



# NOAA *Backgrounder*

## NOAA's "Hurricane Hunter" Aircraft Fly Through Pacific Winter Storms and More

The WP-3D Orion and Gulfstream-IV Jet are Airborne Meteorological Stations

NOAA's "hurricane hunter" aircraft and their crews may be best known for their prowess in flying through and around nature's severest storms over the Atlantic Ocean, Caribbean Sea and Gulf of Mexico. However, these flying meteorological stations prove their mettle on the West Coast and over the Pacific Ocean as well—after hurricane season has ended and severe Pacific winter storms have begun.

### Why Winter Storm Flights?

Pacific winter storms affect not only the western states directly hit, but may also affect weather patterns throughout the United States. On an annual average, the local impacts of these storms are comparable to those of earthquakes. Yet their prediction is hindered because they develop over the ocean where data is sparse. The human and economic costs of winter storms have increased dramatically in recent years as coastal populations continue to increase. High winds, heavy rain, and extreme flooding can occur in a very short period of time as the storm comes ashore. Even storms that form far out over the Pacific that aren't targeted at the western U.S. coast may affect weather patterns across the entire country as the jet stream moves east.

Winter storm data over the Pacific Ocean are limited because most meteorological technology, such as the Doppler radar, used by the National Weather Service is land-based. Accurate warnings to the public are therefore not always as timely as needed for appropriate safety preparations. In addition, gathering research data for climate and weather computer models is essential to NOAA's Office of Oceanic and Atmospheric Research in expanding its understanding of the air-sea interactions that cause much of the weather experienced along the West Coast. This investment by the nation in weather and climate research and modernized weather services will reap important long-term benefits for the safety and economic well being of Americans.

To collect the essential data needed over the Pacific Ocean to aid winter storm prediction and research—both for targeted regions of the U.S. western states

### 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.

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and for climatic patterns reaching as far as the East—NOAA deploys two of its most powerful tools: the P-3 and G-IV hurricane hunters.

### **Into the Storm Flies the P-3**

Temporarily based in Monterey, Calif., during the winter storm experiments that cover the coasts of California, Oregon and Washington, the NOAA P-3 stands ready to fly into the face of an oncoming storm. Its 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. It is these flights over the ocean that collect the data land-based instruments cannot provide. The P-3 carries a Doppler radar antenna in its tail—the first Doppler radar ever flown—and other airborne data collection systems developed by NOAA's Science and Engineering Division at the Aircraft Operations Center. Scientists aboard the aircraft also deploy instruments called GPS (global positioning system) dropwindsondes as the P-3 flies through the storm. These devices continuously radio back to the aircraft 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. New in 2001 was the addition of satellite communications aboard the P-3, which provide both voice and data transmission capabilities for the winter storms experiment along the western U.S. coast. This is an important improvement, because it allows crucial observations from the P-3 to be used directly and immediately by the weather forecasting community.

### **Into the Distance Goes the G-IV**

Several years ago NOAA acquired a Gulfstream-IV jet and turned it into the first flying meteorological platform of its kind in the world. Fleet and far reaching, the sleek G-IV cruises at altitudes up to 45,000 feet with a range of 4,000 nautical miles. That capability makes it the perfect tool to gather data far out into the Pacific for the winter storms experiment, which seeks to increase our knowledge of the jet stream and sea-air interfaces that affect climatic patterns across the country. From its temporary base in Honolulu, the G-IV flies thousands of miles over the Pacific south of the jetstream, painting a detailed picture of weather systems in the upper atmosphere surrounding a developing storm. In 2001 the G-IV also spent considerable time in the jetstream core, where winds occasionally exceeded 200 mph. Air Force Re-

serve WC-130 hurricane reconnaissance aircraft flew out of Alaska at lower altitudes, collecting data north of the jet stream to supplement the G-IV's data. Like the P-3, the G-IV deploys dropwindsondes that transmit meteorological data back to the aircraft; for the winter storms experiment, additional hardware and processing software are installed to provide better dropwindsonde data analysis. Together, the G-IV and P-3, with supplementary data from the Air Force, provide the most comprehensive data coverage collected in the environment of winter storms. This operational data is used in computer models that help forecasters make current predictions.

### **There's More to the Pacific than Storms**

To make the most of available flight hours, NOAA takes every opportunity to use the unique characteristics of the P-3 and G-IV to further our knowledge of the environment. In 2001, instrumentation was installed on both aircraft that sampled ozone and carbon monoxide for NOAA's Aeronomy Lab as it monitored the transport of these gases in the lower troposphere. For the Federal Aviation Administration, the G-IV sampled the environment with dropwindsondes where clear air turbulence presented hazards to commercial air traffic, and then descended into these bumpy regions for direct aircraft measurements. A better understanding of the forces that lead to this potentially disastrous atmospheric condition will help forecasters warn pilots to avoid areas where turbulence could be forming. The G-IV also took measurements to help the Office of Naval Research calibrate its polar-orbiting satellite, and covered for Air Force Reserves aircraft based in Alaska for several days when the WC-130s were not available to fly.

### **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 adverse weather conditions.

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 Pacific winter storms and other severe weather and atmospheric research programs, and flown by NOAA Corps pilots world-wide in a variety of weather conditions.

**For further information please visit our Web site at <http://www.oma.noaa.gov/aoc> or contact Jeanne Kouhestani, Office of Marine and Aviation Operations public affairs, at (301) 713-3431, ext. 220.**

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