Technical Attachment

Familiarization Flight Trip Report
A NOAA Reconnaissance Mission into T.D. 12

Scott M. Spratt and Anthony J. Cristaldi
WFO Melbourne, Florida

Pre-Mission Preparations

An opportunity arose on September 19, 2000, for two forecasters from WFO Melbourne to fly aboard a NOAA reconnaissance mission into a tropical disturbance in the extreme northwest Carribean Sea early the following day. Two NOAA missions were planned for September 20: a high altitude synoptic surveillance flight by the Gulfstream IV (G-IV), encompassing the Gulf of Mexico and northwest Carribean; and a low-level WP-3D reconnaissance mission to determine the location and intensity of the disturbance. While both missions appeared promising for first time observers, we opted for the low-level invest flight, since the disturbance had the potential to strengthen to a tropical storm by the time of the flight. In fact, the disturbance did become better organized during the evening, and was re-designated Tropical Depression (TD) 12 at 2300 UTC (The system had been earlier upgraded to a TD for a 20-hr period on September 15 when it was east of the Lesser Antilles).

NOAA P-3 Orion (nicknamed “Kermit”)

NOAA G-IV (“Gonzo”)

Our endeavor began at 2 am on September 20 when we started our drive from Melbourne to MacDill AFB in Tampa. We arrived at the base at 430 am and were directed to the NOAA Aircraft Operations Center (AOC) at Hangar 5. Upon entering the hangar we immediately recognized a NOAA P-3 Orion (nicknamed "Kermit") and the G-IV ("Gonzo"), along with several other smaller aircraft. Our aircraft, another P-3 ("Miss Piggy"), was visible on the tarmac behind the hangar. After a few

minutes of looking around, we were greeted by Barry Damiano, the flight director (and meteorologist) for our mission. Barry took us to the flight briefing room and showed us a couple recent IR satellite images of TD 12. To our dismay, the images revealed the depression had become devoid of deep convection overnight. We then learned that we had made the correct decision by choosing the P-3 mission over the G-IV, since the planned afternoon synoptic surveillance mission had since been cancelled by NHC.

Our mission was still scheduled to depart at 630 am and return 9 to 10 hr later. Since the TD was located within Cuban airspace and US military aircraft were prohibited from making such flights, the NOAA flight was tasked to make the 1200 and 1800 UTC center fixes in lieu of the USAF 53rd Weather Reconnaissance Squadron. By 5 am (0900 UTC), three NOAA Corps officers arrived to finalize flight planning. The two pilots and the navigator discussed flight patterns, altitudes, and fuel requirements with the flight director. Ironically (to us), one of their greatest concerns involved the likelihood of diurnal thunderstorms in the vicinity of the airport by the time of our mid- to late afternoon return! Additional fuel was loaded due to the possibility of a weather-related landing delay or the need to reach an alternate airport.

Mission Operations

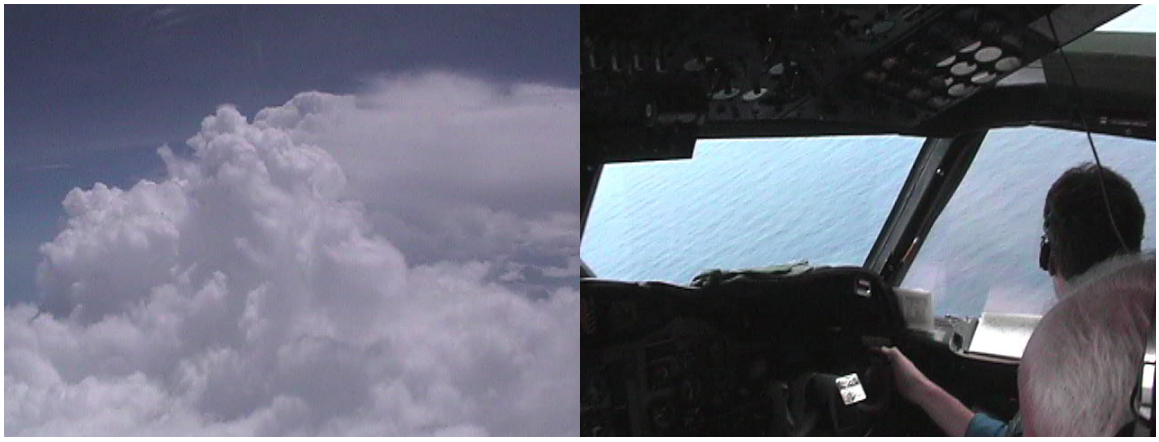
NWS Melbourne Meteorologist Scott Spratt aboard NOAA Hurricane Hunter N43RF observing the latest meteorological data sets and radar presentation (20 Sep 2000).

After the aircraft was fueled, we boarded along with eight NOAA Corps and AOC members and were given a safety briefing by the flight director. We were assigned seats at "station 3" and shown how to secure our seat belts and shoulder straps, and how to monitor onboard and air-to-ground communications via a pair of headsets. The aircraft contained 21 seats or workstations, including the cockpit positions. The flight director worked from a position just outside the cockpit. Each workstation aft of the cockpit comprised a large console with two small built-in displays and space below for a PC CPU and monitor.

The built-in monitors could be switched between the C-band nose radar, nose/right/left/surface-directed cameras, and continuous realtime meteorological data displays of temperature, humidity, surface pressure, winds and fluxes. Since our mission objective was confined to providing center fixes, as opposed to the more typical NOAA mission involving the collection of research data critical for dynamical/ statistical track and intensity models, no Hurricane Research Division (HRD)

scientists joined the flight, nor were any additional PCs or dropsondes loaded aboard.

We departed MacDill AFB at 635 am and climbed quickly to a flight level of 17 000 ft (FL170). With an airspeed of about 225 kt our estimated time of arrival at the suspected center position (21.2 N 83.2 W) was 1 hr 40 min. This position was just south of the Isle of Youth, Cuba. After we climbed to our flight level we were allowed to move about the cabin at our discretion, but were instructed to take the nearest seat if unexpected significant turbulence was encountered.



As we climbed over the Florida west coast, individual towering cumulus were noted, with tops near or slightly above flight level. As the pilot banked the aircraft hard to the right to head over the Gulf of Mexico numerous low level cloud streets were evident offshore. Our flight path then took us directly over the Key West VHF Omni Range (VOR) at about 730 am (1130 UTC), and to the north coast of Cuba at 750 am (see the flight path in Figure 1). Winds aloft were generally southeast near 20 kt. Upon entering Cuban airspace, the co-pilot contacted 'Havana Center' Air Traffic Control (ATC) and informed them of our intent to descend to 1 000 ft just off the south coast. The controller directed us to descend to FL150 while over land, and to 1 000 ft upon reaching the coast. While over Cuba, we first noted a large expanse of mangrove swamps, then regions of lush green vegetation, interspersed with large agricultural plots. We began our descent just after 1150 UTC, and reached 1 000 ft less than 8 min later as we passed above a picturesque, but deserted, tropical beach. Havana Center ATC then informed us to check back with them every 10 min while at our new cruising altitude.

Over the next hour, we followed a heading of 240 deg., from between the Cuban coast and the Isle of Youth, to just offshore the western tip of Cuba, and eventually to a position about 50 nm east of the northeastern Yucatan peninsula. Along this transect, surface pressures fell about one millibar (mb) to a minimum of 1011.2 mb off the Yucatan. A surge of southeast winds between 20 and 30 kt was measured between the Isle of Youth and the mainland coast, with seas heights estimated at about 8 ft. Winds steadily decreased and veered to southerly as we approached the Yucatan. Throughout this time we flew in and out of IFR conditions, with a few periods of light rain noted. Vertical velocities averaged near 1 kt, alternating between weak updrafts and downdrafts. Occasionally, a 3-4 knot upward spike was observed, coincident with a short period of enhanced turbulence, albeit still light. West of the wind surge area seas were small, ranging from nearly flat to about 2 ft.

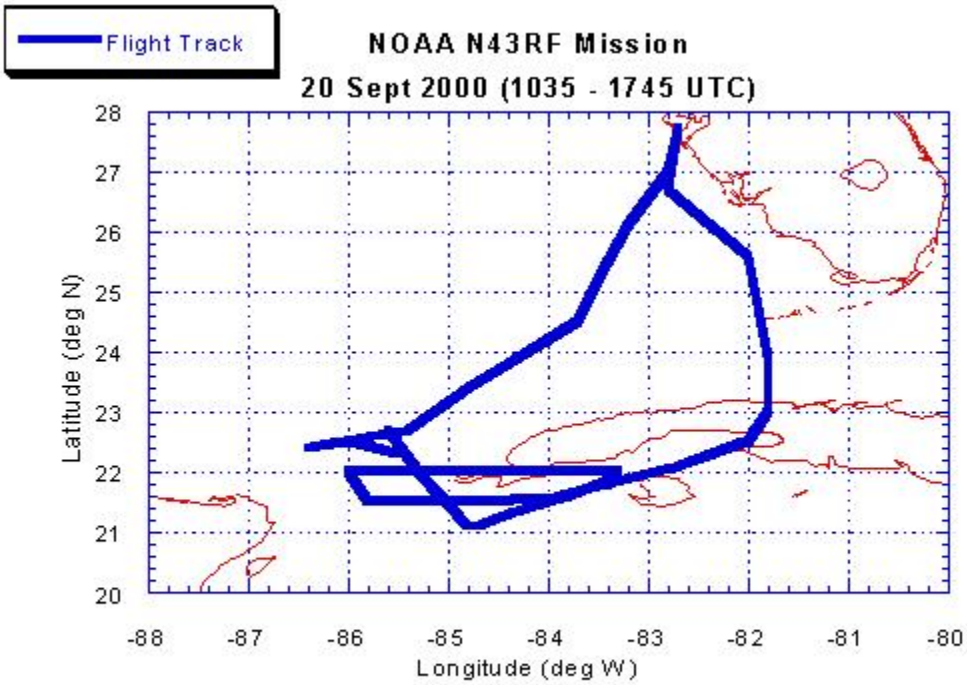


Fig. 1. Flight track of NOAA N43RF reconnaissance mission into Tropical Depression Twelve.

Between 910 and 1030 am (1310 and 1430 UTC), the flight director attempted to confirm the presence of a closed low-level circulation center by vectoring our aircraft over the Yucatan Channel and along the south coast of Cuba. However, after finding only a large area of light southerly or light and variable winds and steady pressures near 1012 mb, it was decided to climb to
10 000 feet for better HF radio propagation and report our observations to Chief, Aerial Reconnaissance Coordination, All Hurricanes (CARCAH) in Miami. Whenever a mission is flown, CARCAH meteorologists act as a ground station monitor to relay information instantly between the airborne meteorologist and NHC forecasters. After receiving permission from Havana Center ATC, we performed a quick climb to FL100 and relayed a message to Miami.

CARCAH advised us to continue attempting to fix a center, near 22.5 N and 85.0 W, a little farther north of where we had previously flown. After returning to 1 000 ft the next hour was spent surveying a region within 60 nm of the location specified by Miami. Although a small area of light easterly winds

was noted at 22.7 N and 85.6 W, pressures rose slightly upon approach, furthermore, a light and variable to northerly flow was observed a little farther to the north. Although only a broad region of light winds was observed near the estimated circulation center (according to NHC satellite fixes), onboard radar images revealed a large area of convection developing farther east over water, extending through western Cuba. Several very small cyclonically curved rain bands were noted within the convection, but observed wind fields in their vicinity did not support closed circulation centers.

By 1620 UTC, it became apparent that a closed center could not be fixed and the flight director suggested we again ascend to FL100 to report our findings to CARCAH. As expected by the flight crew, CARCAH terminated our mission early due to the lack of a well-defined center and disorganized satellite presentation. They cleared us to return to base. Once the co-pilot informed Havana Center ATC of our intent, we were authorized to climb to FL175 and to proceed direct towards Tampa through latitude 25 N. We obtained the new flight level by 1650 UTC and radioed Miami Center ATC at 1710 UTC upon approach to 25 N. Given our return two to three hours earlier than scheduled, the anticipated threat of thunderstorms along the Florida west coast in the vicinity of the airport had not yet materialized, thus, our final flight leg took us on an uneventful direct approach to MacDill AFB, ending with a smooth landing at 145 pm (1745 UTC). After a quick taxi back to the hangar we disembarked, took a few final pictures of the aircraft, thanked the crew, and began our drive back to Melbourne.

NWS Melbourne Meteorologist Tony Cristaldi posing next to NOAA Hurricane Hunter N43RF, after completing a mission to fix the center of Tropical Depression Twelve (20 Sept 2000).

Post-Mission Summary

While the lack of development of TD 12 on September 20 made for a less than exciting mission from a meteorological perspective, we learned a great deal from the experience. We gained a tremendous appreciation for the hard working flight and support crews, due in part to their endurance during very long missions on many consecutive days. We were rather surprised by the nearly continuous stream of communications from the cockpit to air traffic controllers, and to the flight director, which proved especially when their heading and altitude requirements conflicted. Further, operating within multiple, foreign airspaces, sometimes near busy international flight legs, added to the coordination complexities. Finally, the mission was quite intriguing from a geopolitical perspective, given the time spent in Cuban airspace and the island overflights. We thoroughly enjoyed participating in the mission and hope the opportunity arises again in the future - into a more intense tropical cyclone!

Note: While our mission failed to close off a low-level circulation center, NHC forecasters decided to continue to designate the system a tropical depression. This rationale was based on the aircraft observations of sustained 30 kt winds, disorganized convection, proximity to land, and a synoptic environment (and model guidance) which favored additional development. This decision proved wise as the system began to organize significantly less than 24 hr later, reaching 55 kt by 1800 UTC on September 21, as determined by a USAF Reserve Hurricane Hunter reconnaissance mission. Tropical Storm Helene eventually made landfall along the Florida Panhandle near Fort Walton Beach at 1100 UTC on September 22.

Acknowledgments

The authors greatly appreciated the assistance provided by Dr. Frank Marks (HRD) and Jack Parrish (AOC) in allowing us to take part in the mission. Flight Director Barry Damiano provided us with an excellent overview of the flight and remained available to answer a multitude of questions posed to him. Our gratitude is also extended to LCDR Taggart and CDR Kenul and the entire N43RF flight crew for allowing us the opportunity to accompany them on the mission.