Kelly Ryan

Lead Project Scientist

Storm or Project Major Hurricane Michael **Experiment type** TDR / fix / SWAS COYOTE / NESDIS / ocea
Flight ID 20181009H2 **Mission ID** AL14

Preflight

X 1. Participate in general mission briefing.

X 2. Determine specific mission and flight requirements for assigned aircraft from the Field Program Director.

X 3. Contact HRD members of crew to:
   a. Assure availability for mission.
   b. Review field program safety checklist
   c. Arrange ground transportation schedule when deployed.
   d. Determine equipment status.

X 4. Meet with AOC flight director and navigator at least 3 hours before take-off for initial briefing.

X 5. Determine from AOC flight director the mission designation and whether aircraft has operational fix responsibility

X 6. Meet with AOC flight crew at least 2 hours before take-off for crew briefing. Provide copies of flight requirements and provide a formal briefing for the flight director, navigator, and pilots.

X 7 Report status of aircraft, systems, necessary on-board supplies and crews to Field Program Director

X 8. Before take-off, brief the on-board GPS dropsonde operator on times and positions of drops.

X 9. Make sure each HRD flight crew member has a life vest.

X 10. Perform a headset operation check with all HRD flight crew members. Make sure everyone can hear and speak using the headset.

In-Flight

X 1. Confirm from AOC flight director that satellite data link is operative (information).

X 2. Confirm camera mode of operation.

X 3. Confirm data recording rate.

X 4. Request AOC flight director to leave radar in non-sector mode for initial Figure 4.

X 5. Once at IP, request AOC flight director adjust radar tilt to minimize sea clutter.

X 6. Complete Lead Project Scientist Form.

X 7 Check in occasionaly with the flight director to make sure the mission is going as planned (i.e. turns are made when they are supposed to be made).

Post flight

X 1. Debrief scientific crew

X 2. Gather completed forms for mission and turn in to data manager at HRD.

X 3. Obtain a copy of the Dropsonde raw and processed files from the AVAPS operator on thumb drive.

X 4. Obtain a copy of the radar LF files from the radar technician on thumb drive.

X 5. Obtain a copy of the tar'ed radar TA files from the radar scientist on thumb drive.

X 6. Obtain a copy of serial flight data and raw NetCDF file on thumb drive from the data technician.

X 7 Obtain a copy of SFMR data on thumb drive from the data technician.

X 8. Obtain a copy of DMT data on thumb drive from the data technician.

X 9 Report landing time, aircraft, crew, and mission status to the Field Program Director.

X 10. Determine next mission status, if any, and brief crews as necessary

X 11. Prepare written mission summary using **Mission Summary** form.

Fix - NHC
Ocean - UMiami
Coyote - HRD

Lead Project Scientist Check List

Storm or Project Michael **Experiment name** TDR-EMC

Flight ID 20181009H2 **Mission ID** AL14

A. Participants:

HRD		AOC	
Function	**Participant**	**Function**	**Participant**
Lead Project Scientist	Ryan	Flight Director	Holmes
Radar/Workstation	Kalina	Pilots	Price Mitchell Rossi
sUAS Coyote	Cione	Navigator	Freeman
~~Cloud Physics~~	Alex Feist - Raytheon	Systems Engineer	[redacted] Green
		Data Technician	Mascaro
Dropwindsonde	Goldenberg	~~Electronics Technician~~	Mac
AXBT/AXCP	Wadler	Other AVAPS	
Photographer/Observers/Guests			

B. Take-off and Landing Times and Locations:

Take-Off: [redacted]2011 UTC Location: Lakeland

Landing: 0533 UTC Location: Lakeland

Number of Eye Penetrations: [redacted]7

C. Past and Forecast Storm Locations:

958mb @ 20Z (TDAL) 105 kts

Date/Time	Latitude	Longitude	MSLP	Maximum Wind kt
09/1500Z	25.0	86.2	965 (NOAA/AF)	95
10/07Z	26.7	[redacted]86.5		105
10/12Z	28.8	[redacted]86.3		110
11/07Z	30.8	85.1		75
11/12Z	33.0	[redacted]82.5		45

motion 10kts @ 350°

7 - inland

D. Mission Briefing:

20mb dec between 18 & 02 Z → WOW!

Michael on an RI trend: ~~dec. 8mb~~ in a few hours. Satellite pres looks better organized with apparent eye in symmetric cloud tops. (VIS & IR); Deep convection bursting on SE/NE sides & wrapping around center. VWS is apparent but outflow looks better to N/W. VWS = moderate SSTs = ~29C; core temp rising & pressure dropping each pass (AF)

Forecast calls for further strengthening as VWS ↓ and orients in direction of TC motion and SSTs ↑

Storm or Project Michael **Experiment name** TDR/Coyote

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E. —Equipment Status (Up ↑, Down ↓, Not Available **N/A**, Not Used **O**)

Equipment	Pre-Flight	In-Flight	Post-Flight	# DATs / CDs /Expendables/ Printouts
Radar/LF	↑	↑	↑	
Doppler Radar/TA	↑	↑	↑	
Cloud Physics	↑	↑	↑	
Data System	↑	↑	↑	
GPS sondes	↑	↑	↑	
AXBT/AXCP	↑	↑	↑	
Ozone instrument	↑	↑	↑	
Workstation	↑	↑	↑	
Cameras	↑	↑	↑	

REMARKS:

Mysterious vibration (previously determined to be caused by DWL) returns w/ same characteristics

→ loitering was required in NW quad

→ extra caution to avoid weather (vibrations increase w/ each 2.5g + bump)

→ This meant the N/E quadrants were largely avoided. Coyote operations were affected by this since half of the storm was avoided communicatio was lost & was not recovered

→ While trying to regain P3/Coyote comms, flew into moat & upwind (Whoa!) which added quite a bit of time to mission

Lead Project Scientist Event Log

Date _____ Flight ID_____ LPS _____

Time	Event	Position	Comments
2012	takeoff		
			- nice CBurst on E-NE side
			- Satellite ind. lightning
			- apparent(very) clear eye
			- CB [redacted] SE eyewall
			- 958 mb (TEAL)
[redacted]	21:00	IP, combo	N end ① 1001 mb splash
[redacted]	2114	combo	N mid ② - FL 50 kts
			- SFMR 42 kt
			[redacted]
[redacted]	2126	N eyewall	SF 95 kts
			FL 117 kts
			TDR ~ 16-18 km!
2128	combo/IR	center ③	26°12'N
			86°28'W
			- eye not clear above (Maybe almost all SW side)
			- can see surface
			- 956 mb
			- 070@6 kts
			- T = 28 RH = 78%
	* {NHC (5pm EST)	- 120 mph	26N
		360 @ 12 mph	86.4W}
2142	[redacted] combo	S mid ④	SST = 28.8
2149	combo	S end ⑤	* leg cut short to make up time (95 nmi leg) - S side very clear (almost 0 scatterers)

18009H2

Lead Project Scientist Event Log

Date ______________ Flight ID______________ LPS ____________________

Time	Event	Position	Comments
2205		25°40'N 85°28'W	- scattered cellular conv.
			- general stratiform precip
			- eye almost completely obscured by supercell anvil (s[illegible]
	*really diverted on downwind leg		
			- strong cells just E of E endpoint
2238	combo ↳ 35kts @ surf	E end	- still stratiform here & between bands → BEAUTIFUL banding structure (see pic)
2252	Combo ↳ 55kts @ surf	E mid	- slightly delayed ~1 min for release in moat
		E wall	- eyewall FL 125kts SFMR 100 kts
	* eyewall has polygonal appearance - wave#4? (see pic of LF)		*FL winds peaked near outside gradient of wall
			*SFMR winds peaked near inside gradient wall
2307	center	26°27N 86°26W	- eyewall appears open to S/WS (could be SFMR att[illegible]
			- cloud deck below
2310	rmw sonde	W rmw	SFMR - 86 kts
			sonde - 86 kts
2321	combo	W mid	pretty quiet here

processed & sent → 11kts sfc wind, 935mb (circled)

processed & sent ↓ corrected for W quad

Lead Project Scientist Event Log

Date _____ Flight ID_____ LPS _____

Time	Event	Position	Comments
2333	~~Eye~~ combo	SW end	
0003	combo	SW mid	SST = 29.0
0012	—	SW wall	SFMR 84 FL 89
	combo	26°40' / 86°30' Center	
0015	Mike Black's Remains		sonde: 957 mb winds: 19 kts → ? Hmm
			✱ can see lightning - LOTS!
			- very asymmetric precip
0019	sonde	rmw NE	~~SFMR~~ FL 132 kt
	↳ needs to be processed on ground		SFMR ~ 20 kt
			TDR ret ~ 18 km!
			SFMR inc. now 112 kts!
0022	backup sonde for max surf.	NE rmw	another rmw sonde!
			FL 130 kts
			✱ at least 3-4 ~~max~~ max this quadrant (SFMR)
0028	combo	NE mid	~70 ~90 ~112 ~75
	↳ 38 kts @ surf		sonde wind = 90 kts
0040	combo	NE end	

processed & sent ↓

log continued

0144 combo NW end → loitering here to investigate vibrations

0156 combo ↳ 39kts NW mid

NW eyewall FL 134 SFMR 109

Observer's Flight Track Worksheet

Date _____ Flight _____ Observer _____

0211 center sonde only {27°3' N, 86°29' W} → It's been very difficult to do center drops tonight... mesovortices? ↓ I see some via LF radar

948mb

16kts@surf

0213 mw SE side sonde [M Black signed sonde]

90kts@surf

963mb

0228 combo SE mid SST = 27.9

0239 sonde SE end

plan for Coyote

Latitude (°)

0326 BT in center SST = 28.2

0331 sonde

0332 Coyote

0339 sonde

0342 sonde

Coyote

0345 ~~mw~~ eyewall E sonde

0355 ~~eyewall E~~ sonde

0413 accidental sonde Fast fall

Longitude (°)

extremely cellular → difficult to penetrate (see pics); mesovortices apparent in multiple quadrants which may explain difficulty w/ center sondes/mw

141 kt ~2000 ft

142 kt

150 kt ~1900 ft

159 kts

Mission Summary

Storm name

YYMMDDA# Aircraft 42 RF

Scientific Crew (4 RF)

Lead Project Scientist Ryan

Radar Scientist Rodiner

Ocean ~~Cloud Physics~~ Scientist Wadler

Dropwindsonde Scientist Goldenberg

Boundary-Layer Scientist /Coyote: Cione, Feist

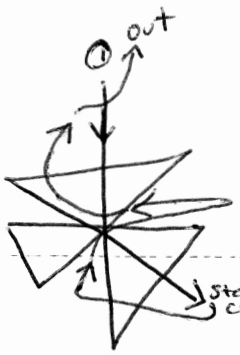
Workstation Scientist

Observers (affiliation)

Mission Briefing (include sketch of proposed flight track or page #)

- See attached track(s)
- Objectives: ① TDR - EMC tasking ② Coyote/sUAS ③ NHC center fix 0230Z ④ MikeBlacks ashes ⑤ ocean heat - UM ⑥ ocean winds - NESDIS
- cygnss overpass ~2335Z (W-E leg)
- Coyote flight track (+ P3 track) dictated by orientation of precip & maxwind azimuth

Mission Synopsis. (include plot of actual flight track)



- actual track (left)
- 3 TDR analyses transmitted for 0Z; 1 transmitted for 06Z
- NHC center fix @ 0211Z (4th pass)
- coincident cygnss pass (2nd P3 pass) @ 2335Z
- MBlacks remains released on 3rd pass ~0Z
- Coyote sUAS released in SE eyewall and found inc. windspeeds until comm. was lost (159 kts @ ~2kft) in N-NE ~~quad~~ quad.; never regained comms (see probs. below)

Evaluation: (did the experiment meet the proposed objectives?) - YES!

Impressive precip structure throughout mission → eyewall extremely cellular and mesovortices were seen in LF radar. TDR showed returns as high as 18km! BL thermo well mixed to surface w/ depth ~875mb level.; very interesting profiles as seen in sondes with obvious shifts @ BL. Center drops = difficult likely due to mesovorts. Banding was spectacular, esp. on E/NE sides. Eye clear to surf. but CB anvils covered sky in eye. Lowest SLP = 948mb; highest SFMR = 115 kts (NE); SST = (28-29)C

Coyote: - deployed in SE in order to capture max wind in NE E/NE quad not penetrable → caused loss of coyote comms

Problems: (list all problems)

- Vibrations & subsequent loss of P3-Coyote communication
- Coyote HDOBs not transmitted in real time (bug in file name)
- ~~Strange tempdrop message transmitted (092017 noaa43)?~~ Not on our end!

Expendables used in mission.

GPS sondes 30

AXBTs 19

~~Sonobuoys:~~ coyote/sUAS

0230 Centerfix - NHC

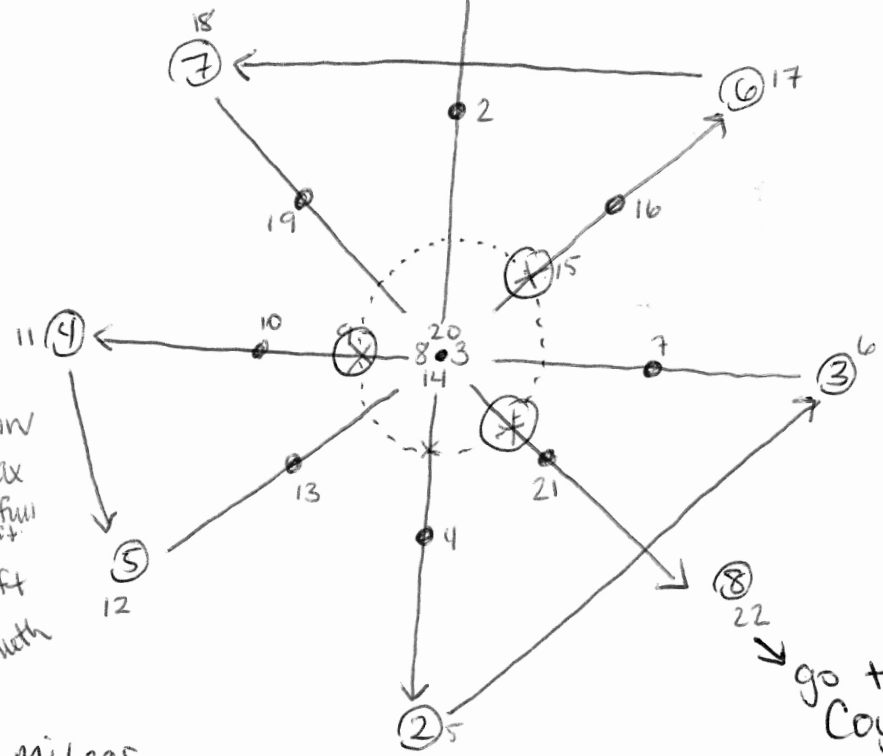
Michael

Prebrief K. Ryan

Ashes

3rd pass

Backup: post Coyote



105 n.mi legs

All combos

1 rmw outbound

3 during Coyote

rmws

1 combo BT/sonde

1-2 sondes only

During Coyote

3 BT/IRsonde

4 IR Sonde only

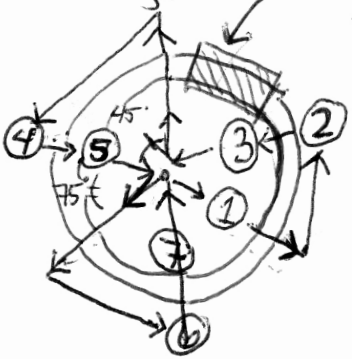
go to Coyote Module

Coyote: alt = 4000 ft to rmw

2000 ft to max

1000 ft, 500 ft, 250 ft, 200 ft etc.. } after full orbit at 2000ft

maximum winds azimuth



* 22 n.mi legs

(1) BT, IRsonde, Coyote

*BT/IRsonde on ends

Rotate based on azimuth of max winds

Satellite Overpass - NESDIS

2336 Z W-E leg (2nd pass)

Motion

350 @ 10 kts

Intensity

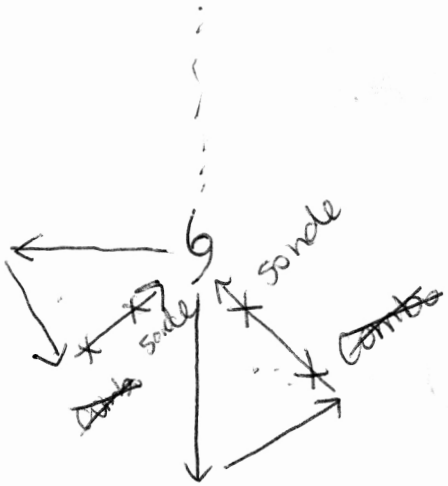
95 kt, 965 mb

Location

TEAL fix: 2029Z

26.2N 86.4W

init: sonde
BT
Coyote



0355 SFMR 115 rmwsonde