

Kelly Ryan

Lead Project Scientist

Storm or Project Major Hurricane Michael Experiment type TDR/Fix/SUAS/COYOTE/NESDIS/Ocean
Flight ID 20181009H2 Mission ID ALI4

Preflight

- ☒ 1. Participate in general mission briefing.
- ☒ 2. Determine specific mission and flight requirements for assigned aircraft from the Field Program Director.
- ☒ 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.
- ☒ 4. Meet with AOC flight director and navigator at least 3 hours before take-off for initial briefing.
- ☒ 5. Determine from AOC flight director the mission designation and whether aircraft has operational fix responsibility.
- ☒ 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.
- ☒ 7. Report status of aircraft, systems, necessary on-board supplies and crews to Field Program Director.
- ☒ 8. Before take-off, brief the on-board GPS dropsonde operator on times and positions of drops.
- ☒ 9. Make sure each HRD flight crew member has a life vest.
- ☒ 10. Perform a headset operation check with all HRD flight crew members. Make sure everyone can hear and speak using the headset.

In-Flight

- ☒ 1. Confirm from AOC flight director that satellite data link is operative (information).
- ☒ 2. Confirm camera mode of operation.
- ☒ 3. Confirm data recording rate.
- ☒ 4. Request AOC flight director to leave radar in non-sector mode for initial Figure 4.
- ☒ 5. Once at IP, request AOC flight director adjust radar tilt to minimize sea clutter.
- ☒ 6. Complete Lead Project Scientist Form.
- ☒ 7. Check in occasionally 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

- ☒ 1. Debrief scientific crew.
- ☒ 2. Gather completed forms for mission and turn in to data manager at HRD.
- ☒ 3. Obtain a copy of the Dropsonde raw and processed files from the AVAPS operator on thumb drive.
- ☒ 4. Obtain a copy of the radar LF files from the radar technician on thumb drive.
- ☒ 5. Obtain a copy of the radar TA files from the radar scientist on thumb drive.
- ☒ 6. Obtain a copy of serial flight data and raw NetCDF file on thumb drive from the data technician.
- ☒ 7. Obtain a copy of SFMR data on thumb drive from the data technician.
- ☒ 8. Obtain a copy of DMT data on thumb drive from the data technician.
- ☒ 9. Report landing time, aircraft, crew, and mission status to the Field Program Director.
- ☒ 10. Determine next mission status, if any, and brief crews as necessary.
- ☒ 11. Prepare written mission summary using Mission Summary form.

Lead Project Scientist Check List

Fix - NHC
Ocean - UMiami
Coyote - HRD

Storm or Project Michael Experiment name TDR-EMC

Flight ID 20181009H2 Mission ID ALH

A. Participants:

HRD		AOC	
Function	Participant	Function	Participant
Lead Project Scientist	<u>Ryan</u>	Flight Director	<u>Holmes</u>
Radar/Workstation	<u>Kalina</u>	Pilots	<u>Price Mitchell</u> <u>Rossi</u>
SUAS Coyote	<u>Cione</u>	Navigator	<u>Freeman</u>
Cloud Physics	<u>AlexFeist-Raytheon</u>	Systems Engineer	Green <u>Green</u>
		Data Technician	<u>Mascaro</u>
Dropwindsonde	<u>Goldenberg</u>	Electronics Technician	<u>Mac</u>
AXBT/AXCP	<u>Wadler</u>	Other	<u>AVAPS</u>
Photographer/Observer			
s/Guests			

B. Take-off and Landing Times and Locations:

Take-Off: ~~0533~~ ²⁰¹¹ UTC Location: Lakeland
Landing: 0533 UTC Location: Lakeland

Number of Eye Penetrations: 7

C. Past and Forecast Storm Locations:

Date/Time	Latitude	Longitude	MSLP	Maximum Wind Kt
09/1500Z	25.0	86.2	965 (NOAA/AF)	95
10/0Z	26.7	86.5		105
10/12Z	28.8	86.3		110
11/0Z	30.8	85.1		75
11/12Z	33.0	82.5		45

958mb @ 20Z (TOTAL)
105 KTS

D. Mission Briefing:

20mb dec between 18/02Z → 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 ↑

Motion
10KTS @ 350°

Finland

Storm or Project Michael Experiment name TDR/coyote
 Flight ID 20181009H2 Mission ID AL14

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	↑	↑	↑	
AXB/T/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 25g + bump)
 → This meant the N/E quadrants were largely avoided. Coyote operations were affected by this since half of the storm was avoided, communication 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 SE SE eyewall
			- 958 mb (TEAL)
21:00	IP, combo	N end ①	1001 mb splash
21:14	combo	N mid ②	- FL 50 kts
			- SFMR 42 kt
			FL 117 kts
			FL 117 kts
21:26	N eyewall		SF 95 kts
			FL 117 kts
			TDR ~ 16-18 km!
21:28	combo/IR	center ③	26° 12' N
			86° 28' W
			- eye not clear above
			- can see surface
			- 951 mb
			- 070 @ 6 kts
			T = 28 RH = 78%
	* { NHC (5 pm EST) - 120 mph	26N	2
		360 @ 12 mph	86.4W
21:42	right combo	S mid ④	SST = 28.8

2149 combo S end ⑤ * leg cut short to make up time (45 mi leg)
 - S side very clear (almost 0 scatterers)

~~181009H2~~
181009H2

Lead Project Scientist Event Log

Date _____ Flight ID _____ LPS _____

Time	Event	Position	Comments
2205		25°40'N - scattered cellular 85°28'W } conv.	- general stratiform precip - eye almost completely obscured by spiraling anvil (SE)
	*really diverted on downleg		
			- strong cells just E of E-end point
2238	combo ↳ 35 kts ⁰ surf	E end	- still stratiform here & between cloud bands → BEAUTIFUL banding structure (see pic)
2252	Combo ↳ 55 kts ⁰ surf	E mid	- slightly delayed ~1 min for release in moat
		E wall	- eyewall FL 125 kts SPMR 100 kts
	* eyewall has polygonal appearance - wave #4? (see pic of LF)		* FL winds peaked near outside gradient of wall * SPMR winds peaked near inside gradient wall
2307	center	2627N 8626W	- eyewall appears open to S/WS (could be MMRAtn) - cloud deck below
2310	rmw sonde	W rmw	SPMR - 86 kts sonde - 86 kts

processed & sent
→ 110 kts surf wind
→ 955 mb

processed & sent
→ corrected for W gust

2321 combo W mid pretty quiet here

Lead Project Scientist Event Log

Date _____ Flight ID _____ LPS _____

Time	Event	Position	Comments
2333	combo combo	SW end	
0003	combo	SW mid	SST = 29.0
0012	—	SW wall	SPMR 84 FL 89
	combo	{ 26°40' center 86°30'	sonde: 951 mb winds: 19 knts → ? Hmm
0015	Mike Black's Remains		* can see lightning - LOTS! - very asymmetric precip
0019	sonde	rmw NE	SPMR 132 kt FL needs to be processed on ground SPMR ~ 20 kt TDR ret ~ 18 km! SPMR inc. now
0022	Backup sonde sonde for max surf.	(NE rmw)	112 kts! another rmw sonde! FL 130 kts * at least 3-4 max maxima this quadrant (SPMR)
0028	combo	NE mid	~ 70 ~ 90 ~ 112 ~ 75 sonde wind = 90 kts
0040	combo	NE end	

processed & sent
↓

log continued

0144

combo

NW end

loitering here to investigate vibrations

0156

combs

→ 39 kts

NW mid

NW eyewall

FL 134

SFMR 109

Observer's Flight Track Worksheet

Date _____ Flight _____ Observer _____

0211

center

{ 27°3' N
86°29' W }

→ it's been very difficult to do center drops tonight... mesovortices?

Sonde only

(948mb)

I see some via LF radar

0213

mmw

SE side

Sonde

M Black signed Sonde

16 kts @ surf

90 kts @ surf

963mb

0228

combo

SE mid

SST = 27.9

0239

Sonde

SE end

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

plan for Coyote

Latitude (°)

0326

BT in center SST = 28.2

0331

Sonde

0332

Coyote

0339

Sonde

0342

Sonde

Coyote

0351

~~eyewall~~ sonde

Longitude (°)

0355

~~eyewall~~ sonde

0413

accidental sonde
Fast fall

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 Rafina

Ocean Cloud Physics Scientist Wadler

Dropwindsonde Scientist Goldenberg

Boundary-Layer Scientist Coyote: Crone, 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 Mike Black's ashes ⑤ Ocean heat - UM ⑥ Ocean winds - NESOL

• Cygnus overpass ~2330Z (VI-E 1eq)
• Coyote flight track (+ P3 track) dictated by orientation of precip & max wind azimuth

Mission Synopsis: (include plot of actual flight track)

• Actual track (left)

• 3 TDR analyses transmitted for 02; 1 transmitted for 02Z

• NHC center fix @ 0211Z (4th pass)

• Coincident cygnus pass (2nd pass) @ 2330Z

• MBlack's remains released on 3rd pass ~02Z

• Coyote suAS released in SE eyewall and found inc. wind speeds until comm. was lost (159 kts @ ~2kft) in N-NE 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 SPMR = 115kts (NE); SST = (28-29)C

Problems: (list all problems)

• Vibrations & subsequent loss of P3-Coyote communication

• Coyote HDOBs not transmitted in real time (bug in file name)

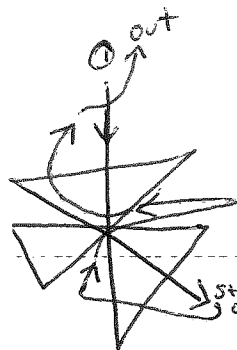
• Strange jump/drop message transmitted (092017 not at 43)? Not on record!

Expendables used in mission:

GPS sondes: 30

AXBTs: 19

Sonobuoys: cogote/suAS



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

Hunt center on 1st & 4th pass

0230 centerfix-NHC

Ashes

3rd pass

Backup: post Coyote

20181009H2
Michael
Prebrief
K. Ryan

~~105 n.mi legs~~
105 n.mi legs

BTs

All combos

- 1 rmw outbound
- 3 during Coyote

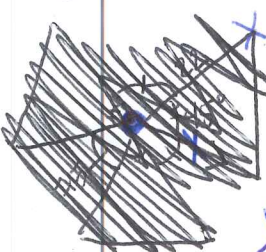
rmws

- 1 combo BT/sonde
- 1-2 sondes only

During Coyote

- 3 ~~BT~~ BT/IR sonde
- 4 IR sonde only

Coyote: alt = 4000 ft ^{to rmw}
2000 ft ^{by max}
1000 ft ^{after full orbit}
500 ft ^{at 2000ft}
250 ft
200 ft
etc...



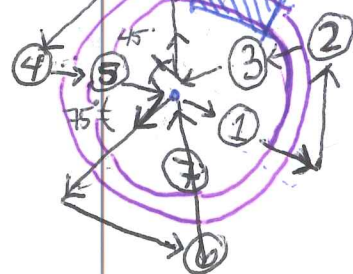
Maximum
Winds Azimuth

* 22 n.mi legs

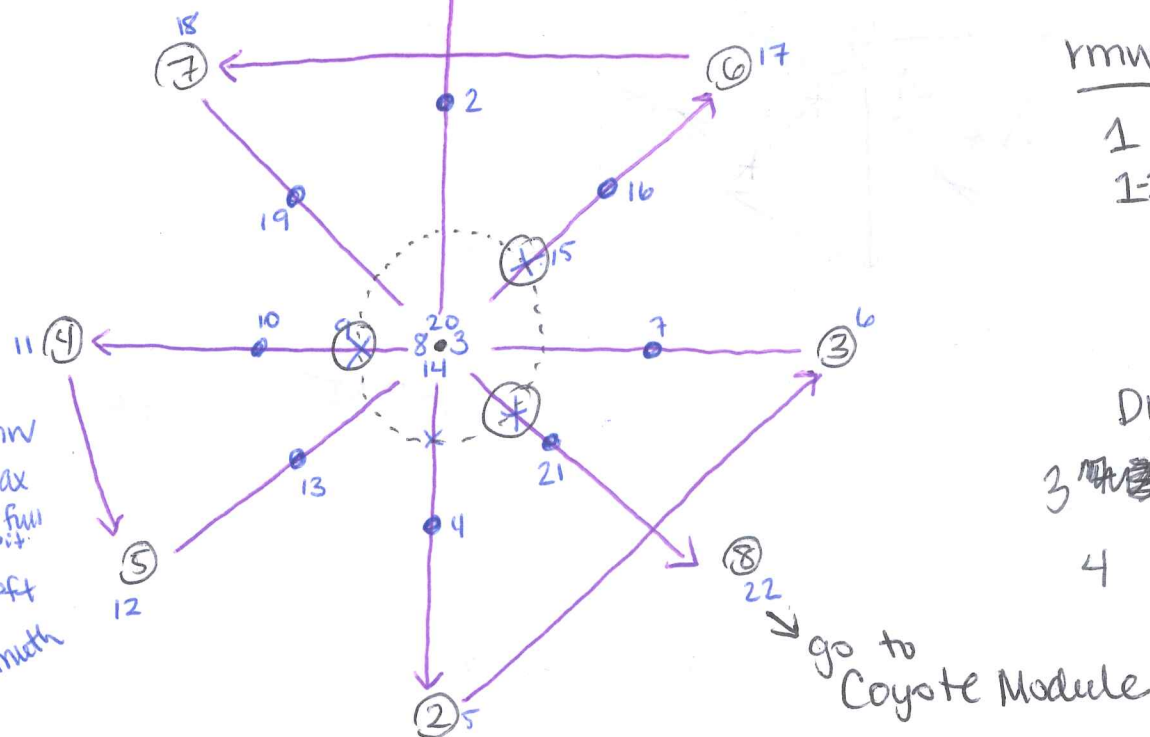
① BT, IR sonde,
Coyote

* BT/IR sonde
on ends

~~105 n.mi legs~~



Rotate based on azimuth of
max winds



go to
Coyote Module

Satellite Overpass - NESDIS

2336 Z W-E leg (2nd pass)

Motion

350 @ 10 kts

Intensity

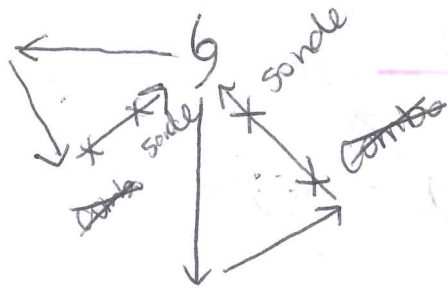
95 kt, 965 mb

Location

TEAL Fix: 2029Z

26.03N 86.42W

Init :
sonde
BT
Coyote



0355

SPMR 115 mmsonde

