



## TYPHOON THAD (04W)

Thad was the second of three tropical cyclones to develop during June and the third typhoon of 1988. Typhoon Thad tracked over 2000 nm (3704 km) during its lifetime, recurved just east of the island of Luzon in the Republic of the Philippines and passed 80 nm (148 km) southeast of the island of Okinawa, Japan before dissipating over water. The recurvature forecast was complicated by a complex interaction of the tropical cyclone with upper-level synoptic features.

After Tropical Depression 03W dissipated during the first week of June, there was a two week hiatus in tropical cyclone activity in the western North Pacific and low-

level westerly flow established itself across the southern Philippine Sea. Thad began in the zone of increased cyclonic shear between this westerly flow and the easterly tradewinds 300 nm (556 km) south of Ulithi Atoll in the western Caroline Islands. The disturbance was first mentioned on the Significant Tropical Weather Advisory at 180600Z. Initially Thad's intensification may have been slowed by increased upper-level wind shear across the system, caused by the unfavorable location of an intense Tropical Upper-Tropospheric Trough (TUTT) low to its northeast. However, as the disturbance's central convection consolidated, the separation between Thad's upper-level circulation center and the TUTT low lessened.

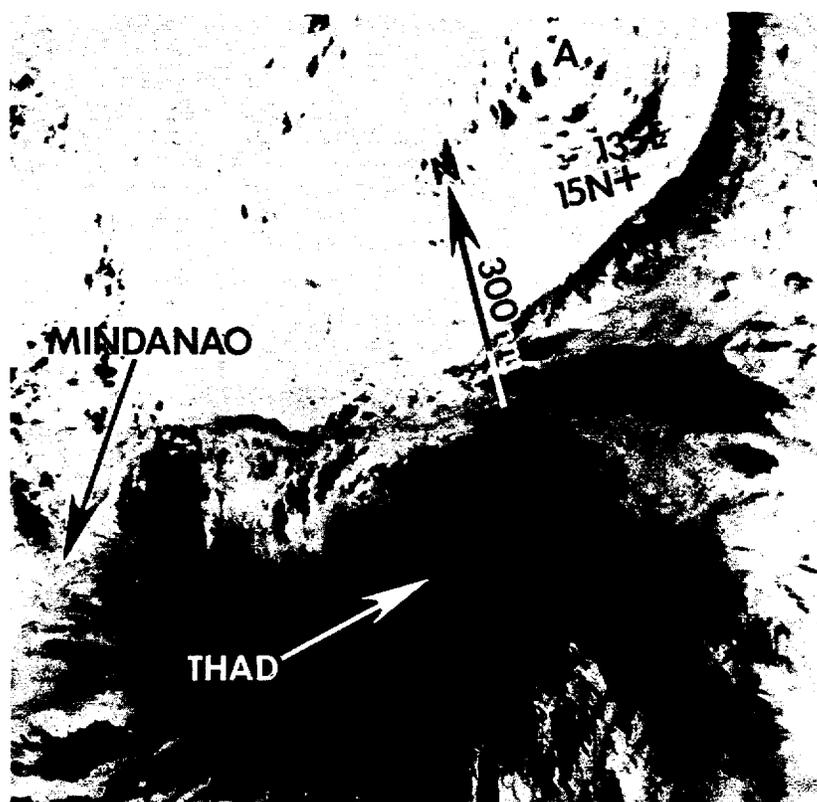


Figure 3-04-1. Thad, shortly before reaching tropical storm intensity. Note the vigorous TUTT cell (at A) to the northeast of the tropical disturbance (191914Z June NOAA infrared imagery).

The system's upper-level outflow pattern improved and a Tropical Cyclone Formation Alert followed at 190800Z (Figure 3-04-1). At 200000Z, satellite intensity analysis indicated a T-number of 2.5, corresponding to maximum sustained surface winds of 35 kt (18 m/sec) (Figure 3-04-2) and the Alert was upgraded to Tropical Storm Thad.

Throughout this period of gradual intensification, Thad was embedded in the flow south of the lower tropospheric subtropical ridge axis and moved northwestward, except for one excursion - the "stair-step" jog in the track from 200000Z to 201800Z. Afterward, Thad continued to track northwestward, intensifying for two more days, until reaching

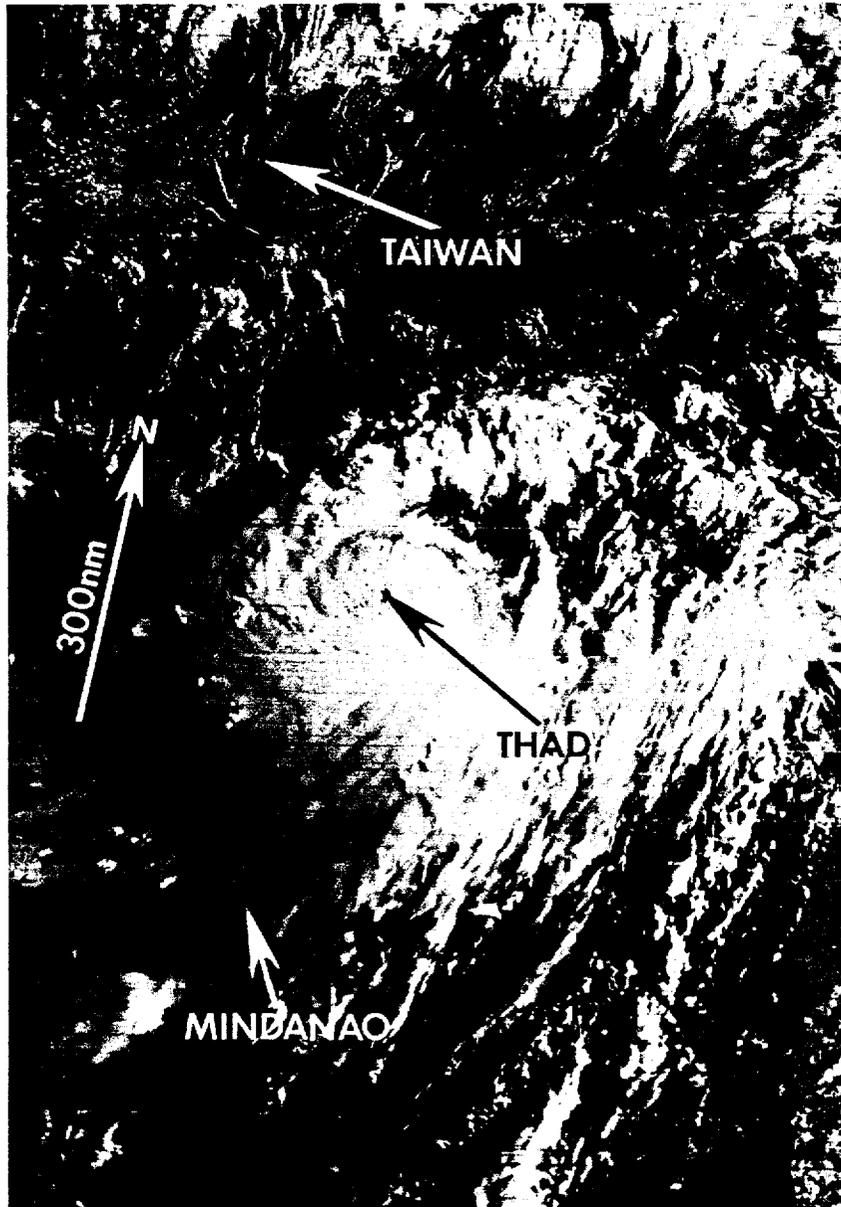


Figure 3-04-2. Thad intensifies as it approaches the island of Luzon (212128Z June NOAA visual imagery).

the westernmost end of the subtropical ridge where it began to recurve at 221800Z. The system reached its peak intensity and was upgraded to typhoon intensity at 220600Z, based on a satellite intensity estimate of 70 kt (36 m/sec) (Figure 3-04-3). Thad then developed a central cold cover (Dvorak, 1984) and further development was arrested.

At 221800Z, Typhoon Thad recurved in response to the approaching mid-level trough in the westerlies aloft over eastern China. The forecast for this event was complicated by the failure of JTWC's dynamic forecast aid, the One Way (Interactive) Tropical Cyclone Model (OTCM), to change from a persistent northwestward track (Figure 3-04-3). At 231200Z, the decision was made to disregard the objective forecast guidance and forecast recurvature based on synoptic data analyses.

This decision was correct, but in retrospect, the timing was 18-hours late.

From 240000Z to 250000Z, Thad underwent rapid weakening as it tracked to the northeast and entered a region of increased vertical wind shear. At 240000Z, Typhoon Thad was downgraded to tropical storm intensity and six hours later the system weakened to a 50 kt (26 m/sec) intensity as it made a closest point of approach of 80 nm (148 km) southeast of the island of Okinawa, Japan. Both Kadena Air Base and Naha airport reported wind speeds below 30 kt (15 m/sec) during Thad's passage. With dissipation over water underway, Thad was downgraded to a tropical depression at 250000Z and the final warning issued. No reports of damage were received.

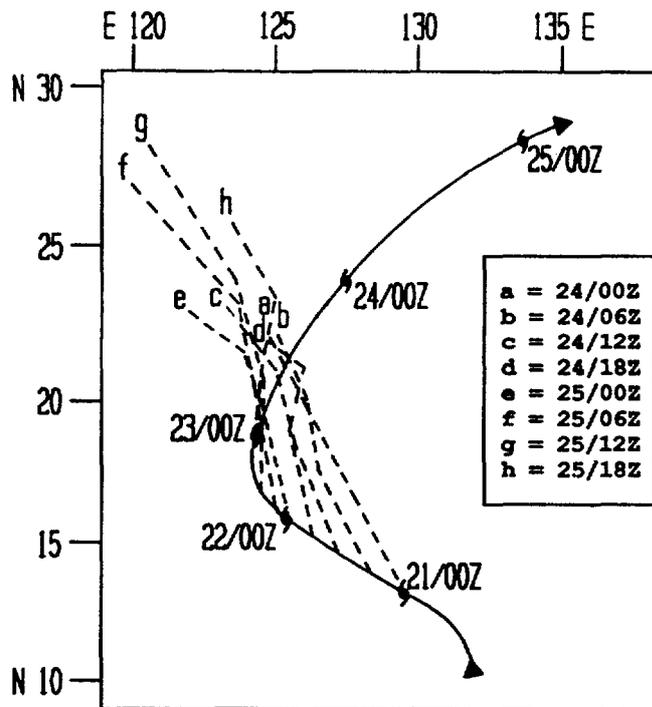


Figure 3-04-3. OTCM forecast guidance (dashed lines) from 210000Z to the point of recurvature at 221800Z basically held Thad to a northwestward track through each 72-hour period, in contrast to the best track (solid line).