G-IV Radar Support Guide

On the AIRCRAFT (Updated 17 June 2021)

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Data should be recorded with a single PRF of ~3100, 100-m range bins, first trip only, long pulse only. John Gamache has communicated with Bobby Peek the RVP-8 tasks to accomplish this. Fore and aft antennas should be transmitting simultaneously. Toggle between fore and aft displays to verify (icon on desktop). If necessary, verify with the data tech.

****BEFORE AND SHORTLY AFTER TAKE-OFF...**

Establish comms with ground radar support at HRD : Xchat (join #hrd and #radar, join #carcah for center fix info; join #tdr-status for TDR warning messages (if available); join #hrd-status for HRD radar software status; join #hrd-sweeps-status for info on the availability of TDR sweeps; join #hrd-scripts-status for info on radarsync and tdrProcSend scripts)

*Note: If the scripts below are not recognized, either the wrong login has been selected at boot-up on the HRD radar workstation or the scripts have been executed outside /home/sysop.

On #radar, allow ground radar support to step you through the following *in the order shown* below (Note: Steps 5-8 technically can be done *before* takeoff without issue):

1. Open Xchat (not HexChat) **at HRD workstation** and **join #hrd-status, #hrd-sweeps-status, and #hrd-scripts-status**

For AOC: When tunneling to HRD workstation from netman, execute 'ssh -Y' (and *not* 'ssh -X')

2. Run 'check_sweeps'. Ground support will advise which files/dirs to remove, if necessary.

3. Run 'radarsync -u' (paste branch/commit info) and, when done, **run 'buildradaranalysis'**.

4. Run 'initial_cleanup'. (You should see no output on execution)

5. A minute or two after radar has been turned on, **run 'run_check_sweeps'.** It will open 1 window. Inform data tech of any anomalies in fore or aft sweep recording (note: YYYYMMDDAI should be populated with fore/aft sweep files nrm* and nrs* every 5 to 6 seconds)

6. Look at master (fore) and slave (aft) displays (labeled TM and TS) to ensure proper radar functioning. Make sure they are similar and both show return from the sea surface.

7. Run 'tdrProcSend'. It will open 2 windows (aircraftTailRadarProcessor.py and xferTDR) that should be left open for the whole flight. Use them to monitor the transfer of EMC data (*.dat). If either window closes at any point, inform ground support of the situation.

8. Run 'radarsync -a' preferably in a new terminal. Assuming all goes well, no further terminal commands should be required during the flight.

9. Throughout flight **MONITOR** the status of the TDR as in (6) above [TDR instrument messages should appear in #tdr-status (if available) … ensure xchat notifications are set to alert you to status changes on this channel]. If in weather, make sure the patterns near aircraft look similar.

****ASSUMING GROUND SUPPORT CREATES JOBFILES...**

Ground support will monitor the status of #tdr-status, #hrd-sweeps-status, and #hrd-scripts-status to ensure the TDR and scripts are properly functioning prior to the IP and prior to analysis jobfile submission. It is important to **be aware of these critical times** and **be available to address issues** as needed.

(If HRD crew on board) **Keep an informal log** of center fix time/lat/lon and leg start/end times. Although the jobfile submitted by ground support contains the official record of parameters for each radar analysis, they may occasionally ask for confirmation.

After ground support notifies that a jobfile has been sent, they will monitor #hrd-status and #hrd-scripts-status for software and script status. As a backup, **monitor the 'radarsync -a' terminal**. You should inform ground support immediately if the radarsync process shows an error message and/or has gone to a command prompt.

****NEAR END OF FLIGHT...**

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1. Once the aircraft reaches the end point of the pattern and/or mission science is complete, the data tech can **end the TDR recording**. Generally, this should be at least 20 min before touchdown to allow sufficient time for data compression, etc.

2. Once ground support confirms that the analysis files have arrived at the AOC site, you may **stop 'radarsync -a'**, and close its terminal.

3. Once the data tech on the aircraft indicates that all TDR files (sometimes AOC calls them messages) have been transmitted off the aircraft (or the ground scientist confirms their arrival on the ground), you may **close the xferTDR and aircraftTailRadarProcessor.py windows**.

4. (If HRD crew on board) Once science portion of mission is over, and all analyses have been completed, but before landing (ideally, at least 30 minutes), **run: './makearchive'**. This will produce file: thumbYYMMDDAI_products.tar.gz which should be **copied to the portable drive**. If time permits, ask the data tech to transfer the TDR product-raw files to the portable drive.

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

****IF CREATING JOBFILES AND EXECUTING SOFTWARE ON THE AIRCRAFT…**

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1. If running, **stop 'radarsync -a' with Ctrl-C** in the terminal

2. In a new terminal **run 'runJobFileApp'**

3. Enter the values of the fields with yellow background, specifically:

- Storm ID: If there is not an appropriate value already in the Storm ID field, enter one in the form ALxx2016, EPxx2016 or CPxx2016, where xx is the TD number or 90-99 for an invest—in a tasked mission (note: a recent NHC storm discussion will have the correct ID).

Note: Most likely, the G-IV flight track will not pass close to the center. It is generally best for the QC method, especially if analyzing the inner 90-n-mi circumnavigation or a center overflight, to center the analysis on your estimate of the circulation center *during the analysis period*. In this case, the **Center Time** would be that corresponding to your center estimate. For flight segments further away from the circulation center, you may center the analysis on those segments and use the midpoint time as the **Center** Time. Set the **Start/End Cross-section** time 2 seconds before/after the **Center Time**.

- Key times (HHMMSS UTC):

  - Start 3D: Usually, time inbound leg started … or 1st drop point of a circumnavigation

  - End 3D: Usually, time downwind leg ended … or last drop point of a circumnavigation

  - Start/End Cross-section: If a center overflight is done, the Start time of inbound leg and the End time of outbound leg (before the turn downwind), otherwise, see note above.

  - Center Time: Time of center estimate, otherwise, see note above.

- Center Lat/Lon: Latitude and longitude (decimal deg) of center estimate. No negative sign for longitude.

- Storm Direction: Meteorological direction storm is headed toward. Get from latest NHC storm advisory.

- Storm Motion: Speed of storm (kt). Get from latest NHC storm advisory.

- Track IN/OUT: After Start/End Cross-section and Center fix fields are filled, click 'Draw/Save Cross-section'. Click 'set' for both Track IN and Track OUT to populate the fields. A flight track graphic will also appear in the right panel. If you entered the Cross-section times and Center fix info properly, blue lines should fall along the inbound and outbound legs and the blue circle should fall along the flight track (for a penetration). [If the penetration is *not close to the center*, still always do this step.]

- Event type (second column): For circumnavigation or synoptic surveillance legs this setting should be based on the *sampled winds*. 'Invest' for invest, 'Tropical Storm' for TD or TS, 'Hurricane' for Cat 1-2, and 'Major Hurricane' for Cat 3-5 hurricane.

- '**Acceptable for Composite**': Uncheck box if the present analysis should not to be included in the real-time graphics composite (the superobs and analysis will still be transmitted to EMC and AWIPS-II, respectively). Paul Reasor can advise if unsure, but the default is box checked.
- **Radius** may be expanded beyond 250 km to encompass observations over larger scales (e.g., a 90-n-mi circumnavigation that is substantially offset from the circulation center). Note that entering a radius > 250 km will automatically adjust horizontal grid spacing from the 2-km default, and possibly the radius value, to keep the grid point domain 250 x 250 and horizontal grid resolution a multiple of 0.5 km. If such a change must be made, note clearly in the Radar Scientist Form and on the TC Summary spreadsheet that Level 2 reprocessing will be necessary. Note also: All analyses in the real-time graphics composite MUST have the *same* grid spacing.

You will not need to set anything else! All other fields are defaults and should not be changed.

4. Click 'Write to Files'. Review the summary information presented and **click 'Yes' if correct**. Take note of the location where the jobfile.tar.gz was created, displayed on top right corner.

(You can leave the app open to build future jobfiles. But, if it was closed, launch it again and select 'Load Last Session'. Don't forget to reset 'Acceptable for Analysis' as needed.)

5. In radarsync terminal **run: 'radarsync ~/tmpjobfile/YYYYMMDDAI_HHMMSS_jobfile.tar.gz'**

You should see software status updates like: 1st pass, 2nd pass, 3rd pass, superobbing, EMC data dumped, 3D solution, listing of files, then job done). The 1st pass software is not run under the "major hurricane" setting. If you do not see all of these steps complete, then the software has crashed at some point. If it is possible to debug with someone on the ground, then try to reach John Gamache or Paul Reasor.

(Rule of thumb: For a standard pattern, G-IV analysis and superobbing should complete in about 1/3 the time it took to fly the pattern.)

6. Transmit. As long as tdrProcSend is running, EMC data will be transmitted automatically.

****POTENTIAL ISSUES…**

>>TO RE-SEND ANALYSIS RESULTS<<

In the rare event that 'radarsync' gives errors during transmission phase of the analysis results (errors like 'Connection timed out', 'Host unreachable'), the script will keep retrying every 10

seconds until successful. If it fails for too long, cancel the process with 'Ctrl-C' and inform of the situation. You may need to involve Dana Naeher (network) or Sonia Otero (software).

When ready to retry transmission phase alone, run 'radarsync --resend'.

The script will attempt to transmit the files sitting in ~/ftpdir from the last analysis. If it fails again, it will start the loop of retrying every 10 seconds.

Once 'radarsync --resend' is done, restart 'radarsync -a'.

>>SHOULD AN ANALYSIS END TOO QUICKLY OR PREMATURELY<<

If an analysis completes in far less time than the "Rule of Thumb" and yields empty analysis files, the issue is *usually* instrument related. But, before involving the data tech, make sure the jobfile was set up properly! If was a jobfile error, have ground support correct it, then submit the corrected jobfile to restart the process.

>>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'. It will open 2 windows (aircraftTailRadarProcessor.py and xferTDR) that should be left open for the whole flight.

2. Run 'radarsync -a' preferably in a new terminal. If the terminal had been in the middle of file transmission during the interruption, you may first need to resend as detailed above.

3. Run 'run_check_sweeps'.

If the software had been in the middle of execution and doesn't restart automatically, have ground support resend the last jobfile to restart the software. In any event, ensure that all EMC files and HRD radar product files have been transmitted off the aircraft.

>>SHOULD COMMUNICATIONS ON THE AIRCRAFT DROP OUT<<

Note: Occasionally, you may need to restart 'radarsync -a' after a comms lapse.

[Simply wait until comms are reestablished. Ground support will then submit any outstanding jobfile. If comms goes down while the software is running, let ground support know the last status update in the terminal when comms are reestablished. Currently, it is <u>not</u> possible to execute runJobFileApp on the aircraft when comms are down. In the future, we want this capability so that the software could run at the HRD radar workstation while waiting for comms to be reestablished.]