

**MATURE STAGE EXPERIMENT**  
*Flight Pattern Description*

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**Experiment/Module:** Gravity Wave Module

**Investigator(s):** Jun Zhang (PI) and David Nolan (co-PI, UM)

**Requirements:** Categories 2–5

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

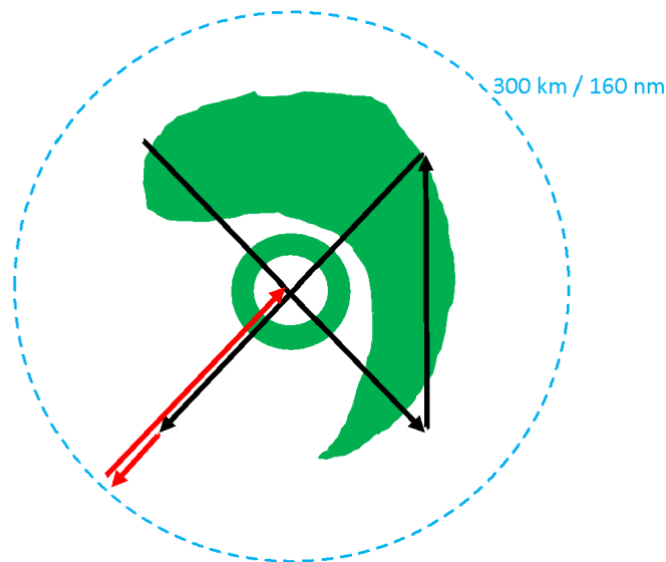
- 1) Collect observations targeted at better understanding internal processes contributing to mature hurricane structure and intensity change [APHEX Goals, 1 3].

**P-3 Pattern 1:**

**What to Target:** Sample the inner core and near environments of the TC

**When to Target:** Any strength TC; no land restrictions. This module ideally should be conducted in quadrant with the least rainband activity, typically the upshear right or right-real quadrant. The best opportunity is at the end of a standard Figure-4 pattern, when the last leg terminates in a quadrant with less rainbands.

**Pattern:** Any standard P-3 pattern that provides symmetric coverage (e.g. Rotated Figure-4, Figure-4 Butterfly, etc.). At the end of the last leg, continue outward to distance of 160 n mi (295 km) from the center, or further if possible (see Fig. MA-1). Then turn the P-3 around and head directly back to the eye, retracing the previous leg in the opposite direction.



**Figure MA-1.** Depiction of the Gravity Wave module in which the P-3 flies an extended leg [160 n mi (295 km)]

**Flight altitude:** 5-10 kft as high as possible. The module should be conducted below the freezing level

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**Leg length or radii:** Leg lengths should extend to at least 160 n mi (295 km) from the center, or farther if time permits, including the turn leg back to the center.

**Estimated in-pattern flight duration:** ~40 min – 1 hr

**Expendable distribution:** Dropsonde and AXBTs are not a requirement

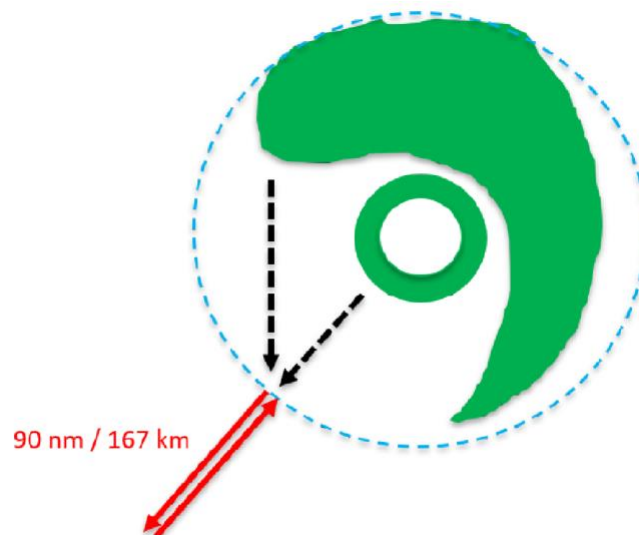
**Instrumentation Notes:** Use TDR defaults. Use straight flight legs as safety permits. After finishing the outbound leg, please turn as fast as possible as safety permits.

**P-3 Pattern 2:**

**What to Target:** Sample the inner core and near environments of the TC

**When to Target:** Any strength TC; no land restrictions. This module ideally should be conducted in quadrant with the least rainband activity, typically the upshear right or right-real quadrant. The best opportunity is at the end of a standard Figure-4 pattern, when the last leg terminates in a quadrant with less rainbands.

**Pattern:** Any standard P-3 pattern that provides symmetric coverage (e.g. Rotated Figure-4, Figure-4 Butterfly, etc.). At the end of the last leg (outbound or downwind leg), continue outward to distance of 90 n mi (165 km) from the end point, or further if possible (see Fig. MA-2). Then turn the P-3 around and head directly back to the eye, retracing the previous leg in the opposite direction to the end point before starting the next radial leg or downwind leg.



**Figure MA-2.** Depiction of the Gravity Wave module in which the P-3 flies an extended leg (90 n mi, red path) and reverses course along the same azimuth back toward the storm center.

## 2024 NOAA/AOML/HRD Hurricane Field Program - APHEX

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**Estimated in-pattern flight duration:** ~40 min – 1 hr

**Expendable distribution:** Dropsondes and AXBTs are not a requirement

**Instrumentation Notes:** Use TDR defaults. Use straight flight legs as safety permits. After finishing the outbound leg, please turn as fast as possible as safety permits.