



## **NOAA's Office of Marine and Aviation Operations (OMAO)**

### **Research Flight and Mission Info Recap: Tornado Formation, Intensity, and Path for the Southeast United States**

**May 2018**



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## Aircraft Operations

NOAA's fleet of nine manned aircraft is operated, managed and maintained by NOAA's Office of Marine and Aviation Operations ([OMAO](#)) and the NOAA Commissioned Officer Corps ([NOAA Corps](#)) – one of the nation's seven Uniformed Services - based at OMAO's Aircraft Operations Center ([AOC](#)). Located at Lakeland Linder Regional Airport in Lakeland, Florida, the officers, crew, and scientists from AOC provide capable, mission-ready aircraft and professional crews to the scientific community – see photo below. AOC is committed to the safe, efficient and economical use of NOAA aircraft and has more than four decades of experience developing, coordinating and successfully and safely conducting airborne environmental data gathering missions. OMAO's aircraft fleet includes the following platforms and the web links provide additional photos, information on each aircraft, and the missions they serve:

- [Lockheed WP-3D Orion \(P3\) "Hurricane Hunter"](#) [Tail ID# N42RF]
- [Lockheed WP-3D Orion \(P3\) "Hurricane Hunter"](#) [Tail ID# N43RF]
- [Gulfstream IV-SP \(G-IV\) "Hurricane Hunter"](#) [Tail ID# N49RF]
- [Gulfstream Turbo \(Jet Prop\) Commander AC-695A \(Jet Prop Commander\)](#) [Tail ID# N45RF]
- [Beechcraft King Air 350CER \(King Air\)](#) – [Tail ID# N68RF]
- [De Havilland DHC-6-300 Twin Otter \(Twin Otter\)](#) [Tail ID# N46RF]
- [Twin Otter](#) [Tail ID# N48RF]
- [Twin Otter](#) [Tail ID# N56RF]
- [Twin Otter](#) [Tail ID# N57RF]

In addition to the fleet of nine, manned aircraft, AOC provides oversight and guidance for all of NOAA's Unmanned Aircraft System (UAS) operations. Please visit [AOC's UAS Section](#) for additional information.



## Hurricane Hunters - WP-3 Aircraft



OMAO's WP-3 takes off from Lakeland Linder Regional Airport, home of the Aircraft Operations Center. Photo: NOAA

NOAA's "*Hurricane Hunters*" are two *Lockheed WP-3D Orion* (WP-3) aircraft, together with the *Gulfstream IV-SP* (G-IV). These aircraft play an integral role in hurricane forecasting. Data collected during hurricanes by these high-flying meteorological stations help forecasters make accurate predictions during a hurricane and help hurricane researchers achieve a better understanding of storm processes, improving their forecast models.

Throughout the year, the aircraft also fly vital missions to help us better understand our atmosphere and the development of severe or extreme weather events.

### When and where did the WP-3 fly to better understand tornadoes in the Southeast United States?

The [WP-3](#) (Tail ID# N42RF) Hurricane Hunter aircraft conducted a number of missions from March 9 - April 14, 2018, and operated in conjunction with ground based mobile radar platforms. The flights were based out of Huntsville International Airport in Huntsville, Alabama, and occurred over:

- Alabama
- Georgia
- Mississippi
- Tennessee
- Louisiana

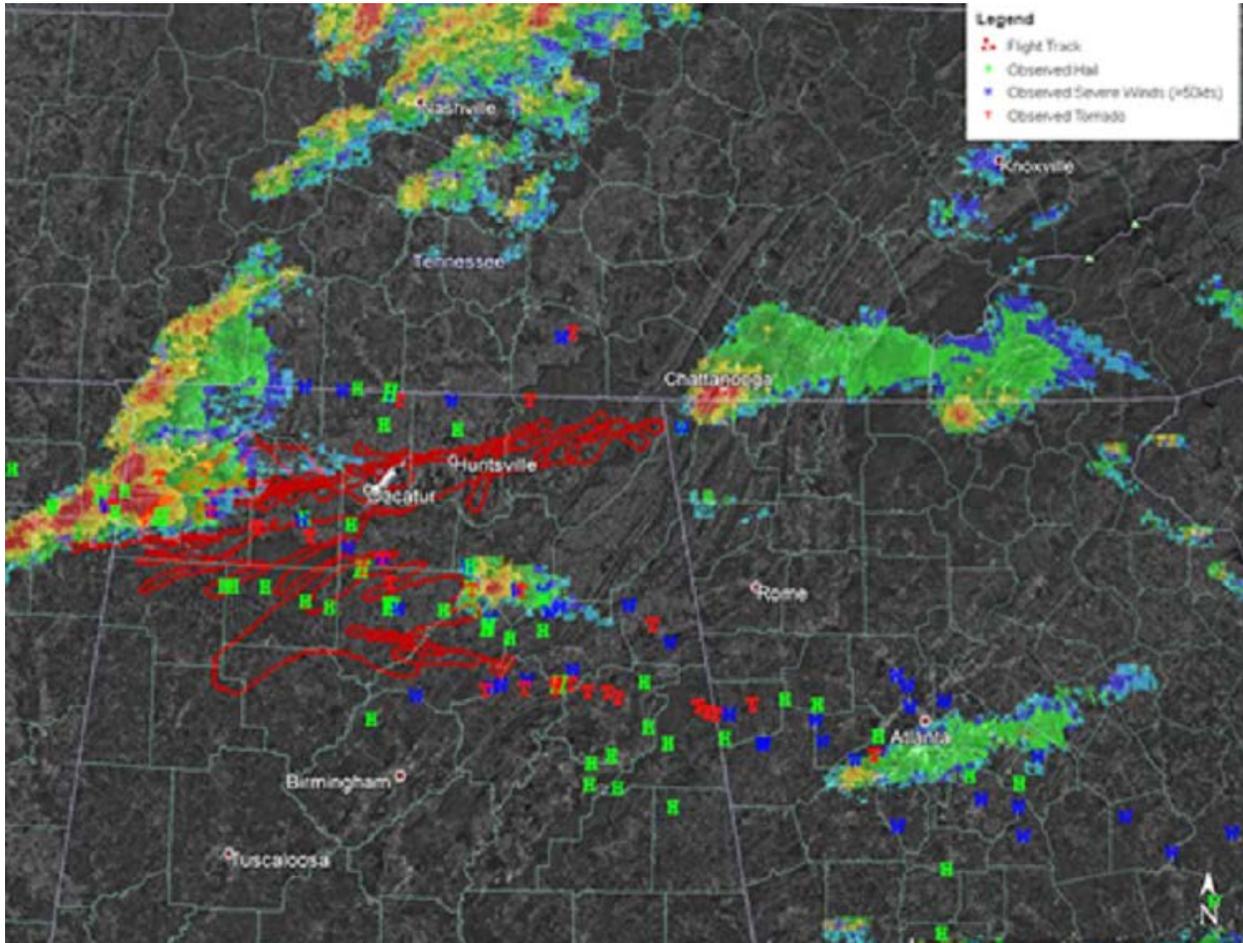
Each flight was operated by the officers and crew of OMAO/NOAA Corps and supported by scientists from [NOAA's Office of Atmospheric Research](#).

## What were the research mission flight paths?

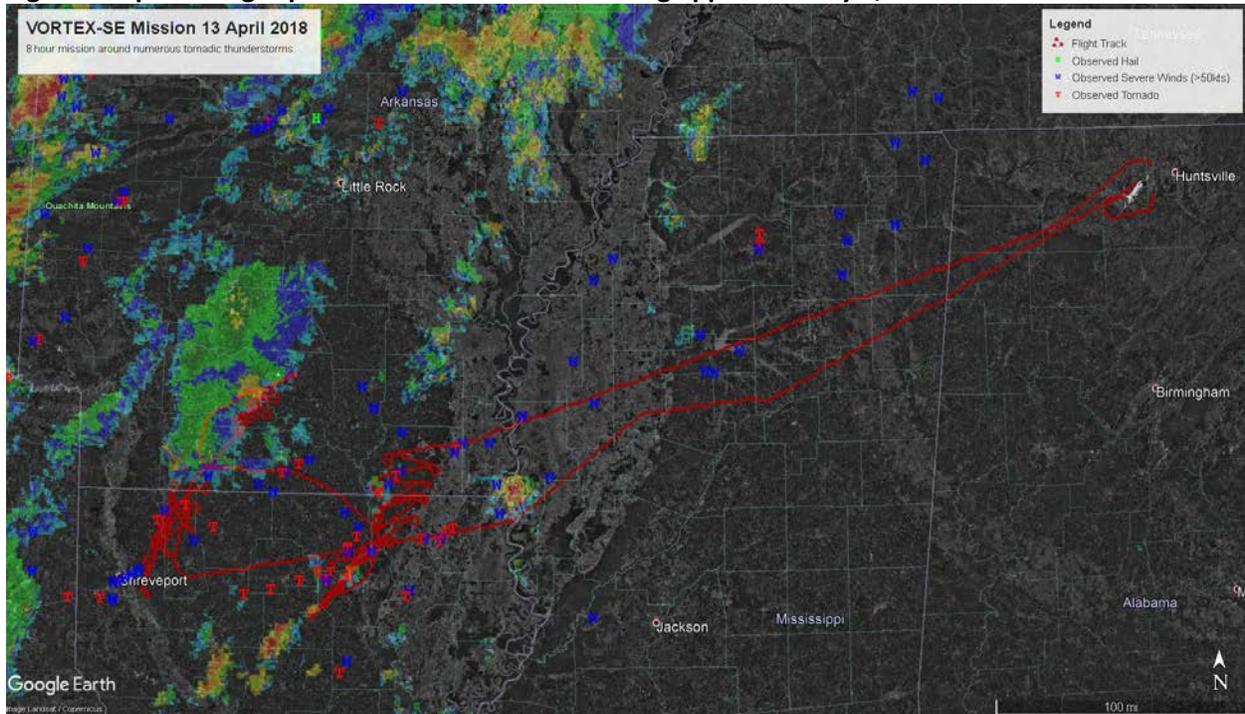
Below are a sampling of flight tracks for the WP-3D as it flew a total of 11 missions in support of the project with over 65 hours flown in support of scientific research.

Figures 1 and 2 below show a sampling of two separate flight paths from flights conducted on March 9 and April 14.

**Figure 1: March 19 flight path. 8-hour mission covering approximately 2,000 nautical miles.**



**Figure 2: April 13 flight path. 7.9-hour mission covering approximately 2,000 nautical miles.**



### **What data was gathered and why is it important?**

The WP-3's research flights were designed to help us better understand how environmental factors that are characteristic of the southeast United States affect the formation, intensity, and path of tornadoes for this region.

While the research process is ongoing, the ultimate goal of the collection of this airborne data and the project as a whole is to provide improved tornado forecasting and warning performance across the Southeast United States. Flights were conducted to leverage the high resolution dual-Doppler and lower fuselage airborne radars onboard NOAA's WP-3D Orion in an effort to better characterize how environmental factors unique to the Southeastern United States affect the formation, intensity, and structure of tornadoes across this region. The experiment will also determine the best methods for communicating the forecast uncertainty related to these events to the public, and evaluate public response.

This research experiment began in 2016 and the missions flown in 2018 brought together meteorologists, researchers, and social scientists to collaborate on a research program looking at the storms and conditions that produce tornadoes in the Southeast United States.

The number of killer tornadoes in the southeastern United States is disproportionately large when compared to the overall number of tornadoes throughout the country. Researchers believe this is caused by a series of physical and sociological factors, like tornadoes in rugged terrain at night, as well as tornadoes occurring before the perceived peak of "tornado season," during a time of year when

storms typically move quickly. Other variables include a lack of visibility of tornadoes, inadequate shelter, and larger population density increasing the vulnerability of residents in this area.

The unique advantage of the WP-3 is its ability to quickly transit to the best science targets (i.e., tornadic cells) and collect data around those targets over their entire lifecycle utilizing state of the art dual-Doppler radar technology. At a planned altitude of 2,500 feet AGL (Above Ground Level), multiple tornadic cells were sampled during a typical 8 to 10 hour mission. One particular highlight during the project occurred on April 13 where a tornado was visually observed west of Monroe, Louisiana, from the aircraft.

Additional project information is available on the [NOAA National Severe Storms Laboratory website](https://www.nssl.noaa.gov/projects/vortexse/) (<https://www.nssl.noaa.gov/projects/vortexse/>).