

## 2021 NOAA/AOML/HRD Hurricane Field Program - APHEX

### MATURE STAGE EXPERIMENT *Flight Pattern Description*

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**Experiment/Module:** Eye-eyewall mixing

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

**Requirements:** Very intense tropical cyclones, intensity category 4 or 5

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

- 1) Collect observations targeted at better understanding internal processes contributing to mature hurricane structure and intensity change [*APHEX Goals, 1-3*].

**P-3 Pattern #1:**

**What to Target:** This module requires a category-4 or category-5 TC with a clearly defined, visible eye, closed eyewall, and inversion and an eye diameter of at least 30 n mi.

**When to Target:** The 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 eye must be  $\geq 25$  n mi in diameter, and for asymmetric or non-circular eyes, the narrowest cross section from eyewall to eyewall must be  $\geq 25$  n mi. Additionally, a 2-n mi standoff distance should be maintained from the radar displayed inner eyewall. The P-3 will penetrate the eyewall at the standard-pattern altitude. Once inside the eye, the P-3 will maintain the flight level of the main mission and perform a single orbit of the eye with a separation distance of approximately 2 n mi from the inner edge of the eyewall. The flight level of the orbit and 2 n mi minimum distance from the edge of the eyewall can be adjusted for safety considerations at the pilot's discretion. For non-circular eyes, maintaining a circular orbit is preferred (i.e., portions of the orbit could be  $>2$  n mi from the eyewall). If a center fix is required, this pattern can be done either before or after the center fix.

**Flight altitude:** The flight altitude will largely be the same as the standard pattern altitude, but can be adjusted for safety reasons.

**Leg length or radii:** The P-3 will circumnavigate the eye about 2 n mi from the edge of the eyewall.

**Estimated in-pattern flight duration:** Depending upon the size of the eye, this pattern should take between 0.25 and 0.5 h.

**Expendable distribution:** No expendables required.

**Instrumentation Notes:** No special instructions for operation.

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#### P-3 Pattern #2:

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

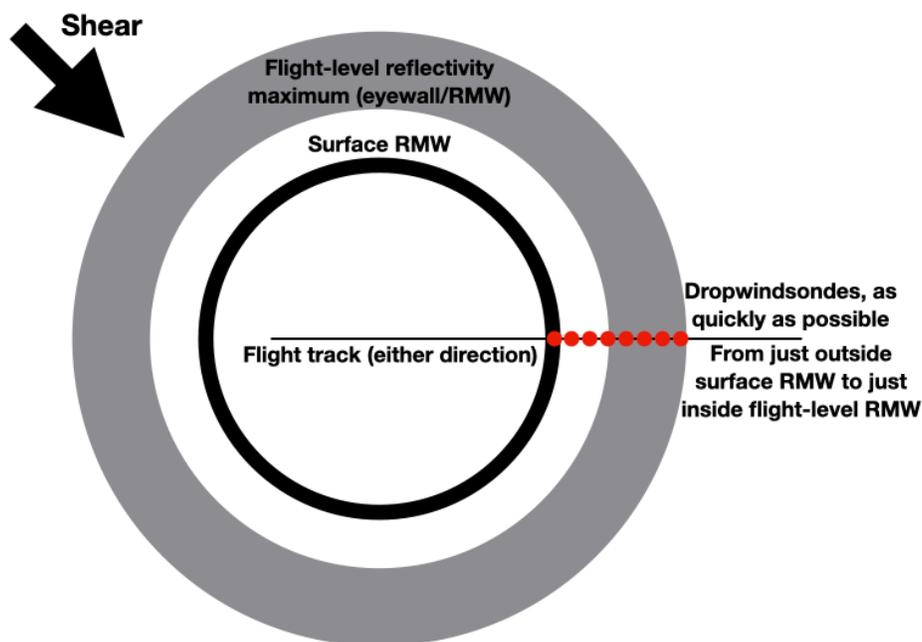
**When to Target:** During any transit across what is believed to be the strongest region of the eyewall.

**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:** 7 or 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.