

# Tech focus

*This month's dual focus is on the tools and equipment used to conduct testing, and on some testing of aerospace systems.*

## Flight tests next for P-8A weapons separation

Flight tests to validate separation are next on tap for the weapons systems (including missiles) to be carried by the P-8A Multi-mission Maritime Aircraft (MMA).



*Wind-tunnel tests for separation of weapons from the P-8A aircraft were done with a 6.4% scale model.*

Safe separation of the weapons was validated during recent wind-tunnel tests at Arnold Air Force Base Engineering Development Center in Tennessee, according to **Boeing**.

The wind-tunnel tests were conducted in half the time expected, said Boeing Vice President and P-8A Program Manager Jack Zerr. "This major milestone moves us significantly closer to the start of flight testing for weapons separation and also validates the aircraft's design."

About 220 h of testing was done over the course of three weeks. Boeing engineers placed weapons on a moveable mount near a 6.2% scale model of the aircraft. As the weapons were moved away from the aircraft at various airspeeds and locations, aerodynamic forces were measured to gauge the effect. Testing was monitored by **U.S. Navy** personnel.

Boeing P-8A Flight Technology Manager Neal Mosbarger said the corre-

lation between predictions and actual results was so close that the company will be able to do less flight testing than planned.

All P-8A aerodynamic wind-tunnel testing is now complete, just 20 months after authorization to proceed with the System Development and Demonstration phase of the program. Overall, Boeing has completed more than 3100 h of P-8A wind-tunnel testing. Boeing will continue to analyze the wind-tunnel data, which will be used to support the program's Critical Design Review, slated for early 2007.

The P-8A, a 737-800 aircraft, is the Navy's replacement platform for the P-3C. Boeing and its partners—**CFM International**, **Northrop Grumman**, **Raytheon**, and **Smiths Aerospace**—will produce five test aircraft during the program's System Development and Demonstration phase.

*Patrick Ponticel*

## Good, bad, and indifferent vibrations

Reducing engine test time without any degradation in accuracy of end results is an aim that increasingly sophisticated computer software can help make a reality. **Oxford BioSignals** (OBS), a spin-out company from **Oxford University**, has launched a military-specific ground-based highly portable vibration analysis product to provide a predictive and diagnostic gas turbine engine health monitoring solution designed to reduce unscheduled maintenance and engine test time. OBS's generic technology is based on neural networks and intelligent algorithms.

The system, designated QUICKev620-m, builds on what the company describes as a small, robust hardware platform specifically designed for use in the field. It extrapolates OBS's civil engine health monitoring system, QUICK Technology, into the high-performance military sector. QUICK Technology is described by the company as an advanced monitoring solution, providing real-time acquisition, data fusion, and intelligent interpreta-



*Oxford BioSignals' new portable vibration analysis system for military aircraft provides detailed evidence to support engine-management decisions.*

tion from multiple and varied signal sources to deliver condition, diagnostic, and prognostic analyses.

Matthew Walls, CEO of OBS, founded in 2000 and 30% owned by **Rolls-Royce**, said, "Advanced signal-processing technology is particularly suited to problems where a precise solution is difficult to specify but where analysis of large amounts of data can provide real insight into the underlying condition."

QUICKev620-m constitutes a laptop computer with customizable interface that offers various levels of data analysis. "The system's vibration survey can produce clear, unequivocal, and decisive results," said Walls. On completion of a survey, the system presents a definitive "Go" or "No go" result, indicating an aircraft's airworthiness status.

"The product has been designed to support OBS's QUICKNet centralized data-management system, which allows multiple, remote vibration monitoring units to be run in parallel, with the collective data sets gathered being used to provide detailed insight of fleet-wide maintenance issues," said Walls.

*Stuart Birch*

## Mitutoyo helps NIST round out spherical measurement system

Mitutoyo America has helped the National Institute of Standards and Technology (NIST) develop the most accurate calibration system in the world for the roundness of spheres and hemispheres, the company says.



Mitutoyo claims its RA-H5000AS/AH provides the most accurate roundness measurement in the world.

NIST is using the company's standard RA-H5000 roundness tester, which achieves a measuring uncertainty of less than 3 nm (close to one-tenth of a millionth of an inch).

Mitutoyo says NIST in the past had been unable to keep up with the roundness-accuracy needs of industry.

In a presentation at the 2005 National Conference of Standards Laboratory International (NCSLI) Workshop and Symposium, Theodore Doiron, Acting Group Leader for NIST's Engineering Metrology Group, explained that the keys to achieving the low levels of uncertainty the agency now is capable of are a special error-separation measuring method, a tightly controlled temperature, and the stability of the RA-H5000.

At NIST's Advanced Measurement Laboratory (opened in 2004) temperature can be controlled to  $\pm 0.01^\circ\text{C}$  in several test areas, one of which uses the RA-H5000. Researchers there have found

that the RA-H5000 has a long-term repeatability of around 1 nm, which is key to the lab's world-class level of uncertainty.

James Salsbury, Corporate Metrologist at Mitutoyo America, worked with the researchers at NIST to develop the measurement process. "The new roundness capability at NIST will quietly impact many U.S. industries where roundness is controlled to tighter and tighter tolerances," he said. "This is quite significant, and I'm very excited for NIST."

As a federal agency within the U.S. Commerce Department, the mission of NIST includes providing advanced measurement services to support U.S. industry. Within its 578-acre campus in Gaithersburg, MD, lies the Engineering Metrology Group, which has laboratories and equipment to provide industry with standards directly traceable to national and international standards through use of state-of-the-art calibration services.

Patrick Ponticel

## Test success for SBIRS payload

Payload functionality and performance in a vacuum environment were validated in a recent engineering test of the Space-Based Infrared System (SBIRS), according



Final preparations are made before thermal vacuum testing is conducted on the payload of the first Space-Based Infrared System geosynchronous-orbit satellite.

to Lockheed Martin (LM) Space Systems, which is leading the project.

On a geosynchronous orbit (GEO), SBIRS will provide early warning of missile launches and support other missions simultaneously including missile defense, technical intelligence, and battle-space characterization.

During the test, the payload was stressed at temperatures greater than those expected in orbit. The baseline ambient functional tests and radiometric tests were repeated in what LM describes as a "test-it-like-it-flies" environment with IR sensors at their cryogenic operating temperatures.

"Successful completion of this critical test phase is an important achievement and gives us high confidence that the payload will meet all performance requirements," Lockheed Martin SBIRS Vice President Mark Crowley said.

A key aspect of the test was the successful input of simulated IR targets against earth disk background scenes that resulted in the correct data stream from the payload downlink interfaces.

Payloads for SBIRS GEO satellites are produced by Northrop Grumman and consist of two advanced sensors: a scan-

ning sensor designed for continuous observation and surveillance of traditional intercontinental ballistic missile threats, and a staring sensor designed to detect very low signature, short-burn-duration theatre missiles.

"The scanning and staring sensors performed well under simulated space operating conditions," said Sal Romano, Vice President of the SBIRS High program at Northrop Grumman's Electronic Systems sector. "Their detection and surveillance capabilities will be key assets for SBIRS operation."

Lockheed Martin Space Systems is developing the SBIRS program under contract to the U.S. Air Force Space and Missile Systems Center, Los Angeles Air Force Base.

Lockheed Martin is currently under contract to provide two payloads in highly elliptical orbit and two GEO satellites, as well as fixed and mobile ground-based assets to receive and process the infrared data. The team has delivered both HEO payloads and is beginning final integration and test of the first GEO satellite for launch in fiscal year 2008.

Patrick Ponticel

## Early testing of early-warning-system radar a success

The Multi-role Electronically Scanned Array (MESA) radar aboard a 737 airborne early warning and control (AEW&C) aircraft for Australia's Project Wedgetail is ready for flight testing at full power now that **Boeing** and **Northrop Grumman** Electronic Systems have completed ground testing of the system.

The ground testing demonstrated that the radar would not interfere with the aircraft's avionics and engines and is compatible with the mission system hardware and software, said Jack Delange, 737 AEW&C Integration and Test Manager.

Boeing also integrated the radar and Identification Friend or Foe system, allowing for simultaneous operation and more efficient targeting and data collection.

The program now will move aggressively into the development, test, and evaluation phase. This includes calibrating the radar for aircraft and ground environment effects and detecting targets of opportunity such as commercial aircraft.



*The radar system for Australia's airborne early warning and control is ready for flight testing.*

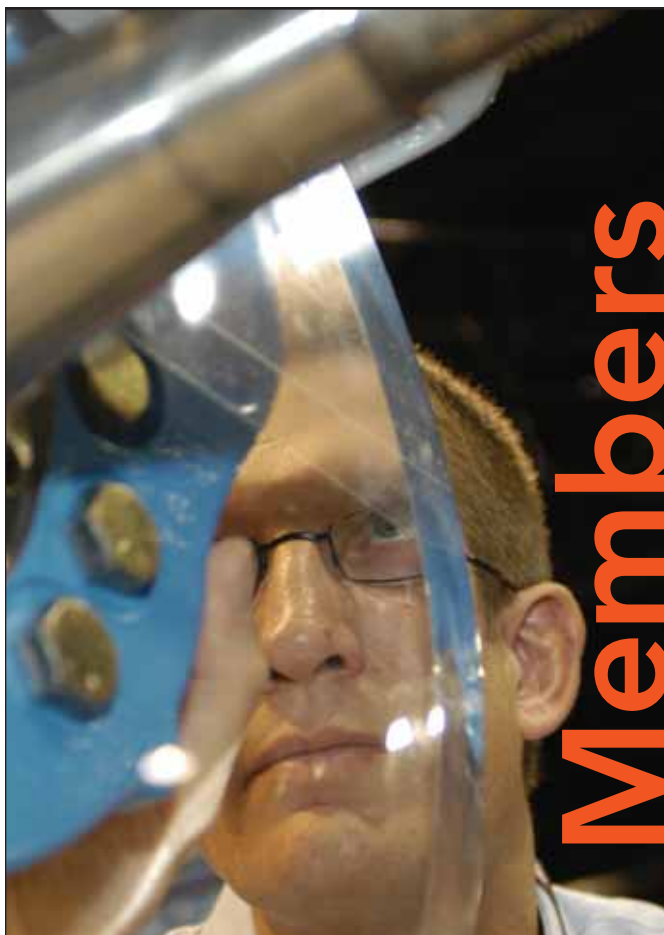
The radar also will be tested against towed spheres, simulating the cross section of fighter aircraft. Subsequent testing will involve single and multiple fighter jets and surface ships.

Northrop Grumman's MESA radar is designed to provide optimal performance in range, tracking, and accuracy. It can track airborne and maritime targets simul-

taneously and help the mission crew direct the control of fighter aircraft while continuously scanning the operational area.

Australia has purchased six 737 AEW&C aircraft. The first two will be delivered for initial operational capability in July 2007. The remaining aircraft are scheduled to be delivered by 2008.

*Patrick Ponticel*



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