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Aurora Flight Sciences Corporation

Tracking Severe Storms

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Founded in 1989 to develop affordable robotic aircraft as a tool for researching global changes, Aurora Flight Sciences Corporation (AFSC), is now focusing on four lines of business: rapid prototyping, composites and metal manufacturing, fault-tolerant controls, and flight services.

With its headquarters at the Manassas Regional Airport in Manassas, Virginia (30 miles west of Washington DC), Aurora runs a combined ISO 9001-certified engineering office and composite, metalworking, and electronics shop in a 30,000 square feet facility. In addition to the main facility in Manassas, Aurora also has a 13,000 square feet facility which contains three engine

test cells, including one that is capable of simulating atmospheric profiles up to 85,000 ft.

Extensive software development tools

Aurora has extensive software development tools suitable for real-time embedded designs and compatible with the computers installed in our UAVs and in the O-2. Our avionics software development environment consists of a network of 5 Sun workstations, running the Microware FasTrak development tool set. This is specifically designed to produce code for the OS-9 operating system used on Aurora's flight computers.

A Systems Integration Laboratory (SIL) allows hard-

ware/software integration and testing to be performed under conditions that closely simulate the flight environment. The SIL includes a hardware-in-the-loop simulator as well as avionics units similar to those used on the aircraft. Visual scene generation capabilities were recently added to the SIL. High Speed Data Acquisition systems such as DSPACE are used for control law development and for troubleshooting with high dynamics events such as those encountered in electronics engine control systems.

Composite aircraft and aerodynamic parts

In September 1994, Aurora opened a 68,000 square feet fa-

Perseus B UAV, with its three-stage turbocharged engine, will carry 50–200 kg payloads to an altitude of 20 km for duration of up to 24 hours.



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cility in Fairmont, West Virginia, for the production of composite aircraft and aerodynamic parts. Aurora Flight Sciences of West Virginia is a small business that specializes in prototype work and production runs, manufacturing high-quality airframe composite parts at a low cost. This ISO-9002-certified location consists of both engineering offices and a large composite production shop.

Aurora of West Virginia is a wholly owned subsidiary of Aurora Flight Sciences Corporation and draws upon Aurora Flight Sciences Corporation's resources in aircraft design and testing to support customer needs. Aurora West Virginia has provided manufacturing support to its parent company on both the Perseus and Theseus unmanned aerial vehicle (UAV) programs, as well as to prime aerospace companies. Examples include manufacturing the diagonal stabilizers, or V-Tails, for the Global Hawk aircraft for Teledyne Ryan Aeronautical (now Northrop Grumman) and the wing for the X-34 vehicle for Orbital Sciences Corporation.

In early 2000, Aurora acquired the Northrop Grumman production manufacturing plant located at the Benedum Airport near Clarksburg, West Virginia. This 56,000 square

feet facility currently builds metal components, supporting the Air Force/Army Joint STARS, the Army IFTE, and the Navy E-2C programs. Together, our Fairmont and Clarksburg facilities provide complete capabilities for manufacturing modern aircraft structures.

Perseus B flight system

The Perseus B flight system consists of an aircraft and a ground station. The aircraft takeoff is operated manually from the ground by a pilot using a forward-pointing video camera and instruments. The aircraft is then flown in semiautonomous or autonomous modes by on-board computers using waypoint navigation. The primary communications system is the L/S-band radio. Payloads are carried in the forward payload bay. All payloads installations are configured so that instruments can be prepared in the Principal Investigator's (P.I.'s) laboratory and mounted to the aircraft in the field.

Perseus B UAV, with its three-stage turbocharged engine, will carry 50–200 kg payloads to an altitude of 20 km for duration of up to 24 hours. The Perseus B aircraft is a high-wing monoplane similar in general layout to a sailplane. The aircraft has a tricycle landing gear, which allows it to operate from conventional runways in the same manner as other aircraft traffic. External

wing pods can carry additional fuel or payloads.

The aircraft is powered by an Aurora Arion IIB engine. The Arion IIB has a horizontally opposed, four-cylinder, four-stroke, liquid-cooled engine core as well as a three-stage turbocharger and intercoolers. The propulsion system design permits operation at altitudes up to 20 km. The following table provides the specifications of the Perseus B aircraft:

Various flight missions

Typical Perseus B missions might include measuring the earth's radiation or water vapor budgets or tracking severe storms.

Scientific payloads are built up and checked out at home laboratories using interface specifications provided in Aurora's Payload Users Guide (PUG). The payload frame becomes part of the aircraft structure; the structure and fairing can be purchased from Aurora or can be built by the user subject to the requirements outlined in the PUG. The aircraft themselves are prepared at a main operating base, typically Aurora's main facility in Manassas Virginia. New payloads are integrated and ground tested for compatibility and safety with the aircraft at this main base during their development phase. Once certified for use, they can be integrated in the field. ■

The basic concept regarding operation of the Perseus B aircraft is as follows:

Height	3.5 m
Length	7.6 m
Wingspan	21.8 m
Gross takeoff mass	1100 kg
Speed Range	46 – 69 KIAS
Maximum nose payload	150 kg
Maximum pod payload	90 kg per side