| **MISSION PLAN** | | | |
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| **FLIGHT ID** | 20230910I1 | **STORM** | AL13 / Lee |
| **MISSION ID** | 1113A LEE | **TAIL NUMBER** | NOAA43 |
| **TASKING** | EMC | **PLANNED PATTERN** | Butterfly pattern with 105 NM legs |
| **MISSION SUMMARY** | | | |
| **TAKEOFF [UTC]** | 0836 | **LANDING [UTC]** | 1637 |
| **TAKEOFF LOCATION** | St. Croix | **LANDING LOCATION** | St. Croix |
| **FLIGHT TIME** | 8.0 | **BLOCK TIME** | 8.3 |
| **TOTAL REAL-TIME RADAR ANALYSES**  **(Transmitted)** | 6 (6) | **TOTAL DROPSONDES Deployed (Transmitted)** | 39 (38) |
| **OCEAN EXPENDABLES (Type)** | 3 ONR AXBT (1 bad),  1 MicroSWIFT | **sUAS (Type)** | n/a |
| **APHEX EXPERIMENTS / MODULES** | * *Surface Wind and Wave Validation Module- P-3 Pattern #1 (Priority 1)* * *FLAIMS Module (Priority 2)* * *Stratiform Spiral Module (Priority 3)* * *TDR Dual-PRF module* * *In-storm location(s) for the modules may be determined/adjusted at the discretion of the onboard HRD LPS* | | |
| **HRD CREW MANIFEST** | | | |
| **LPS ONBOARD** | Aberson | **LPS GROUND** | Marks |
| **TDR ONBOARD** | Aberson | **TDR GROUND** | Reasor |
| **ASPEN ONBOARD** | J. Zhang/Ko | **ASPEN GROUND** | n/a |
| **NESDIS SCIENTISTS** | n/a | | |
| **GUESTS (Affiliation)** | Ryan (CIMAS), Duran (NASA/MSFC), Scotland, Knox-Limbacker, Walters | | |
| **AOC CREW MANIFEST** | | | |
| **PILOTS** | Copare/Keith/Wood | | |
| **NAVIGATOR** | Utama | | |
| **FLIGHT ENGINEERS** | Tyson/Tufnell | | |
| **FLIGHT DIRECTOR** | Kalen/Lundry | | |
| **DATA TECHNICIAN** | Richards | | |
| **AVAPS** | Warneke/Kotz | | |

| **PRE-FLIGHT** | |
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| **Flight Plan** | *Butterfly pattern with 105 NM legs*     * *8-12 kft (pressure altitude) depending on AF deconfliction requirements* |
| **Expendable Distribution** | * *Load 40 dropsondes*   + *Release at endpoints, midpoints, centers, RMWs (NHC)*   + *Possible drops for Surface Wind and Wave Validation Module (HRD)*   + *Possible supplemental rapid RMW drops (ONR)*   + *Possible drops at top of the Microphysics Spiral (ONR)*   + *Additional drops may be requested at the discretion of the onboard HRD LPS*   + *All dropsondes transmitted to the GTS* * *3 AXBTs - see notes below*   + *All AXBTs transmitted to the AOC ground server if possible* * *1 microSWIFT wave buoy - see notes below* |
| **Preflight Weather Briefing** | *A. 10/1200Z*  *B. NOAA3 1113A LEE*  *C. 10/0830Z*  *D. 21.5N 60.8W*  *E. 10/0930Z TO 10/1530Z*  *F. SFC TO 10,000 FT*  *G. TAIL DOPPLER RADAR* |
| **Instrument Notes** | *Everything working nominally* |

| **IN-FLIGHT** | |
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| **Time [UTC]** | **Event** |
| 0836 | Take-off from St. Croix |
| 0929 | IP Point 1 drop #1, 10 kft altitude, TK 045    Pretty good wave#1 asymmetry in IR. Coldest IR tops in the WSW quadrant. Expect north eyewall to be the most active right now to produce those cold tops. Some lightning detected in SW eyewall. |
| 0942 | Midpoint drop #2, inside edge of possible outer eyewall |
| 0950 | RMW sondes 1, 2, 3 (drops #3-5) |
| 0954 | Eye drop (drop #6), early because FD display went out.  Estimated center 21.35 N, 60.67 W. Central press 957.  On satellite it appears that the center is just inside the coldest IR tops |
| 0958 | RMW sonde 1, 2 (drops #7-8) |
| 0959 | RMW sonde 3 (drop#9), on MMR eyewall is a spiral starting east, then extending all the way around northeast again. West side has higher SFMR winds than the east. Opposite at FL |
| 1007 | Midpt sonde (drop #10) |
|  | MMR has lots of missing rays in the display |
| 1019 | Endpoint (PT #2) sonde (drop #11), TK 300 to PT #3 |
| 1023 | TDR jobfile #1 started |
| 1038 | TDR analysis #1 complete  TDR center info from 230910I1\_0954\_xy.nc:  Alt (km) Lat (deg) Lon (deg W)  0.5 21.38 60.64  2.0 21.38 60.64  3.0 21.38 60.68  6.0 21.41 60.68  2-6-km Vortex Tilt: 5.7 km at 315 deg    Analysis shows peak FL WS 101.5 kt at ~95 deg. Peak 0.5-km WS 108.3 kt at ~265 deg (opposite side). Agrees with SFMR and FL winds  Tilt hodograph suggests a more vertically-coherent vortex. Centers no longer displaced prominently downshear at upper levels. |
| 1043 | Endpoint (PT #3) drop #12, turn TK 180 |
| 1051 | Midpt sonde in small moat between bands (drop #13),  Satellite imagery suggests a new convective pulse is starting in NE eyewall and will rotate downwind to a point along inbound track. |
| 1100 | RMW sondes 1, 2 (drops #14-15), passed just west of convective pulse |
| 1102 | RMW sonde 3 (Drop #16) |
| 1106 | Center sonde (Drop #17), Eye very different, now circular open south |
| 1109 | RMW sonde 1 (Drop #18) |
| 1110 | RMW sondes 2, 3 (Drops #19-20) |
| 1122 | Midpt sonde (Drop #21) |
| 1132 | Endpt (PT #4) sonde (Drop #22), turn TK 045, sonde shows layers of dry air remaining in environment with many inversions |
| 1133 | Convective pulse has rotated to the NW of center |
| 1136 | TDR job #2 started |
| 1155 | Endpt (PT #5) sonde (Drop #23) |
| 1156 | TDR analysis #2 complete  TDR center info from 230910I1\_1106\_xy.nc:  Alt (km) Lat (deg) Lon (deg W)  0.5 21.44 60.71  2.0 21.44 60.73  3.0 21.46 60.75  6.0 21.50 60.77  2-6-km Vortex Tilt: 7.2 km at 326 deg |
| 1200 | Active outer rainband, extreme turbulence, satellite image showed band had some relatively cold tops |
| 1206 | Midpt combo (drop #24, AXBT #1) SST=28.45 |
| 1214 | RMW sonde 1 (drop #25) |
| 1215 | RMW sonde 2 (drop #26) |
| 1216 | RMW sonde 3 (drop #27) |
| 1219 | Center combo (drop #28, AXBT #2), SST=28.94 |
| 1222 | RMW sondes 1, 2 (drops #29-30) |
| 1223 | RMW sonde 3 (drop #31) |
| 1230 | Setting up to do Surface Wind and Wave Validation Module - P-3 Pattern #1 along radial 090 deg from center. Set up to do some 3-4 in/out spokes. First outbound (090)/inbound (270) with dual PRF, the rest at single PRF. |
| 1233 | Midpt combo (drop #32, AXBT #3) SST= system froze, not sure if we got data, will check later |
| 1244 | Endpt (#6) sonde (drop #33), microswift buoy, TRK 135 to center |
| 1249 | Inbound, switch TDR to dual prf |
| 1253 | TDR Job #3 started |
| 1309 | TDR Job #3 complete  TDR center info from 230910I1\_1219\_xy.nc:  Alt (km) Lat (deg) Lon (deg W)  0.5 99.99 99.99  2.0 21.51 60.82  3.0 21.53 60.84  6.0 21.55 60.90  2-6-km Vortex Tilt: 9.0 km at 297 deg... vortex just doesn't want to align in low-mid levels  ~34-km azi-mean RMW ... so 9 km is not huge in the grand scheme of things |
| 1323 | Inbound rmw sonde (drop #34) |
| 1326 | Center, begin Surface Wind and Wave Validation Module along radial 090 deg from center. First outbound (090) |
| 1343 | Endpt turn inbound TK 270 to center |
| 1348 | Switch to single prf |
| 1356 | RMW Sonde (drop #35), failed above 1000 m, going out to try again. |
| 1400 | Orbiting in center waiting for drop location, unfortunately sonde failed at 1100 m, so going out to try again |
| 1404 | Start outbound leg TK 090, this time we will try to drop 2 RMW sondes |
| 1413 | Endpt turn inbound TK 270 to center |
| 1417 | 2 RMW sondes (drops #36-37). Sondes dropped within 2 s of each other, landed about 30 s apart. Second one had higher 10-m wind (80.8 kt vs 72 kt). WL150 96 kt |
| 1420 | Orbiting in center waiting for drop locations. Will try a different azimuth |
| 1432 | Start outbound leg, TK 060, satellite shows another major convective burst that started in the NNW eyewall and is rotating down wind |
| 1442 | Endpt turn TK 240 |
| 1443 | TDR analysis #4 (1415-1442) - Should capture convective burst in N eyewall development |
| 1449 | 2 RMW drops (drops #38-39) Sondes dropped within 2 s of each other, landed about 30 s apart. One had higher 10-m wind (109.5 kt vs 100.5 kt). WL150 117 kt |
| 1453 | TDR analysis #4 completed  TDR center info from 230910I1\_1422\_xy.nc:  Alt (km) Lat (deg) Lon (deg W)  0.5 99.99 99.99  2.0 21.68 61.02  3.0 21.68 61.02  6.0 21.70 61.06  2-6-km Vortex Tilt: 4.5 km at 297 deg  Really good coverage of the eyewall in the swaths that captured two major convective bursts in the NE and NW part of the eyewall with tops >18 km |
| 1455 | Orbiting in the eye waiting on drops |
| 1459 | Start outbound leg TK 030 |
| 1507 | Endpt turn TK 210 |
| 1513 | Start TDR analysis #5 |
| 1518 | Center, end module, TK 230 for St. Croix (TISX) |
| 1551 | TDR analysis #6 started |
| 1603 | TDR analysis #6 completed.  TDR center info from 230910I1\_1518\_xy.nc:  Alt (km) Lat (deg) Lon (deg W)  0.5 99.99 99.99  2.0 21.77 61.09  3.0 21.77 61.11  6.0 21.82 61.15  2-6-km Vortex Tilt: 8.5 km at 315 deg |
| 1637 | Landed TISX |
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| **POST-FLIGHT** | |
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| **Mission Summary** | Today’s missions collected important airborne radar information and transmitted it to NOAA/NCEP for assimilation into NOAA’s HAFS and HWRF models to improve forecasts of the track, structure, and intensity of Lee. In addition, today’s NOAA-43 AM mission deployed a University of Washington microSWIFT expendable wave buoy, collected additional observations in the region of strongest winds within the eyewall to improve measurements of the surface wind speeds in this region, tested a new sampling mode for the TDR, and sampled a region of rapidly changing and growing convection in the eyewall. These additional research observations will lead to improvements in our observing capabilities of tropical cyclones along with a better understanding of the processes that impact changes to the structure and intensity of tropical cyclones.  Excellent radar and dropwindsonde coverage, much larger eye than previous days: |
| **Actual Standard Pattern Flown** | *Butterfly, Rotated Figure-4, plus Surface Wind and Wave Validation Module - P-3 Pattern #1 (3 legs), plus TDR dual-PRF module* |
| **APHEX Experiments / Modules Flown** | [*https://www.aoml.noaa.gov/wp-content/uploads/2023/04/2023HFP\_MatureStage\_Flight\_Patterns\_Wind\_Wave.pdf*](https://www.aoml.noaa.gov/wp-content/uploads/2023/04/2023HFP_MatureStage_Flight_Patterns_Wind_Wave.pdf)  [*https://www.aoml.noaa.gov/wp-content/uploads/2023/04/2023HFP\_MatureStage\_Flight\_Patterns\_TDR\_Dual\_PRF.pdf*](https://www.aoml.noaa.gov/wp-content/uploads/2023/04/2023HFP_MatureStage_Flight_Patterns_TDR_Dual_PRF.pdf) |
| **Plain Language Summary** | Very successful operationally tasked TDR mission:   * Produced 6 TDR analyses with radial wind files transmitted to EMC and NHC * Produced 38 dropsondes transmitted to EMC and NHC * Completed Surface Wind and Wave Validation Module with 3 legs * Completed a TDR Dual-PRF Module * Captured explosive convective bursts in redeveloping eyewall with echo tops >18 km altitude. It may be possible to see structure of these features rotating inside the eye using the TDR. |
| **Instrument Notes** | *[Notes about instrument status from during and after the mission]* |
| **Final Mission Track** |  |