

Primary responsibilities of Aircraft Radar Support:

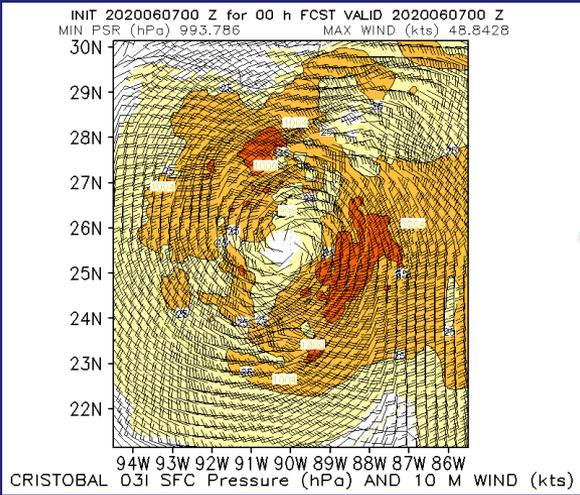
- 1) Ensure data collection from all aircraft radar systems
 - Monitor the radar systems (TDR and MMR)
- 2) Ensure real-time radar data QC/synthesis and transmission
 - Execute scripts
 - As needed, resolve software/transmission issues with ground radar support
- 3) Monitor weather conditions and relay to ground radar support for their log

Additional responsibilities of Aircraft Radar Support:

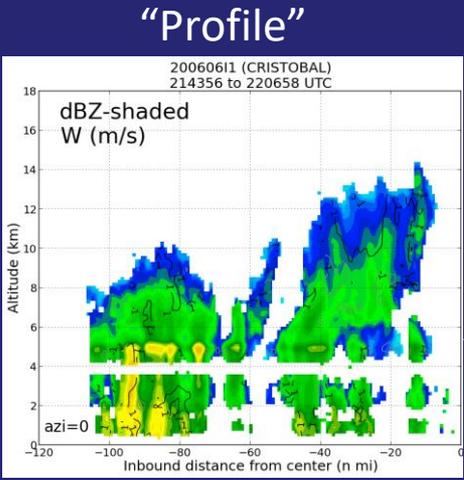
- Provide ground radar support with any requested information
- Assist ground radar support and LPS with making mission science decisions
- Ensure Flight Director (FD) is made aware of *mission-critical* issues (via LPS)

Note: 2022 Aircraft Support Guides (P-3/G-IV) available in Drive (Training / Radar)

Real-time Products

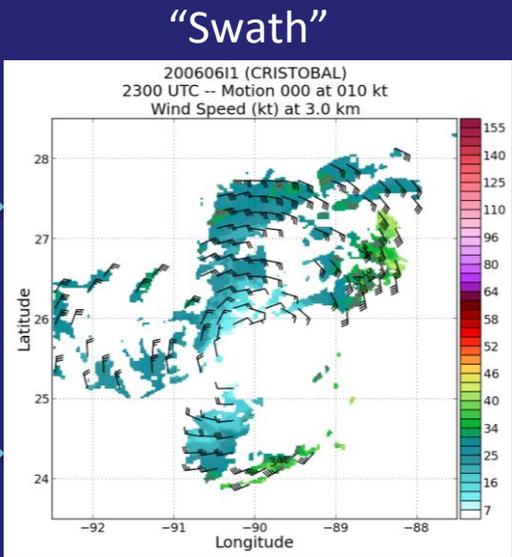


QC'd Doppler radials (target: EMC)
Assimilated into operational HWRF model



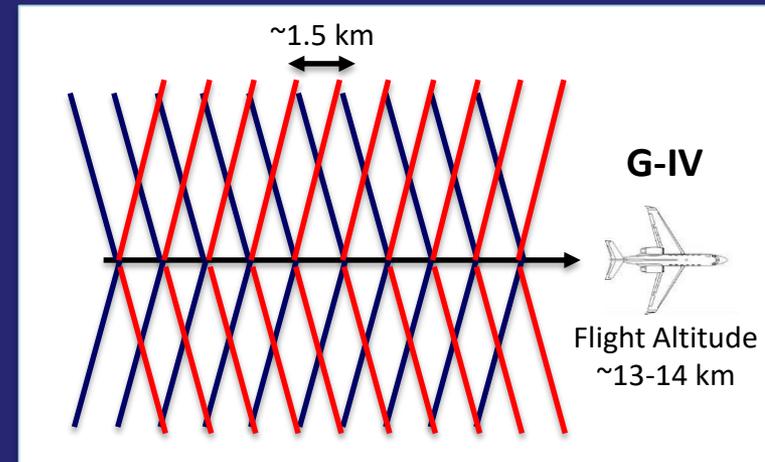
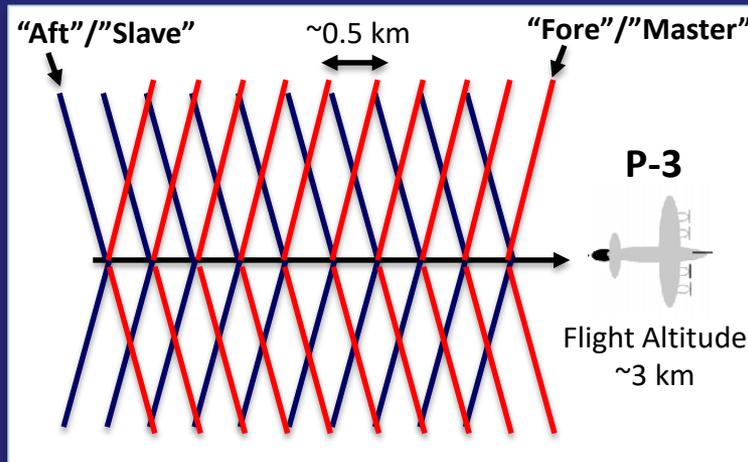
Analysis Data (target: NWS/NHC)
Ingested by AWIPS-II

Analysis Graphics (target: HRD)
Transmitted to AOML ftp



X-Band TDR System

- Dual flat-plate antennas
- Dual solid state transmitter/receiver
- Typical P-3 (G-IV) operating specs:
 - Range gate: 75 (100) m
 - Pulse Repetition Freq: 2770 (3000) Hz
 - Scan rate: 15 (12) rpm
 - Nyquist interval: ± 22 (24) ms^{-1}
 - Max unambiguous range: 54 (50) km
- Short/long pulse (P-3 TDR) to get 1st 3 km



Setting up (ideally, before take off)

- Typically board ~1 h before take off
 - Power up HRD radar workstation (HRD WS) if not already done
 - Make sure you are logged in as HRD user (ask AOC if unsure)
 - Open Xchat *or* HexChat at the HRD WS ... use a nick with ‘_N42/3/9’
- Communicate with ground radar support via Xchat/#radar
 - Relay any pre-flight issues
 - Relay any pattern changes discussed at pre-flight briefing
 - Let ground radar support lead you through the initial set-up steps...

1. Open Xchat or HexChat at HRD (radar) workstation. Ensure the following ground situational-awareness channels were autojoined: **#hrd-status**, **#hrd-sweeps-status**, and **#hrd-scripts-status**

For AOC: If tunneling to HRD workstation, ensure ‘ssh -Y’ (not ‘ssh -X’) is executed to open terminals. This will ensure proper script execution.

2. Run ‘diskusage’. Ground support will advise which files/dirs to remove, if necessary.

3. Run ‘updateradar’. Sometimes software/script changes need to be implemented at the HRD radar workstation. As a matter of routine, typically this will be executed.

4. Run ‘buildradaranalysis’. Compiles the radar analysis code and generates scripts, ~1 minute.

Setting up (ideally, before take off)

- Communicate with ground radar support via Xchat/#radar
 - Let ground radar support lead you through the initial set-up steps...

5. Run 'initialcleanup' (Start fresh: removes some old files and creates a new emcdata/)

6. Run 'checksweeps' (Monitors TDR data files on HRD workstation - opens 1 window)

7. Run 'tdrProcSend' (Controls EMC radial processing and netman transfer - opens 2 windows)

8. Run 'radarsync' preferably in a new terminal (Controls radar analysis software execution)

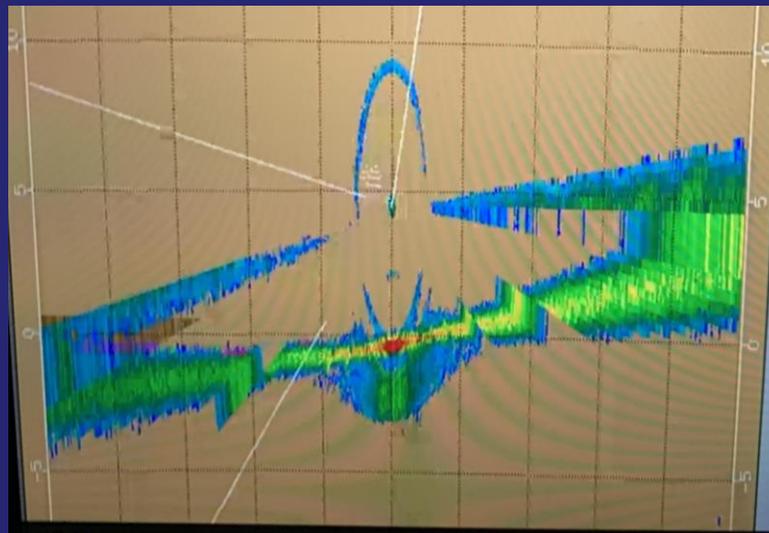
Once TDR is turned on (after take-off)

9. After TDR is turned on, **look** at master (fore) and slave (aft) displays (labeled TM and TS) to ensure proper radar functioning (e.g., correct radar altitude and flat surface when straight and level). Make sure they are similar and both show returns from the sea surface.

10. Throughout the flight **MONITOR** the status of the TDR (and MMR). Relay notable weather conditions to ground radar support for their Radar Scientist Form.

Note: At this point, ground radar support has near-complete situational awareness of the radar instrument (#tdr-status, #hrd-sweeps-status), software (#hrd-status) and data transmission (#hrd-scripts-status).

Ground support can't see the radar displays ... See something, say something!



While in Pattern

What do you do during the flight besides stare at the radar display?

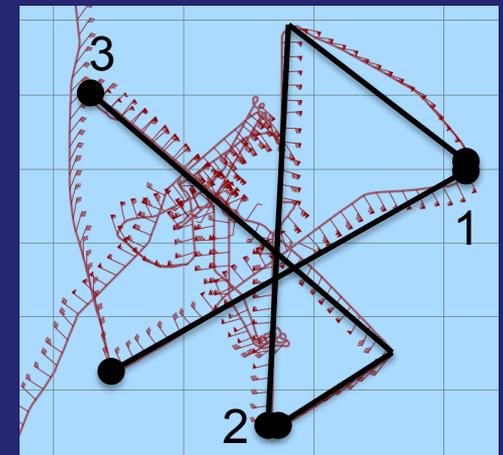
- Update ground support on planned/unplanned track deviations
 - Discuss strategies for how to set up analyses
- Communicate pertinent weather obs to ground support
 - Not always easy for ground to assess precipitating/non-precipitating from satellite
- Assist with center estimates when fixes aren't done
- Take a look at the radar analyses and discuss science
 - Via the real-time graphics ftp site (...but can be slow on the aircraft)
 - In a terminal: `cd wfiles ... then run 'radar_slicer YYYYDDAI_HHMM_xy.w'`
- Be prepared to resolve issues (we'll discuss this later)

Oh, and monitor the radar displays!

While in Pattern

So what exactly is ground radar support doing?

Basically, monitoring the flight in MTS and filling in a Jobfile App with parameters needed to execute the automated radar data QC and synthesis software on the aircraft.



HRD Radar Jobfile Creator (Ground)

Flight

2022060311

Mission ID: WXWA TRAIN Storm ID: AL012022 Mode Real-time Load Data

Start 3D	000000 (hhmmss)	Antenna	AOC
End 3D	000000 (hhmmss)	IBST	1
Start Cross-section	000000 (hhmmss)	Radius	250 (km)
End Cross-section	000000 (hhmmss)	dX	2 (km)
Center Time	000000 (hhmmss)	dY	2 (km)
Center Lat	[-90,90]	dZ	0.5 (km)
decimal	0	Profile dZ	0.15 (km)
Center Lon	W	Profile dR	1.5 (km)
decimal	0	Ctr X	250 (km)
Storm Direction	0 (deg nav)	Ctr Y	250 (km)
Storm Motion	0 (kt)	Event type	Invest
Track IN	0 (deg nav)	<input checked="" type="checkbox"/> Acceptable for Composite	
Track OUT	0 (deg nav)		

Draw/Save Cross-section Write to Files

Objective: QC all in-pattern radar data and transmit products to the ground.

Accomplish this by analyzing separately radar data from each inbound-outbound center pass (plus downwind legs).

While in Pattern

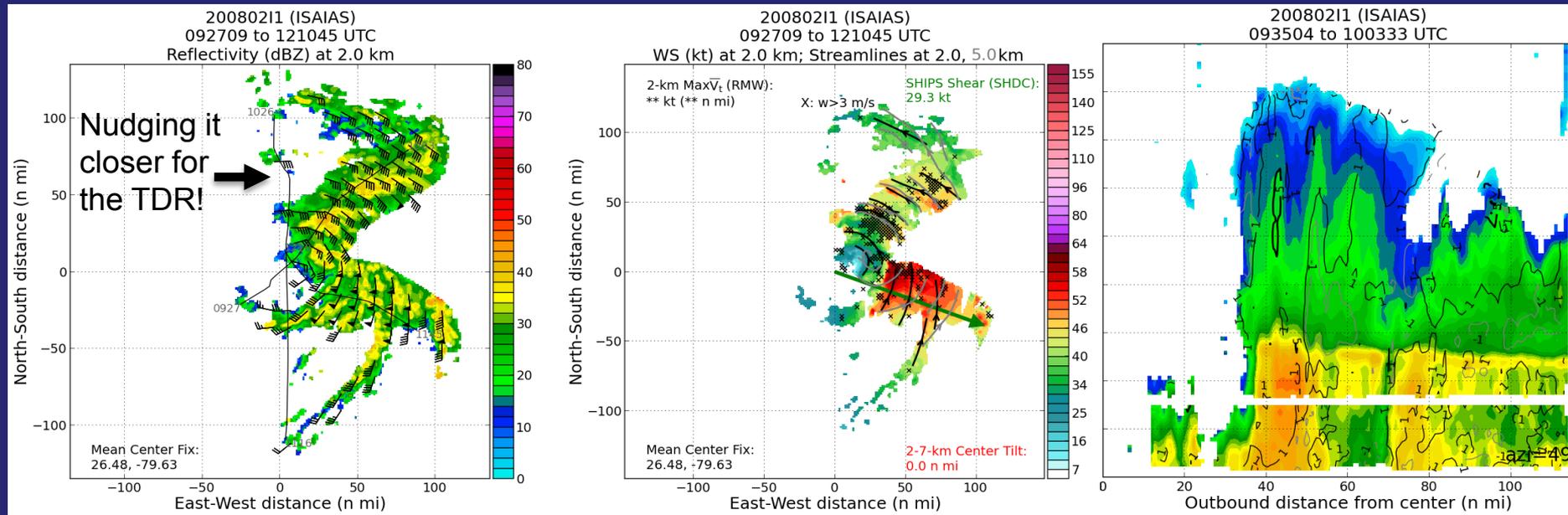
Timing is everything!

- Jobfile transmitted to aircraft right after end of analysis period
 - Typically about 25-30 min after center fix
- Takes $\sim 1/3$ the analysis period to get QC'd data into the queue
 - So for 70-90 min of data, about 20-30 min (to execute software)
- At best, NHC gets a 3-D look at wind field ~ 45 min after center fix
 - In operations, NHC specialists are concerned about “staleness” of the TDR data
 - But, we're providing a 2-D mapping of eyewall winds from a single pass
- For EMC, we must be mindful of data cut-off times
 - For 12 UTC cycle, radar data from 9 UTC to 15 UTC is included
 - But, that data must be *off the aircraft* and on to NCO no later than ~ 1530 UTC
- These time considerations sometimes impact how we analyze

Monitoring Data Transmission

Ground radar support is also monitoring the flow of data to EMC, NHC and AOML (...because sometimes it doesn't flow)

- Aircraft radar support may be asked to assist when issues arise
- Usually, everything works and we can focus on mission science:



What could possibly go wrong?

>>SHOULD THE WORKSTATION GO DOWN<<

If the workstation power is interrupted or the workstation needs to be restarted, then after the workstation is restarted:

1. Run `'tdrProcSend'`

2. Run `'radarsync'`

3. Run `'checksweeps'`

If the software had been in the middle of execution, it should restart from the beginning once `radarsync` is executed again: In any event, ensure that all EMC files and HRD radar product files have been transmitted off the aircraft.

>>SHOULD RADAR ANALYSIS PRODUCTS NOT FULLY TRANSMIT<<

If a glitch should ever happen where analysis products are not fully transmitted from the aircraft, the following should be done:

In a terminal, run: `resendradar` (note: you can leave `radarsync` running while you do this)

>>SHOULD COMMUNICATIONS ON THE AIRCRAFT DROP OUT<<

Ground support will wait until comms are reestablished and then submit any outstanding `jobfile`. If comms goes down while the software is running, inform ground support of the last status update in the `radarsync` terminal when comms `are` reestablished.

>>SHOULD AN ANALYSIS END TOO SOON OR A JOBFILE ERROR IS QUICKLY DISCOVERED<<

If an analysis completes in far less time than "Rule of Thumb" (~1/3 analysis period)

- Ground support will submit corrected `jobfile` to restart the process, if possible

If a `jobfile` error is discovered as the summary information is being presented in `#hrd-status`, be prepared to `quickly Ctrl-C in the radarsync terminal`, then ground support will

- Correct any `jobfile` errors
- Have you move the bad `jobfile` in `/home/sysop` on the HRD workstation to `~/tdr/fail`
- Have you run `'radarsync'`
- Submit corrected `jobfile` to restart the process

Happened during a recent test flight, so it could happen again.

Happened during an early test flight, but we think the cause of partial transmission is resolved.

Happened during test flights, so be prepared.

Happened during test flights

- Wrong longitude in jobfile
- Non-functioning aft antenna went unnoticed

Finishing up radar duties

Stop the TDR ... Stop the scripts ... Generate archive for upload

1. Once the aircraft reaches the end point of the pattern and/or mission science is complete, the AOC data tech can **end TDR recording**.
2. Once ground support confirms that all analysis files have transmitted, you may **Ctrl-C** 'radarsync', and close its terminal.
3. Once ground support confirms that all EMC files have left the HRD workstation, you may **close tdrProcSend** windows. All other scripts may be closed as well.
4. Run: './makearchive'. AOC will upload thumbYYMMDDAI_products.tar.gz, TDR product-raw tar.gz archive, and a zip archive of MMR Cfradial files to the SEB server.

****END OF AIRBORNE RADAR DUTIES****