**13. Tropical Cyclone in Shear Experiment**

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**Mission Description:** Sample the wind, temperature and moisture fields within and around a tropical cyclone experiencing a significant increase in environmental vertical wind shear (> 10 kts in 24 h).

**G-IV Module 1**

**What to Target:** Sample the *environment* of a TC for which the distance of the center from significant land mass and significant SST gradients exceeds ~ 3x the radius of maximum wind.

**When to Target:** Sample before a significant increase in environmental vertical wind shear; during the period of maximum vortex tilt. Coordinate G-IV take-off with the corresponding P-3 mission such that the innermost G-IV circumnavigation coincides with the P-3 sampling.

**Pattern:** G-IV Circumnavigation (Hexagon). Should be storm centered. Alternate patterns: G-IV Circumnavigation (Octagon) for more sondes; G-IV Star if TDR coverage is not crucial

**Flight altitude:** 40-45 kft

**Leg length or radii:** 150 n mi, 90 n mi, and 60 n mi

**Estimated in-pattern flight duration:** ~ 4 h 25 min

**Expendable distribution:** Standard (18 dropsondes total).

**Instrumentation Notes:** Use TDR defaults. Use straight flight legs as safety permits.

**P-3 Module 1**

**What to Target:** Sample the *core region* of a TC for which the distance of the center from significant land mass and significant SST gradients exceeds ~ 3x the radius of maximum wind.

**When to Target:** Sample before a significant increase in environmental vertical wind shear. The P-3 should be coordinated with G-IV Module 1.

**Pattern:** Rotated Figure-4. Alternate patterns: Butterfly; Fig-4; Alpha

**Flight altitude:** 12 kft preferable for best dropsonde coverage

**Leg length or radii:** 105 n mi

**Estimated in-pattern flight duration:** ~ 5 h

**Expendable distribution:** Modify standard by including an RMW dropsonde, moving the mid-point dropsonde to half the radius of innermost G-IV circumnavigation (or 30 n mi) and removing turn-point dropsondes. Modification ensures eyewall thermodynamic coverage and 30 n mi radial sampling of thermodynamic fields immediately outside the eyewall. Modification also leverages availability of G-IV dropsondes (20 dropsondes total).

**Instrumentation Notes:** Use TDR defaults. Use straight flight legs as safety permits. Inbound-outbound passes should be uninterrupted.

**P-3 Module 2**

**What to Target:** Sample the *core region* of a TC for which the distance of the center from significant land mass and significant SST gradients exceeds ~ 3x the radius of maximum wind.

**When to Target:** Sample as the large-scale, deep-layer shear increases and downshear convective asymmetry is evident; when the TC core exhibits large vertical tilt (an intensifying TC may have reduced its rate of intensification or begun to weaken); and when the TC core has realigned (a weakening or steady state TC may have begun to intensify).

**Pattern:** Figure-4, fly 45 deg downwind, then uninterrupted small-scale Rotated Figure-4. Orient initial pass along shear vector if possible. Purpose of small-scale Rotated Figure-4 is high-temporal-resolution sampling of eyewall and near-eyewall thermodynamic structure. Alternate (small-scale) patterns: Butterfly for coarser azimuthal sampling; P-3 Circumnavigation

**Flight altitude:** 12 kft preferable for best dropsonde coverage

**Leg length or radii:** 105 n mi (initial Figure-4); small-scale Rotated Figure-4 should extend just beyond the primary region of organized convection outside the eyewall (~15-30 n mi beyond *mean* radius of maximum wind).

**Estimated in-pattern flight duration:** ~ 4 h 45 min for Figure-4 + Rotated Figure-4 (45 n mi legs)

**Expendable distribution:** For initial Figure-4, modify standard by removing mid-point dropsondes (if G-IV present, remove IP and turn-point dropsondes). For small-scale Rotated Figure-4, modify standard by launching 4 equally-spaced dropsondes from the *mean* radius of maximum wind to the turn point of each leg (42 dropsondes total, 38 if G-IV present). Given limited resources, may target only quadrant *downwind* of organized convection (22 dropsondes total, 18 if G-IV present).

**Instrumentation Notes:** Use TDR defaults. Use straight flight legs as safety permits. Inbound-outbound passes should be uninterrupted.