

# 2020 NOAA/AOML/HRD Hurricane Field Program - IFEX

## SATELLITE VALIDATION EXPERIMENT

### *Flight Pattern Descriptions*

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**Experiment/Module:** ADM-Aeolus Satellite Validation Module

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**Requirements:** No requirements: flown at any stage of the TC lifecycle

#### **P-3 Pattern #1:**

**What to Target:** Coordinated underflights of the ADM-Aeolus satellite in the environments of tropical disturbances (e.g., African easterly waves, invests, and TCs) and the Saharan air Layer (SAL).

**When to Target:** P-3 flight patterns will be adjusted to coordinate temporal and spatial overlap with overpasses by the ADM-Aeolus satellite. GPS dropsonde and P-3 tail Doppler radar (TDR) sampling should be timed to be  $\leq 30$  min and  $\leq 15$  n mi (25 km) of collocated ADM-Aeolus wind and aerosol retrievals and will depend on the area of operation (determined on a case-by-case basis).

**Pattern:** This is a breakaway pattern that involves a straight-line leg that underflies the ADM-Aeolus satellite and requires an offset of 125 n mi (230 km) from nadir (due to the  $35^\circ$  scan angle of the satellite's Aladin lidar instrument). The P-3 leg should ideally begin  $\sim 10$ -15 min before and continue for  $\sim 10$ -15 min after the satellite passes "overhead". This will equate to a P-3 leg length of  $\sim 90$ -135 n mi (165-250 km). NASA's MTS aircraft software should be used to coordinate the underflight.

For ADM-Aeolus satellite *ascending* orbital passes (see Fig. 1):

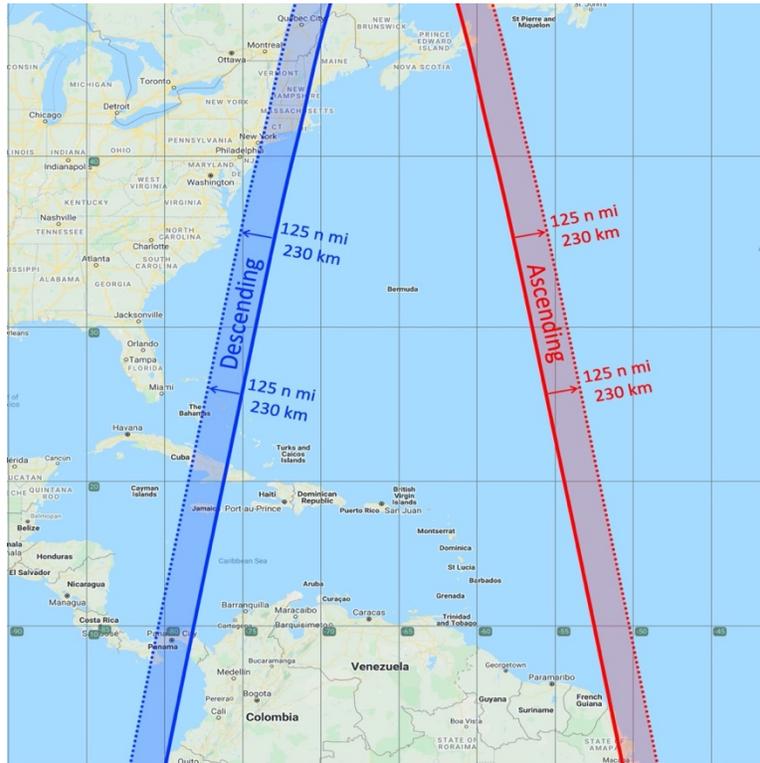
- ADM-Aeolus crosses the equator (SSE-NNW) at 1800 LST
- P-3 underflight legs will be generally oriented SSE-NNW
- P-3 underflight legs will offset 125 n mi (230 km) to the east of nadir

For ADM-Aeolus satellite *descending* orbital passes (see Fig. 1):

- ADM-Aeolus crosses the equator (NNE to SSW) at 0600 LST
- P-3 underflight legs will be generally oriented NNE-SSW
- P-3 underflight legs will offset 125 n mi (230 km) to the west of nadir

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*Fig. 1: Sample ADM-Aeolus ascending (red) and descending (blue) satellite passes. The solid lines denote the nadir points directly below the satellite. The dashed curves denote the desired aircraft underflight locations offset 125 n mi (230 km) to the east (ascending orbit) and west (descending orbit) of the satellite nadir.*

**Flight altitude:** 10-12 kft (5 kft is minimum altitude for dropsonde launches).

**Leg length or radii:** N/A

**Estimated in-pattern flight duration:** ~20-30 min

**Expendable distribution:** During the ADM-Aeolus underflight, GPS dropsonde spacing should generally be ~20 n mi (35 km), which will require ~4-8 dropsondes. The sampling frequency can be increased to 10 n mi (20 km) in high gradient areas (e.g., near the TC radius of 34 kt winds or the SAL).

**Instrumentation Notes:** Use TDR defaults. Use straight flight legs as safety permits. All GPS dropsonde data should be transmitted to the Global Telecommunication System (GTS) in real-time to ensure availability for assimilation into forecast models.

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**G-IV Pattern #1:**

**What to Target:** Coordinated underflights of the ADM-Aeolus satellite in the environments of tropical disturbances (e.g., African easterly waves, invests, and TCs) and the SAL.

**When to Target:** G-IV flight patterns will be adjusted to coordinate temporal and spatial overlap with overpasses by the ADM-Aeolus satellite. GPS dropsonde and TDR sampling should be timed to be  $\leq 30$  min and  $\leq 15$  n mi (25 km) of collocated ADM-Aeolus wind and aerosol retrievals and will depend on the area of operation (determined on a case-by-case basis).

**Pattern:** This is a breakaway pattern that involves a straight-line leg that underflies the ADM-Aeolus satellite and requires an offset of 125 n mi (230 km) from nadir (due to the 35° scan angle of the satellite's Aladin lidar instrument). The G-IV leg should ideally begin ~10-15 min before and continue for ~10-15 min after the satellite passes "overhead". This will equate to a G-IV leg length of ~140-210 n mi (~260-390 km). NASA's MTS aircraft software should be used to coordinate the underflight.

For ADM-Aeolus satellite *ascending* orbital passes (see Fig. 1):

- ADM-Aeolus crosses the equator (SSE-NNW) at 1800 LST
- G-IV underflight legs will be generally oriented SSE-NNW
- G-IV underflight legs will offset 125 n mi (230 km) to the east of nadir

For ADM-Aeolus satellite *descending* orbital passes (see Fig. 1):

- ADM-Aeolus crosses the equator (NNE to SSW) at 0600 LST
- G-IV underflight legs will be generally oriented NNE-SSW
- G-IV underflight legs will offset 125 n mi (230 km) to the west of nadir

**Flight altitude:** 40–45 kft or as high as possible to provide better vertical sampling by dropsondes that are deployed.

**Leg length or radii:** N/A

**Estimated in-pattern flight duration:** ~20-30 min

**Expendable distribution:** During the ADM-Aeolus underflight, GPS dropsonde spacing should generally be ~35 n mi (65 km), which will require ~4-6 dropsondes. The sampling frequency can be increased to 15 n mi (30 km) in high gradient areas (e.g., near the TC radius of 34 kt winds or the SAL).

**Instrumentation Notes:** Use TDR defaults (though not a requirement for this experiment). Use straight flight legs as safety permits. All GPS dropsonde data should be transmitted to the Global Telecommunication System (GTS) in real-time to ensure availability for assimilation into forecast models.