| **MISSION PLAN** | | | |
| --- | --- | --- | --- |
| **FLIGHT ID** | 20241105H1 | **STORM** | AL18 / RAFAEL |
| **MISSION ID** | 1018A | **TAIL NUMBER** | NOAA-42 |
| **TASKING** | NHC/EMC TDR | **PLANNED PATTERN** | Butterfly |
| **MISSION SUMMARY** | | | |
| **TAKEOFF [UTC]** | 2013 | **LANDING [UTC]** | 0258 |
| **TAKEOFF LOCATION** | KLAL | **LANDING LOCATION** | KLAL |
| **FLIGHT TIME** |  | **BLOCK TIME** |  |
| **TOTAL REAL-TIME RADAR ANALYSES**  **(Transmitted)** | 3 (3) | **TOTAL DROPSONDES Deployed (Tx to GTS)** | 21 (18) |
| **OCEAN EXPENDABLES deployed (good)** | 0 | **sUAS (Type)** | 0 |
| **APHEX EXPERIMENTS / MODULES** |  | | |
| **HRD CREW MANIFEST** | | | |
| **LPS ONBOARD** | Aberson | **LPS GROUND** | None |
| **TDR ONBOARD** | Aberson | **TDR GROUND** | Gamache |
| **ASPEN ONBOARD** | N/A | **ASPEN GROUND** | Sellwood/Goldenberg |
| **NESDIS SCIENTISTS** | N/A | | |
| **GUESTS (Affiliation)** |  | | |
| **AOC CREW MANIFEST** | | | |
| **PILOTS** | Keith, Ellis, Taraboletti | | |
| **NAVIGATOR** | Meier | | |
| **FLIGHT ENGINEERS** | Tyson, Wysinger | | |
| **FLIGHT DIRECTOR** | Elgart, Zawislak | | |
| **DATA TECHNICIAN** | MacAllister | | |
| **AVAPS** | Vargas, Dykeman | | |

| **PRE-FLIGHT** | |
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| **Flight Plan** | *NHC-EMC tasked NOAA-42 TDR mission into Hurricane Rafael - 1500L / 2000z takeoff from Lakeland and recovering in Lakeland. Timing of the pattern is to be on-station for EMC data collection for the 0000z assimilation window between 2100z and 0300z.*  *Pattern: Fly butterfly pattern with 105 NM legs*  *Altitude:*   * *10 kft preferred - 8 kft if AF deconfliction is required (pressure* * *altitude)Research Modules:* * *APHEX Early Stage: Vortex Alignment Module (VAM) - see notes below*   *Expendables:*   * *Load 30 dropsondes - see notes below*   + *All dropsondes transmitted to the GTS*   *NHC-EMC tasked NOAA-42 TDR mission into Tropical Depression 18 - 1500L / 2000z takeoff from Lakeland and recovering in Lakeland. Timing of the pattern is to be on-station for EMC data collection for the 0000z assimilation window between 2100z and 0300z.*  *Pattern: Fly butterfly pattern with 105 NM legs*  *Altitude:*   * *10 kft preferred - 8 kft if AF deconfliction is required (pressure altitude)*   *Research Modules:*   * *APHEX Early Stage: Vortex Alignment Module (VAM) - see notes below*   *Expendables:*   * *Load 30 dropsondes - see notes below*   + *All dropsondes transmitted to the GTS* |
| **Expendable Distribution** | *Dropsonde at endpoints, midpoints and center. 6 dropsondes to be released en route to test interference from N42 ground receiver.* |
| **DDPreflight Weather Briefing** | *[Notes from the Flight Crew Preflight Briefing and other relevant notes about the current and forecasted storm state from the most recent NHC advisory (location, intensity, MSLP, movement, possible intensity change during the flight)]*  *Tropical Storm Rafael Discussion Number 9*  *NWS National Hurricane Center Miami FL AL182024*  *400 PM EST Tue Nov 05 2024*  *Reports from an Air Force Reserve Hurricane Hunter aircraft and*  *radar data from Grand Cayman indicate that Rafael has developed an*  *inner wind core during the past several hours. The radar data shows*  *the development of a ragged eye, and the Hurricane Hunter reported*  *850-mb flight-level winds of 73 kt about 30-35 n mi northeast of the*  *center. The aircraft also reported that the central pressure has*  *fallen to near 989 mb. Based on these data, the initial intensity*  *is increased to 60 kt. The wind radii have been revised some based*  *on the aircraft data.*  *The initial motion is northwestward at 325/13 kt. Rafael is*  *currently on the southwestern side of a low- to mid-level ridge over*  *the western Atlantic, and this feature should steer the cyclone*  *generally northwestward for the next 36-48 h, with the center*  *passing near the Cayman Islands and over western Cuba. From 48-72*  *h, the models are in better agreement that the center should turn*  *more westward as the ridge builds a little westward along the*  *northern Gulf coast. After 72 h, there remains some significant*  *spread in the track guidance, due partly to differences in how fast*  *Rafael will shear apart and due partly to differences in the*  *forecast strength of the ridge along the Gulf coast. The GFS*  *weakens the ridge and shows a northward turn, while the ECMWF keeps*  *a stronger ridge and shows a more westward motion. The*  *deterministic UKMET has now changed to a northward turn scenario,*  *but the HWRF, HMON, and UKMET ensemble mean join the ECMWF with a*  *westward motion. As mentioned with the previous forecast, until*  *there is a clearer signal on which of these scenarios is more*  *likely, the forecast compromises between these extremes with a slow*  *turn toward the north over the northern Gulf of Mexico.*  *Now that Rafael has developed an inner wind core, conditions are*  *favorable for steady to rapid strengthening during the next 24 h or*  *so. The system is expected to reach hurricane strength during*  *the next several hours as it passes through the Cayman Islands with*  *additional strengthening before it reaches Cuba. While the peak*  *intensity forecast is near the high end of the intensity guidance,*  *there is a chance that Rafael could get stronger than currently*  *forecast. Once the center is north of 25N in the Gulf of Mexico,*  *the cyclone is likely to encounter increasing vertical wind shear,*  *dry air entrainment, and cooler sea surface temperatures, which*  *should lead to Rafael weakening and eventually shearing apart*  *vertically. This part of the intensity forecast lies near or just*  *above the intensity consensus.*  *Key Messages:*  *1. Rafael is forecast to be a hurricane when it passes near or over*  *the Cayman Islands during the next 12 hours, where damaging*  *hurricane-force winds, a dangerous storm surge, and destructive*  *waves are expected. Additional strengthening is expected before*  *Rafael reaches western Cuba and the Isle of Youth on Wednesday. A*  *hurricane warning is in effect for this region, where damaging*  *hurricane-force winds, life-threatening storm surge, and destructive*  *waves are also expected.*  *2. Tropical storm conditions are expected in the Lower and Middle*  *Florida Keys beginning Wednesday and Wednesday night.*  *3. It is too soon to determine what, if any, impacts Rafael could*  *bring to portions of the northern Gulf Coast. Residents in this*  *area should regularly monitor updates to the forecast.*  *4. Rafael will bring areas of heavy rain across portions of the*  *western Caribbean through early Thursday, including Jamaica and the*  *Cayman Islands, along with southern and western portions of Cuba.*  *Flash flooding and mudslides are possible along the higher terrain*  *in Jamaica and Cuba.*  *FORECAST POSITIONS AND MAX WINDS*  *INIT 05/2100Z 19.1N 79.6W 60 KT 70 MPH*  *12H 06/0600Z 20.5N 80.7W 70 KT 80 MPH*  *24H 06/1800Z 22.5N 82.4W 80 KT 90 MPH*  *36H 07/0600Z 24.1N 83.8W 80 KT 90 MPH*  *48H 07/1800Z 25.0N 85.2W 80 KT 90 MPH*  *60H 08/0600Z 25.4N 86.5W 75 KT 85 MPH*  *72H 08/1800Z 25.8N 87.8W 65 KT 75 MPH*  *96H 09/1800Z 27.1N 90.1W 50 KT 60 MPH*  *120H 10/1800Z 28.8N 90.7W 40 KT 45 MPH*  *[Briefly describe the relevant environmental drivers.]*  *[Copy in GIF of recent (~6 hr) satellite loops (https://www.star.nesdis.noaa.gov/GOES/index.php)]* |
| **Instrument Notes** | *[What instruments are working, not working, not functioning nominally, not installed?]* |

| **IN-FLIGHT** | |
| --- | --- |
| **Time [UTC]** | **Event** |
| 2113 | Take-off from Lakeland |
| 2133 | Issue with aft TDR sweeps until 2048. Aft TDR system restarted. |
|  |  |
| 2049 | 2 drops released for interference test DROP 1 and 2 |
| 2109 | 2 drops released for interference test DROP 3 and 4 |
| 2125 | 2 drops released for interference test DROP 5 and 6 |
| 2214 | IP and sonde dropped DROP 7 |
| 2229 | Midpoint NW sonde dropped DROP 8 |
| ~224535 | Appears to be good center fix (Gamache initial estimate 19.192,79.74)  Center DROP 9 |
|  |  |
| 2256 | Midpoint SE sonde Drop 10 |
| 2309 | End outbound of first penetration. Drop 11 |
| 2311 | 23 |
| 2334 | Beginning of inbound no. 2 DROP 12 |
| 2343 | First analysis 8 km at 90 degrees from TDR analysis |
| 2345 | Midpoint NE drop DROP 13 |
|  |  |
|  |  |
| 2359 | Center DROP 14 Fast Fall |
| 0000 | Center DROP 15 backup channel 1 good drop |
| 0011 | Midpoint SW DROP 16 |
| 2425 | End of outbound on SW side (240) DROP 17 |
|  | << INSERT ADDITIONAL ROW AS NEEDED >> |
| 2446 | Beginning of inbound pass 3 S DROP 18 |
|  |  |
| 2457 | Midpoint S DROP 19 |
| 2508 | Center DROP 20 |
| 0122 | Midpoint N DROP 21 |
| 0135 | Endpoint N DROP 22 Last Report |
| 0141 | Science complete |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
| 0030 |  |
|  | Second analysis had same tilt of 8 km at 90 degrees |
| 2535 | Approximate FP |
|  | Third analysis had tilt of 10 km at 90 degrees |
|  |  |
|  |  |
|  |  |
|  |  |

| **POST-FLIGHT** | |
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| **Mission Summary** | *[Short description of interesting observations from the flight; what objectives were successful? What was unsuccessful? Was the planned pattern flown? What deviations occurred?*  *[Don’t forget to fill in Tables on page 1]*  *[Sonde and ocean expendable accounting: how many total of each? How many are charged to each account?]*  *22 dropsondes total 21 good 1 bad (fast-fall) 6AOC 16 NWS* |
| **Actual Standard Pattern Flown** | *Butterfly* |
| **APHEX Experiments / Modules Flown** | *Storm was vertically aligned so decided not to fly the VAM.* |
| **Plain Language Summary** | *[Boil down the above into a couple of bullet points in “plain language”. This will help us when we report to management & OAR Public Affairs and prepare storm mission summaries]* |
| **Instrument Notes** | *[Notes about instrument status from during and after the mission]* |
| **Final Mission Track** |  |