2018 NOAA/AOML/HRD Hurricane Field Program - IFEX

TAIL DOPPLER RADAR (TDR) EXPERIMENT
Pattern and Module Descriptions

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Requirements: Clear air and TCs of any intensity

SCIENCE OBJECTIVE #1: *Gather airborne Tail Doppler Radar wind measurements that permit an accurate initialization of HWRF, and also provide three-dimensional wind analyses for forecasters* [Tail Doppler Radar, TDR, Experiment]

P-3 Pattern #1: TDR

What to Target: Sample invests and tropical cyclones of interest to the NHC/EMC

When to Target: Sampling commences when tasked by EMC. Missions tasked for TDR assimilation purposes are carried out every 12 h, typically with takeoff times of 0600 and 1800 UTC.

Pattern: While TDR data can be collected whenever the P-3 is flying, the standard patterns are best used during a tasked mission. For reconnaissance, the Alpha pattern is typically employed. For TDR assimilation purposes, the Lawnmower and Square-spiral patterns are appropriate for invests and tropical depressions. For systems having a more well-defined center of circulation, the Figure-4, Rotated Figure-4, Alpha, Butterfly, and P-3 Circumnavigation patterns are all appropriate.

Flight altitude: TDR data for assimilation and analysis can be collected at most flight altitudes. Typical flight altitude is 10 kft.

Leg length or radii: The standard leg length for TDR missions is 105 n mi, but this can be adjusted as needed for land restrictions and ferry times. Legs may be shortened due to lack of scatterers, but the HRD LPS should be consulted first to ensure that other scientific objectives are not adversely impacted.

Estimated in-pattern flight duration: See the listing of standard pattern figures.

Expendable distribution: Expendables are not required. Dropsondes may be requested by NHC.

Instrumentation Notes: TDR coverage and analyses are best when straight and level flight is maintained. During tasked missions, straight leg segments (e.g., passes through the center of circulation) should not be interrupted with break-away modules. Doppler radars should be operated in a single-PRF mode, at a PRF of 2100 Hz.

P-3 Pattern #2: TDR (Clear Air)

What to Target: Clear air over open ocean conditions in a low-wind region

When to Target: At the beginning of the season, preferably during a pre-season test flight

Pattern: Straight and level flight, reversing course (Fig. TD-1). The pattern should be flown upwind and downwind, defined by the flight-level winds.

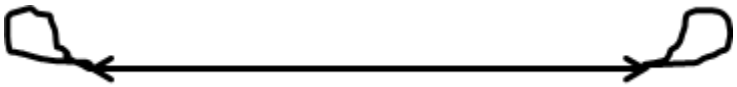

Fig. TD-1. *Example of clear-air TDR pattern*

Flight altitude: 15–20 kft is best.

Leg length or radii: 5–10-minute segment (10–20 minutes for entire pattern)

Estimated in-pattern flight duration: 10–20 minutes

Expendable distribution: None

Instrumentation Notes: The purpose of this sea-surface module is to identify angle corrections to be applied in the P-3 TDR software for the season. The sea surface should be unobstructed by intervening scatterers and the winds should be light enough so as to yield a smooth sea state.

G-IV Pattern #1: TDR

What to Target: Sample invests and tropical cyclones of interest to the NHC/EMC

When to Target: Sampling commences when tasked by EMC. Missions tend to follow the NHC synoptic surveillance schedule, typically with a takeoff time of 0530 and/or 1730 UTC. The ability to perform storm overflights at any time is desirable, but safety concerns (e.g., the impact of intense convection on flight and lack of visual) may restrict overflight to certain conditions and times of day.

Pattern: While TDR data can be collected whenever the G-IV is flying, the standard patterns are best used during a TDR-focused mission. For TDR assimilation purposes, the Lawnmower and Square-spiral patterns are appropriate for invests and tropical depressions. For systems having a more well-defined center of circulation, the Figure-4, Rotated Figure-4, Alpha, Butterfly, and G-IV Star and Star with Circumnavigation patterns are all appropriate.

Flight altitude: TDR data for assimilation and analysis can be collected at most flight altitudes. Typical flight altitude is 40–45 kft.

Leg length or radii: The standard leg length for TDR missions is 105 n mi, but this can be adjusted as needed for land restrictions and ferry times. Legs may be shortened due to lack of scatterers, but the HRD LPS should be consulted first to ensure that other scientific objectives are not adversely impacted. For circumnavigations without a P-3 present, the radius of the innermost "circle" should be set to resolve the maximum wind region. Typically, winds can be retrieved out to 40–50 km from the aircraft.

Estimated in-pattern flight duration: See the listing of standard pattern figures

Expendable distribution: Expendables are not required

Instrumentation Notes: TDR coverage and analyses are best when straight and level flight is maintained. During tasked missions, straight leg segments (e.g., passes through the center of circulation) should not be interrupted with break-away modules. Doppler radars should be operated in a single-PRF mode, at a PRF of 3000 Hz.

G-IV Pattern #2: TDR (Clear Air)

What to Target: Clear air over open ocean conditions in a low-wind region

When to Target: At the beginning of the season, preferably during a pre-season test flight

Pattern: Straight and level flight, reversing course (Fig. TD-1). The pattern should be flown upwind and downwind, defined by the flight-level winds.

Flight altitude: 15–20 kft is best

Leg length or radii: 5-minute segment (10 minutes for entire pattern)

Estimated in-pattern flight duration: 10–15 minutes

Expendable distribution: None

Instrumentation Notes: The purpose of this sea-surface module is to identify angle corrections to be applied in the G-IV TDR software for the season. The sea surface should be unobstructed by intervening scatterers and the winds should be light enough so as to yield a smooth sea state.