The NASA P-3B Orion aircraft is a former U.S. Navy patrol aircraft that has been extensively modified by NASA for use as an airborne science platform. It is owned by NASA and operated by NASA Goddard Space Flight Center’s Wallops Flight Facility Aircraft Office at Wallops Island, Virginia. NASA Wallops has provided airborne platforms for scientific research since 1969 and continues this tradition today with the P-3 Orion and various other contract aircraft. NASA also owns and operates the Wallops airport with hangar, ramp, and lab spaces for aircraft and instrument storage and integration.

The P-3 is a four-engine turboprop aircraft and is in the 135,000-pound gross weight class. Designed for endurance and range, the aircraft is capable of long duration flights of 8-14 hours, large payloads up to 14,700 pounds, true airspeeds up to 400 knots, and a minimum runway length of 7,000 feet. The aircraft is 104 feet long with a 100 foot wingspan and is 34 feet tall. It has many sensor ports, 4 to 4 ½ feet of ground clearance for ease of access and calibration, and ample pressurized cabin space for user systems. Our in-house engineering staff can design and fabricate appropriate custom modifications.

### P-3B Performance Table:

<table>
<thead>
<tr>
<th>Altitude, Range and Airspeed Table</th>
<th>High Altitude 20-30K feet</th>
<th>Medium Altitude 10-20K Feet</th>
<th>Low Altitude 200-10K Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endurance (hours)</td>
<td>14</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>Range (Nautical Miles)</td>
<td>3,800</td>
<td>3,000</td>
<td>2,400</td>
</tr>
<tr>
<td>Air Speed (Knots True)</td>
<td>390</td>
<td>330</td>
<td>300</td>
</tr>
</tbody>
</table>
P-3 Scientific Accommodations:

The aircraft has been modified with a "glass" cockpit or electronic flight instrumentation system (EFIS) and a flight management system (FMS). The FMS integrates redundant laser reference, inertial navigation, and GPS position data onto composite cockpit CRT displays with weather radar and graphical flight plan overlays. A cabin intercom system is available for experimenters to communicate with other investigators and flight crew members, as well as an IRIDIUM phone for in-flight use. The aircraft is equipped with a Ground Proximity Warning System (GPWS) and a Traffic Alert and Collision Avoidance System (TCAS) along with various VHF/UHF/HF radios. The aircraft is capable of carrying 24 persons and has a lavatory, galley, and other convenience facilities on board.

Some of the airborne science-supporting features of this aircraft include zenith ports, three nadir ports (aft of wings), and eight P-3 and DC-8 style windows to mount experiments, a tail cone, nose radome and ten wing mounting locations. A Pressurized Sonobuoy Launch Tube (PSLT) is also available for deployment of standard "A" size sonobuoys or smaller dropsondes. Most of the fuselage ports are contained within the
pressurized cabin environment. However, the bomb bay can be converted to experimenter use using a custom fairing. Though unpressurized, the bomb bay provides large nadir and oblique ports and combines ease of installation with convenient access and calibration during ground operation for the largest of antennas or sensors.

Electrical power is abundant on the aircraft. Available power includes 110V/60 Hz AC, 110V/400 Hz AC and 28VDC regulated and is distributed throughout the aircraft for use via mil-standard connections. Unique power requirements are easily accommodated. Various antennas (GPS, VHF, etc.) also exist on the aircraft for experimenter use. The addition of experimenter provided antennas to the aircraft is also possible.

The P-3 can support the use and transport of a variety of gases for purge and calibration, cryogenic and radioactive materials, lasers, uninterruptible power supplies (UPS), batteries, and a variety of other hazardous materials.

A project data system is located on the aircraft and provides aircraft data (ARINIC 429) and video throughout the cabin via Ethernet. This system is also connected to the IRIDIUM and INMARSAT satellite constellations, and provides uplink/downlink capability, internet access, flight tracking, and instant messaging between other aircraft and ground assets. Several sensors (GPS, angle of attack, slide slip angle, total air temperature, hydrometer, IR, etc.) are connected to the project data system to provide basic metrological and aircraft positional data to experimenters. Data/video is provided with time stamp and can be recorded real time or copies provided via DVD post flight. A state-of-the art engineering test flight data system is also integrated into the aircraft, along with an air data boom to gather pertinent flight test data to determine effects of installations on the aircraft flight envelope.
Scientific Support Functions:

Wallops provides complete support for all your aircraft integration and flight needs including our in-house designed and built 19” equipment racks. We have on staff: aeronautical, mechanical and electrical engineers; metal trades and electronics technicians; and A&P mechanics – all professionals who will work with you concerning instrument and sensor interfaces.

We adhere to formal design review processes, a rigorous aviation safety and airworthiness program, and we assign mission managers/engineers to work with you to assure that your flight requirements will be met on cost, on schedule and as risk free as possible. Our pilots are all highly experienced professionals with thousands of hours of world-wide flight experience under many types of conditions. Our engineering staff has experience with multiple types of aircraft and various aircraft installations (internal and external) ranging in size. In the field, the mission managers and pilots will work with you before and during mission flights to accommodate the inevitable changes in requirements.
NASA Programs on the P-3:

The P-3 is a NASA-owned “core” aircraft provided by the NASA Airborne Science Program. Data gathered by the P-3 has been used for scientific studies in ecology, geography, hydrology, meteorology, oceanography, atmospheric chemistry, soil science, biology, cryospheric research, and satellite calibration/validation. The P-3 is also used as a technology test bed for new airborne and satellite instrumentation.

Atmospheric Composition Programs:
- Stratospheric Aerosol Gas Experiment (SAGE)
- Global Tropspheric Experiment (GTE)
- Arctic Research of the Composition of the Troposphere from Aircraft and Satellites (ARCTAS)

Terrestrial Hydrology Program:
- Soil Moisture Experiment (SMEX)
- Soil Moisture Active Passive Experiment (SMAP)

Physical Oceanography Program:
- Ocean Salinity
- Ocean Wave Spectra
- High Winds

Biological Oceanography Program:
- Airborne Oceanographic Lidar (mapping of phytoplankton)

Earth Observing System:
- AMSR cal/val
- Antarctic and Arctic Sea Ice
- Snow Precipitation
- Cold Land Processes
- IceSat cal/val

Cryospheric Sciences Program:
- Greenland / Arctic (continental) Ice Mapping (AIM)
- Operation IceBridge (IceSat gap filler)

Earth Surface and Interior and the Natural Hazards Programs:
- Storm Damage Beach Mapping

Technology Program:
- Global Ice Sheet Mapping Orbiter (GISMO)
- Geostationary Imaging Fabry-Perot Spectrometer (GIFS)
- Airborne Earth Science Microwave Imaging Radiometer (AESMIR)
Instruments Integrated on the P-3 to Support Research:

Past Instruments (clockwise):
- AATS-14: Ames Airborne Tracking Sunphotometer – 14 channel (NASA Ames)
- RADSTAR/ESTAR (bomb bay): Electronically Scanned Thinned Array Radiometer (NASA GSFC)
- MAPIR- Marshall Airborne Polarimetric Radiometer (NASA MSFC)
- PolSCAT: Polarimetric Scanning Scatterometer (JPL)
- PALS: Passive Active L and S-band sensor (JPL)
- Generic Exhaust Venturis (NASA WFF)
- HIGEAR: Hawaii Group for Environmental Aerosol Research (Univ. of Hawaii)
- ATM – Airborne Topographic Mapper (NASA WFF)
- ATM and KU Radar Suite instrument racks
- PSR (center image): Polarimetric Scanning Radiometer (NOAA)
Where We’ve Been…

We’ve conducted scientific missions over every ocean, every State in the U.S., and worldwide…

- Diego Garcia
- Oman
- North Pole
- Spain
- Chile
- Crete
- Wake Island
- Drake Passage
- Peru
- Equador
- Costa Rica
- South Africa
- Panama
- Canada:
  - Thunder Bay
  - Goose Bay
  - Yellow Knife
  - Newfoundland
- Norway
- Sweden
- Greenland
- Antarctica
- Guam
- Galapagos
- Singapore
- Iceland
- Ireland
- Germany
- Spitzbergen (Svalbard)
- Brazil
- Christmas Island
- Hong Kong
- Japan
- Azores
- Bahamas
- Belize
- Bermuda
- …everywhere in between
- …and in 1995, we circumnavigated the globe.
Scheduling and Information:

Experimenters who would like to schedule the P-3 or any other NASA Airborne Science platform must submit a flight request which details your requirements and identifies your NASA program sponsor(s). To submit a flight request, browse to:
http://airbornescience.nasa.gov/sofrs

A downloadable copy of the P-3B Experimenter’s Handbook is available at:
http://airbornescience.nasa.gov/aircraft/P-3B

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