FLT ID: 970719I	FM: MCF	TO: OFF TIBB
FLT NO: 97-22	BLK IN: 1536 / 2328	ATA: 1534 / 2325
ETD: 1430Z	BLK OUT: 1427 / 1651	ATD: 1442 / 1657
ETE: ?	BLK TIME: 1:09 (1.1) / 6:37 (6.6)	FLT TIME: 0:52 / 6:28
SPONSOR ORG: HRD	PROGRAM: RESEARCH TDS	PURPOSE: Deploy

ORD PERSONNEL

AC KENNEDY ✓	SYS ENG LYNCH ✓
CP OMAAA ✓	DATA SYS DELGADO ✓
NAV KOZAK ✓	RADAR
FE MOORE / WADE ✓	BT/ODW McNAMARA ✓
RADIO SADS SOUCI ✓	~~CLD PHYS~~ KROLL ✓
FD PARADISI ✓	~~DOPPLER~~ CLOSSER

PARTICIPATING SCIENTIST/VISITORS/ORD

LAST, FIRST NAME	ACTIVITY ON A/C	AFFILIATION
~~LYNCH~~, T. CIONE, J. * ✓		HRD
~~MCNAMARA~~, P. ACASOR, P. ✓		↓
LEIGHTON, P. * ✓		
Black, P. * ✓		
Black, M. * ✓		
Bracken, E. * ✓		

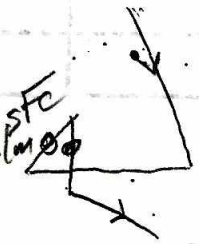
PROPOSED/ACTUAL MISSION/REMARKS (RECCO, FIXES, STORM, PENET, NHOP #)

Sfc 1016 25 55 80 17 OFF T.O. S/W not working.
Fm 1.5K 13 04 59 39 TIBB

300f OFF
1016.5
50/4 LAND
10.5.4
Ps 1017.5

0°C at 575 mb.

Something wrong with Vortex Program wind direction on pattern climbout.



Low level pattern

TO OFF Sfc 1017.9
3002 Fm 2.7K.
100/10 Sfc 1018.2
30.4 Fm 5K
28.
1016.1
120
10:5.8
Fm. 2K

LAND
SP 1014.4 Fm 1.5K
070/5 40/10
1010.5 land Ps
27/24
1016

Sfc 1014.7
Fm. 2K
Sfc 1014.3
Fm. 8K

970719I N43RF T.D.5 HRD RESEARCH

Sensor or system	Number or Name
INE	2
Accelerometer	2
Temperature Probe	2
Dew Point Probe	1
Altimeter	APN-159
Altitude change option (for vertical winds)	RA
Static Pressure	Rosemount Fuselage
Dynamic Pressure	Rosemount Fuselage
Time Source	Micro 99
Constants File	CO3972.CON

Notes:

INE 2 positions were corrected periodically with good GPS positions. No corrections were made to groundspeeds.

The APN-159 radar altimeter was corrected at take off and landing by substituting offset APN-232 values.

PQF2 was about 14-15 mb low for the whole flight. Do not use. PQF1 was used for all dynamic pressure calculations.

Special note. Locations 80, 81 and 82 of the Type 5 record on the Standard Tape contain vertical groundspeed, vertical airspeed and vertical wind, respectively, computed using Dave Jorgensen's vertical wind algorithm. It is recommended that these values be used for vertical wind analysis.

Jack Parrish, Flight Director

NOAA FORM 59-4
(2-72)

2330 ETA 23 cold 100/10
69 low 3002

970719I FERAY/MISSION TD 5

Time	LAT	LON	TK	WD	WS	Pa	GA	TA	TD	SF	FS	
1429	2730.9	8229.6						27.7	24.3		1015.6	13LK MAF
144415	2753.3	8223.6	78	236	10.7	492	544	24.5	21.1	1006.7	943	↑
144930	27 38	82 18	196	249	13	1660	1263	16.7	12.4	1014.8	817.1	↑
145630	27 14	82 18.6	147	252	9.7	3377	3570	5.9	3.1	1015.7	671.0	—
152230	26 21.2	81 27.3	114	295	6.1	3338	3537	6.4	-1.1	1016.2	671.5	
151845	26 08.4	81 03.0	123	316	5.7	1806	1926	16.1	9.5	1016.4	814.3	-6K
152430	25 58.8	80 44.0	116	31	4.8	585	633	24.1	21.3	1015.1	946.5	-21K
1651	25 54.6	80 16.4				-23		31.4	23.3		1016.1	13LK
1658	25 54.9	80 12.3	88	99	7	378	429	25.5	21.0	1016.4	954.0	↑ thru 1500 ft
170830	25 49.1	79 30.6	112	332	8.2	3554	3790	5.1	0.7	1015.5	647.0	↑
1722	25 23.6	78 35	119	244	2.6	6160	6533	-9.2	-15.7	1008.8	459.4	↑
173545	24 48	77 35.6	117	208	4.5	6432	6814	-11.4	-17.4	1009.8	444.6	—
175645	23 55	75 56	121	349	.7	6429	6809	-12.2	-14.2	1010.6	444.7	
181530	23 09.6	74 27.5	119	52	10.1	6426	6809	-12.3	-19.0	1013.1	444.9	
1830	22 36	73 20	118	93	6.7	6424	6805	-12.5	-24.8	1013.6	444.9	
1845	22 00.5	72 09.8	118	180	4.5	6423	6811	-13.1	-26.4	1016.3	445.1	
190030	21 21.3	70 58.3	124	216	6.8	6422	6813	-12.3	-26.3	1014.5	445.1	
1931	19 57.6	68 45.1	125	235	5	6435	6825	-12.0	-30.0	1013.7	444.4	
1945	19 17.8	67 43.2	125	211	11.3	6435	6827	-11.8	-29.0	1013.0	444.4	
200015	19 01	66 26	97	154	9.6	6435	6832	-11.4	-21.1	1011.5	444.5	
2010	18 51	65 36										↓ to 5K
20216			START A RT									
2030	18 30.6	64 12.3										
203830	18 03	63 55	150	89	22	1525	1632	17.7	15.4	1016.2	843	
204745	17 36	63 37	150	90	14.5	1524	1631	17.2	15.0	1016.5	842.9	
210215	16 51	63 10	Turn to 265°									
211245	16 47	63 54	261	117	12.5	1525	1626	18.0	14.3	1015.5	843	
212135	16 40.4	64 30	145	14	—	1525	1623	18.3	14.2	1014.7	842.8	
213100	16 36	65 08	266	162	16	1522	1616	18.5	15.6	1014.4	843.	
213545	16 36	65 27										
2143	17 00	65 16	Turn on	D S	ide							
214515	16 53	65 18	174	140	10.5	1523	1618	18.6	14.1	1014.2	843.4	
215230	16 32	65 06	121	137	7.6	1522	1619	17.4	17.1	1015.2	843.4	
220130	16 15	64 36.	122	77	8.9	1522	1622	17.7	15.0	1015.4	843.3	
220330	16 11.3	64 29.4	↑ to BARBADOS									
2231	14 42	63 17	113	53	12.3	7049	7479	-13.9	-18.5	1005.4	407.9	-23K
224730	14 09.6	61 59.3	112	168	14.8	7049	7477	-15.2	-21.0	1009.5	407.8	
230145	13 41.6	60 51.8	113	151	22	7049	7477	-15.2	-25.9	1009.9	407.8	
2310	13 24	60 14	↓ to land			Adams						
2328	13 04.6	59 29.4				34		28.8	24.8		1009.2	15K

Start 165131Z 970719I TD 05 OFF → TBBB
End 232800Z

			IDE2	REDAV
165700	-0.9	⊖ +0.2	54.8	16.1
173700	+0.2	0.0	44.8	29.3
181700	-1.4	⊕ -0.5	05.8	21.3
185630	+0.2	⊖ +0.2	31.9	16.9
193630	-1.1	⊕ -0.8	41.6	20.8
201730	-1.2	⊖ +0.2	47.1	57.1
205700	-0.5	⊕ -1.1	07.1	18.9
213700	-0.4	⊕ -0.4	40.0	24.8
221700	-1.1	⊕ -0.6	16.0	14.2
225500	+0.3	⊕ -0.7	54.5	23.4
(11) 232800	-08	⊕ -0.6	04.6	29.4

Renamed IDE2 From QFF.

Sporatic performance of RVR 232 due to proximity to 42.

PQF2 reads ~ -14.5 mb low during entire flight.

Patched RVR 159 at start, end with RVR 232.

The WSR-88D radars operate from fixed locations, allowing the use of algorithms that calculate a number of quantitative indices, shears, gradients, rotational velocities, and other useful quantities to help nowcasters evaluate and issue warnings on potentially dangerous rainbands. While much is made of these values in the studies of TC rainband severe weather, they are not available in real time to AOC flight crews and need not be cited here. Correlation of mesocyclones in the vertical occurred far less often than in organized midwest thunderstorms, attributed to a combination of the rainband cell's small size and shear in the horizontal wind with altitude. These factors undoubtedly help explain why there are relatively few tornadoes in TC rainbands, and why the tornadoes that do form are relatively weak.

3. Flight considerations

The insight gained from these WSR-88D studies, in almost all cases, reinforces the approach AOC flight crews have taken from the beginning in attempting the overland modules in tropical cyclones. These studies highlight the following items regarding aircraft studies near TC rainbands over land.

1. Virtually all of the loss of control incidents attributed to severe weather have occurred at or below 5,000 feet (1.5 km) in the last four decades, and if there is a greater likelihood of severe weather over land than in ocean borne cyclones, higher altitude is usually safer. For example, if the smallest measured mesocyclones with the highest shear were encountered at P-3 airspeeds, the expected horizontal shear would be about 7.5 knots/second (3.9 m/s) (these shear values must be used carefully, though, as the WSR-88D beam width and pixel resolution will not capture all of the fine scale turbulence and shear in a rainband mesocyclone). On the other hand, if an average size F2 tornado was penetrated, with a diameter of about 400 m and tangential wind speed of 135 knots, the shear could be as high as 150 knots/second (77.5 m/s).

2. All of the tornado-spawning rainband regions were highly cellular, and manifested high radar reflectivity values, at least at low levels. Since we often see about a 10 dBZ dropoff in reflectivity at and slightly above the melting level (about 15,000 feet, or 4.6 km), use great caution near cells depicting 45 dBZ or greater on the nose radar at these altitudes. If possible when crossing the rainbands, scan the highest reflectivity areas with lower tilts to obtain the low level structure and dBZ values.

3. Outer bands well away from the storm center are often in a transitional thermodynamic and dynamic environment, and can have growth characteristics not possible in the strongly sheared, neutrally buoyant environment well within the TC envelope. These bands are frequently very cellular, have precipitation tops higher than those near the center, and at times resemble squall lines much more than bands closer to the center. Never underestimate a rainband's intensity simply because the eye is far off in the distance.

4. Use the subjective tools radar observers have relied upon long before there were doppler measurements. Various curved features, most often noted at the downwind end of high reflectivity cells and the end of bands, are certainly not always indicative of tornadoes, but why take the chance...they sure might be.

DATE : 19 July 1997

TO : Chief, AOC Flight Operations

FROM : Pilot/Flight Director, Aircraft N43RF ON 2328Z BLOCKTIME
OFF 1651Z 6.6

SUBJECT: Hazardous Duty

PURPOSE OF FLIGHT: T.D. #5 Cyclogenesis Research (HRD)

Hazardous Duty Pay is required for flight made on 19 July 1997
(DATE)

Request based on penetration of tropical cyclone convective rainbands.

Personnel on board authorized Hazard Pay:

Moore, H.	
Wade, S.	
Sans Souci, D.	
Clasen, G.	
Parrish, J.	
Lynch, T.	
Delgado, J.	
McDamara, A.	

PILOT/FLIGHT DIRECTOR: John A Parrish

APPROVED: _____ DISAPPROVED: _____

CHIEF, AOC FLIGHT OPERATIONS: _____

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Rockville, MD 20852-3019

OFFICE OF NOAA CORPS OPERATIONS
Aircraft Operations Center
P.O. Box 6829
Tampa, Florida 33608-0829

MEMORANDUM FOR: Dr. Hugh Willoughby, NOAA
Director, HRD, AOML

FROM: CAPT George C. Player III, NOAA
Acting Director, Aircraft Operations Center

SUBJECT: Hazard Duty Flight

The mission flown on AOC aircraft # N43RF on 19 July 97 has been declared hazardous. The following personnel from you laboratory participated in this mission.

Black, P. Bracken, E.
Black, M.
Leighton, P. Cione, J.

For purposes of computing allowable hazard duty time, the hazard period during this mission was from 1251 local time on 19 July until 1928 on 19 July.

NOAA • AOC • SED

N43RF DROP STATION LOG

Project: Hurricane '97 Mission: HURR97 → FERRY Flight ID: 970719I

Take Off: 14:42/16:56 Landing: 15:33/23:25

Drop #	Sonde Serial #	Rcvr #	Press Offset	Launch Time	Operator	Sonde OK	Comments
1	SOUND1	ch ~~405.27~~ at 405.42	-0.3	2037 Z	DELGADO	NOTE1	TRASMITTED FROM SOUND DROPPED FROM N42RF
2	SOUND2	ch 1 at 405.42	-0.4	21·	"	NOTE2	ABORTED BY N43RF
3	SOUND3	~~405.27~~	-0.5	2143		NOTE 3	
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26	NOTE 1: BAD AIR TEMP & NO WINDS. ELSE OK.						
27	NOTE 2: ABORTED TO AVOID INTERF. TO N43RF. NEED COORDN. ON SETS;						
28	NOTE 3: N42RF CALLED 405.27 MHz, (S.N 9701S0200 DROP 3)						
29	AVAPS HAS NO FINE TUNNING and 405.26 MHz WAS NOT GOOD ENOUGH.						
30							
31							
32							
33							
34							
35							

N43RF RECEIVING SIGNALS FROM SOUND DROPS FROM N42RF'

SOUND USED S.N. 9650402500

D SOUND 2036:01.1

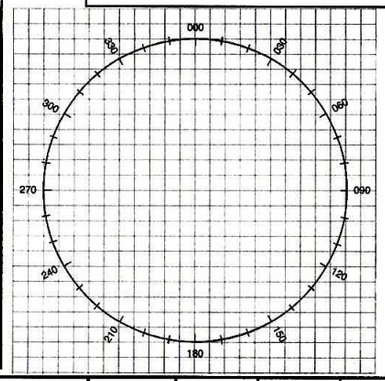
TEST SOUND S.N 9650402 50

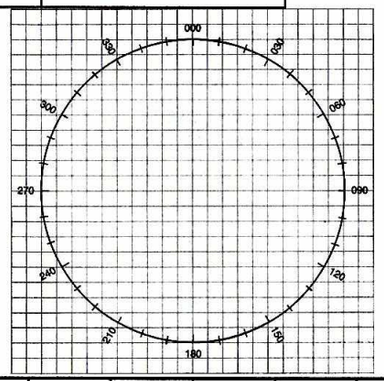
D

1930

CLEARANCES			
FREQ	ALT	HDG	OTHER

MISSION LOG | **PAGE ___ OF ___**





POSITION REPORT

1. POSITION
2. TIME
3. ALTITUDE
4. NEXT POSITION
5. ETA
6. NEXT POSITION

EMERGENCY MESSAGE

TRANSMIT THE FOLLOWING MESSAGE TO ANY AGENCY ON THE AIR-GROUND FREQUENCY IN USE. IF UNABLE TO ESTABLISH COMMS, ATTEMPT CONTACT ON ANY OF THE FOLLOWING EMERGENCY FREQUENCIES:

UHF/VOICE	VHF/VOICE	MF/VOICE	HF/CW	MF/CW
243.0	121.5	2182 KHZ	8364 KHZ	500 KHZ

MAYDAY, MAYDAY, MAYDAY
THIS IS NOAA _____, NOAA _____, NOAA _____

- POSITION _____ N / S
  _____ E / W AT _____ Z
- HEADING _____ TRUE/MAG
- AT _____ KTS TRUE/INDICATED
- FLIGHT LEVEL OR ALTITUDE _____
- WE ARE A P-3 AIRCRAFT WITH _____ SOULS ON BOARD
- NATURE OF EMERGENCY
- ASSISTANCE DESIRED
- PILOT INTENTIONS
- WE HAVE _____ ENDURANCE REMAINING

TIME	FIX TYPE	POSITION	INS 1 POSITION	K ERR	INS 2 POSITION	K ERR	MH	VAR +E==>	TH	DR +R==>	TRK	GS	WD	WS	ALT	TAS	NEXT PT	DIST	TIME	ETA	REMARKS
1423	VIS	2750.9N 8229.5W	✓		✓																Enb/Checks
1429																					Taxi
1440																					Takeoff
1453	GPS	2725.6N 8220.9W	2725.4N 8221.0W	+.2 -.1	2725.5N 8220.9W	+.1 0			160	3L	177	248	251	8	10K	244					climb out
1534	LAND	OFF			80																
1536	VIS	2554.7N 8016.5W	2554.8N 8017.4W	+.5 -.9	2555.2N 8016.9W	-.5 -.4															checks off
1647	VIS	2554.6N 8016.4W	2554.0N 8018.0W	+.6 -1.6	2555.5N 8016.4W	-.9 0															Enb checks
1651	TAXI	OFF																			
1657	TAKEOFF	OFF																			
1804	GPS	2337.7N 7523.4W	2337.4N 7525.7W	+.3 -2.3	2338.9N 7522.9W	-.8 +.5			182	1L	181	295	70	2	21D	297					GPSD
1911	GPS	2052.6N 7012.2W	2052.6N 7015.0W	0 +2.8	2052.8N 7011.9W	-.2 +.3			126	2L	124	297	164	6	21D	309					GPSD
2244	GPS	1415.8N 6214.7W	1414.2N 6220.4W		1415.5N 6214.0W				115	3L	112	298	164	12	230	306					GPSD
2325	LAND	BARBADOS																			
2327	VIS	13 04.6N 59 29.4W	1305.2N 5934.7W	+.6 -5.3	1305.4N 5928.8W	-.8 +.6															checks

NOAA FORM 56-49
(2-95)

MISSION PREFLIGHT LOG

DESTINATION	MISSION	NAVIGATOR	AIRCRAFT COMMANDER	FLIGHT DIRECTOR	SCHEDULED / ACTUAL TAKEOFF Z	DATE OF TAKEOFF
MCF→OPF-TPPB	97-22	Kozak	Kennedy	Parrish	1430	97-07-14

1 40/66

WP	LAT / LON	RTE	MH	VAR +E==>	TH	DR +R==>	TRK	GS	WD	WS	ALT	TAS	LEG / TOT DIST	LEG / TOT TIME	PROP ETA	ETA	ATA	REMARKS
1	2558.5N 7923.05W	BETA						250					50 / 50	+12 / +12				
2	2501.7N 7727.0W	ZOA						280					119 / 169	+26 / +38				
3		IMOKE						300					203 / 372	+40 / 1+18	1817	1816		
4	2126.1N 7108.1	GOK											208 / 580	+43 / 2+01	1900	1859		
5	2031.3N 6937.9W	Godi											101 / 681	+20 / 2+21	1920			
6	1915.6N 6738.4W	IDXO											136 / 817	+25 / 2+46				
7	1826.8N 6559.4W	SJU											106 / 923	+21 / 3+09				
8	1821.4N 6501.5W	STT											55 / 978	+11 / 3+20				
9	1844N 6420W	ANEGADA						↓					45 / 1023	+09 / 3+29		1925		
1.	1652N 6308W	PTB						280					131	+24				
2	1704N 6400W																	
3	1801N 6152.9W	TORTOLA																
4	1707.6N 6147.9W	BIRD																
5	1304.1N 5929.1W	ANCHS																

INS PERFORMANCE

	INS 1	INS 2
BEGIN ALIGN TIME	1315	1315
ALIGN STATUS (0-5)	1	1
END NAV TIME	2329	2329
START NAV TIME	1423	1423
DELTA T	9+06	9+06

TERMINAL ERRORS

	INS 1	INS 2
DELTA LAT	+.6	-.8
DELTA LON	-5.3	+.6
RGS	8	~~4~~
RADIAL ERROR	5 ~~0~~	1.

REMARKS

mia 8
2.000
12.6 5.7.7