

# Education Outreach Office

## Technology Student Tours Program 2011/2012 School Year

*Naval Air Warfare Center Aircraft Division  
Patuxent River, Maryland*

The Education Outreach Office schedules student tours based on curriculum requirements to provide real-world examples of science, technology, engineering and mathematics classroom lessons. Tours can also be customized for business and finance classes as well. While most facilities are appropriate for middle and high school students, specialized visits for elementary schools can be arranged. Due to the high demand for these visits, requests should be made no less than one month in advance of the tour proposed date(s). If foreign national students are attending, requests must be received six weeks in advance of the proposed tour date. Tours are generally 20 to 25 people. Larger groups can be accommodated on a limited basis.

This document lists a variety of laboratories and facilities at Patuxent River. After each tour site description is a recommended grade level based on past experience and feedback from schools. All sites can be made available for college level visits. Tour requests are submitted via a form available on the outreach office website: [www.ndep.us/LabsPax.aspx](http://www.ndep.us/LabsPax.aspx). (Go to the Program Offerings Tab, then the Educators section.) Please submit your typed form to [PaxR\\_Education\\_Outreach@navy.mil](mailto:PaxR_Education_Outreach@navy.mil) or [Kathryn.glockner@navy.mil](mailto:Kathryn.glockner@navy.mil) for St. Mary's, Charles and other areas; Karen Lane for Calvert County [karen.lane.ctr@navy.mil](mailto:karen.lane.ctr@navy.mil).

Location	Details
Aircraft Prototype Systems Division	Engineers and artisans design, build and install prototype aircraft and field system installations providing customers with a fully-integrated engineering design, machining, sheet metal/composite fabrication, prototype modeling and installation capability. This visit is 45 minutes. Limited to 20 students. <b>(Recommended for 8-12 grades)</b>
Aircraft Vehicle Modification and Instrumentation (AVMI)	The Air Vehicle Modification and Instrumentation (AVMI) group provides source data and air vehicle modifications necessary to support the NAVAIR test and evaluation community. The Aircraft Instrumentation Division designs, develops, builds, installs, calibrates and provides operational support of flight test aircraft instrumentation and telemetry systems. The Division also provides airborne video data support at Patuxent River. This visit is 30 minutes. <b>(Recommended for 8-12 grades)</b>

<b>Air Operations Tower and Radar Room</b>	The Air Operations Tower is the tallest building in Southern Maryland and oversees the world's busiest flight test center. Small groups of students (less than 12) can go to the tower observation deck. This visit is 30 minutes for an average class size. Access is by an elevator and steps. <b>(Recommended for grades 6-12)</b>
<b>Air Test and Evaluation Squadron, HX-21</b>	Explore this fascinating facility which paves the future for rotary wing and tilt rotor aircraft. Students are guided through the hangar by active duty military personnel as they discuss the aircraft under their charge ranging from the H-53 Sea Stallion to the SH-60 Sea Hawk. As with all hangar visits, no opened toed shoes, cell phones or cameras. This visit is 45 minutes. <b>(Recommended for grades 8-12)</b>
<b>Air Test and Evaluation Squadron, VX-20</b>	VX-20 was commissioned to safely provide assets and services in support of program teams, the fleet and other customers associated with research, development, test and evaluation of P-3 Orion, E-2 Hawkeye, C-2 Greyhound, C-130 Hercules, T-24 Mentor, T-6 Texan, and E-6B Mercury aircraft. During this visit, we allow at least an hour to explore the various aircraft. <b>(Recommended for grades 4-12)</b>
<b>Air Test and Evaluation Squadron, VX-23</b>	Flight test engineers and pilots teach students about the FA/18 Hornet, EA-6 Prowlers, and T-45 Goshawks. These highly trained engineers and pilots conduct over 3,000 flight operations annually. This site is limited to 20 students on a tour. This visit is 45 minutes. <b>(Recommended for grades 8-12)</b>
<b>Alternative Fuels</b>	The alternative fuels laboratory is located in the Power and Propulsion Facility and provides research, development, test and evaluation of jet engine bio fuels. This lab is within the Power and Propulsion building and the entire facility tour is one hour. A specialized 25 minute visit can be arranged for the alternative fuels laboratory. <b>(Recommended for grades 9-12)</b>
<b>Altitude Lab</b>	The Altitude Lab evaluates the performance of oxygen systems operated in individually controlled hypobaric chambers, which duplicate pressures that would be experienced aboard aircraft in flight. This is a 30 minute visit with an activity. <b>(Recommended for grades 7 – 12)</b>

<p><b>Anechoic Chamber</b></p>	<p>The Anechoic Test Facilities provide a secure and quiet environment to perform testing on installed avionics and handheld equipment. This facility has two aircraft sized anechoic chambers, a shielded hangar, and multiple small chambers. Tours are very limited to the large anechoic chamber but may be more accessible to the smaller chambers located at the FARM facility (see below) or the Electromagnetic Environmental Effects facility. This is a 30 minute visit. <b>(Recommended for grades 9-12)</b></p>
<p><b>Atlantic Test Range (ATR )</b></p>	<p>The ATR controls fully-instrumented and integrated test ranges that provide full-service support for cradle-to-grave testing. Airspace and surface target areas are used for test and evaluation of aircraft and for war fighter training missions. The Telemetry Data Center provides real-time radio-link reception, translation, processing and display of test data using the Real-time Telemetry Processing System. This widely used system provides real-time test information from up to nine separate in-flight aircraft to ground engineering personnel. This is a great tour selection for aspiring aerospace engineers. This is a 45 minute visit. <b>(Recommended for grades 9 – 12)</b></p>
<p><b>Atomic Physics and Optical Research Labs</b></p>	<p>Explore the world of atoms and more at the physics and optical research lab. Specific functions supported by the lab consists of the potential gain in sensitivity of 2 to 3 orders of magnitude over existing magnetometers and developing high sensitivity gyroscopes with long term stability. Other functions include nonlinear optical properties, refractive indices, thermal stability capacities applicable to improved gravity gradient sensing and atomic clocks, and other sensor based on warm atomic vapors are also being developed. This is a 30 minute visit. <b>(Recommended for grades 9 -12)</b></p>
<p><b>Aviation Survival Training Center</b></p>	<p>Being a pilot is challenging, both physically and mentally. To ensure aviators are prepared for the rigors of flight, the Aviation Survival Training Center provides real-life scenarios in a safe testing environment. Students will learn about the physical effects of flight and experience some of the challenges aviators face. This is a one hour visit. <b>(Recommended for grades 5-12)</b></p>

---

**Becker Materials Laboratory**

Virtually every material used on naval aircraft is selected and engineered for the unique maritime operational requirements and harsh corrosive environment. Several thousand materials, manufacturing and maintenance processes are selected and used on each and every aircraft, all of which are tailored to a unique application, but also must provide robust and cost effective life cycle performance. This tour is an excellent stop for aspiring chemists, materials engineers and related career fields. This is a 45 minute visit. **(Recommended for grades 9-12)**

**Cargo Laboratory**

This unique facility ensures that cargo aboard aircraft fits securely during flight. A general tour is available for 25 minutes in addition to an extended half-day visit. Students may participate in a math and physics focused exercise to determine the correct cargo placement and tie down in an aircraft. This half day event is suitable for physics and geometry (middle school) and must be requested no less than three months in advance. **(Recommended for grades 8-12).**

**Clothing Systems Design Lab**

Enter the world of “aviation fashion” where the serious business of design and rapid prototyping of military protective apparel are performed. Learn about anthropometry and the importance of precise measurement. Students will view equipment such as the TC2 Body Measurement Scanner. Other focuses include: creation of patterns and sample prototypes of new flight clothing, collection of current and past flight clothing prototypes, archiving of standard production samples, technical drawings, patterns and fabrics. This tour can also be combined with an adjoining lab, the Textiles Analysis Laboratory. This is a 20 minute visit. **(Recommended for grades 9 – 12)**

**Cockpit Lighting**

This lab is responsible for component certification and engineering investigations, and primary display/lighting tests that measure luminance, Night Vision Imaging System radiance, colorimetry, contrast, daylight readability, spectral radiance and filter transmission. This is a 20 minute visit. **(Recommended for grades 6-12)**

**Crew Station Technology and the Quarter Dome Simulator**

This Lab supports the integration of advanced technologies into crew station designs and assessment of human performance. This lab focuses on modeling and simulation for the purpose of evaluating display formats and cockpit design, rapid prototyping of display symbology, creation of out-the-window scene generation software, human performance measurement and evaluation, and software and hardware engineering to support all lab projects. While these are two separate facilities, they fall under the same department and can be bundled into one visit or separated. Each visit is 20 minutes. **(Recommended for grades 6 – 12)**

**Electrical and Environmental Test Facilities**

This facility is part of the Propulsion and Power Department. This lab visit shows students the myriad of test equipment that simulates nearly every natural or induced environmental condition encountered by modern aircraft. This is a 20 minute visit. **(Recommended for grades 11-12)**

**Electromagnetic Environmental Effects (E3)**

The E3 facility specializes in a variety of capabilities, ranging from box level to complete system level testing for electromagnetic interference detection, mobile electromagnetic compatibility and electromagnetic vulnerability. This is a 20 minute visit. **(Recommended for grades 9-12)**

**Electromagnetic Pulse**

Many aircraft must be capable of functioning in a nuclear theater. The nuclear electro-magnetic threat is a fast rise-time, high-amplitude Electro-Magnetic Pulse (EMP) produced by a high-altitude nuclear detonation. The coupling of the EMP onto the aircraft produces skin currents, which in turn may be coupled onto cable bundles and wires inside the aircraft. These currents can upset or damage the aircraft or weapon systems electronics. This is a 30 minute visit. **(Recommended for grades 11 and 12)**

**Environmental Education Center**

Younger students will enjoy up close and personal exposure to live and “stuffed” animals, learn about noise abatement and wildlife management. This is a 45 minute to one hour visit. **(Recommended for grades 4 -5)**

---

**Environmental and Human Performance Lab**

Lab scientists and technicians assess human performance and physiology in simulated and real world combat and training environments at the Environmental and Human Performance Lab. The lab supports G-load simulation; dynamic and isometric neck strength analysis; human thermal regulation analysis; environmental chamber stress analysis; individual protective equipment test and evaluation; and collaborative human centrifuge studies. The lab develops and evaluates protective clothing and sensing systems to protect against chemical/biological threats and environmental hazards, and models human cognitive and physiology functioning. This is a 20 minute visit. **(Recommended for grades 9 – 12)**

**Facilities for Antenna and RCS Measurements (FARM)**

The FARM specializes in antenna technology research and development. The site has two anechoic chambers used for antenna systems evaluations in a free space environment or mounted on scale models; three outdoor ranges used for evaluation of antennas and avionics systems mounted on full-size airframes; and rain erosion/impact measurement laboratories. This is an excellent stop for engineering and physics classes. This is a 45 minute visit. **(Recommended for grades 10 – 12)**

**Fleet Readiness Center Support Equipment Facility (Solomons, MD)**

This facility is responsible for the repair and overhaul of naval aviation ground support equipment. Students will see an extensive array of equipment and learn about the work performed by engineers, auto mechanics, machinists, electronics technicians and other specialists required to support this diverse operation. This is a 45 minute visit. **(Recommended for grades 9-12)**

**Global Hawk and BAMS**

This tour will guide students through the specifics of unmanned flight and relates directly to students involved in autonomous robotics programs. This is a 45 minute visit when combined with the C-12 aircraft tour co-located in the hangar. **(Recommended for grades 6-12)**

### **Helmet Mounted Displays**

The human systems program at Pax River is rich and diverse in supporting classroom lessons in anatomy, physics, and more. The Helmet-Mounted Display (HMD) lab is responsible for monocular day display evaluations; monocular night vision performance processes; binocular day display evaluations; and binocular night vision performance processes. This is a 20 minute visit. **(Recommended for grades 6-12)**

### **Helmet Systems Lab**

The Helmet Systems Lab evaluates current and future helmets used by the Navy and Marines Corps and conducts engineering investigation on helmets that have been in mishaps. Other processes carried out by this lab include: Impact Testing, Mass Properties Measurements, Dynamic Retention Test, Mishap Investigations, Fleet Support, and Head Scans. This is a 30 minute visit. **(Recommended for grades 5-12)**

### **Horizontal Accelerator**

The Horizontal Accelerator is a high-speed test lab which creates accelerations up to 50 g to simulate occupant and equipment reactions during a crash. High speed digital video and instrumented Anthropomorphic Test Devices (crash test dummies) and are used in the testing of crashworthy seating, restraints and crew gear. This is a 30 minute visit. **(Recommended for grades 7-12)**

### **Laser Imaging, and Laser Communications Test Tank (LIDAR)**

The tank is 26 ft in diameter and 14 ft deep and is used for in-water testing of optical oceanographic sensors including Laser-Radar, laser imaging, and wireless laser communications. In addition to state of the art laser sources and receivers, the facility also hosts a suite of sensors and methods for simulating real ocean conditions in the lab. The laser group has been a key player in developing optics programs for the area middle and high school students. This is a 30 minute visit. **(Recommended for grades 5-12)**

### **Manned Flight Simulator**

The Manned Flight Simulator provides real-time, high fidelity flight simulation capabilities to support aircraft and system flight test and ground test activities such as flying qualities and performance evaluations, avionics integration testing, mission scenario rehearsal, accident investigations, prototype evaluations, installed systems testing, and prototype simulator design. If available, students *may be* afforded time in a simulator, but this is work-load dependent at the time of the tour. This visit is 45 minutes. *(This tour stop is only available to high school and college students. For elementary and middle school visits, we recommend using the simulators at the Naval Aviation Museum.)* **(Recommended for grades 9-12)**

### **Naval Aviation Museum**

Learn about the history of naval aviation and many technological advances that keep America on the cutting edge. Groups can be provided an hour long tour. The outreach office can make the reservation for the tour, but all arrangements to use the simulators must be made directly by the school to the vendor by contacting Kevin Davis at [kdavis9000@yahoo.com](mailto:kdavis9000@yahoo.com). Simulator cost is \$20 per hour. **(Recommended for grades 4-12)**

### **Night Vision Capability Lab (Night Vision Goggles)**

The Night Vision Capability Lab designs aircraft cockpit lighting systems to be night vision goggle compatible. This is a 30 minute visit with a hands on activity, limited to 13 students at a time. **(Recommended grades 6-12)**

### **Oxygen Lab**

This facility performs development, and test evaluation of aircrew breathing components and systems, including: Liquid oxygen converters, onboard oxygen generation systems, oxygen concentrators, oxygen monitors, personal-and-aircraft-mounted oxygen regulators, oxygen pressure reducers and manifold assemblies, oxygen cylinders, oxygen masks, oxygen hose assemblies. **(Recommended grades 9-12)**

### **Propulsion and Power**

The Propulsion Systems Evaluation Facility (PSEF) tests every aspect of propulsion systems and contains 55 test and support areas including: Fuels and Lubricants Test and Laboratory areas, Rotor Spin Facility for Compressors and Turbines, Altitude Environmental Chamber, Helicopter Drive System Facility, Small Engine and Accessory Test Area, and the Central Computer Facility. The Aircraft Test and Evaluation Facility (ATEF), commonly called the Hush House, is a test cell for propulsion testing of Fighter and Attack sized aircraft. This is a great stop for aspiring chemists and engineers. This visit is 45 minutes. **(Recommended for grades 10 – 12)**

### **Recycling Center**

Students will see how recycled products are sorted, processed, shipped and then later used to make new products. The tour includes a close examination of cardboard, paper, metals and plastics products, steel and the new composting project underway at the center. This is a 20 minute visit. **(Recommended for grades 4 –7)**

### **Steam Catapult and Arresting Gear Facility (TC-7)**

Learn what it takes to launch an 85,000 pound aircraft off a flight deck with launch end speeds in excess of 200 mph. This underground installation accommodates structural tests and aircraft/catapult compatibility studies with all models of carrier aircraft in the US Navy. Despite its age (built in 1954), the TC-7 has gone through continuous upgrades and is representative of the steam catapults used on today's aircraft carriers. This is a great tour stop for physics classes and the ultimate  $F=MA$  experience. This is a 45 minute visit. Part of this tour is outdoors. **(Recommended for grades 8-12)**

### **Structures Laboratory**

Ever wonder how strong materials are? The team at the Structures lab use sophisticated testing equipment to validate the strength and endurance of aircraft parts. From aircraft wings to small bolts, this lab ensures structural integrity. This is a great stop for aspiring engineers. This visit is 20 minutes. **(Recommended for grades 9-12)**

<p><b>Targets</b></p>	<p>Atlantic Targets &amp; Marine Operations uses a low-cost, vacuum thermal-forming process to fabricate a variety of plastic armored vehicle targets. These simulated targets support a wide range of RDT&amp;E and training requirements. <i>This facility is located at the Solomons naval complex and is not aboard the main Patuxent River base.</i> This visit is suitable for production engineering students. This visit is 30 minutes and will demonstrate the production of a plastic target. <b>(Recommended for grades 10-12)</b></p>
<p><b>Textile Analysis Lab</b></p>	<p>The Textile Analysis Lab evaluates the physical properties of an array of textile materials, but specifically those used in aircrew personal protective apparel. This is a 25 minute visit. <b>(Recommended for grades 9 – 12)</b></p>
<p><b>United States Naval Test Pilot School</b></p>	<p>Students and educators can't help but feel awed when entering the front doors at the US Naval Test Pilot School. Military aviators from around the world attend this school which has also produced some of our nation's astronauts. This is an hour tour and includes a briefing on the school along with a hangar visit. <b>(Recommended for grades 6-12)</b></p>
<p><b>V-22 Osprey Aircraft</b></p>	<p>This unique aircraft can fly in both vertical and horizontal modes making it one of the most unique planes at Pax River, if not the entire Navy. A briefing on the aircraft's unique capabilities followed by a hangar tour is scheduled. This is a 30 minute visit. <b>(Recommended for grades 9-12)</b></p>
<p><b>Vision Lab</b></p>	<p>Students can explore a host of human systems labs at Patuxent River including the vision lab which studies and develops new technologies to improve the vision capability for aviators. This is a 30 minute visit. <b>(Recommended for grades 6 – 12)</b></p>
<p><b>Weather Balloon Launch</b></p>	<p>Before many test flights at Pax River, a weather balloon is launched to capture wind speed, direction and other data. For this activity, students will launch a weather balloon from the shoreline of the Chesapeake Bay. Data can be downloaded and sent back to the school for further mathematical inquiry exercises. This activity is 45 minutes. <b>(Recommended for grades 4 – 5)</b></p>

---

**Weather Forecasting**

The weather forecasting office offers tailored forecasting services in support of range missions, providing information on optimized flying windows and validation for “Go/No-Go” calls. This is a 20 minute visit. **(Recommended for grades 4 - 5)**

**Webster Field St. Inigoes, Maryland**

Located 12 miles southwest of Pax River, Webster Field is home to the Ship and Shore Based Electronics Systems. There are four main mission components at Webster Field: Air Traffic Control Systems, Identification Systems Division, Integrated Communications and Information Systems and the Special Communications Requirements Division. There is also an unmanned air vehicle operation at Webster Field. There is no food service available on-site. The nearest dining facility is at St. Mary’s College of Maryland, 15 minutes north of Webster Field. **(Recommended for grades 10-12)**

**Wind Tunnel**

The Naval Aerodynamics Test Facility or “wind tunnel” specializes in aerodynamics testing of scaled and full-sized Naval models. This visit is 20 minutes. **(Recommended for 9-12 grades)**

---