19940910I1-LPS

## E.2 Lead Project Scientist (On-Board)

### E.2.1 Preflight

✓ 1. Participate in general mission briefing.

✓ 2. Determine specific mission and flight requirements for assigned aircraft.

✓ 3. Determine from CARCAH or field program director whether aircraft has operational fix responsibility and discuss with OAO flight director/meteorologist and CARCAH unless briefed otherwise by field program director.

✓ 4. Contact HRD members of crew to:

   a. Assure availability for mission.
   b. Arrange ground transportation schedule when deployed.
   c. Determine equipment status.

✓ 5. Meet with OAO flight crew at least 90 minutes before takeoff, provide copies of flight requirements and provide a formal briefing for the flight director, navigator, and pilots.

✓ 6. Report status of aircraft, systems, necessary on-board supplies and crews to appropriate HRD operations center (MGOC in Miami or FGOC at remote recovery location).

### E.2.2 In-Flight

____ 1. Confirm from OAO flight director/meteorologist that satellite data link is operative (information).

____ 2. Confirm camera mode of operation.

____ 3. Confirm data recording rate.

____ 4. Complete Form E-2.

### E.2.3 Postflight

____ 1. Debrief scientific crew.

____ 2. Report landing time, aircraft, crew, and mission status along with supplies (tapes, etc.) remaining aboard the aircraft to the appropriate HRD operations center (MGOC or FGOC).

____ 3. Gather completed forms for mission and turn in at the appropriate operations center. [Note: all data removed from the aircraft by HRD personnel should be cleared with the OAO flight director.]

____ 4. Determine next mission status, if any, and brief crews as necessary.

____ 5. Notify the appropriate operations center (FGOC or MGOC) as to where you can be contacted and arrange for any further coordination required.

Form E-2


## On-Board Lead Project Scientist Check List

Date 10SEP94 Aircraft N43RE Flight ID 940910I

A. Participants

| HRD Function | HRD Participant | OAO Function | OAO Participant |
|---|---|---|---|
| Lead Proj. Sci. | WILLOUGHBY | Flight Director | DAMIANO |
| Cloud Physics | M. BLACK | Pilots | TICKNOR/TENNSON |
| Radar | | Navigator | RATHBURN |
| Doppler | | Sys. Engr. | ROLLS |
| WORKSTA ~~Photographer~~ | GRIFFIN | Data Tech. | LYNCH |
| Omegasonde | KAPLAN | El. Tech. | |
| AXBT/AXCP | | Other | GONZALES |

Take-Off 10/1819 Location OPF Landing Location

B. Past and Forecast Storm Locations

| | Date/Time | Latitude | Longitude | MSLP | Max. Wind |
|---|---|---|---|---|---|
| FCT | 11/00 | 15.3 | 66 | | 35 KT |
| OBS | 10/2100 | 15.3 | 65.8 | | |
| | | | | | |
| | | | | | |
| | | | | | |

C. Mission Briefing

FLY TCGEN 500 mb FIG 4 DROP AT ENDS AND MIDPOINTS.

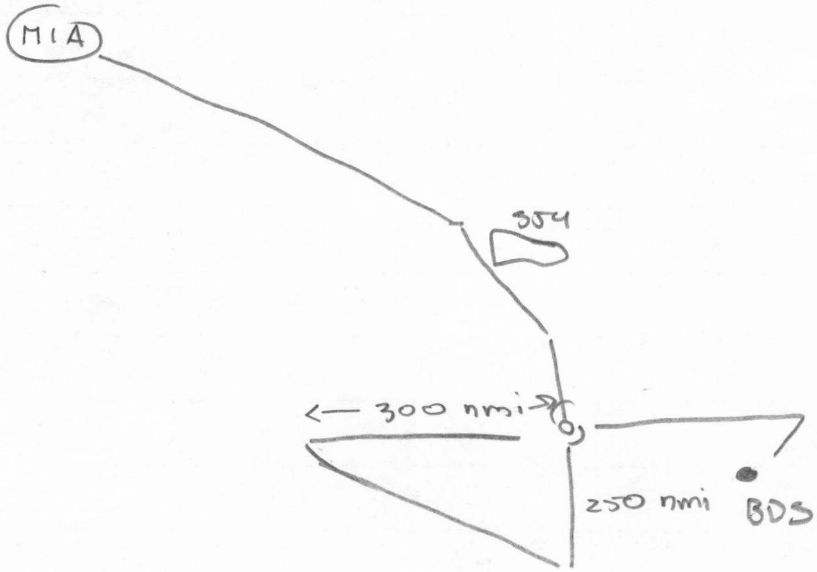
D. Equipment Status

| Equipment | Pre-Flight | In-Flight | Post-Flight |
|---|---|---|---|
| Aircraft | ↑ | ↑ | ↑ |
| Radar | ↑ | ↑ | ↑ |
| Cloud physics | ↑ | ↑ | ↑ |
| Data system | ↑ ① | ↑ ② | ↑ |
| Omegasondes | ↑ | ↑ | ↑ |
| AXBT/AXCP | NO 13 | | |
| Doppler | ↑ | ↑ | ↑ |
| Photography | ↑ | ↑ | ↑ |

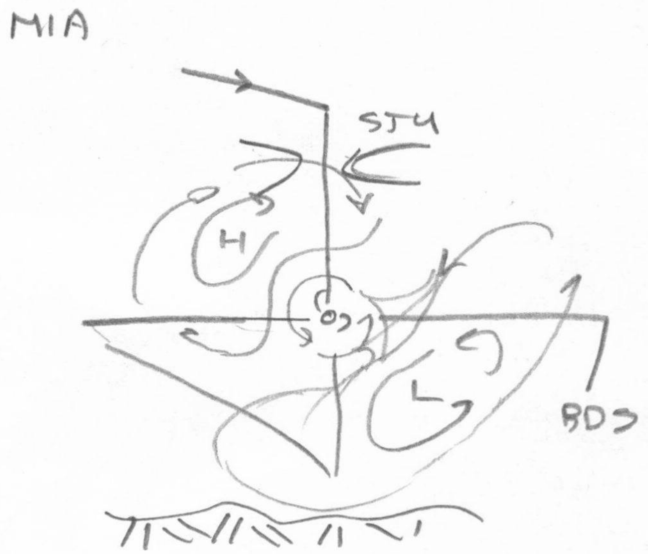
REMARKS: ① PRESSURE/RA DROPOUT REPORTED

② DROPOUTS CONTINUE, DISPLAY PROBLEMS TOO, BETTER LATE IN FLIGHT

E. I. Proposed Flight Pattern (sketch or designate by number)



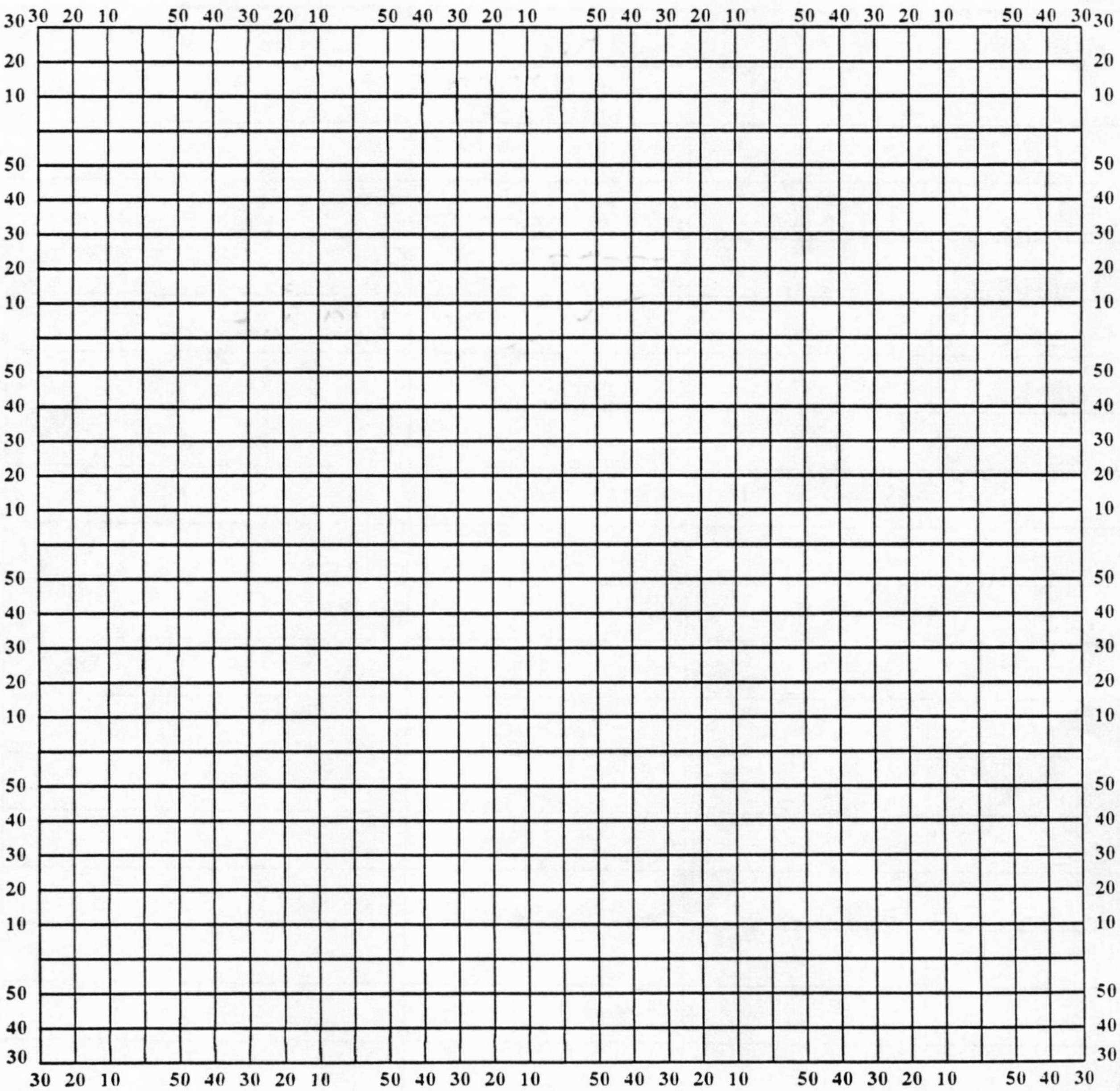

E. II. Actual Flight Pattern



**Hurricane Recco Plotting Chart**

True at 25° Latitude, in Degrees and Minutes of $\phi$ and $\lambda$.

Date________________ Longitude ________________ Observer ________________




Note: Label full degrees according to location of flight area.

Form E-2
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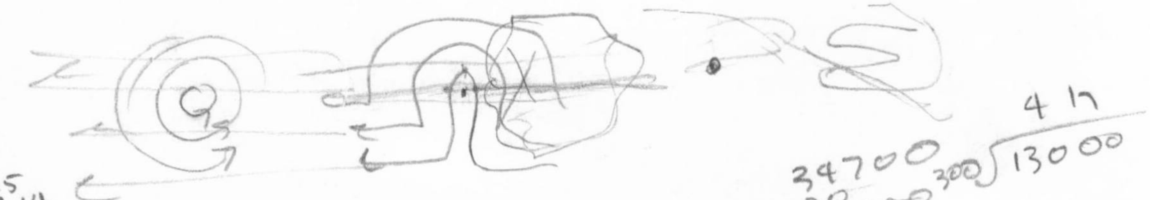


2850 295 @14
15 31 60KT
66-33 1008

34700 20000 300)13000 4h
7
15 3 45

## Lead Project Scientist Event Log

Date 10SEP94 Flight 940910I LPS WILLOUGHBY

| Time | Event | Position | Comments |
|---|---|---|---|
| 10/1819 | T/O | OPF | |
| ALTIMETER AND DISPLAY PROBLEMS ON FERRY TO IP | | | |
| 10/2109 | 19-32 68-08 | TURN SSE IP | |
| 10/2115 | 19 08 67-48 | DROP 1 | SIG LOSS AT 700mb OR SO |
| 2140 | 17-06 66-58 | DROP 2 | GOOD EXCEPT NO RH WINDS LOOK STRONG |
| 2204 | 15-28 65-58 | VISUAL SFC | TRAK S FLYING DOWN WAVE AXIS |
| 2222 | 14-00 66-22 | DROP 3 | RH BAD GOOD |
| 2245 | 12-03 67-03 | DROP 4 | GOOD BRIEF DROP OUT AT<700 mb |
| 2320 | 42 LOST | INE #1 | |
| 2357 | 15-33 71-57 | TURN E DROP 5 | GOOD PTH, LOST WIND @ 650 MB CAME BACK @ 750 |
| 11/0033 | 15-33 69-00 | DROP 6 | GOOD |
| 0057 | 15-36 66-52 | VISUAL SFC | |
| 0131 | 15-30 64-18 | DROP 7 | LOST WINDS BELOW 850 mb |
| 0153 | 15-36 62-32 | DROP 8 | BAD BELOW 819 MB |
| 0224 | 15-30 60-00 | TURN S TO BDOS | |
| 11/0307 | BDOS | LAND | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

10/2100
15.3N
65.8W
19
15-09
65 19

TRACK 060

**Hurricane Research Division**

AOML/NOAA
4301 Rickenbacker Causeway
Miami, FL 33149 USA

TEL: (305) 361-4407, FAX: (305) 361-4402
Internet:
WILLOUGHBY@OCEAN.AOML.ERL.GOV

15 September 1994

To: F. D. Marks

From: H. E. Willoughby

Subject: Flight 940910I (Debby)

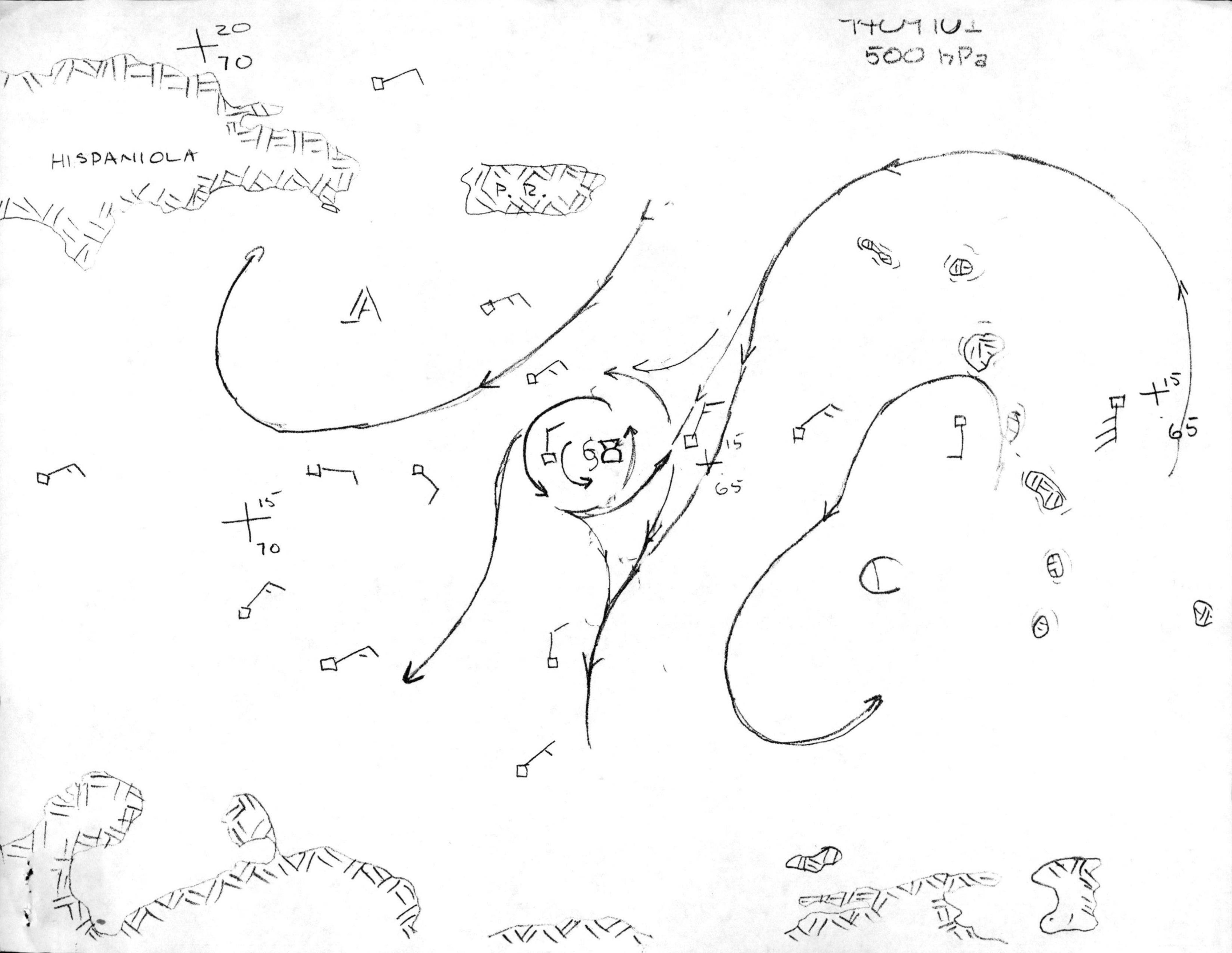
**Planning:** N43RF was the synoptic mapping aircraft for the Tropical Cyclogenesis Experiment (TCGX). The nominal mission involved flying a figure-4 centered on Tropical Storm Debby with 300 nmi radial legs oriented along cardinal compass directions at 500 hPa. We intended to deploy 8 dropsondes—at the midpoints and ends of the radial legs. Satellite imagery showed an exposed low–level center west of a mass of deep convection. We had an accurate forecast of the center's position and expected to be able to see the center if our flight track passed within 50–100 nmi of it.

**Operations:** N43RF departed Opa–Loca at 1819 UT on 10SEP94. We had an 800 nmi ferry to an initial point (IP) at 19.5N 68W. We reached the IP at 2109 and tracked south–southeast through the Mona Passage between Puerto Rico and Hispaniola toward the forecast center. Conditions at flight level were clear with widely scattered cumulonimbus and a broken stratocumulus undercast within 1–2 km of the surface. The wind was from the east–notheast at 7–10 m $s^{-1}$. By 2045 UT a mass of convection with abundant lightning appeared ahead and to the left of track. We altered course to pass near the convection. At 2204 we flew over a swirl in the stratocumulus that marked the low level center at 15.5N 66W. We continued south–southwest to 12N 67E in the same flight conditions with wind from the north at 5 m $s^{-1}$. From this southernmost point we flew northwestward along the diagonal of the figure four to 15.5N 72W, nominally due west of the center, and turned eastward. By this time it was dark. The flight–level wind had been from the northeast along the diagonal leg, as expected, but the winds veered to from the south–southeast along much of the approach to the center from the west. Near the center, the wind finally backed from the north. Although the moonlight was too dim the reveal the low–level center, frequent lightning flashes from the nearby convection enabled us to locate it at 0057 UT on 11SEP94 near 15.6N 66.9W. In the convection on the east side of the center, the wind first blew from the north, then shifted from the south. As we continued eastward, the flight–level wind veered, eventually blowing from the south at 10 m $s^{-1}$ by 0224 UT when we reached the end of the leg at 15.5N 60W. Despite the complicated shifting of the flight–level wind, dropsonde winds showed a broad cyclonic circulation at 700 hPa and below. N43RF recovered in Barbados at 0307 UT on 11SEP94.

**Interpretation:** The attached sketch summarizes these observations. The observations are consistent with a weak cyclonic circulation filling the Caribbean. Superimposed upon the circulation is a cyclone–anticyclone couplet with the cyclone east and south of the center of the broad circulation and the anticyclone north and west of the center. The cyclone appears stronger than the anticyclone because it rotates in the same sense as the larger circulation. Dropsonde data indicate that the couplet decreases in strength below flight level, which was essentially at 0 to −5 °C.

**Equipment:** Aircraft and instrumentation worked well. We had problems with AD conversion and displays dropping out early in the flight, but AOC engineers were able to effect repairs. Some bits on the PMS precipitation probe remained triggered, and the beginning of the cloud physics tape turned out to be ureadable. All of the eight dropsondes were deployed worked, but 5 lost some wind or humidity data before they splashed.

**Critique:** This mission showed that the exposed surface center is a reliable reference point that can be located visually if the aircraft is within a degree of latitude of its position in clear air at 500 hPa—but only in daylight, bright moonlight, or if there is a lot of lightning. The center's association with a prominent cumulonimbus complex can be a help. The north, south, and west legs were essential to delimiting the cyclone anticyclone couplet, but much of the interesting dynamics appeared to be in the southeast quadrant. If we had not used so much range in the ferry from Miami, a better flight plan would have been: initial north–south leg, diagonal leg to *east* of the center, east to west across the center, then a shorter diagonal to northwest of the center, and finally northwest to southeast across the center to Barbados.


500 hPa
HISPANIOLA
P. R.
A
C
20
70
15
65
15
65
15
70