19930828I1-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 AOC 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 AOC 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 AOC flight director that satellite data link is operative (information).

X 2. Confirm camera mode of operation. — not applicable

✓ 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 AOC flight director.]

✓ 4. Obtain a copy of the 10-s flight listing from the AOC flight director. Turn in with completed forms.

✓ 5. Determine next mission status, if any, and brief crews as necessary.

✓ 6. 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
Page 1 of 5

On-Board Lead Project Scientist Check List

Date 28 August 1993 Aircraft NOAA43 Flight ID 930828I

A. Participants

HRD Function	HRD Participant	OAO Function	OAO Participant
Lead Proj. Sci.	BURPEE	Flight Director	BOGERT
Cloud Physics		Pilots	McKim, PHILLIPSBORN
Radar	MARKS	Navigator	ROTHBUN, NOZAK
Workstation	GRIFFIN	Sys. Engr.	GOLDSTEIN
Photographer		Data Tech.	LYNCH
Omegasonde	FRANKLIM	El. Tech.	PRADAS
AXBT/AXCP		Other	

Take-Off 180437Z Location BERMUDA Landing 0001 Z Location Bermuda

B. Past and Forecast Storm Locations

	Date/Time	Latitude	Longitude	MSLP	Max. Wind
initial	28/1500 Z	27.6 N	67.5 W	981 mb	70 kts
	29/0000 Z	28.2 N	68.7 W		80 kts
	29/1200 Z	28.8 N	70.3 W		90 kts

C. Mission Briefing

Coordinated vortex interaction experiment in Hurricane Emily with NOAA42 - NOAA43 is the high plane and is scheduled to begin the pattern 160 nm to the north of Emily's center, 42 begins pattern 50 nm to the west of the storm center

D. Equipment Status

Equipment	Pre-Flight	In-Flight	Post-Flight
Aircraft	✓	✓	✓
Radar/LF	✓	✓	✓
Radar/TA (Doppler)	✓	✓	✓
Cloud physics	precip ✓ cloud ?	no change	no change
Data system	✓	✓	✓
Omegasondes	✓	as reported	Al Goldstein will try to improve.
AXBT/AXCP	NA	NA	NA
Workstation	✓	✓	✓
Photography	Not available side or nose	NA	NA

REMARKS: tentative initial point 160 nm north of storm 30°50'N, 67°36'W

1703Z 27°54'N 67°33'W Air Force fix
979 mb 88 kts N quadrant

1830Z 28°02'N 67°42'N 42's radar fix, 42 Doppler not working

Omega signals weak - compared with 42's - some on 42 stronger, some weaker

start pattern at #1 184818Z

first ODW - no Omega dropped LOD2

second ODW - also no Omega - backed up with channel 2

in general ODWs did not work well, James decided to abort the pattern, 42 ~~restored~~ Doppler was fixed, 43 continued pattern to point #11 because of the possibility of a double eyewall seen on first figure four - the pattern was coordinated with 42 from #1 to #3 and from #8 to #11, but 42 did not have Doppler from #1 to #3.

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

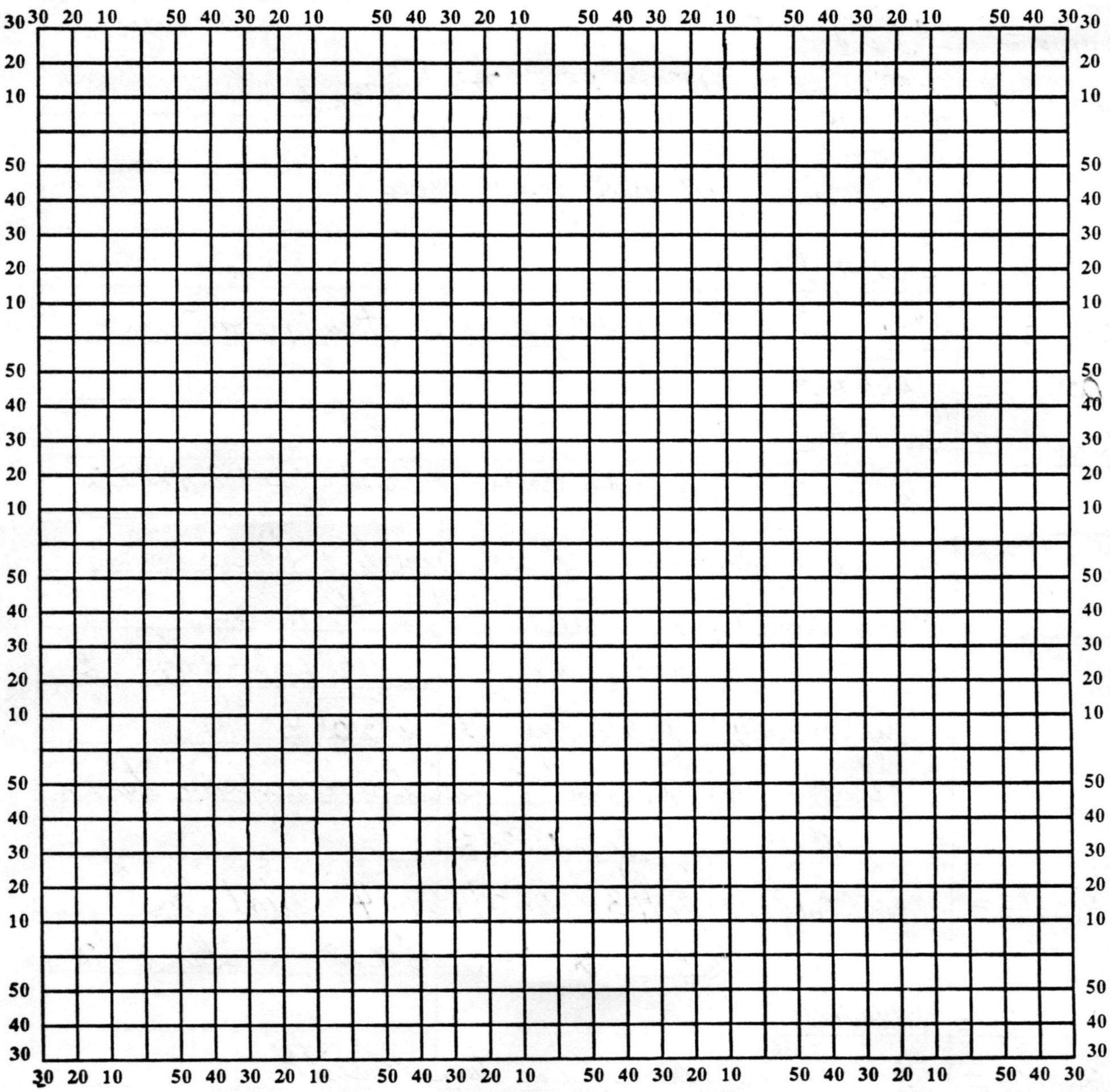
pattern flown as in the book from #1 to #11

E. II. Actual Flight Pattern

Hurricane Recco Plotting Chart

True at 25° Latitude, in Degrees and Minutes

Date ______________ Aircraft ______________ Observer ______________



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

Lead Project Scientist Event Log

Date 28 August 1993 Flight 930828I LPS Burpee

Time	Event	Position	Comments
184818 Z	start pattern at point 1		42 Doppler system down
192145 Z	center of eye off to left	192048 28°05 67°45W from 42	975 mb
193445 Z	point #3		
	Frank Marks reports double eyewall cycle		
194700 Z	point #4		
2000 Z	wind center tilts	to the north from center at surface to 500 mb	
200850 Z	point #5		
214100 Z	point #6		
212000 Z	point #7	two sondes dropped,	channel 1 ODW and LOD2
	no more drops	because of poor quality of Omega	
	also workstation	unable to talk with ASDL	
	2129 Z	28°22'N 68°01W from 42	85 kts 975 mb
	Doppler system	on 42 back up	~ 2100 Z
	slowed down	for about 3 minutes	to improve timing
	with 42	ending at ~ 2139 Z	
215445 Z	center of eye	for 43 28°29'N 67 54'	flight level
	surface	2153Z 28°24'N 6	8°00'W from 42
210330 Z	point #9		
221400 Z	ahead of 42,	begin 4 min turn	to right
222340 Z	point #10		
223310 Z	wind center	28° 33'N 68 02W	

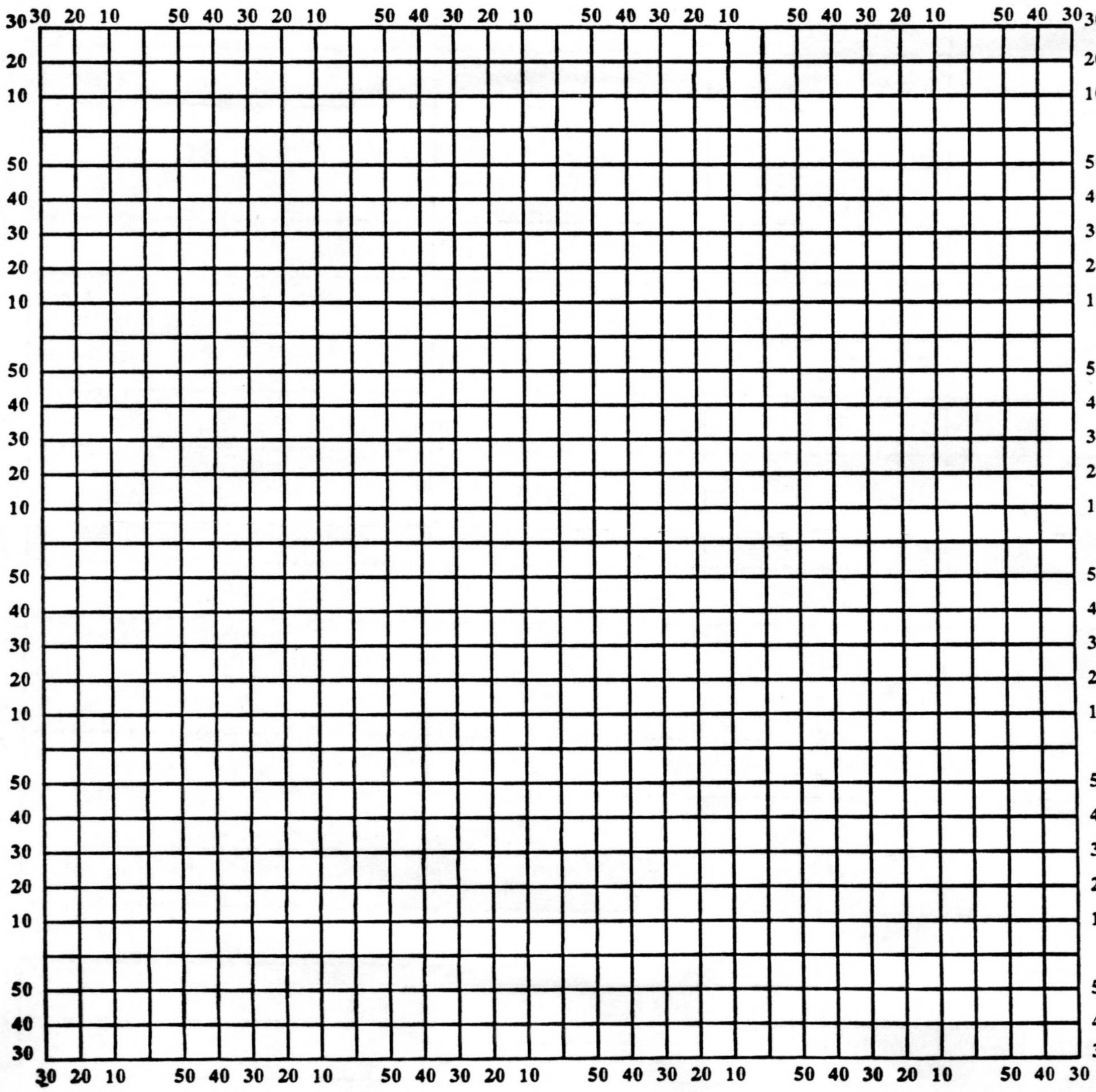
42 2234Z - 28° 35N 68° 08W 976 mb

224633 Z point #11 end of abbreviated pattern - head for Bermuda
the pattern was successfully completed from points #1 to #11
with #1 on the north side of the storm.

Hurricane Recco Plotting Chart

True at 25° Latitude, in Degrees and Minutes

Date ______________ Aircraft ______________ Observer ______________



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

Form E-2

Lead Project Scientist Event Log

Date ____________________ Flight ____________________ LPS ____________________

Time	Event	Position	Comments

SECONDARY (LOWER) FLIGHT PATTERN

Navigation points:

Segment	Dist (nm)	GS (kt)	Seg/Tot Time (h:mm)	
-1			/ 0:00	
1-2	80	250	0:19 / 0:19	
2-3	56	290	0:12 / 0:31	
3-4	80	250	0:19 / 0:50	
4-5	22	290	0:05 / 0:55	
5-6	80	250	0:19 / 1:14	
6-7	56	290	0:12 / 1:26	
7-8	80	250	0:19 / 1:45	
8-9	56	290	0:12 / 1:57	(Delay ~20 m until upper A/C reaches pt. 8)
9-10	80	250	0:19 / 2:36	
10-11	56	290	0:12 / 2:48	
11-12	80	250	0:19 / 3:07	
12-13	22	290	0:05 / 3:12	
13-14	80	250	0:19 / 3:31	
14-15	56	290	0:12 / 3:43	
15-16	80	250	0:19 / 4:02	
16-17	56	290	0:12 / 4:14	(Delay ~20 m until upper A/C reaches pt. 14)
17-18	80	250	0:19 / 4:53	
18-19	56	290	0:12 / 5:05	
19-20	80	250	0:19 / 5:24	

Note: Lower aircraft begins its pattern (point 1) when upper aircraft reaches its point 2.

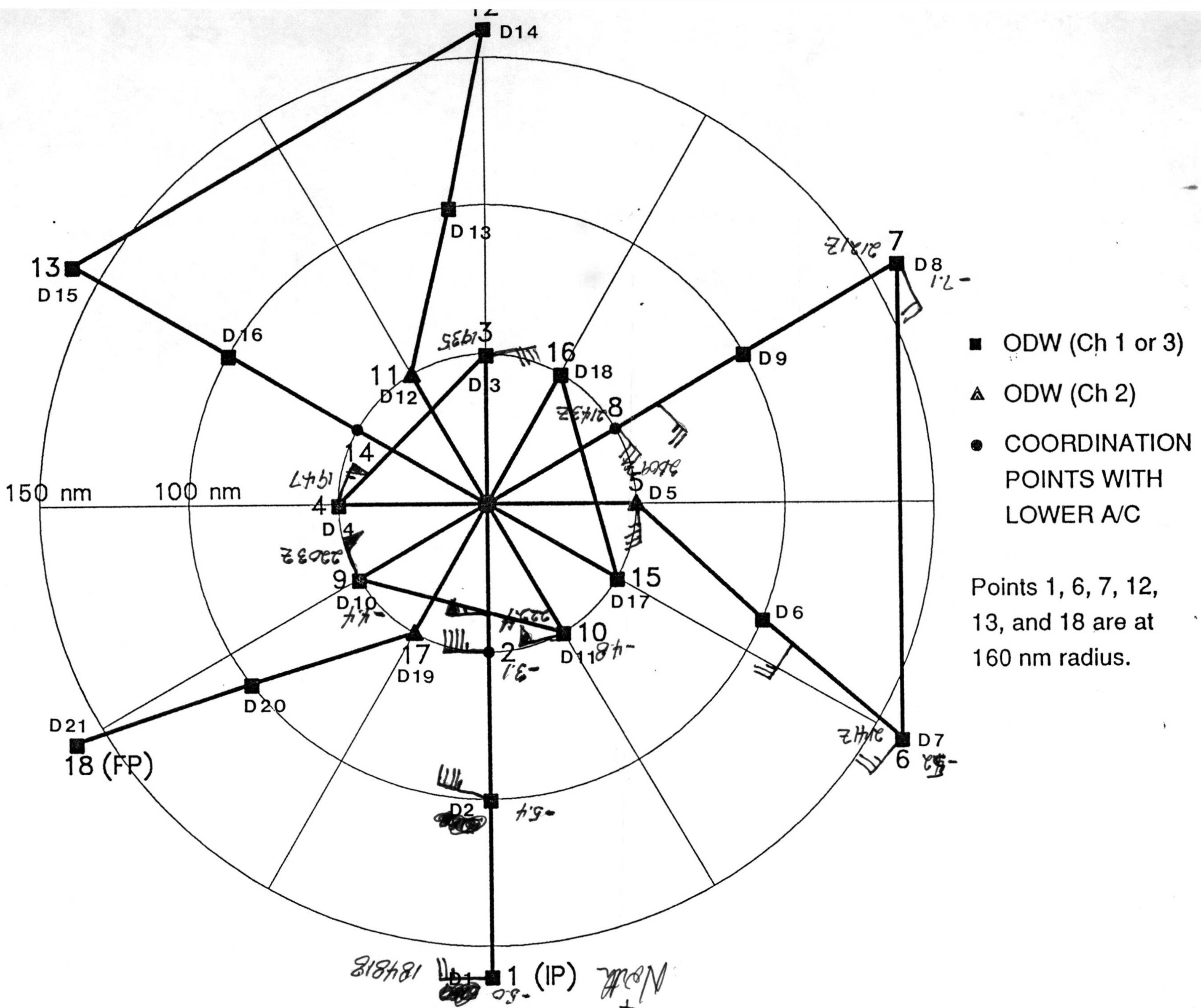


Fig. 1. Primary (Upper) Flight Pattern

Emily 9308281

Mission Summary

930828I Aircraft 43RF

Scientific Crew (43RF)	
Chief Scientist	Burpee
Doppler Scientist	Marks
Cloud Physics	
Omega-dropwindsonde	Franklin
Work-station	Griffin

Mission Briefing:

Vortex Interaction experiment, 42RF at 5000' doing Doppler pattern, and 43RF as high as possible doing ODW pattern. Both aircraft take off from Bermuda at 1800Z, 42RF set to return to MIA, and 43RF returns to Bermuda. Coordinate with AF aircraft so that 42RF will give center pressures to the AF in exchange for them not dropping sondes from 10 kft. NHC requests that 42RF get a 2100Z fix.

Mission Synopsis:

Took off from Bermuda at 1800Z. 43RF starts pattern 160 nm N of center, while 42RF starts 40 nm W of center. 43RF at their IP 160 nm at 1856Z. The first ODW failed and 42RF reports radar problems again. 43RF reached 50 nm radius at 1919Z and 42RF point 40 nm W of center, starting coordinated fig 4. 42RF fixed the center at 1921Z and then headed for area outside the eye NE of the center to fix radar. 43RF continued pattern to W after cordinated fig 4 trying to get good ODWs. 43RF didn't get PMS data on first leg because I forgot to have the operator start it up.

On the first coordinated pattern storm looked like it might have double eyewall structure so we starting thinking about options if ODWs kept failing and 42RF TA radar didn't work. Decided to make decision point the same as the one we used the day before, the beginning of the second coordinated fig 4 pattern. Meanwhile, Joe Griffin completed a radar composite and sent it over ASDL after a little glitch in the ASDL computer was repaired. James decided that the ODW failures had compromised the mission as far as he was concerned and that we should investigate options if 42RF TA came back up. James suggested attempting ODW/LOD2 intercomparison to SW of center on final turn before fig 4 (2121Z). Also set up monitoring of omega signal on both aircraft to try to resolve the problem.

42RF TA radar repaired at 2115Z and they do fix at 2129Z on their way to the coordination point 40 nm NW of center. John Gamache suggests we do at least one coordinated fig. 4 together with both TA radars working. Start coordinated pattern at 2152Z, 43RF tracking 050° and 42RF tracking 140°. Center appears to have tilt from NW to SE with increasing altitude. No longer and indication of double eyewall, although eyewall has radar echo only on N semicircle. Radar eye appears to have contracted, with intense cells in NE corner, extending downwind. Finished coordinated pattern at 2248Z, 43RF SSE of the center and 42RF WSW of center. 42RF climbed to 18 kft after fixing the center to drop ODW as a test of signal strength. At 2249Z 42RF departed for MIA and 43RF headed for Bermuda.

James compared omega signals with 42RF during ferry. 43RF transmitted a second LF composite just before landing. 43RF landed in Bermuda at 0000Z.

Evaluation:

Similar problems to those experienced the day before. 43RF had many problems with the ODWs, while 42RF had no TA radar until the start of the second coordinated fig 4. 43RF completed almost half the pattern (to the end of the second coordinated Fig 4), while 42RF made one pass at 5000' then loitered NE of center to repair the radar.

42RF managed to get the TA radar repaired around 2110 UTC and fixed the center at 2130Z. Starting at 2200Z we did the coordinated fig 4 with both TA Dopplers for 3-D mapping. 43RF also managed to get an ODW/LOD2 intercomparison at the last drop SW of center. Mission was a marginal success. One lesson that was learned was that the Vortex-interaction experiment is very susceptible to failure if only a few drops are compromised. We need to re-evaluate the plan to build in better flexibility.

Two LF composites transmitted via ASDL to NHC, and the EVTD looked real interesting (shallow circulation with hint of double wind maxima in earliest time period). Coordinated Fig 4 should help John Gamache evaluate the GPS effects on Doppler analysis. ODW/LOD2 intercomparison should be useful to James Franklin.

Problems:

1. 42RF TA radar problems for the first 1.5 h of mission. Jim Roles got it working in time for last coordinated fig 4 pattern. If we hadn't cancelled the mission we could have continued to use the radar system.

2. 43RF had numerous ODW failures, compromising the flight. Dropped 9 sondes and 6 were failures. The main culprit appears to be weak omega signals being received on 43RF. During the mission we monitored the omega signal on both aircraft for 1.5 h and 42RF did a test drop to see if the signal strength was the problem or it was the 43RF receiver. Evaluation of the signal test suggests the problem is on 43RF. Interesting sidelight is that the LOD2/ODW intercomparison worked well till the ODW lost signal near 850 mb, while the LOD2 continued to report omega winds. Al Goldstein is working to try to trouble shoot ODW system by next mission.

Frank Marks

Hurricane Research Division

LEAD PROJECT SCIENTIST CHECKLIST

Date: 930828I

Aircraft IDs: 42RF, 43RF

Proposed Takeoff Time: 1800 Z

Base of Operations: Bermuda

Primary Mission: Vortex Interaction

Alternate Mission:

Scientific Crew:

	42RF	43RF
Ch. Scientist:	Gamache	Burpee
Doppler Sci.:	M. Black	Marks
Doppler Op:	DeMaria	
Cloud Phys:		
Others:	Paylor (UMASS)	Franklin (ODW)
Others:		Griffin (workstation)
Others:		
Others:		
Others:		

Mission Briefing (including proposed flight pattern numbers):

Vortex Interaction experiment, 42RF at 5000' doing Doppler pattern, and 43RF as high as possible doing ODW pattern. Similar problems to yesterday, 43RF had many problems with the ODWs, while 42RF had no TA radar until the second coordinated fig 4. 43RF completed almost half the pattern (to the end of the second coordinated Fig 4), while 42RF made one pass at 5000' tehn loitered NE of center to repair the radar. 42RF got the radar repaired around 2110 UTC and fixed the center at 2130. starting at 2200 we did the coordinated fig 4 with both TA Dopplers for 3-D mapping. 43RF also managed to get an ODW/LOD2 intercomparison at the last drop SW of center. Marginal success - Vortex-interaction is very susceptible to failure if only a few drops are compromised. Need to re-evaluate plan to build in better flexibility. 2 LF composites transmitted and EVTD looked real interesting. Coordinated Fig 4 should help John evaluate the GPS effects on Doppler analysis. ODW/LOD2 intercomparison should be useful to James.

SIGNATURE Frank Marks

Hurricane Research Division
LEAD PROJECT SCIENTIST CHECKLIST

Flight Number: 930828I

Date: 28 Aug. 1993 Aircraft ID: 43RF

Proposed Takeoff Time: 1800 UTC Base of Operations: Bermuda

Primary Mission: Vortex Interaction Alternate Mission:

Flight Crew:

Scientific Crew *AOC Crew*

Designated Ch. Sci: Franklin Flight Director: Bogert

LPS: Burpee AC Commander: McKim

Omeg-Dropwindsonde: Franklin Pilot: Philipsborn

Doppler Sci.: Marks Data Tech: Lynch/Prada/ McMillan

Doppler/Sonde Operator: Sys Engineer: Goldstein

Cloud Phys. Sci.: HF Radio: SanSouci

Specialist: Griffin (workstation) Navigator: Kozak/Rathbun
(Circle one: WPL Radiometer, SRA, SST IR Radiometer)

Other Scientific Crew, Observers, and Visitors:

Name	Function	Name	Function
McFadden			

Airborne Mission Coordinator: Franklin Location: 43RF

Mission Briefing (including proposed flight pattern numbers):

Vortex Interaction experiment, 42RF at 5000' doing Doppler pattern, and 43RF as high as possible doing ODW pattern. Similar problems to yesterday, 43RF had problems with the ODWs, while 42RF had no TA radar until the second coordinated fig 4. 43RF completed almost half the pattern (to the end of the 2nd coordinated Fig 4), 42RF made one pass at 5000' then loitered NE of center to repair the radar. 42RF got the radar repaired around 2110 UTC and fixed the center at 2130. Starting at 2200 did the coordinated fig 4 with both TA Dopplers for 3-D mapping. 43RF also managed to get an ODW/LOD2 intercomparison at the last drop SW of center.

Mission Summary:

Takeoff Time: 1802 UTC Landing Time: 0000 UTC Location: Bermuda

Official Mission Duration: 6.2 hr (from Flight Director)

Tapes Utilized: *Data Sys:* 1 *Radar:* 7 *Cloud Phy:* 1 DAT *Gust Probe:* 0
Dropsonde:

Number of Sondes Dropped: 9 + 2 LOD2 Sonde Failures: 6 + 0 LOD2

SIGNATURE Frank Marks

Airborne Chief Scientist Log

Flight Number: 930828I

Date: 28 August 1993 Aircraft ID: 43RF Scientist: Marks

Event Log

Time (UTC)	*Position (Lat, Lon)*	*Comments*
18:33:53	31 10, 66 29	28 02, 67 42 fix from 42RF radar
18:48:14	30 45.9, 67 39.6	at pt 1 turn TK 180 to eye, ODW #1
18:53:07	30 25, 67 42	entering outer rainbands on N side running FAST
18:56:13		ODW #1 bad, TA on 42RF down again!!
19:02:12	29 43, 67 42	ODW #2 at 100 nm pt, 42RF may have received our first sonde
19:09:59	29 10.2, 67 47.7	punched thru big cell 8-10 m/s up draft some graupel
19:12:32	28 58.2, 67 51.5	start coordinated run in bound we are at 50 nm radius
19:19:19	28 27.7, 67 54	approaching N side of eyewall
19:26:23	27 55.2, 67 51.7	storm has small partial inner eyewall and hints of another ring ~35 nm radius
19:33:21		42RF fix 192048: 28 05 67 45
19:34:10	27 21, 67 51	turn to TK 045 to point east of center 50 nm
19:47:54	28 6.7, 66 51.5	turn TK 270 at pt 50 nm E of center, definite indication of double eyewall structure
20:02:47	28 12.3 68 1.7	beautiful TA look at the tilt in the NW eyewall, seems to be N-NNW tilt of center, 5000' center ~6 nm S of our 500 mb center.
20:06:16	28 12, 68 19	on the edge of next rb out from eye, good cells for PMS
20:08:34		in outer ring good precip, some graupel
20:11:21	28 15, 68 42	turn at 50 nm ring, TK 315 to 160 nm NW of center
20:23:03	28 51, 69 25	on west edge of anvil
20:26:22	29 01.5, 69 37	in chop out west of anvil, seem to be at top of wind maxima below our flight level, undulating rollercoaster type stuff
21:01:04	28 38.7, 70 25.5	42RF has no TA radar and no hope of getting one back in the near future, our ODWs are only marginally better than yesterday, current thinking is have 42RF go direct to MIA, 43RF finish third leg for VTD, than head back to Bermuda, with an intercomparison between LOD2 and ODW at next drop (160 nm SW of center). ASDL down on 43RF at this time.
21:21:39	26 55, 70 22	end N-S leg, 160 nm SW of center, turn TK 045 to center ODW/LOD2 intercomparison, last drop-James says it is hopeless to continue throwing them out.
21:33:29		42RF fix 2129Z: 28 22 68 01, 85 kt, 976mb, talk to John-TA working OK, suggests we do 1 Fig 4 then head home, we end at our pt 11
21:43:36	27 51, 68 45	at 50 nm ring, start coordinated fig 4 with 42
21:49:19	28 09, 68 20	choppy on enterring radius of outer ring
21:55:46	28 29,.1 67 53	wind center at alt., real interesting sheared radar echoes to our right, tall and leaning back toward SE, center: 28 28.9, 67 54 center at 500 mb, surface center: 28 24, 68 00
22:04:38	28 51.5, 67 10.1	turn TK 285 to pt 10 downwind
22:16:43	29 18,68 05	turn outside to TK 150 thru center (mini-pearl)
22:31:14		entering outer edge of intense portion of eyewall

SIGNATURE Frank Marks

AIRBORNE CHIEF SCIENTIST LOG

Flight Number: 930828I

Date: 28 August 1993 Aircraft ID: 43RF Scientist: Marks

Event Log

22:37:19	28 19.5, 67 53.4	42RF fix 2234Z: 28 35, 68 08; 43RF fix 2833Z: 28 33 68 02, 976 mb. S eyewall still open, but choppy at base of anvil, eye is now like a coma or fig 9, with strongest echoes on N semicircle, and a radius of 18-20 km (somewhat smaller than earlier). No apparent double ring this fig 4 (probably a figment of an overactive imagination on my part)
22:48:12	27 36, 67 28	turn at end of coordinated fig 4, 42RF climbed after getting fix to do some ODW drops enroute to MIA
22:56:23	28 01, 66 48	bumping through top of little feeder band 70 nm SE of center, FAST scan in progress
23:59:30	Bermuda	land

SIGNATURE Frank Marks