

Mission Summary
970719I Aircraft 43RF
TD#5

Scientific Crew (43RF)

Lead Scientist	P. Black, E. Bracken
Doppler Scientist	M. Black, J. Cione
Workstation	Leighton

Mission Briefing:

This flight was a ferry mission to Barbados for a [genesis mission](#) into decayed TD#5. An abbreviated Fig 4 pattern was flown in route for two hours from 2010 UTC to 2204 UTC at 850 mb (5,000 ft PA) through the wave. The flight departed Opa Locka (KOPF) at 1657 UTC and terminated at Grantley Adams, Barbados (TBPB) at 2325 UTC.

Mission Synopsis:

This flight suggested a closed circulation center still persisted at 16.7 N, 65.5 W moving toward 295° at 12 kt, consistent with earlier (12Z) [AFRES flight](#) data. A weak 500 mb trough axis was encountered at 22N, 72.5W beneath the upper cold low. A 500 mb circulation center was also encountered near 14.5N, 63W. No MCS-type circulation in the stratiform rain region. SE flow predominated on the SE leg at 850 mb in predominantly stratiform precipitation while NE flow predominated at 500 mb (i.e. 42RF). The 850 mb circulation center was in the clear about 50 nm E of two clusters of intense Cb activity centered near 17N, 65W. These were two lines of 50 dBZ+ reflectivity. Our flight path turned N along the E flank of the western-most cluster for 30 nm, then turned south along the W flank of the eastern-most cluster. Tops were 15 km+, and later IR satellite pictures showed that tops were colder than -75C. Cbs were sheared to the ENE with increasing height (visual). Lightning activity present. Surface winds were calm between clusters despite SSE at 15 kt at flight level. SE wind shifted to NE above 800 mb on climb-out. FAST [Doppler data](#) was taken through out flight near precipitation and buildups.

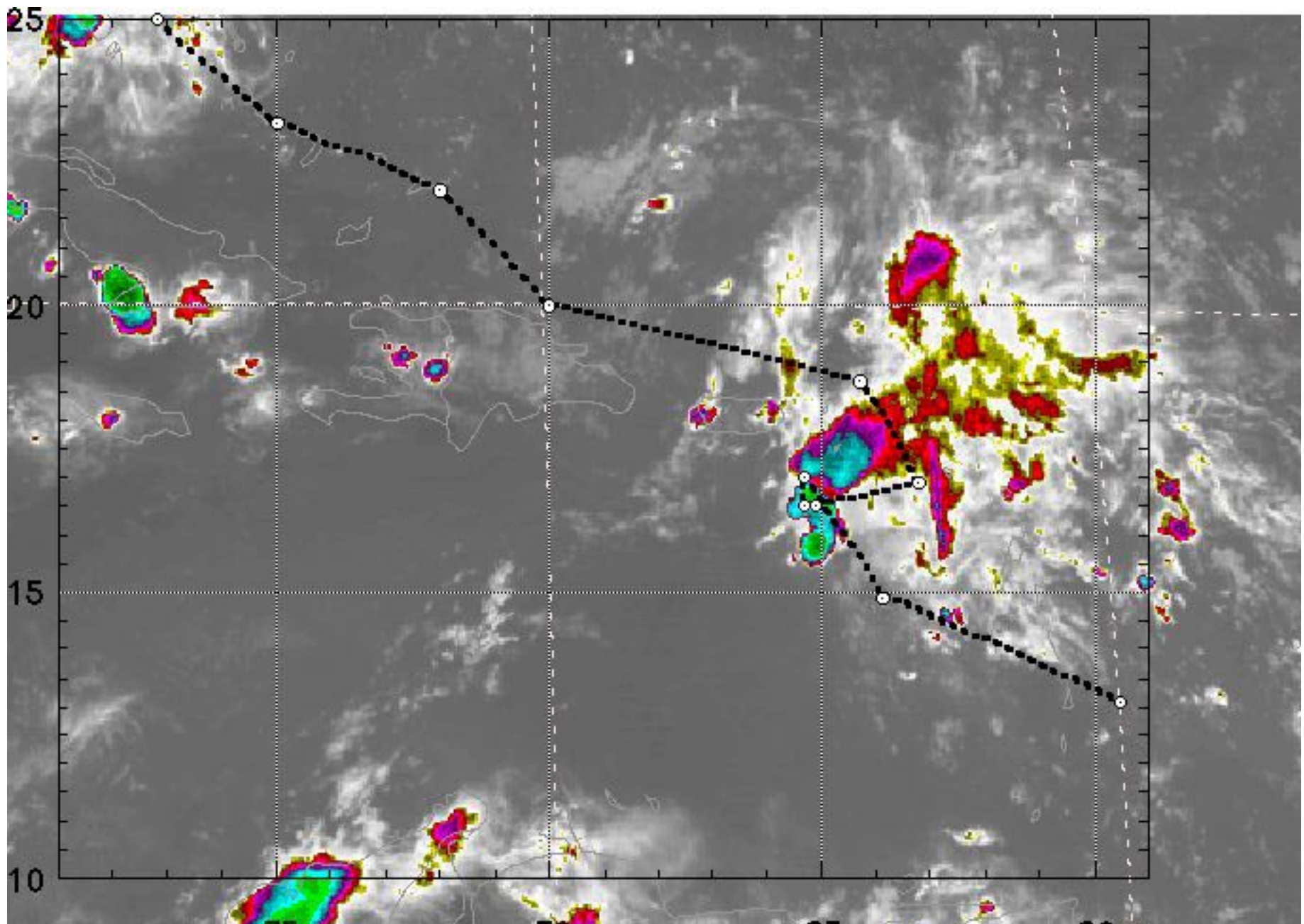
Evaluation:

This will be a brief sample of a null case for [genesis](#), i.e. a lysis case. No sign of development- moderate upper level shear predominates. This is our first lysis case—good for comparison with [genesis cases in Dolly](#), etc.

Problems:

- Work station went down hard resulting in no real-time composites or GPS sonde processing, which wasn't a problem since these function were not needed.
- King probe wires broke- happening once per flight.

[Peter G. Black](#)



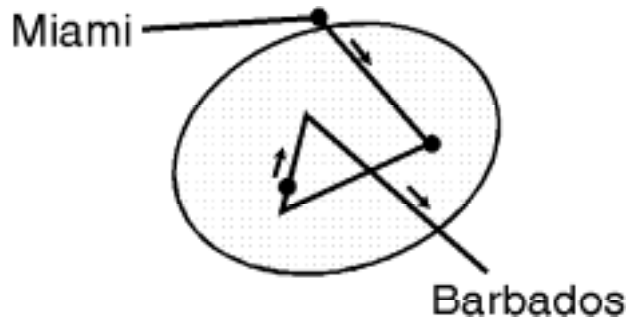
Mission Summary
970719H Aircraft 42RF
TD#5

Scientific Crew (42RF)

Chief Scientist:	H. Willoughby
Radar:	F. Marks
Dropwindsonde:	S. Goldenberg/S. Aberson
Workstation:	P. Dodge

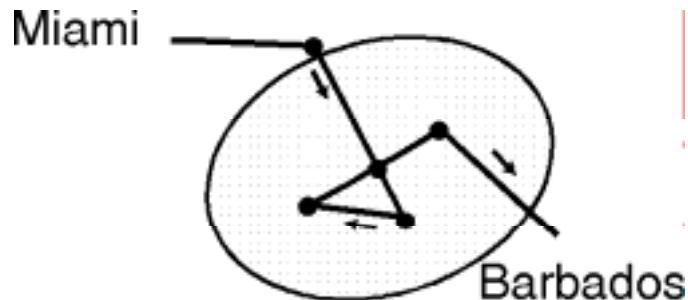
Mission Briefing:

The objective of this flight was location of the trough axis and reconnaissance of mid-level mesovortices in TD#5 in the course of a deployment to Barbados as part of the [Tropical Cyclogenesis Experiment](#). N42RF would depart from Opa-Locka, execute a figure-4 pattern under the convective anvil at 500 hPa, and recover at the deployment site in preparation for a second flight on the following day. The airplane would also deploy [GPS-sondes](#) at the initial point, the center of the pattern and the turn points. N43RF would fly a coordinated pattern at 850 hPa and guide N43RF relative to the trough.



Mission Synopsis:

N42RF left Opa-Locka at 1701 UTC. Soon after takeoff the AFC on the [tail radar](#) began to drift so that no Doppler wind observations were possible. N42RF dispensed two GPS sondes en route, both of which had good thermodynamics but problems with winds, and arrived at the initial point (16°42"N, 64°19"W) at 2035 UTC where it deployed a third sonde which worked. As we tracked to the SSE, the winds were shifty from the east to northeast with no indication of the trough axis. In response to direction from the other aircraft, we deviated from the planned track, turning westward and then executing a rotated figure four and dispensing another sonde. As we tracked ESE from the pattern we encountered a wind shift that might have been the trough axis near 65W. We recovered in Barbados at 2313 UTC, 6 h 12 min duration.



Evaluation:

The mission obtained some useful flight-level and dropsonde observations in a slowly dissipating tropical depression. It was difficult to guide the aircraft through the meteorological situation because of the shifty winds and lack of a well-defined trough axis in the pattern.

Problems:

- Failure of the Doppler radar and unreliability of the GPS winds were the major disappointments.
- Limited time in the pattern and inconsistent flight level winds prevented location of the trough axis or detailed exploration of flight-level mesovortices.

[Hugh Willoughby](#)

Mission Summary
970720I **Aircraft 43RF**
TD#5

Scientific Crew (43RF)

Lead Scientist	E. Bracken, P. Black
Doppler Scientist	F. Marks, J. Cione
Workstation	P. Leighton

Synoptic Overview:

TD#5 formed from a well defined ITCZ wave on 17 July at 12.4N 53.4W. Upper tropospheric flow near the depression was characterized by an anticyclone centered to the northeast and a cyclone to the southeast. This flow configuration resulted in a highly diffluent flow over the depression at upper levels. **Air Force Reconnaissance** aircraft found a 1009 mb low and winds of 36 kts late on the 17th. On the 18th central pressure increased to 1013 mb but convection persisted near the center and flow around the disturbance locally deformed the ITCZ into the classic "S-shape". As the depression moved westward on the 18th it came under the poleward flow on the east side of an upper-tropospheric trough located poleward of the Dominican Republic. Convection near the center began to show signs of increasing shear as the depression moved westward. Satellite imagery on the 19th showed a poorly defined circulation center southeast of Puerto Rico moving east-northeast with deep convection along its east side.

Mission Briefing:

Satellite imagery on the morning of the 20th showed a large area of organized deep convection ~250 km northeast of Puerto Rico with just scattered convection surrounding Puerto Rico. In addition, a band of cloudiness (likely the east end of the ITCZ which had been pulled well north by southerly flow east of TD#5) arched southeastward from the large area of convection and then eastward to the north of Barbados. The aforementioned area of convection northeast of Puerto Rico appeared to be the result of the interaction of the ITCZ and the upper-tropospheric trough north of the Dominican Republic. Upper-tropospheric flow in this region was dominated by strong southerly flow (and likely strong shear) east of the stationary the upper-tropospheric trough.

No circulation was evident in the imagery on the morning of the 20th. A flight plan was designed to investigate the region north of Puerto Rico, the Mona Passage, and south of Puerto Rico to determine if the circulation center observed on the 19th still existed. The plane was to fly three nearly east-west legs north of Puerto Rico, come south through the Mona Passage and fly three more east-west legs south of Puerto Rico and the Dominican Republic at an altitude of 5000 ft.

Mission Synopsis:

The flight departed Grantley Adams, Barbados (TBPB) at 1535 UTC. The initial point in the flight plan was chosen to be near the center of the large area of convection. During the ferry, flight level observations at ~450 mb showed a wind shift from east to south as the plane crossed the ITCZ band of cloudiness southeast of Puerto Rico. The first leg of the flight began at 1740 UTC. Flight level observations from ~850 mb along all three flight legs north of Puerto Rico showed only uniform east-southeasterly flow and suggested the presence of a jet streak. No significant circulation center was found and convection was widely scattered in this region. At ~2000 UTC the plane came south through the Mona Passage. Once again, flow at ~850 mb was uniformly east-southeasterly. No circulation center was observed and convection was widely scattered. The final leg of the flight (from west to east) was flown at ~700 mb to determine if any significant circulation features could be found at higher altitudes. Observations at this level did

show a wind shift from east-northeast to southeast indicating the presence of an easterly wave axis that could not be observed at lower levels. At the final point in the flight plan the plane climbed to ~500 mb and ferried back to Barbados. During the ferry back, flight level wind observations again showed a wind shift from south to east as the plane crossed the ITCZ band of cloudiness. The flight terminated Grantley Adams, Barbados (TBPB) at 0006 UTC the 21st.

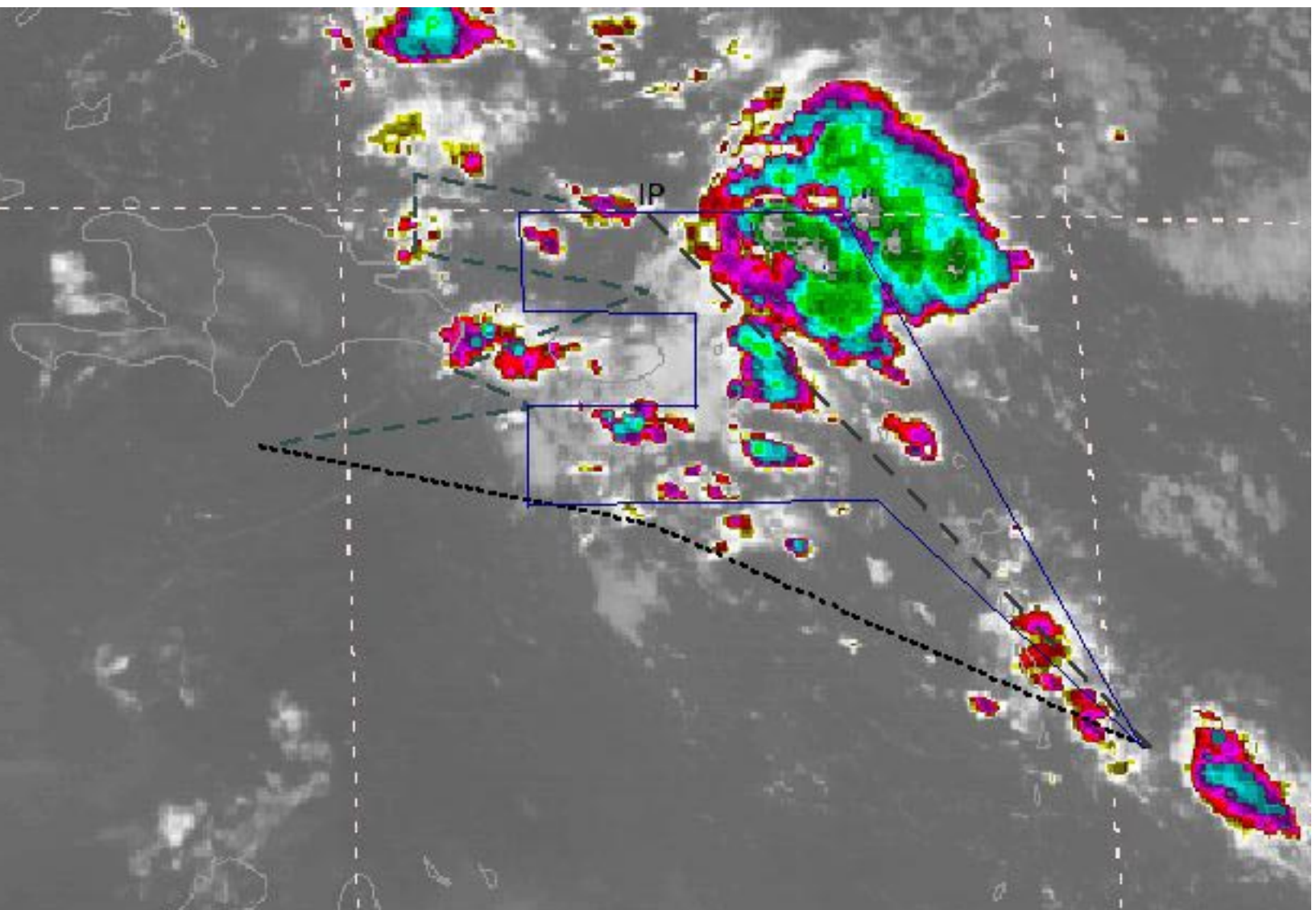
Evaluation:

Flight was unable to find evidence that the circulation center associated with TD#5 observed on the 19th still existed on the 20th. It is possible that the circulation center did exist at higher levels but the lack of significant areas of precipitation during the flight may make diagnosis of upper-level flow with [Doppler radar](#) observations difficult. In view of the sudden appearance of "structure" at 700 mb along the final flight leg it is suggested that future genesis flights into weak waves be flown no lower than 700 mb.

Problems:

- Workstation was down at the start of the flight but was brought back up during the flight.
- Tail radar went down from 1815-1835 UTC and 2026-2037 UTC.

[W. Edward Bracken](#)



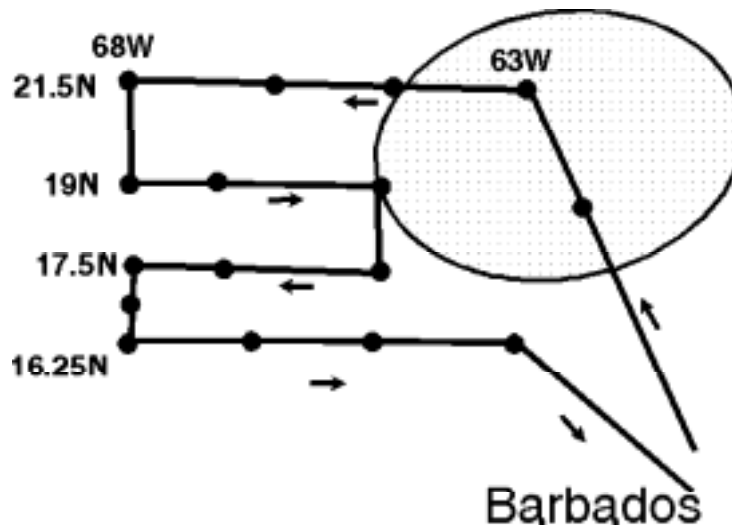
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Scientific Crew (42RF)

Chief Scientist:	H. Willoughby
Radar:	M. Black
Dropwindsonde:	S. Goldenberg/S. Aberson
Workstation:	P. Dodge

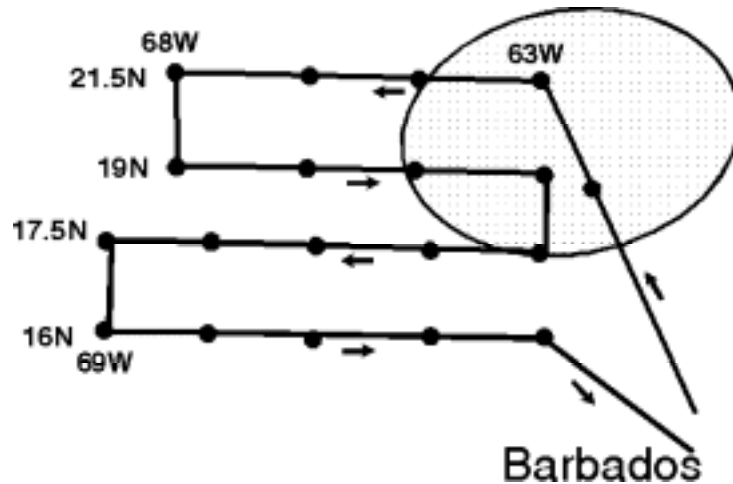
Mission Briefing:

This flight was designed to execute several east–west transects of the convective mass and trough in TD#5. The meteorological objectives were location of mid–level mesovortices under the anvil and exploration of the dynamics of the dissipating wave as part of the [Tropical Cyclogenesis Experiment](#). N42RF would depart from Barbados, execute the pattern at 500 hPa, and recover back in Barbados after a full duration mission. The airplane would also deploy [GPS–sondes](#) and collect flight level data along track. Simultaneously, N43RF would fly a coordinated zig–pattern at 850 hPa across the trough.



Mission Synopsis:

N42RF left Barbados at 1533 UTC. During the takeoff roll, the pilot's attitude indicator failed. The AFC problem on the [tail radar](#) from the previous day continued as did the unreliable dropsondes. N42RF dispensed two good GPS sondes in convection, one before the initial point and the second at the IP. After we turned westward from the IP, the pilot's emergency gyro failed, leaving only to copilot's indicator for attitude reference. Safety of flight constraints dictated that we had to remain largely out of cloud and to recover before dark. We shortened the remaining east–west legs to meet these constraints and continued the mission. The winds were shifty under the anvil, but settled down as we emerged into the clear. On the western end of the northernmost transect we encountered a col between TD#5 and the upper low to the NW. In the rest of the abbreviated mission, we deployed 17 GPS sondes, 2 of which failed completely, and 7 of which failed to report winds. The drops on the two southern transects revealed the 850 hPa trough near 67W. Shifty flight level winds during the limited time under the anvil indicated multiple small mesovortices. We recovered in Barbados at 2104 UTC, 15 min before local sunset, 5 h 12 min duration.



Evaluation:

The meteorological situation was interesting. The east-west transects captured many of the essential features. If the instrumentation had worked we would have had a very successful mission. The experience clearly demonstrated the feasibility of operations in systems this week or poorly organized. Nevertheless, acquisition of only flight-level and dropsonde observations was less than we hoped for. The flight crew's handling of the difficult situation was exemplary.

Problems:

- Failure of the Doppler radar,
- unreliability of the GPS winds, and
- constraints to remain VFR.

Hugh Willoughby

Mission Summary
970721I Aircraft 43RF
TD#5

Scientific Crew (43RF)

Lead Scientist	J. Cione
Doppler Scientist	P. Black, E. Bracken
Workstation	P. Leighton
GPS Scientist	F. Marks

Mission Briefing:

This flight was a return ferry mission from Barbados to Opa Locka. Enroute to Miami, we were to conduct the final flight (i.e. flight 3 of 3) into what were the remnants of TD#5. A near-straight line pattern was flown in route between Grand Turk (21.5N;70.6W) and just west of Nassau in the Bahamas (25.2N; 77.5W). The operational portion of this ferry was expected to be approximately two hours from 1900 UTC to 2100 UTC conducted 500 mb, near 19,000 ft PA. The planned operational track was to go through observed convection (obtained via communication with Kaplan/NHC) north of Hispaniola and north and west of the upper level wave axis. The flight departed Grantley Adams, Barbados (TBPB) at 1603 UTC and terminated at Opa Locka, USA (KOPF) at 2115 UTC.

Mission Synopsis:

Enroute to Miami, flight level winds (19,000 ft PA) strongly suggested the presence of a mid level circulation north and west of Puerto Rico at approximately 20.5N 68W at 1800 UTC. Pre-flight satellite guidance (faxed drawing, Kaplan/NHC) illustrated both MCS convection north of Hispaniola (i.e., primary flight objective/IP) as well as some convection just to the south of the Mona Passage at approximately (17N; 68W). LF reflectivity confirmed the Mona Passage convection, which was south and east of the approximate location of the wave axis. This convective complex appeared to have cyclonic curvature along its western-most boundary. The possibility of deviating southward to investigate the possibility of a lower level circulation center was briefly discussed but due to tight fuel/time constraints this option was quickly (and understandably) abandoned. Upon arriving at the IP (i.e. Grand Turk Island) at 1904 UTC, the first of six GPS sondes were deployed at ~ 1° latitude intervals along the flight track. The first three drops were released ahead of stratiform convection associated with the 'north of Hispaniola' cloud cluster approximately between 22-25N and 71-76W. The fourth drop was deployed at (24.3N; 74.9W) at 2001 UTC into the stratiform precipitation shield. At this time, a rather pronounced curvature at the western boundary of the **LF reflectivity** field was observed. A track deviation from 308° to 295° was requested to the flight engineer in order to intercept. Due to air traffic control problems this track change came a bit late but we were still able to conduct drop 5 (full winds and pressure, temperature, humidity (PTH)) within the northern edge of the precipitation shield just east and north of the suspected lower circulation (lat./lon.). Flight level winds depicted a wind shift from E-SE *before* to NE *right at* the proposed circulation boundary. The 5th GPS drop showed SE surface winds at 23 kts. Further investigation of 42RF flight level and GPS drop (?) data will be necessary before any conclusions can be drawn. (NOTE: 42RF's flight track was approximately 60 nm south of the 43RF flight track.) The sixth and final drop was delayed (i.e. air traffic-induced) until we passed Nassau. It was released at (25.25N; 78.6W) at 2042 UTC. The end of data transmission from this sonde marked the conclusion of the flight mission. It should be noted that all Doppler data collected on this flight was taken in F/AST mode. It should also be noted that flight level data was transmitted in route to NHC.

Evaluation:

This will be a limited sample of a null case for [genesis](#). Evident in this data was the mid-level circulation at 20.5N and 68W and to a lesser degree, the possible lower level circulation just to the south of 24.8N and 78.6W, east of the Bahamas. Both features were, previous to this flight, unknown to NHC. The mid-level circulation was not present in previous analyses or even satellite wind estimates (Kaplan). This information would prove helpful to forecasters as the system tracked westward towards the Florida straits. Overall, there was little evidence of wave development during this flight. This flight (in conjunction with the 2 previous TD#5 flights) should provide a good opportunity for researchers to contrast 'non-development' conditions found during this mission with more 'cyclogenic' conditions observed during previous genesis missions (i.e. [Dolly in 1996](#)).

Problems:

- PMS station was essentially inoperable.
- Of the six GPS drops conducted, three had no winds, two had full winds and one had intermittent winds. All six sondes successfully reported PTH data.
- King probe wires were broken again. (This is occurring roughly once per flight.)

[Joseph J. Cione](#)

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TD#5

Scientific Crew (42RF)

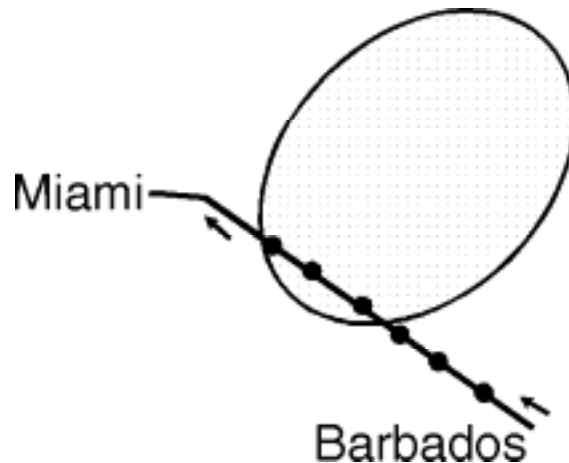
Chief Scientist:	H. Willoughby
Radar:	M. Black
Dropwindsonde:	S. Goldenberg/S. Aberson
Workstation:	P. Dodge

Mission Briefing:

This flight was designed to locate the trough southeast of a convective mass that blew up in the remains of TD#5 and to ferry the P-3s from Barbados to Tampa at the end of operations. N42RF flew from Barbados along a track designed to be tangent to the clouds at pressure altitude somewhat above 500 hPa, and recover at Opa-Locka then continue to Tampa after dropping off the HRD scientists. The airplane would deploy [GPS-sondes](#) and collect flight level data along track. Simultaneously, N43RF would fly a parallel track north of 42RF's at the same altitude.

Mission Synopsis:

N42RF left Barbados at 1601 UTC. We flew on airways to an initial point at 20° 32'N 72° 30'W, near Grand Cayman. The convection was farther south than expected so that our track passed through the stratiform rain and some convection. We encountered convective drafts > 5 m s⁻¹. We dispensed 6 sondes, 3 worked, 1 lost winds below 820 hPa, and 2 reported no winds. The soundings indicated a low-level trough axis near Andros Island at the west end of the pattern. We landed at Opa-Locka at 2104 UTC, 5 h 3 min duration.



Evaluation:

This flight, in conjunction with N43RF's and those on the two previous days documented the structure of TD#5 as weakened, thus providing a control case for the Tropical Cyclogenesis Experiment

Problems:

- Failure of the Doppler radar and unreliability of the GPS winds.

[Hugh Willoughby](#)