

# 2019 NOAA/AOML/HRD Hurricane Field Program - IFEX

## MATURE STAGE EXPERIMENT *Flight Pattern Descriptions*

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**Experiment/Module:** Eye-Eyewall Mixing Module

**Investigator(s):** Sim D. Aberson (PI)

**Requirements:** Categories 2–5

**Mature Stage Science Objective(s) Addressed:**

- 1) Collect observations targeted at better understanding internal processes contributing to mature hurricane structure and intensity change [*IFEX Goal 3*]

**P-3 Pattern 1:**

**What to Target:** This module requires a TC with a clearly defined, visible eye, eyewall, and inversion and an eye diameter of at least 25 n mi (45 km).

**When to Target:** This module should only be attempted during daytime missions. It can be included within any missions during aircraft passage through the eye.

**Pattern:** This is a break-away pattern that is compatible with any standard pattern with an eye passage (all P-3 patterns except the Square spiral or Lawnmower). The P-3 will penetrate the eyewall at the standard-pattern altitude. Once inside the eye, the P-3 will descend to a safe altitude below the inversion, if necessary, while performing a Figure-4 pattern. The leg lengths will be determined by the eye diameter, with the ends of the legs at least 2 n mi from the edge of the eyewall. Upon completion of the descent, the P-3 will circumnavigate the eye about 2 n mi from the edge of the eyewall in the shape of a pentagon or hexagon. Time permitting; another Figure-4 will be performed during ascent to the original flight level. Depending upon the size of the eye, this pattern should take between 0.5 and 1 h.

**Flight altitude:** The flight altitude will vary from just below the inversion inside the eye to the standard-pattern altitude.

**Leg length or radii:** The leg lengths will be determined by the eye diameter, with the ends of the legs at least 2 n mi (3.5 km) from the edge of the eyewall. Upon completion of the descent, the P-3 will circumnavigate the eye about 2 n mi (3.5 km) from the edge of the eyewall in the shape of a pentagon or hexagon.

**Estimated in-pattern flight duration:** Depending upon the size of the eye, this pattern should take between 0.5 and 1 h.

**Expendable distribution:** No expendables required.

**Instrumentation Notes:** No special instructions for operation. If DWL is available, it should scan downward, though not necessarily exclusively, during the pattern. Each leg of the pattern should be straight within safety constraints.

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#### **P-3 Pattern 2:**

**What to Target:** Any category-4 or category-5 hurricane with a well-defined eyewall.

**When to Target:** During any transit across what is believed to be the strongest region of the eyewall.

**Pattern:** The pattern will not deviate from the regular eyewall penetration during any mission.

**Flight altitude:** A regular altitude for the main purpose of the flight.

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

**Estimated in-pattern flight duration:** This module does not add any time to the mission.

**Expendable distribution:** 8 dropwindsondes will be dropped as quickly as possible across the wind-speed maximum of the eyewall. The sondes should be spaced as close together as possible. The goal is to have the second-outermost sonde to be coincident with the flight-level radius of maximum wind speed, and the second-innermost sonde to be coincident with the surface radius of maximum wind speed.

**Instrumentation Notes:** The goal is to have as many sondes as possible in the air at the same time to investigate the structure of an individual miso- or meso-scale vortex.