N 143.5W	SAT	STG X	DIA 2.5		CAT 3.5	-----	-----	----	----
11	140040Z	12.6N 148.1W	P-10	700MB	95	95	967	2786	16/8	CIRC	30
12	180131Z	15.1N 163.8W	P-1	700MB	---	85	950	2646	16/11	CIRC	23
13	190605Z	15.9N 167.6W	P-5	700MB	---	---	943	2594	17/--	CIRC	22
14	200310Z	17.5N 169.2W	P-10	700MB	100	130	---	2585	20/13	CIRC	30
15	210240Z	20.0N 170.3W	P-10	700MB	90	110	981	2911	18/9	----	----
16	211837Z	21.2N 171.8W	P-15	700MB	45	45	994	3054	14/10	----	----

EYE FIXES, HURRICANE DIANA 10 AUG - 15 AUG 72

FIX NO.	TIME	POSIT	FIX CAT	ACC	OBS (EST) SFC WND	EYE FORM	EYE DIAM
1	102232Z	10.0N 116.5W	SAT	STG B	--------	----	----
2	112040Z	12.0N 119.3W	---	3NM	45	CIRC	7
3	112330Z	12.9N 120.5W	SAT	STG X	DIA 1.0	CAT 3.0	----
4	122238Z	13.8N 124.9W	---	2NM	74	CIRC	11
5	122353Z	14.0N 125.0W	SAT	STG X	DIA 1.5	CAT 3.5	----
6	132337Z	15.5N 129.9W	SAT	STG X	DIA 2.0	CAT 3.5	----
7	141810Z	17.5N 130.9W	---	2NM	UNK	CIRC	30
8	142245Z	17.0N 132.8W	SAT	STG X	DIA 4.0	CAT 4.0	----
9	152335Z	18.9N 137.2W	---	5NM	45	ELIP	060/23/17
10	152339Z	17.9N 137.4W	SAT	STG X	DIA 2.0	CAT 3.0	----

EYE FIXES, HURRICANE ESTELLE 14 AUG - 21 AUG 72

FIX NO.	TIME	POSIT	FIX CAT	ACC	OBS (EST) SFC WND	EYE FORM	EYE DIAM
1	142241Z	09.5N 111.0W	SAT	STG B	---------	----	----
2	152144Z	12.0N 114.5W	SAT	STG B	---------	----	----
3	162242Z	16.0N 117.0W	SAT	STG C	---------	----	----
4	172341Z	16.5N 121.8W	SAT	STG C+	---------	----	----
5	182244Z	17.2N 122.0W	SAT	STG X	DIA 3.0	CAT 2.0	----
6	192343Z	19.0N 123.0W	SAT	STG X	DIA 3.0	CAT 3.0	----
7	201743Z	20.9N 123.4W	P	12NM	UNK	ELIP	180/30/25
8	202247Z	22.0N 126.5W	SAT	STG C	---------	----	----
9	212127Z	24.7N 130.8W	P	20NM	UNK	CIRC	15

EYE FIXES, HURRICANE FERNANDA 19 AUG - 25 AUG 72

FIX NO.	TIME	POSIT	FIX CAT	ACC	OBS (EST) SFC WND	EYE FORM	EYE DIAM
1	191554Z	09.5N 104.0W	SAT	STG C	---------	----	----
2	202242Z	12.9N 108.0W	SAT	STG X	DIA 4.0	CAT 2.0	----
3	221801Z	15.5N 114.8W	P	10NM	85	CIRC	24
4	232347Z	16.8N 121.2W	SAT	STG X	DIA 5.0	CAT 4.0	----
5	241700Z	17.9N 124.8W	P	20NM	90	CIRC	25
6	242250Z	17.4N 127.4W	SAT	STG X	DIA 2.0	CAT 3.0	----
7	252349Z	19.2N 134.5W	SAT	STG X	DIA 2.0	CAT 3.5	----

EYE FIXES, HURRICANE GWEN 23 AUG - 30 AUG 72

FIX NO.	TIME	POSIT	FIX CAT	ACC	OBS (EST) SFC WND	EYE FORM	EYE DIAM
1	232152Z	14.2N 106.1W	SAT	STG B	---------	----	----
2	242125Z	16.9N 106.8W	P	20NM	40	CIRC	20
3	242250Z	15.9N 106.7W	SAT	STG X	DIA 3.0	CAT 2.0	----
4	262253Z	18.0N 110.5W	SAT	STG X	DIA 2.0	CAT 4.0	----
5	271758Z	19.5N 111.9W	P	5NM	UNK	CIRC	35
6	272156Z	19.0N 113.0W	SAT	STG X	DIA 3.0	CAT 4.0	----
7	281730Z	22.4N 114.8W	P	3NM	55	CIRC	5
8	282259Z	23.2N 115.6W	---	STG X	DIA 4.0	CAT 2.0	----
9	300600Z	28.2N 119.6W	P	5NM	UNK	CIRC	25
10	301405Z	28.7N 120.5W	P	5NM	UNK	CIRC	30
11	302300Z	29.2N 120.7W	SAT	STG C-	---------	----	----
12	302330Z	29.4N 121.5W	P	4NM	35	----	----

EYE FIXES, HURRICANE HYACINTH 29 AUG - 05 SEP 72

FIX NO.	TIME	POSIT	FIX CAT	ACC	OBS (EST) SFC WND	EYE FORM	EYE DIAM
1	292157Z	11.5N 101.8W	SAT	STG C	---------	----	----
2	301923Z	14.3N 106.5W	P	5NM	80	CIRC	30
3	311712Z	15.7N 111.2W	P	5NM	110	CIRC	60
4	012302Z	17.5N 116.5W	SAT	STG X	---------	----	----
5	022150Z	19.1N 119.9W	P	1NM	65	CIRC	25
6	022207Z	18.5N 121.0W	SAT	STG X	---------	----	----
7	030156Z	16.0N 122.5W	SAT	STG C	---------	----	----
8	032309Z	22.5N 123.8W	SAT	STG X	---------	----	----
9	041800Z	28.9N 125.0W	SAT	STG C	---------	----	----
10	042208Z	27.4N 124.5W	P	1NM	50	MISG	MISG
11	051513Z	30.8N 122.1W	P	5NM	35	CIRC	20
12	051830Z	31.3N 120.9W	P	5NM	30	UNK	UNK

EYE FIXES, HURRICANE JOANNE 29 SEP - 05 OCT 72

FIX NO.	TIME	POSIT	FIX CAT	ACC	OBS (EST) SFC WND	EYE FORM	EYE DIAM
1	292136Z	11.7N 105.1W	SAT	STG B	---------	----	----
2	302228Z	13.6N 109.3W	SAT	STG C	---------	----	----
3	011731Z	14.8N 111.7W	P	3NM	65	CIRC	20
4	012137Z	15.1N 113.6W	SAT	STG X	DIA 2.0	CAT 3.0	----
5	020126Z	15.1N 114.0W	SAT	STG C-	---------	----	----
6	022233Z	17.5N 116.0W	SAT	STG X	DIA 3.0	CAT 3.0	----
7	031750Z	18.9N 116.5W	P	10NM	80	CIRC	40
8	032141Z	19.0N 116.7W	SAT	STG X	DIA 2.0	CAT 3.0	----
9	042241Z	23.0N 116.8W	SAT	STG X	DIA 1.5	CAT 2.5	----
10	050152Z	23.2N 116.6W	P	15NM	45	CIRC	60

6. POSITION DATA - TROPICAL STORMS AND DEPRESSIONS

TROPICAL DEPRESSION TWO
27 - 28 JUNE

DTG	LAT	LONG	DTG	LAT	LONG
270000Z	13.0N	98.0W	280000Z	16.5N	104.4W
270600Z	13.7N	99.8W	280600Z	17.7N	105.5W
271200Z	14.7N	101.7W	281200Z	17.8N	106.8W
271800Z	16.0N	104.0W	281800Z	18.3N	107.7W

TROPICAL DEPRESSION THREE
04 - 06 JULY

DTG	LAT	LONG	DTG	LAT	LONG
040000Z	9.5N	109.5W	050600Z	10.2N	118.0W
040600Z	9.5N	111.1W	051200Z	11.5N	120.3W
041200Z	9.7N	112.4W	051800Z	13.9N	123.9W
041800Z	10.0N	114.0W	060000Z	13.0N	124.0W
050000Z	10.0N	115.5W			

TROPICAL STORM BONNY
27 - 30 JULY

DTG	LAT	LONG	DTG	LAT	LONG
271800Z	19.0N	109.5W	290000Z	21.7N	115.0W
280000Z	19.6N	110.0W	290600Z	22.0N	116.0W
280600Z	20.0N	111.0W	291200Z	22.3N	117.0W
281200Z	20.6N	112.0W	291800Z	22.2N	117.8W
281800Z	21.2N	114.2W	300000Z	22.2N	118.1W

TROPICAL STORM DIANA
16 - 20 AUGUST

DTG	LAT	LONG	DTG	LAT	LONG
161800Z	18.3N	141.1W	190000Z	19.2N	153.2W
170000Z	18.2N	143.7W	190600Z	19.6N	153.6W
170600Z	18.3N	145.4W	191200Z	20.0N	153.9W
171200Z	18.4N	147.1W	191800Z	20.5N	154.4W
171800Z	18.5N	148.9W	200000Z	20.8N	154.9W
180000Z	18.7N	149.7W	200600Z	21.2N	155.3W
180600Z	18.8N	150.8W	201200Z	21.7N	155.7W
181200Z	18.9N	151.7W	201800Z	22.4N	156.0W
181800Z	19.0N	152.7W			

TROPICAL STORM FERNANDA
27 - 31 AUGUST

DTG	LAT	LONG	DTG	LAT	LONG
270000Z	20.0N	140.9W	291200Z	21.4N	151.5W
270600Z	20.2N	142.2W	291800Z	21.5N	152.2W
271200Z	20.4N	143.6W	300000Z	21.8N	153.0W
271800Z	20.6N	145.0W	300600Z	22.4N	153.4W
280000Z	20.6N	146.6W	301200Z	22.9N	153.8W
280600Z	20.8N	147.3W	301800Z	23.5N	154.2W
281200Z	21.0N	148.4W	310000Z	23.7N	154.7W
281800Z	21.2N	149.3W	310600Z	23.9N	155.3W
290000Z	21.2N	150.1W	311200Z	24.2N	155.8W
290600Z	21.3N	150.7W	311800Z	24.6N	156.3W

TROPICAL STORM JUNE
26 - 28 SEPTEMBER

DTG	LAT	LONG
261800Z	14.2N	166.0W
270000Z	14.7N	166.8W
270600Z	15.3N	167.8W
271200Z	15.9N	168.7W
271800Z	16.3N	169.2W
280000Z	16.8N	170.3W

TROPICAL STORM IVA
13 - 22 SEPTEMBER

DTG	LAT	LONG	DTG	LAT	LONG
131800Z	12.0N	102.0W	180600Z	17.8N	110.1W
140000Z	13.0N	102.5W	181200Z	18.0N	110.5W
140600Z	13.4N	103.3W	181800Z	18.3N	111.0W
141200Z	13.8N	104.0W	190000Z	18.4N	111.8W
141800Z	14.9N	104.8W	190600Z	18.7N	112.9W
150000Z	15.3N	106.5W	191200Z	18.8N	114.1W
150600Z	15.8N	107.2W	191800Z	18.8N	115.6W
151200Z	16.2N	108.0W	200000Z	18.8N	116.8W
151800Z	16.7N	108.6W	200600Z	18.6N	118.3W
160000Z	16.9N	108.6W	201200Z	18.4N	119.7W
160600Z	17.0N	108.5W	201800Z	18.1N	121.0W
161200Z	17.2N	108.3W	210000Z	18.0N	122.5W
161800Z	17.4N	108.2W	210600Z	18.0N	124.0W
170000Z	17.4N	108.4W	211200Z	17.8N	126.0W
170600Z	17.4N	108.5W	211800Z	17.5N	127.5W
171200Z	17.3N	108.8W	220000Z	17.5N	128.5W
171800Z	17.3N	109.1W	220600Z	17.5N	129.5W
180000Z	17.4N	109.6W	221200Z	17.5N	130.5W

TROPICAL DEPRESSION THIRTEEN
12 - 18 OCTOBER

DTG	LAT	LONG	DTG	LAT	LONG
121800Z	14.5N	114.5W	160000Z	14.7N	123.1W
130000Z	14.2N	115.5W	160600Z	14.1N	124.0W
130600Z	14.1N	116.3W	161200Z	14.6N	124.9W
131200Z	13.7N	118.0W	161800Z	14.9N	125.5W
131800Z	12.5N	120.0W	170000Z	15.2N	126.1W
140000Z	13.0N	121.5W	170600Z	15.7N	126.9W
140600Z	13.9N	122.9W	171200Z	17.1N	127.0W
141200Z	14.1N	123.5W	171800Z	18.1N	127.0W
141800Z	14.2N	124.0W	180000Z	19.2N	127.1W
150000Z	14.4N	124.5W	180600Z	20.3N	127.6W
150600Z	15.0N	125.1W	181200Z	21.2N	127.8W
151200Z	15.5N	124.9W	181800Z	21.0N	126.0W
151800Z	15.1N	123.4W			

TROPICAL STORM KATHLEEN
17 - 19 OCTOBER

DTG	LAT	LONG	DTG	LAT	LONG
171200Z	14.5N	107.0W	181800Z	16.8N	110.8W
171800Z	15.0N	108.1W	190000Z	17.5N	111.0W
180000Z	15.6N	109.5W	190600Z	18.8N	110.1W
180600Z	15.9N	109.8W	191200Z	20.0N	109.0W
181200Z	16.0N	110.1W			

TROPICAL STORM LIZA
13 - 16 NOVEMBER

DTG	LAT	LONG	DTG	LAT	LONG
131200Z	11.0N	97.0W	150000Z	11.0N	100.2W
131800Z	10.0N	97.5W	150600Z	11.1N	100.7W
140000Z	10.5N	97.0W	151200Z	11.2N	101.4W
140600Z	11.0N	97.5W	151800Z	10.8N	104.7W
141200Z	11.0N	98.0W	160000Z	10.8N	104.8W
141800Z	10.0N	99.0W			

TROPICAL DEPRESSION SIXTEEN
20 - 21 NOVEMBER

DTG	LAT	LONG	DTG	LAT	LONG
200000Z	13.5N	111.0W	210000Z	15.0N	112.0W
200600Z	14.0N	111.0W	210600Z	15.0N	112.0W
201200Z	14.2N	110.8W	211200Z	15.0N	112.0W
201800Z	15.0N	112.0W	211800Z	15.0N	112.0W

7. POSITION AND VERIFICATION DATA - HURRICANES

HURRICANE DIANA

POSITION FROM BEST TRACK AND VERIFICATION DATA
101800Z to 161200Z AUG 1972

TIME	STORM POSITION LAT	LONG	24 HR ERROR DEG/DIST	48 HR ERROR DEG/DIST	TIME	STORM POSITION LAT	LONG	24 HR ERROR DEG/DIST	48 HR ERROR DEG/DIST
101800Z	09.0N	114.0W	-	-	131800Z	15.6N	127.9W	103/120	080/100
110000Z	09.9N	115.0W	-	-	140000Z	16.2N	128.7W	038/110	083/162
110600Z	10.7N	116.3W	-	-	140600Z	16.8N	129.3W	048/156	080/195
111200Z	11.2N	117.9W	-	-	141200Z	17.1N	130.1W	025/120	081/222
111800Z	11.6N	119.3W	328/145	-	141800Z	17.5N	131.0W	057/90	084/300
120000Z	11.9N	120.6W	060/65	-	150000Z	18.0N	132.0W	060/90	040/222
120600Z	12.3N	121.9W	070/80	-	150600Z	18.2N	133.0W	063/90	052/228
121200Z	12.8N	123.3W	060/60	-	151200Z	18.4N	134.0W	060/90	028/210
121800Z	13.2N	124.2W	000/02	321/220	151800Z	18.7N	135.7W	060/90	035/130
130000Z	13.7N	125.3W	100/25	070/120	160000Z	18.7N	137.5W	270/72	090/30
130600Z	14.2N	126.1W	095/75	072/175	160600Z	18.6N	138.6W	260/110	0901/24
131200Z	14.9N	127.1W	098/90	077/200	161200Z	18.5N	139.7W	260/120	085/50

24 HR FORECAST ERROR = 90.0NM
48 HR FORECAST ERROR = 161.7NM

HURRICANE ANNETTE

POSITION FROM BEST TRACK AND VERIFICATION DATA
311800Z MAY to 071800Z JUNE 1972

TIME	STORM POSIT LAT	STORM POSIT LONG	24 HR ERROR DEG/DIST	48 HR ERROR DEG/DIST
311800Z	12.0N	107.8W		
010000Z	12.4N	107.6W		
010600Z	12.5N	107.5W		
011200Z	12.5N	107.4W		
011800Z	12.5N	107.3W	093/245	
020000Z	12.5N	107.2W	090/220	
020600Z	12.5N	107.2W	092/200	
021200Z	12.6N	107.2W	092/310	
021800Z	12.7N	107.3W	277/72	093/490
030000Z	12.8N	107.3W	080/70	091/430
030600Z	12.9N	107.4W	085/95	092/460
031200Z	13.0N	107.5W	083/120	092/480
031800Z	13.1N	107.6W	072/120	293/110
040000Z	13.2N	107.6W	053/30	080/300
040600Z	13.3N	107.6W	083/112	085/210
041200Z	13.4N	107.6W	082/125	085/230
041800Z	13.5N	107.6W	070/80	083/230
050000Z	13.6N	107.6W	062/132	083/150
050600Z	14.0N	107.6W	058/170	086/215
051200Z	14.3N	107.5W	057/192	087/245
051800Z	14.5N	107.5W	052/150	061/170
060000Z	14.7N	107.5W	060/185	057/230
060600Z	15.4N	107.0W	056/252	055/300
061200Z	15.9N	106.8W	046/336	055/355
061800Z	16.4N	106.2W	063/320	050/330
070000Z	16.8N	105.9W	065/302	056/410
070600Z	17.4N	105.5W	DISSIPATING	053/460
071200Z	18.0N	105.2W	076/372	053/492
071800Z	18.8N	104.0W	327/78	DISSIPATING

24 HR FORECAST ERROR = 171.5NM
48 HR FORECAST ERROR = 299.8NM

HURRICANE ESTELLE

POSITION FROM BEST TRACK AND VERIFICATION DATA
150600Z to 230600Z AUG 1972

TIME	STORM POSITION LAT	STORM POSITION LONG	24 HR ERROR DEG/DIST.	48 HR ERROR DEG/DIST.
150600Z	10.0N	111.0W	-	-
151200Z	10.6N	111.4W	-	-
151800Z	11.2N	112.9W	-	-
160000Z	11.9N	114.3W	-	-
160600Z	12.0N	115.5W	000/120	-
161200Z	12.4N	116.6W	355/138	-
161800Z	13.8N	117.8W	297/330	-
170000Z	15.0N	118.8W	352/145	-
170600Z	15.3N	119.4W	002/145	-
171200Z	15.6N	119.9W	014/150	-
171800Z	15.9N	120.9W	010/115	-
180000Z	16.4N	121.6W	320/48	050/85
180600Z	16.5N	121.7W	120/96	032/200
181200Z	16.7N	121.9W	112/140	053/210
181800Z	16.9N	121.9W	110/195	057/210
190000Z	17.0N	122.0W	095/240	230/80
190600Z	17.2N	122.3W	093/276	103/282
191200Z	17.5N	122.6W	092/324	097/340
191800Z	18.2N	123.0W	110/70	092/360
200000Z	18.9N	123.2W	070/60	082/408
200600Z	19.5N	123.7W	355/150	079/440
201200Z	20.0N	124.1W	001/408	068/510
201800Z	20.9N	125.2W	305/90	025/100
210000Z	21.9N	126.3W	303/160	025/100
210600Z	22.5N	127.3W	300/150	015/245
211200Z	23.2N	128.2W	296/306	324/312
211800Z	24.1N	129.5W	000/61	342/162
220000Z	25.0N	130.8W	301/72	298/380
220600Z	25.9N	131.9W	310/90	295/354
221200Z	26.7N	133.2W	016/08	288/510
221800Z	26.9N	134.5W	002/45	350/265
230000Z	27.9N	136.0W	022/75	301/162
230600Z	27.0N	136.4W	190/90	295/118

24 HR ERROR = 151.6NM
48 HR ERROR = 233.3NM

HURRICANE CELESTE

POSITION FROM BEST TRACK AND VERIFICATION DATA
041800Z to 220600Z AUG 1972

TIME	STORM POSIT LAT	STORM POSIT LONG	24 HR ERROR DEG/DIST	48 HR ERROR DEG/DIST
041800Z	15.0N	119.0W	-	-
050000Z	15.0N	119.0W	-	-
050600Z	15.0N	119.3W	-	-
051200Z	15.0N	119.6W	-	-
051800Z	15.0N	119.9W	270/54	-
060000Z	15.0N	120.2W	270/12	-
060600Z	14.9N	120.3W	245/18	-
061200Z	14.8N	120.4W	250/24	-
061800Z	14.7N	120.5W	248/60	-
070000Z	14.7N	120.6W	242/42	-
070600Z	14.3N	120.8W	231/66	-
071200Z	14.0N	121.0W	225/90	-
071800Z	13.6N	121.3W	221/120	-
080000Z	13.2N	120.6W	127/126	-
080600Z	14.0N	121.8W	090/70	-
081200Z	14.2N	123.0W	072/40	-
081800Z	14.2N	123.8W	295/50	-
090000Z	14.3N	124.7W	318/20	343/18
090600Z	14.3N	126.0W	288/60	288/60
091200Z	14.3N	127.7W	282/100	285/85
091800Z	14.4N	128.4W	265/150	272/200
100000Z	14.7N	129.7W	272/180	328/80
100600Z	15.1N	131.5W	276/260	284/270
101200Z	15.4N	133.3W	278/336	285/350
101800Z	15.7N	134.2W	087/230	279/372
110000Z	15.8N	135.2W	274/150	279/390
110600Z	15.7N	136.4W	264/115	278/432
111200Z	15.4N	137.4W	270/162	275/456
111800Z	15.0N	138.2W	230/192	268/240
120000Z	14.8N	139.0W	228/132	220/162
120600Z	14.5N	139.8W	215/150	221/180

24 HR FORECAST ERROR = 111.4NM
48 HR FORECAST ERROR = 235.3NM

* FOR ADDITIONAL DATA REFER
FLEWEACEN PEARL HARBOR

HURRICANE CELESTE

POSITION FROM BEST TRACK AND VERIFICATION DATA
041800Z to 220600Z AUG 1972

TIME	STORM POSIT LAT	STORM POSIT LONG	24 HR ERROR DEG/DIST	48 HR ERROR DEG/DIST	72 HR ERROR DEG/DIST
120600Z	14.5N	139.8W	010/90	060/110	070/80
121200Z	14.1N	140.6W	090/70	080/100	110/110
121800Z	13.8N	141.8W	020/70	360/90	340/80
130000Z	13.3N	142.8W	030/50	020/50	300/10
130600Z	13.1N	144.2W	100/30	170/20	-
131200Z	12.9N	145.6W	230/40	230/90	230/140
131800Z	12.7N	147.0W	220/50	220/90	240/150
140000Z	12.6N	148.2W	340/40	290/90	290/160
140600Z	12.6N	149.3W	210/100	220/180	-
141200Z	12.5N	150.3W	250/90	250/150	280/230
141800Z	12.4N	151.5W	240/50	230/80	270/140
150000Z	12.6N	152.8W	220/80	240/170	250/220
150600Z	12.8N	153.8W	230/100	250/190	250/300
151200Z	12.9N	154.7W	190/70	220/100	290/100
151800Z	13.1N	155.6W	180/50	270/70	300/40
160000Z	13.4N	156.7W	350/30	360/140	020/360
160600Z	13.7N	157.7W	020/40	020/170	020/390
161200Z	14.0N	158.8W	300/70	310/130	310/200
161800Z	14.3N	159.7W	250/70	340/80	350/240
170000Z	14.5N	160.3W	330/70	010/220	010/440
170600Z	14.6N	161.1W	350/140	010/340	020/580
171200Z	14.8N	161.8W	360/40	360/50	270/110
171800Z	14.9N	162.6W	330/50	290/140	280/280
180000Z	15.1N	163.3W	010/30	290/100	270/300
180600Z	15.3N	164.2W	060/30	270/90	270/290
181200Z	15.4N	165.2W	320/20	260/190	250/430
181800Z	15.5N	166.4W	250/70	230/260	240/450
190000Z	15.7N	167.1W	240/80	240/340	240/450
190600Z	16.0N	167.6W	230/100	220/330	220/340
191200Z	16.4N	168.2W	220/130	220/290	-
191800Z	16.8N	168.7W	230/140	210/250	-
200000Z	17.1N	169.3W	240/170	250/180	-
200600Z	17.6N	169.5W	250/70	020/20	-
201200Z	18.2N	169.8W	040/160	-	-
201800Z	18.8N	170.0W	060/160	-	-
210000Z	20.3N	169.7W	030/260	-	-
210600Z	20.6N	170.4W	040/250	-	-
211200Z	20.9N	171.2W	-	-	-
211800Z	21.2N	172.0W	-	-	-
220000Z	21.5N	172.8W	-	-	-
220600Z	21.9N	173.5W	-	-	-

24 HOUR FORECAST ERROR = 85 NM
48 HOUR FORECAST ERROR = 146 NM
72 HOUR FORECAST ERROR = 245 NM

HURRICANE FERNANDA

POSITION FROM BEST TRACK AND VERIFICATION DATA
191800Z to 261800Z AUG 1972

TIME	STORM POSITION LAT	LONG	24 HR ERROR DEG/DIST.	48 HR ERROR DEG/DIST.
191800Z	11.0N	104.0W	-	-
200000Z	11.2N	104.5W	-	-
200600Z	11.2N	105.2W	-	-
201200Z	11.5N	105.7W	-	-
201800Z	11.7N	106.9W	040/18	-
210000Z	12.2N	108.1W	287/114	-
210600Z	12.5N	108.9W	287/108	-
211200Z	12.8N	109.4W	300/90	-
211800Z	13.0N	110.1W	030/45	013/36
220000Z	13.2N	110.8W	010/102	288/170
220600Z	13.5N	111.8W	040/48	285/144
221200Z	13.9N	112.4W	165/143	295/144
221800Z	14.9N	114.3W	040/60	286/84
230000Z	15.8N	116.0W	324/132	282/162
230600Z	16.2N	117.1W	304/198	280/206
231200Z	16.6N	118.2W	305/192	236/180
231800Z	16.9N	119.4W	215/45	325/130
240000Z	17.2N	120.8W	185/72	310/162
240600Z	17.4N	122.0W	202/72	287/288
241200Z	17.6N	123.2W	213/102	291/276
241800	17.8N	125.0W	300/90	230/108
250000Z	18.0N	127.0W	290/60	216/186
250600Z	18.4N	128.9W	300/132	237/234
251200Z	18.8N	130.8W	288/252	242/294
251800Z	19.1N	132.6W	310/102	320/282
260000Z	19.4N	134.8W	296/198	300/246
260600Z	19.7N	136.3W	040/78	295/330
261200Z	19.9N	137.8W	335/162	291/402
261800Z	20.0N	139.1W	132/96	304/216

24 HR FORECAST ERROR = 108.4NM
48 HR FORECAST ERROR = 203.8NM

HURRICANE GWEN

POSITION FROM BEST TRACK AND VERIFICATION DATA
211800Z to 310600Z AUG 1972

TIME	STORM POSITION LAT	LONG	24 HR ERROR DEG/DIST.	48 HR ERROR DEG/DIST.
211800Z	09.6N	96.4W	-	-
220000Z	10.1N	97.5W	-	-
220600Z	10.1N	98.5W	-	-
221200Z	10.1N	99.5W	-	-
221800Z	10.2N	101.1W	174/66	-
230000Z	11.0N	102.5W	267/102	-
230600Z	11.6N	103.2W	270/102	-
231200Z	12.1N	104.0W	282/90	-
231800Z	13.0N	104.9W	004/144	322/60
240000Z	13.9N	105.8W	021/108	320/132
240600Z	14.4N	106.2W	031/138	322/132
241200Z	15.1N	106.6W	036/152	337/150
241800Z	15.6N	106.9W	060/168	033/282
250000Z	16.2N	107.3W	087/168	056/212
250600Z	16.4N	107.5W	083/180	040/228
251200Z	16.6N	107.8W	103/270	060/312
251800Z	16.7N	107.9W	110/162	085/315
260000Z	16.8N	108.0W	121/198	087/342
260600Z	17.0N	108.8W	135/330	090/331
261200Z	17.5N	109.4W	122/378	117/384
261800Z	17.9N	110.0W	265/108	115/336
270000Z	18.4N	110.8W	310/42	111/252
270600Z	18.6N	111.2W	308/42	126/342
271200Z	18.9N	111.9W	325/30	114/553
271800Z	19.3N	112.5W	236/112	258/192
280000Z	19.7N	113.2W	257/55	308/42
280600Z	20.3N	113.6W	260/50	004/66
281200Z	21.2N	113.8W	248/114	030/102
281800Z	21.9N	115.0W	292/84	248/112
290000Z	23.0N	116.2W	331/108	283/126
290600Z	24.0N	116.9W	293/120	290/133
291200Z	25.0N	117.5W	277/120	283/210
291800Z	26.2N	118.6W	305/210	298/246
300000Z	27.3N	119.4W	070/210	336/243
300600Z	28.2N	120.0W	034/130	020/120
301200Z	29.0N	120.2W	202/228	285/300
301800Z	29.3N	120.3W	200/192	312/288
310000Z	29.5N	120.8W	122/168	105/510
310600Z	29.5N	121.3W	144/120	DISSIPATING

24 HR FORECAST ERROR = 142.8MI
48 HR FORECAST ERROR = 227.5MI

HURRICANE HYACINTH

POSITION FROM BEST TRACK AND VERIFICATION DATA
281200Z AUG to 060600Z SEP 1972

TIME	STORM POSITION LAT	LONG	24 HR ERROR DEG/DIST.	48 HR ERROR DEG/DIST.
281200Z	10.7N	94.9W	-	-
281800Z	10.4N	95.8W	-	-
290000Z	10.1N	97.5W	-	-
290600Z	10.3N	98.6W	-	-
291200Z	10.6N	99.3W	226/84	-
291800Z	11.3N	101.2W	207/108	-
300000Z	12.6N	103.2W	315/198	-
300600Z	13.1N	104.1W	317/210	-
301200Z	13.8N	105.3W	318/240	-
301800Z	14.0N	106.3W	008/150	-
310000Z	14.5N	107.2W	330/24	-
310600Z	14.8N	108.1W	146/45	-
311200Z	15.0N	109.1W	112/90	318/318
311800Z	15.3N	110.9W	170/24	015/204
010000Z	15.8N	112.6W	223/120	310/90
010600Z	16.2N	113.8W	225/162	318/138
011200Z	16.8N	115.0W	228/162	142/90
011800Z	17.1N	116.2W	158/126	214/210
020000Z	17.5N	117.5W	225/48	207/240
020600Z	17.8N	118.5W	140/90	310/252
021200Z	18.0N	119.5W	148/60	195/252
021800Z	18.4N	120.1W	120/90	165/224
030000Z	18.8N	120.8W	090/84	150/210
030600Z	19.4N	121.7W	092/112	177/132
031200Z	19.8N	122.5W	096/141	092/141
031800Z	20.8N	123.5W	020/72	268/204
040000Z	22.9N	124.2W	000/90	072/204
040600Z	23.0N	124.9W	003/120	071/192
041200Z	24.1N	125.2W	025/210	055/330
041800Z	26.3N	125.2W	025/90	035/342
050000Z	28.5N	124.6W	048/240	028/348
050600Z	29.7N	123.5W	060/360	037/402
051200Z	30.6N	122.3W	055/354	045/690
051800Z	31.4N	120.7W	092/186	065/224
060000Z	32.3N	119.6W	095/258	070/780
060600Z	32.5N	118.5W	100/150	075/878

24 HR FORECAST ERROR = 140.5 MI
48 HR FORECAST ERROR = 295.4 MI

HURRICANE JOANNE

POSITION FROM BEST TRACK AND VERIFICATION DATA
291800Z SEP to 161800Z OCT 1972

TIME	STORM POSITION LAT	LONG	24 HR ERROR DEG/DIST.	48 HR ERROR DEG/DIST.
291800Z	12.4	103.7	-	-
300000Z	12.5	105.0	-	-
300600Z	12.5	105.8	-	-
301200Z	12.6	106.7	-	-
301800Z	12.9	108.0	-	-
010000Z	13.5	109.6	245/45	-
010600Z	13.8	110.6	250/45	-
011200Z	14.1	111.5	260/126	-
011800Z	14.7	112.3	080/45	-
020000Z	15.0	113.2	098/84	-
020600Z	15.5	114.0	095/120	-
021200Z	15.8	114.6	086/138	270/90
021800Z	16.6	115.5	045/48	060/75
030000Z	17.4	116.2	030/108	070/165
030600Z	18.1	116.5	038/162	072/228
031200Z	18.6	116.6	045/222	085/315
031800Z	19.1	116.6	085/228	048/288
040000Z	19.5	116.6	110/150	057/384
040600Z	20.2	116.6	105/192	055/408
041200Z	20.9	116.7	103/240	056/524
041800Z	22.0	116.7	270/96	074/540
050000Z	23.0	116.5	323/48	090/204
050600Z	24.3	116.3	358/72	086/168
051200Z	25.3	116.2	330/105	090/390
051800Z	26.5	115.9	300/78	320/132
060000Z	27.3	115.7	280/102	312/162
060600Z	28.4	115.5	320/96	325/150
061200Z	29.0	115.0	310/102	327/142
061800Z	30.7	113.9	DISSIPATED	DISSIPATED

24 HR FORECAST ERROR = 115.3 MI.
48 HR FORECAST ERROR = 242.5 MI.

ANNEX B

BAY OF BENGAL TROPICAL CYCLONES

1. SUMMARY OF DATA[1]

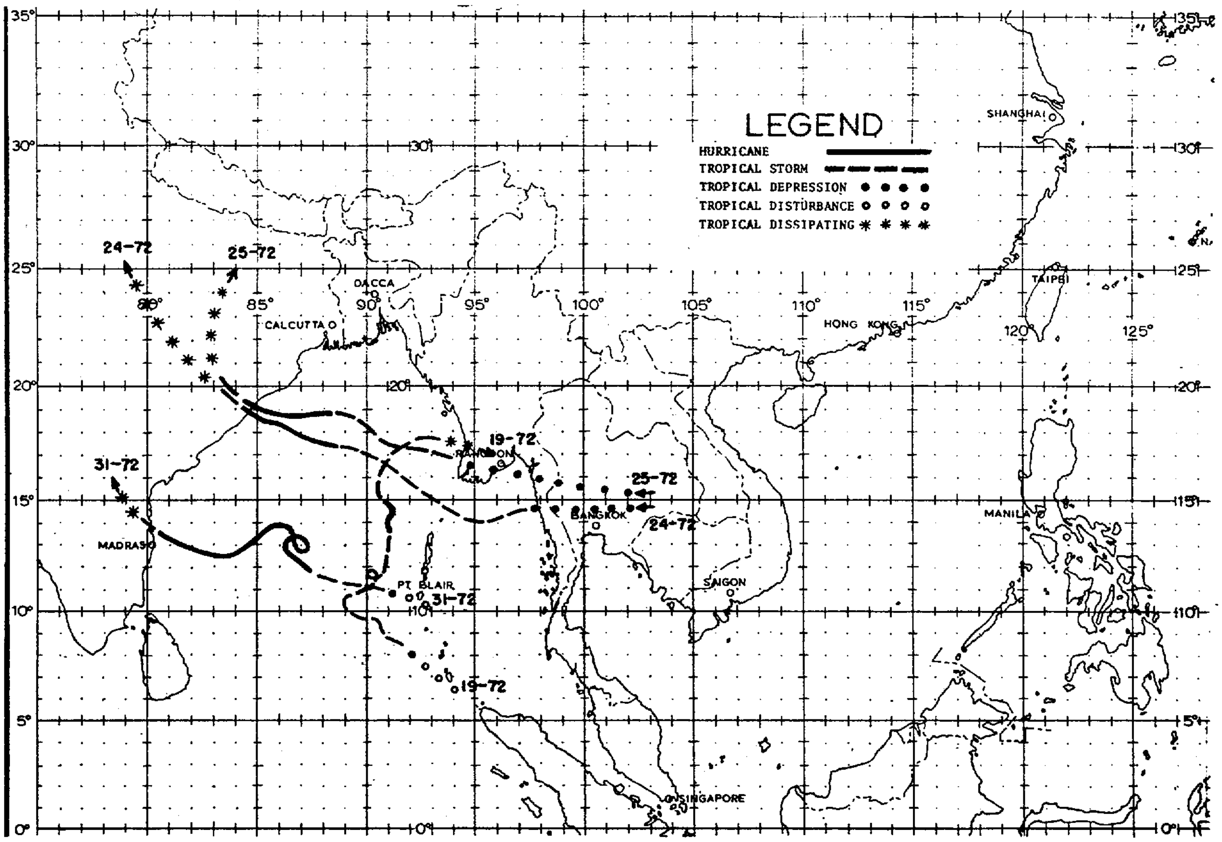


FIGURE B-1. *Composite chart of best tracks for the Bay of Bengal.*

TABLE B-1. 1972 BAY OF BENGAL TROPICAL CYCLONES

CYCLONE	INCLUSIVE DATES	MAX SFC WND	MIN OBS SLP	NO. OF WARNINGS ISSUED	REMARKS
19-72	06 APR - 13 APR	85	---	6	-----------------
24-72	06 SEP - 12 SEP	80	968	5	FORMERLY TY ELSIE
25-72	18 SEP - 25 SEP	70	975	15	FORMERLY TY FLOSSIE
31-72	16 NOV - 23 NOV	90	983	4	-----------------

[1]Tropical cyclones in the Bay of Bengal are numbered consecutively from the beginning of the calendar year and are included with those developing in the South Pacific and Indian oceans. The JTWC area of responsibility in the Bay of Bengal was expanded on 4 June 1971 to include the area north of the equator between the Malay Peninsula and 90°E. Only those cyclones that developed or tracked through this area are included in Annex B.

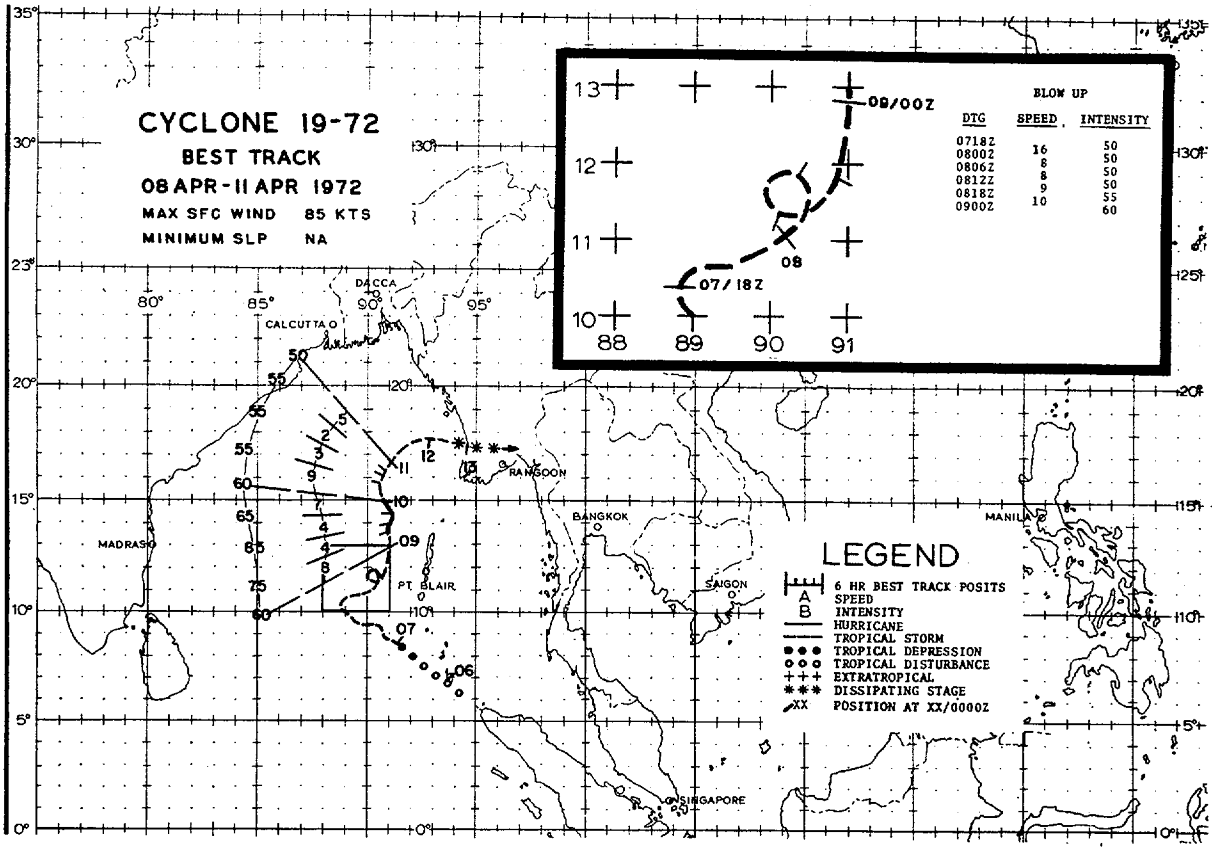


FIGURE B-2. *Best track chart for Tropical Cyclone 19-72.*

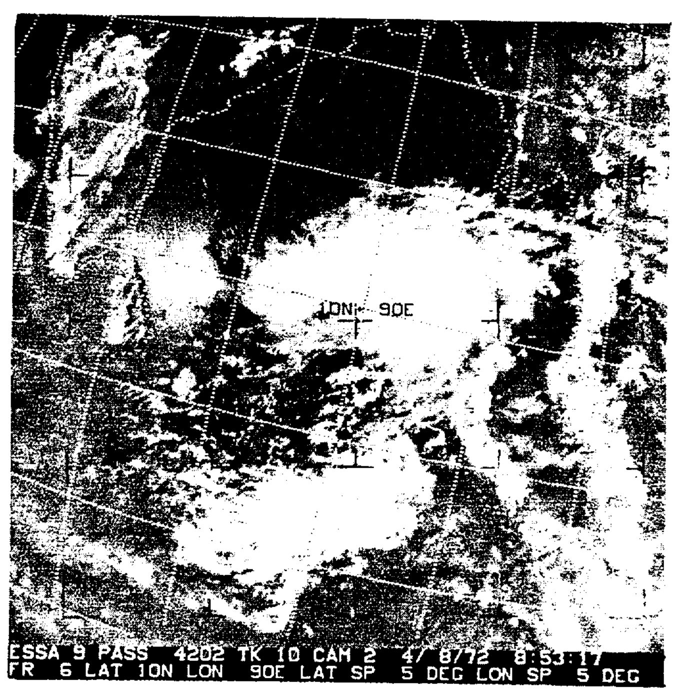


FIGURE B-3. *ESSA-9 photo of Tropical Cyclone 19-72, 8 April 1972, 0852 GMT.*

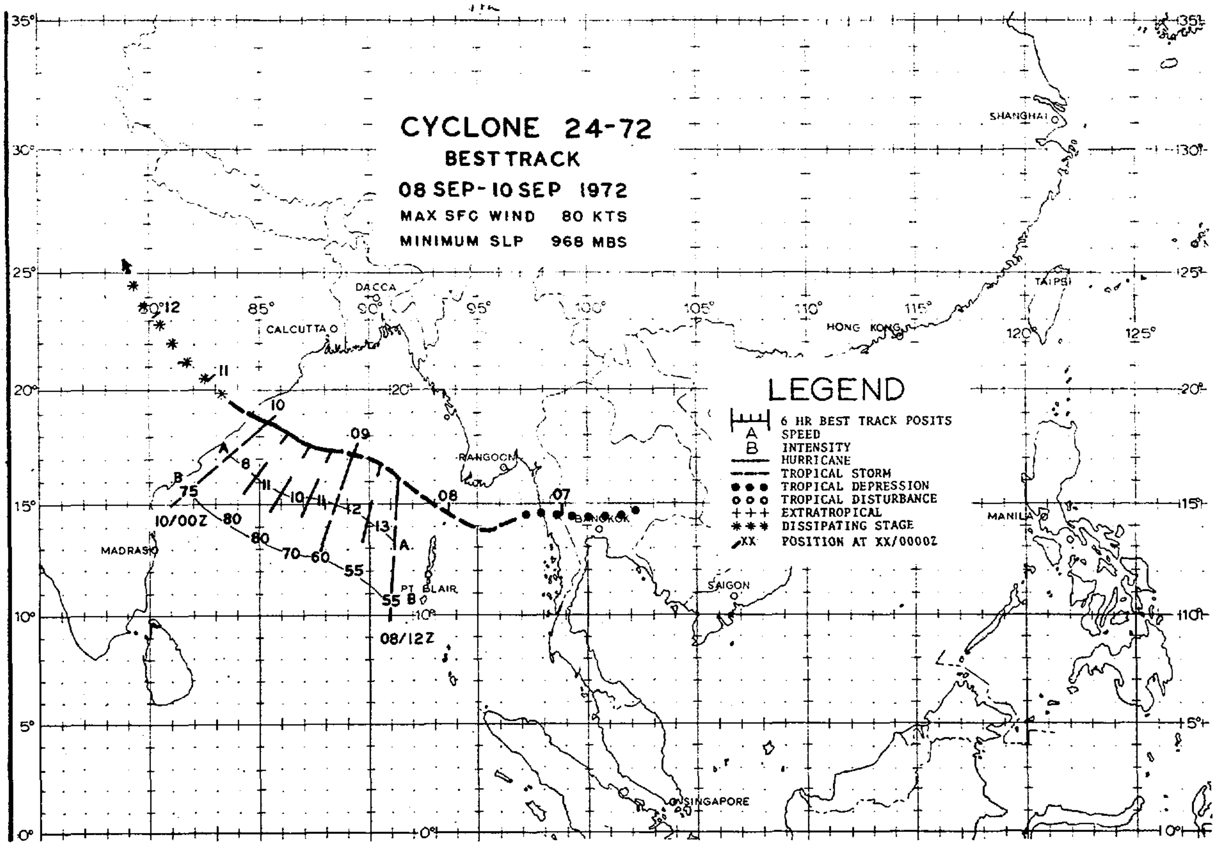


FIGURE B-4. *Best track chart for Tropical Cyclone 24-72.*

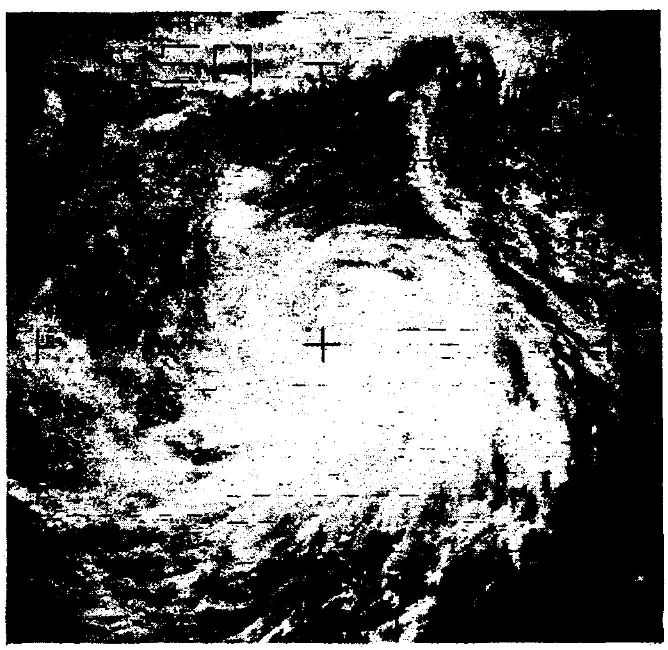


FIGURE B-5. *ESSA-8 satellite view of Tropical Cyclone 24-72 on 9 September 1972, 0417 GMT.--Photo courtesy of Royal Observatory, Hong Kong.*

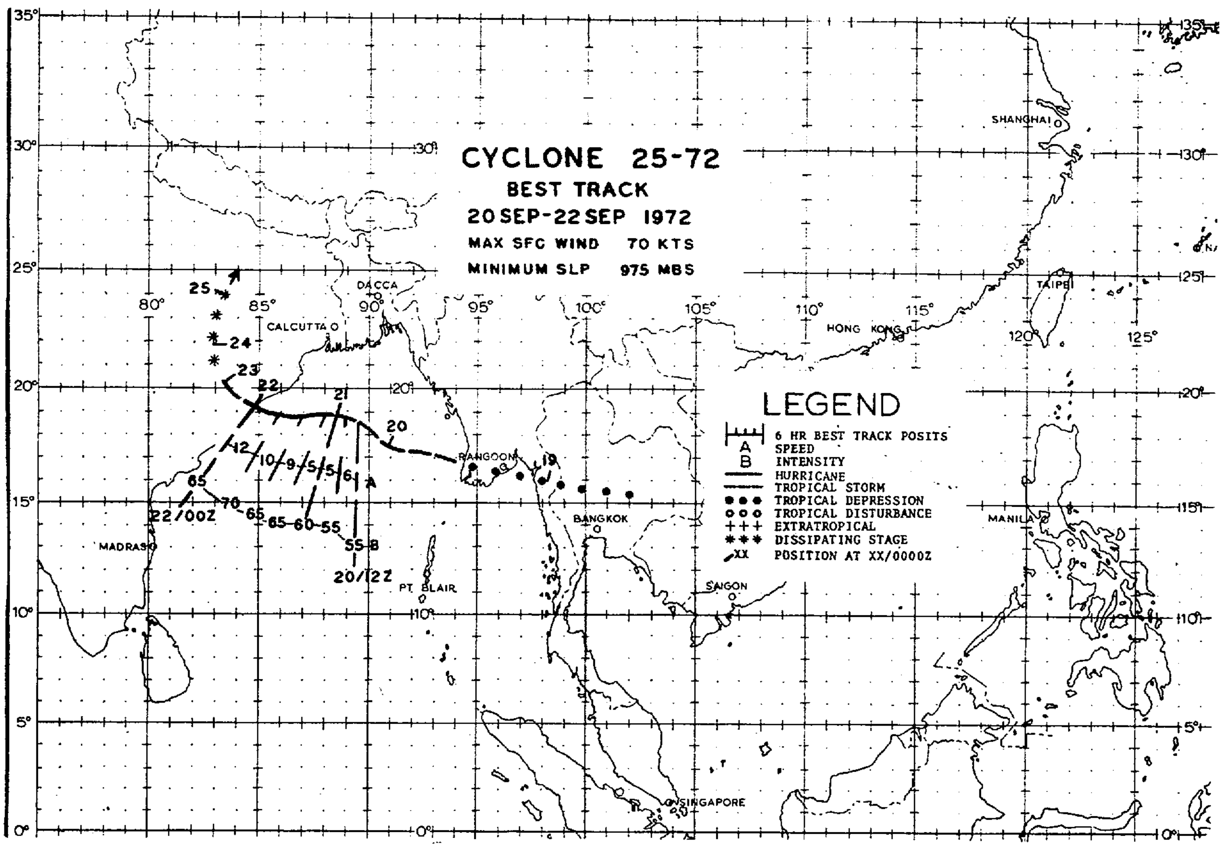


FIGURE B-6. *Best track chart for Tropical Cyclone 25-72.*

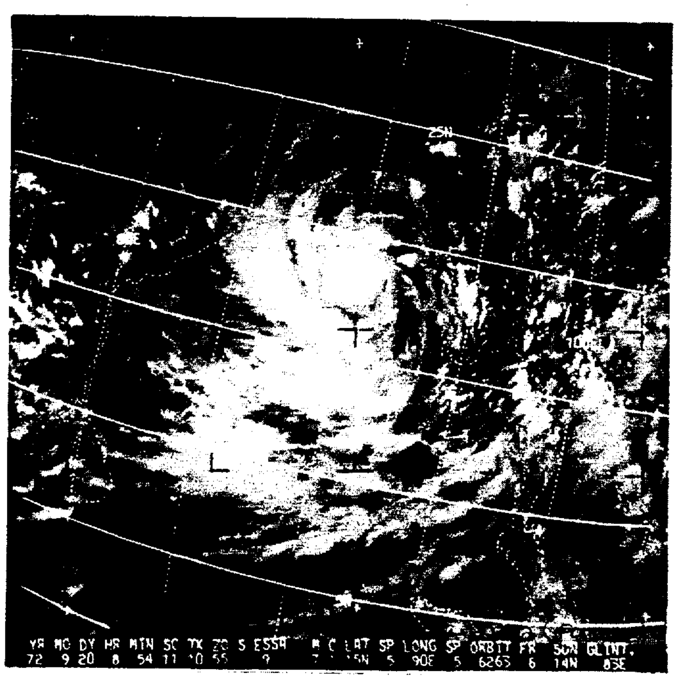


FIGURE B-7. *ESSA-9 satellite view of Tropical Cyclone 25-72, 20 September 1972.*

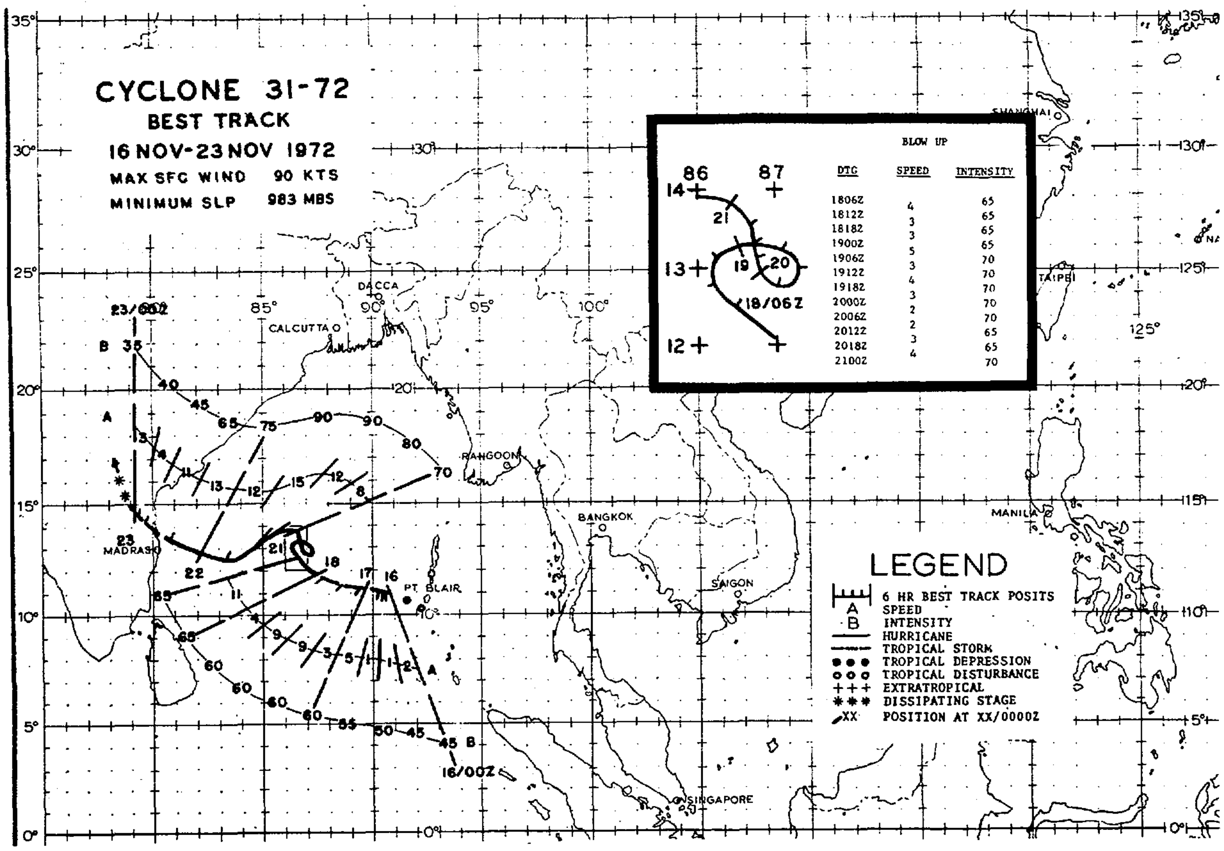


FIGURE B-8. *Best track chart for Tropical Cyclone 31-72. MSLP and MAX WIND were based on 21/1530 GMT observation from the Indian ship JAG JAWAN.--Courtesy of Indian Meteorological Department*

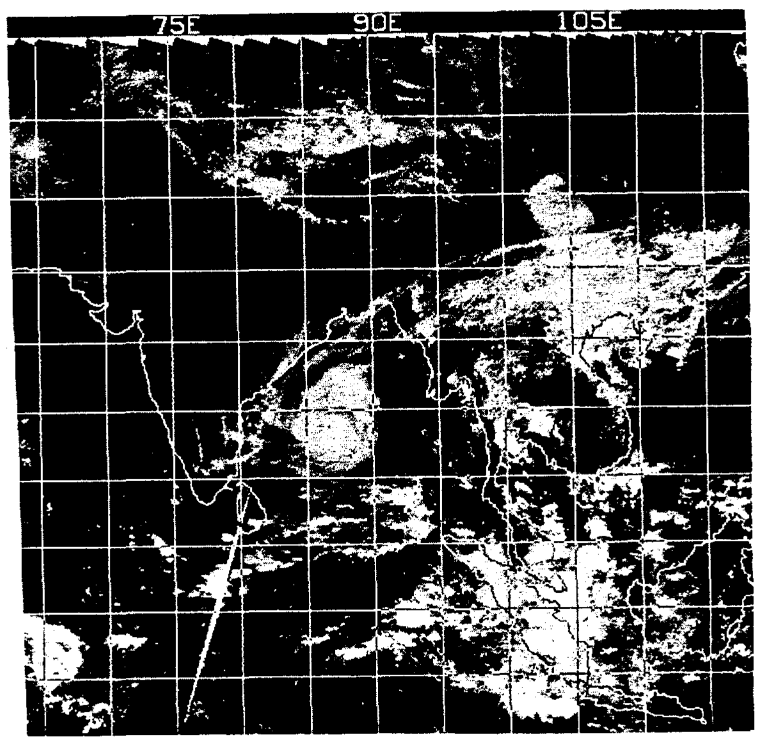


FIGURE B-9. *NOAA-2 digitized mosaic of Tropical Cyclone 31-72, 20 November 1972.*

3. CENTER FIX DATA

FIX POSITIONS FOR TROPICAL CYCLONE NO. 19-72
7 APR - 11 APR

FIX NO.	TIME	POSIT		FIX CAT	ACCRY NAV-MET	FLT LVL	FLT LVL WND	OBS SFC WND	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIEN-TATION	EYE DIA	THKN WALL CLD	POSIT OF RADAR /REMARKS	
1	070408Z	9.4N	90.0E	SAT	STG UNK											ESSA 8 (VTBD)	
2	070755Z	10.0N	90.5E	SAT	STG C+											ESSA 9	
3	080653Z	11.5N	90.0E	SAT	STG X DIA 2 CAT 3.0											ESSA 9	
4	090351Z	13.3N	91.9E	SAT	STG X DIA 6 CAT 2.0												
5	090359Z	14.0N	92.0E	SAT	STG UNK												
6	090801Z	14.0N	91.0E	SAT	STG X DIA 2 CAT 3.0											ESSA 9	
7	091300Z	13.9N	91.2E	P	15 2	700 MB	85	80	975	285	17 11	-	--	-	8	WC CLSD, LING ALGDS	
8	100445Z	16.5N	91.5E	SAT	STG UNK												
9	100855Z	16.5N	90.5E	SAT	STG C+											ESSA 9	
10	100858Z	16.5N	90.5E	SAT	STG C+											ESSA 9	
11	101545Z	15.2N	90.5E	P	- -	500MB	-	-	1004	-	-5 -	-	--	-	-		
12	110803Z	17.5N	91.5E	SAT	STG C											ESSA 9	

FIX POSITIONS FOR TROPICAL CYCLONE NO. 24-72
7 SEP - 9 SEP

FIX NO.	TIME	POSIT		FIX CAT	ACCRY NAV-MET	FLT LVL	FLT LVL WND	OBS SFC WND	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIEN-TATION	EYE DIA	THKN WALL CLD	POSIT OF RADAR /REMARKS	
1	071318Z	14.4N	96.2E	SAT												ESSA 9	
2	080642Z	16.1N	91.2E	SAT												ESSA 9	
3	090418Z	17.0N	88.0E	SAT	STG UNK												
4	090940Z	17.8N	87.3E	SAT	T4.0/4.0/D0.5/24 HRS											ESSA 9	
5	091227Z	17.4N	87.1E	P	30 5	500MB	75	65	968	284	18 13	ELIP	E-W	40X30	12	PRTL WC-FBS ALGDS	02

FIX POSITIONS FOR TROPICAL CYCLONE NO. 25-72
19 SEP - 22 SEP

FIX NO.	TIME	POSIT		FIX CAT	ACCRY NAV-MET	FLT LVL	FLT LVL WND	OBS SFC WND	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIEN-TATION	EYE DIA	THKN WALL CLD	POSIT OF RADAR /REMARKS	
1	190755Z	17.5N	91.5E	SAT	T2/2D1/24 HRS												
2	200405Z	17.0N	90.0E	SAT	STG X DIA 2 CAT 2.0											ESSA 8 (VTBD)	
3	200730Z	17.6N	91.0E	P	15 10	700 MB	35	55	994	305	15 -	-	--	-	-	NO WC-BRKN SC CNTR	01
4	200858Z	18.5N	90.0E	SAT	T4.0/4.0/D2.0/24 HRS											ESSA 9	
5	210830Z	18.6N	88.0E	P	10 8	700 MB	60	65	978	292	17 -	-	--	-	-	NO WC-BRKN SC CNTR	02
6	210956Z	19.0N	86.5E	SAT	T4.0/4.0/S0.0/24 HRS											ESSA 9	
7	211008Z	18.8N	87.7E	P	- -	700 MB	-	80	-	-	- -	-	--	-	-		
8	211104Z	18.8N	87.3E	P	10 5	700 MB	50	100	982	294	16 -	-	--	-	-	NO WC-FBS FRMG S-W	02
9	220900Z	19.5N	84.0E	SAT	STG X DIA 2 CAT 2.0												

FIX POSITIONS FOR TROPICAL CYCLONE NO. 31-72
16 NOV - 22 NOV

FIX NO.	TIME	POSIT		FIX CAT	ACCRY NAV-MET	FLT LVL	FLT LVL WND	OBS SFC WND	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIEN-TATION	EYE DIA	THKN WALL CLD	POSIT OF RADAR /REMARKS
1	160852Z	11.0N	89.2E	SAT	STG C+											
2	170353Z	12.0N	89.0E	SAT	STG X DIA 8 CAT 1.0											
3	170409Z	11.0N	89.[illegible]E	SAT	T4.5/4.5/NA/19 HRS											ESSA 8 (VTBD)
4	180235Z	11.0N	87.[illegible]E	SAT	T4.0/4.0/S0.0/17 HRS											NOAA 2
5	180435Z	11.5N	85.0E	SAT	T4.5/4.5/D1.0/24 HRS											
6	180445Z	12.8N	86.0E	SAT	STG X DIA 7 CAT 3.0											NOAA 2
7	190330Z	12.5N	87.0E	SAT	T4.5/4.5/D0.5/24 HRS											ESSA 8 (VTBD)
8	200300Z	15.0N	86.[illegible]E	SAT	STG UNK											NOAA 2
9	220227Z	13.9N	81.3E	SAT	T5.0/5.0/D1.0/24 HRS											ESSA 8 (NEW DELHI)
10	220419Z	13.0N	81.5E	SAT	STG X DIA 8 CAT 2.0											NOAA 2
11	220420Z	13.2N	81.5E	SAT	STG X DIA 3 CAT 2.0											ESSA 8 (VTBD) NOAA 2 (NESS)

4. POSITION AND VERIFICATION DATA

TROPICAL CYCLONE 12-72

1200Z 08 APR TO 0000Z 11 APR

	BEST TRACK POSIT	BEST TRACK WIND	WARNING POSIT	WARNING WIND	WARNING ERRORS DST	WARNING ERRORS WIND	24 HOUR FORECAST POSIT	24 HOUR WIND	24 HOUR ERRORS DST	24 HOUR ERRORS WIND	48 HOUR FORECAST POSIT	48 HOUR WIND	48 HOUR ERRORS DST	48 HOUR ERRORS WIND	72 HOUR FORECAST POSIT	72 HOUR WIND	72 HOUR ERRORS DST	72 HOUR ERRORS WIND
081200Z	11.3N 90.1E	55	11.7N 89.8E	50	30	-5	13.2N 89.1E	60	126	-25	15.0N 88.6E	60	120	5	--.- ---.-	--	--	--
090000Z	12.9N 91.0E	60	12.2N 89.5E	50	97	-10	13.8N 89.0E	60	123	0	15.2N 88.9E	65	147	15	--.- ---.-	--	--	--
091200Z	14.0N 91.1E	85	13.9N 91.2E	100	8	15	16.5N 94.2E	90	209	35	--.- ---.-	--	--	--	--.- ---.-	--	--	--
100000Z	14.9N 90.8E	60	15.3N 92.4E	95	95	35	17.3N 96.0E	50	269	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
101200Z	16.0N 90.6E	55	15.2N 90.7E	35	48	-20	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
110000Z	16.6N 91.0E	50	16.6N 90.5E	35	29	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS WARNING	24-HR	48-HR	72-HR	ALL FORECASTS WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	0NM	0NM	0NM	0NM	51NM	166NM	133NM	0NM
AVERAGE RIGHT ANGLE ERROR	0NM	0NM	0NM	0NM	35NM	176NM	100NM	0NM
AVERAGE MAGNITUDE OF WIND ERROR	0KTS	0KTS	0KTS	0KTS	17KTS	15KTS	10KTS	0KTS
AVERAGE BIAS OF WIND ERROR	0KTS	0KTS	0KTS	0KTS	0KTS	3KTS	10KTS	0KTS
NUMBER OF FORECASTS	0	0	0	0	6	4	2	0

TROPICAL CYCLONE 24-72

1200Z 08 SEP TO 0000Z 10 SEP

	BEST TRACK POSIT	BEST TRACK WIND	WARNING POSIT	WARNING WIND	WARNING ERRORS DST	WARNING ERRORS WIND	24 HOUR FORECAST POSIT	24 HOUR WIND	24 HOUR ERRORS DST	24 HOUR ERRORS WIND	48 HOUR FORECAST POSIT	48 HOUR WIND	48 HOUR ERRORS DST	48 HOUR ERRORS WIND	72 HOUR FORECAST POSIT	72 HOUR WIND	72 HOUR ERRORS DST	72 HOUR ERRORS WIND
081200Z	16.0N 91.5E	55	16.2N 92.2E	40	42	-15	17.8N 89.8E	70	148	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
090000Z	17.2N 89.2E	60	17.7N 90.0E	55	54	-5	20.3N 86.8E	65	133	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
091200Z	17.6N 87.2E	80	17.4N 87.2E	65	12	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
100000Z	18.5N 85.4E	75	18.4N 85.1E	80	18	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS WARNING	24-HR	48-HR	72-HR	ALL FORECASTS WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	0NM	0NM	0NM	0NM	32NM	141NM	0NM	0NM
AVERAGE RIGHT ANGLE ERROR	0NM	0NM	0NM	0NM	29NM	91NM	0NM	0NM
AVERAGE MAGNITUDE OF WIND ERROR	0KTS	0KTS	0KTS	0KTS	10KTS	10KTS	0KTS	0KTS
AVERAGE BIAS OF WIND ERROR	0KTS	0KTS	0KTS	0KTS	-8KTS	-10KTS	0KTS	0KTS
NUMBER OF FORECASTS	0	0	0	0	4	2	0	0

TROPICAL CYCLONE 25-72

1200Z 20 SEP TO 0000Z 22 SEP

	BEST TRACK POSIT	BEST TRACK WIND	WARNING POSIT	WARNING WIND	WARNING ERRORS DST	WARNING ERRORS WIND	24 HOUR FORECAST POSIT	24 HOUR WIND	24 HOUR ERRORS DST	24 HOUR ERRORS WIND	48 HOUR FORECAST POSIT	48 HOUR WIND	48 HOUR ERRORS DST	48 HOUR ERRORS WIND	72 HOUR FORECAST POSIT	72 HOUR WIND	72 HOUR ERRORS DST	72 HOUR ERRORS WIND
201200Z	18.5N 89.5E	55	17.9N 90.2E	45	53	-10	20.9N 87.4E	65	127	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
210000Z	18.7N 88.5E	60	19.0N 88.3E	45	55	-15	23.6N 86.2E	25	244	-40	--.- ---.-	--	--	--	--.- ---.-	--	--	--
211200Z	18.8N 87.0E	65	18.9N 87.2E	100	13	35	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
220000Z	19.6N 85.3E	65	19.9N 84.9E	60	29	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS WARNING	24-HR	48-HR	72-HR	ALL FORECASTS WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	0NM	0NM	0NM	0NM	37NM	186NM	0NM	0NM
AVERAGE RIGHT ANGLE ERROR	0NM	0NM	0NM	0NM	37NM	185NM	0NM	0NM
AVERAGE MAGNITUDE OF WIND ERROR	0KTS	0KTS	0KTS	0KTS	16KTS	20KTS	0KTS	0KTS
AVERAGE BIAS OF WIND ERROR	0KTS	0KTS	0KTS	0KTS	1KTS	-20KTS	0KTS	0KTS
NUMBER OF FORECASTS	0	0	0	0	4	2	0	0

TROPICAL CYCLONE 31-72

0000Z 16 NOV TO 1200Z 22 NOV

	BEST TRACK POSIT	BEST TRACK WIND	WARNING POSIT	WARNING WIND	WARNING ERRORS DST	WARNING ERRORS WIND	24 HOUR FORECAST POSIT	24 HOUR WIND	24 HOUR ERRORS DST	24 HOUR ERRORS WIND	48 HOUR FORECAST POSIT	48 HOUR WIND	48 HOUR ERRORS DST	48 HOUR ERRORS WIND	72 HOUR FORECAST POSIT	72 HOUR WIND	72 HOUR ERRORS DST	72 HOUR ERRORS WIND
160000Z	11.0N 90.7E	45	11.3N 89.2E	60	90	15	12.2N 85.2E	70	271	10	13.1N 81.3E	80	366	15	--.- ---.-	--	--	--
161200Z	11.0N 90.4E	50	11.8N 87.1E	65	199	15	12.9N 83.2E	75	324	15	13.8N 79.2E	60	411	-5	--.- ---.-	--	--	--
170000Z	11.1N 89.7E	60	11.3N 88.7E	70	60	10	12.0N 86.3E	75	67	10	12.6N 82.3E	80	248	15	--.- ---.-	--	--	--
171200Z	11.3N 88.5E	60	12.1N 87.8E	70	63	10	12.6N 85.2E	75	59	10	12.8N 82.3E	80	288	10	--.- ---.-	--	--	--
180000Z	11.7N 87.4E	65	12.1N 87.0E	75	27	10	12.5N 86.6E	60	48	15	13.3N 84.7E	85	182	15	--.- ---.-	--	--	--
181200Z	12.8N 86.2E	65	13.3N 85.1E	75	71	10	14.4N 81.8E	80	318	10	15.6N 78.3E	45	550	-20	--.- ---.-	--	--	--
190000Z	13.3N 86.5E	65	14.2N 83.7E	75	171	10	16.3N 80.7E	60	438	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
191200Z	13.5N 87.2E	70	15.0N 83.2E	75	248	5	17.2N 80.8E	50	438	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
200000Z	13.7N 87.8E	70	13.5N 85.9E	75	111	5	15.0N 84.7E	85	123	15	17.4N 80.4E	30	249	-45	--.- ---.-	--	--	--
201200Z	14.1N 87.7E	65	14.1N 85.6E	75	122	10	15.8N 84.3E	85	137	-05	16.4N 82.6E	45	366	0	--.- ---.-	--	--	--
210000Z	13.9N 86.5E	70	15.2N 87.5E	80	97	10	17.5N 88.5E	80	431	-05	--.- ---.-	--	--	--	--.- ---.-	--	--	--
211200Z	13.5N 84.3E	90	14.3N 86.1E	70	115	-20	16.7N 85.9E	70	426	25	--.- ---.-	--	--	--	--.- ---.-	--	--	--
220000Z	13.6N 82.2E	75	14.6N 82.2E	65	60	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
221200Z	13.0N 79.6E	45	13.7N 80.0E	55	48	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS WARNING	24-HR	48-HR	72-HR	ALL FORECASTS WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	0NM	0NM	0NM	0NM	106NM	257NM	336NM	0NM
AVERAGE RIGHT ANGLE ERROR	0NM	0NM	0NM	0NM	55NM	122NM	113NM	0NM
AVERAGE MAGNITUDE OF WIND ERROR	0KTS	0KTS	0KTS	0KTS	10KTS	15KTS	14KTS	0KTS
AVERAGE BIAS OF WIND ERROR	0KTS	0KTS	0KTS	0KTS	10KTS	10KTS	-1KTS	0KTS
NUMBER OF FORECASTS	0	0	0	0	14	12	8	0

APPENDIX

ABBREVIATIONS AND DEFINITIONS

The following abbreviations and definitions apply for the purposes of this report.

1. ABBREVIATIONS

AJTWC	Alternate Joint Typhoon Warning Center (Asian Tactical Forecast Center, Fuchu, Japan)
APT	Automatic Picture Transmission
ATS	Applications Technology Satellite
CINCPAC	Commander in Chief, Pacific
CINCPACAF	Commander in Chief, Pacific Air Forces
CINCPACFLT	Commander in Chief, Pacific Fleet
DAPP	Data Acquisition and Processing Program
EPRF	Environmental Prediction Research Facility (Naval Postgraduate School, Monterey, California)
NEDN	Naval Environmental Data Network
NESS	National Environmental Satellite Service (Suitland, Maryland)
NWS/NOAA	National Weather Service, National Oceanic and Atmospheric Administration
PACOM	Pacific Command
SLP (MSLP)	Sea Level Pressure (Minimum Sea Level Pressure)
TCRC	Tropical Cyclone Reconnaissance Coordinator

2. DEFINITIONS

CYCLONE - An atmospheric closed circulation rotating counterclockwise in the northern hemisphere.

TROPICAL CYCLONE - A non-frontal cyclone of synoptic scale, developing over tropical or sub-tropical waters and having a definite organized circulation and warm core.

TROPICAL DEPRESSION - A tropical cyclone in which the maximum sustained surface wind is 33 kt or less.

TROPICAL STORM - A tropical cyclone with maximum sustained surface winds in the range 34 to 63 kt inclusive.

TYPHOON/HURRICANE - A tropical cyclone with maximum sustained surface wind speeds 64 kt or greater. West of 180 degrees longitude the name TYPHOON is used and east of 180 degrees longitude the name HURRICANE is used. All descriptive references to typhoons apply equally to hurricanes.

SUPER TYPHOON - A typhoon with maximum sustained winds greater than or equal to 130 kt.

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 non-frontal migratory character and having maintained its identity for 24 hours or more. It may or may not be associated with a detectable perturbation on the wind field. As such, it is the basic generic designation which, in successive stages of intensification, may be subsequently classified as a tropical depression, tropical storm or typhoon.

EYE/CENTER - EYE refers to the roughly circular central area of a well-developed tropical cyclone usually characterized by comparatively light winds and fair weather. If more than half surrounded by wall cloud, the word EYE is used; otherwise, the area is referred to as a CENTER.

WALL CLOUD - A densely organized, roughly circular structure of cumuliform clouds completely or partially surrounding the eye or center of a tropical cyclone.

MAXIMUM SUSTAINED WIND - Highest surface wind speed of a cyclone averaged over a one minute period of time.

EXTRATROPICAL - A term used in warnings and tropical summaries to indicate that a cyclone has lost its "tropical characteristics". The term implies both poleward displacement from the tropics and the conversion of the cyclone's dominant energy source from latent heat of condensation release to baroclinic processes.

TROPICAL CYCLONE RECONNAISSANCE COORDINATOR - A CINCPACAF representative designated to levy tropical cyclone weather reconnaissance requirements on CINCPACFLT and CINCPACAF reconnaissance units within a designated area of PACOM and to function as a coordinator between CINCPACAF, weather reconnaissance units, and JTWC.

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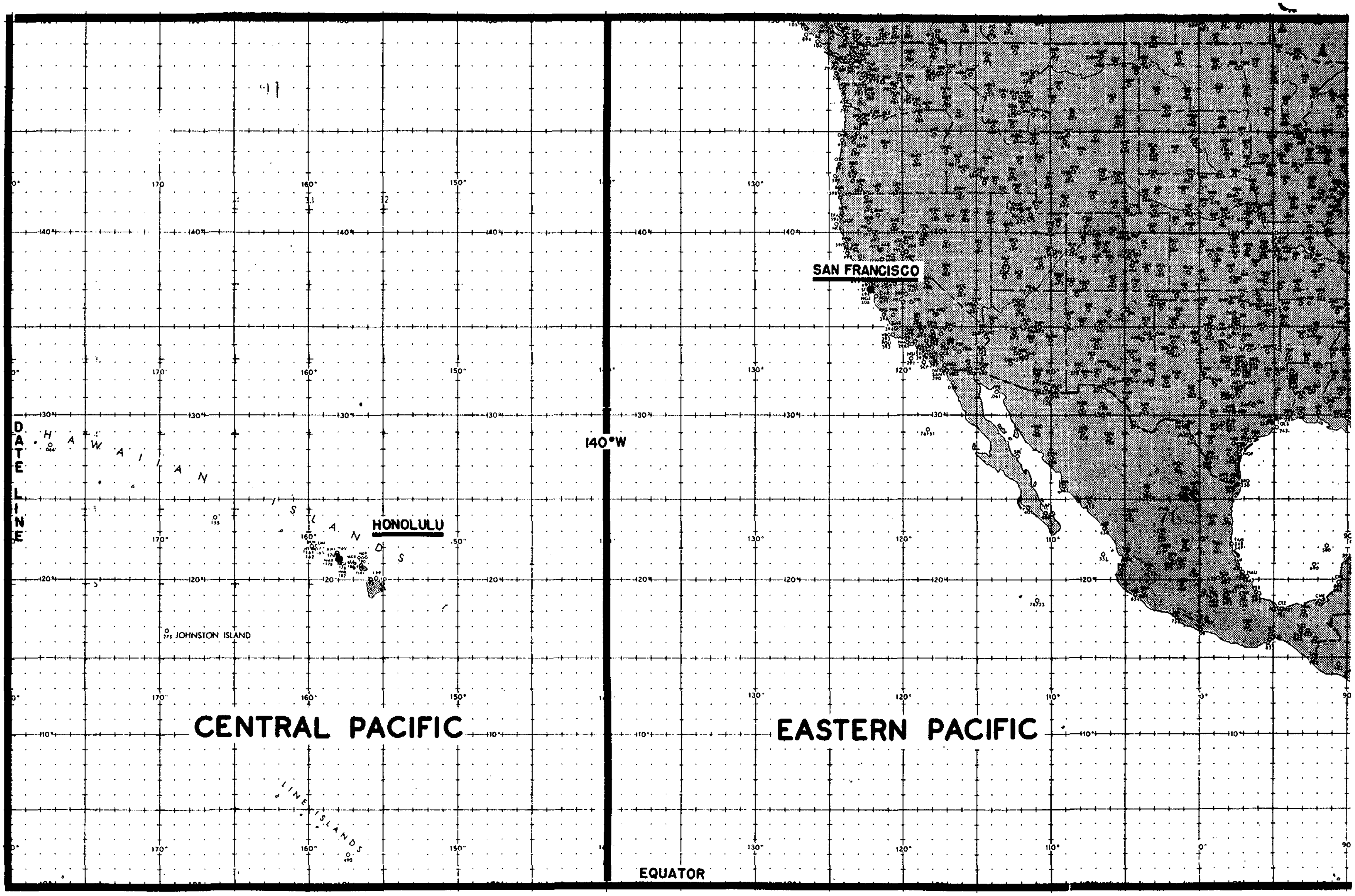

Areas of Responsibility - Central and Eastern Pacific Hurricane Centers

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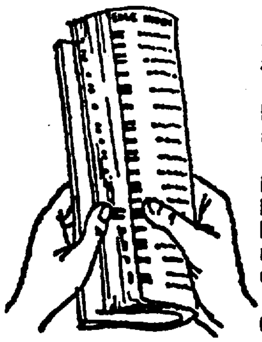

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