



# NOAA *Background*

## NOAA's "Hurricane Hunter" Aircraft

Lockheed WP-3D Orions (P-3s) and Gulfstream IV SP (G-IV) Jet

Specially equipped NOAA aircraft play an integral role in hurricane forecasting. Data collected during hurricanes by these high-flying meteorological stations and from a variety of other sources are fed into numerical computer models to help forecasters predict how intense a hurricane will be, and when and where it will make landfall. These computer models fulfill two important purposes: to help forecasters make accurate predictions during a hurricane; and to help hurricane researchers achieve a better understanding of storm processes, thereby improving their forecast models.

NOAA's newest aircraft acquisition is a Gulfstream IV SP (Special Performance) jet, which began hurricane surveillance missions in 1997 in support of forecasters at NOAA's National Hurricane Center. The jet, which can fly high, fast and far with a range of 4,000 nautical miles and a cruising altitude of 45,000 ft., paints a detailed picture of weather systems in the upper atmosphere surrounding developing hurricanes. This operational data is used in computer models that help forecasters make current predictions.

### A WORD ABOUT NOAA. . .

The National Oceanic and Atmospheric Administration (NOAA) conducts research and gathers data about the global oceans, atmosphere, space, and sun, and applies this knowledge to science and service that touch the lives of all Americans.

NOAA warns of dangerous weather, charts our seas and skies, guides our use and protection of ocean and coastal resources, and conducts research to improve our understanding and stewardship of the environment which sustains us all.

A Commerce Department agency, NOAA provides these services through five major organizations: the National Weather Service, the National Ocean Service, the National Marine Fisheries Service, the National Environmental Satellite, Data and Information Service, and Office of Oceanic and Atmospheric Research; and numerous special program units. In addition, NOAA research and operational activities are supported by the Nation's seventh uniformed service, the NOAA Corps, a commissioned officer corps of men and women who operate NOAA ships and aircraft, and serve in scientific and administrative posts.

For further information: NOAA Office of Public Affairs, 14th Street and Constitution Avenue NW, Room 6013, Washington, D.C. 20230. Phone: (202) 482-6090.

The G-IV's data also supplements the critical low-altitude research data that is collected by NOAA's two WP-3D Orion turboprop aircraft. The P-3's mission is to provide data for NOAA's Hurricane Research Division as it continues to improve its hurricane prediction computer models.

### P-3 Aircraft—Into the Storm

Slicing through the eyewall of a hurricane, buffeted by howling winds, blinding rain, hail, and violent updrafts and downdrafts before entering the relative calm of the storm's eye, NOAA's two P-3 turboprop aircraft probe every wind and pressure change, repeating the grueling experience again and again during the course of a ten-hour mission.

Scientists aboard the aircraft deploy instruments called GPS (Global Positioning System) dropwindsondes as the P-3 flies through the hurricane. These devices continuously radio back measurements of pressure, humidity, temperature, and wind direction and speed as they fall toward the sea, providing a detailed look at the structure of the storm and its intensity.

For years NOAA pilots have flown P-3s into hurricanes at low altitudes (1,500-10,000 ft.) to collect research-mission data critical for computer models that predict

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hurricane intensity and landfall. This information is used differently than the hurricane reconnaissance information provided to the National Hurricane Center by U.S. Air Force Reserves WC-130s. Information from both types of flights, however, directly contributes to the safety of Americans living along the vulnerable Atlantic and Gulf coasts.

In addition to flying hurricane research and reconnaissance missions, NOAA's P-3s participate in a wide variety of national and international meteorological and oceanographic research programs each year. Recently, these aircraft have been used in major studies on storms approaching the continents of Europe and North America to improve forecasts and study the effects of El Niño; atmospheric gases and aerosols over the North Atlantic; large-scale convective storm complexes in the Midwest, and winter storms battering U.S. Pacific coastal states.

#### **G-IV Jet—Seeking the Storm's Path**

Since the beginning of the 1997 hurricane season, the G-IV has flown missions around every Atlantic-based hurricane that has posed a potential threat to the United States. The jet's mission covers thousands of square miles surrounding the hurricane, gathering, with newly developed GPS dropwindsondes, vital high-altitude data needed for improved numerical forecast models. The G-IV has added a vital new dimension as it maps the steering currents that influence the movement of hurricanes.

Data from GPS dropwindsondes that measure pressure, temperature, humidity, and wind information are relayed to the aircraft for transmission by satellite to the National Hurricane Center in Miami and the National Centers for Environmental Prediction in Camp Springs, Md. There the data are available for many numerical forecast models, providing important information about regions—mostly over oceans—in which there are no other sources of weather data.

G-IV flight data are expected to help numerical guidance computer models improve hurricane landfall and track forecasts by up to 20 percent, and to further refine storm intensity forecasts.

After hurricane season, NOAA's interest in severe weather becomes focused on the winter storms affecting the western, central and northeastern United States. NOAA has used the G-IV to help monitor and study these storms to advance our understanding of them and improve winter storm forecasts. The G-IV has also been used to study clear air turbulence—a condition that threatens the safety of air traffic—over the Pacific Ocean, helping scientists increase their ability to understand and predict this potentially deadly phenomenon.

#### **The G-IV and P-3s—Working Together**

On several missions during recent hurricane seasons, the high-altitude G-IV was joined by the P-3s, which fly at much lower altitudes and collect data that complement the G-IV data. Together, these aircraft provided the most comprehensive data coverage ever collected in the environment of hurricanes. The missions not only provided hurricane forecasters with critical data via the numerical model forecasts, but also gave real-time indicators of the overall weather conditions working together that were thought to be influencing the tracks of the hurricanes. These data will also enable researchers to investigate the factors related to hurricane track forecasts and gain further knowledge in this scientific field of study.

#### **NOAA's Aircraft Operations Center**

The P-3s and G-IV are based at NOAA's Aircraft Operations Center at MacDill Air Force Base in Tampa, Fla. AOC is part of the Office of Marine and Aviation Operations, which includes civilians as well as officers of the NOAA Corps, the nation's smallest uniformed service. NOAA Corps pilots and civilian flight engineers, meteorologists and electronic engineers are highly trained to operate in the kind of adverse weather conditions that keep other aircraft on the ground.

Much of the scientific instrumentation flown aboard NOAA aircraft is designed, built, assembled, and calibrated by AOC's Science and Engineering Division. During non-hurricane season months, the P-3s and G-IV are tailored by AOC engineers for use in other severe weather and atmospheric research programs, and flown by NOAA Corps pilots worldwide in a variety of weather conditions. ☺

**For more information contact Jeanne Kouhestani, Office of Marine and Aviation Operations Public Affairs, at (301) 713-3431, ext. 220, or visit the Web site: <http://www.oma.noaa.gov/aoc.html>**

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