

Technology update

Cell phones and laptops on planes

While the FCC's May auction of spectrum in the 800-MHz band clears away an impediment to the use of laptops and VoIP phone service on airplanes, do not expect cell phones to find their way into plane cabins on the same timetable.



AirCell provides telecommunications systems including voice, data, fax, e-mail, and Internet access for all types of aircraft. Shown is the AirCell ST 3100 Iridium satellite system with cordless handset and patch-style Iridium antenna.

The threat posed to aircraft communications and navigations systems by RF interference from laptop wireless connections is thought to be considerably less than the threat from cell phones. So com-

panies such as **Verizon Airfone**, **AirCell**, and **Boeing Connexion** who bid in the FCC's May auction fully expect, should they win a license, to quickly team up with U.S. air carriers who will then have to go to step two: convincing the **FAA** that the carrier can fly its broadband-supplied planes without compromising safety systems.

With regard to cell phones, the path forward is more complicated. The FCC in December 2004 proposed to permit the airborne operation of off-the-shelf wireless handsets and other devices in a different spectrum reserved for personal cell phones so long as the device operates at its lowest power setting under control of a "pico cell" located on the aircraft. But nearly a year and a half later, the commission has shown no intention of finalizing that rule, nor does it have a timetable for doing so, according to spokeswoman Chelsey Fallon, who noted the commission received 8000 comments on the proposal before the comment period closed last August.

At the end of February, **Carnegie Mellon University** published a report showing that even though cell phone use is prohibited in the air, fliers ignore that prohibition with the result that RF interfer-

ence is much greater than previously thought. Normally, according to Bill Strauss, author of the study, that cumulative interference would not be a problem for airline navigation systems. It is only in the one-in-a-million case where the pilot faces very poor visibility conditions, and perhaps some other things go wrong, that cell phone interference with airline navigation systems might lead to an accident.

Nonetheless, Strauss's study dampened the hopes of Connexion, Verizon, and others that the RF-interference barrier could be quickly surmounted. Even if the FCC clears cell phone use, airlines, as with broadband Internet, VoIP, and other in-air wireless services, would have to get specific FAA approval.

Verizon claims its third-generation Code Division Multiple Access technology—which relies on a customized radio base station with unique RF filtering capabilities—that it has been testing since fall 2004 ensures that no interference is caused to systems operating in adjacent radio bands. AirCell uses the same basic broadband air-to-ground link, which also uses custom-designed EVDO (Evolution Data Optimized) wireless technology.

Stephen Barlas

Bombardier boasts of success in flight test

The **Bombardier** Challenger 605 business jet met all engineering expectations during its recent first flight.

The 3-h, 23-min flight was dedicated to testing basic system functionality and

assessing the handling and flying qualities of the aircraft. The first series of tests occurred in an initial altitude block of 5000 to 15,000 ft and included handling qualities, flight control checks, and

avionics testing. The aircraft then climbed to 30,000 ft for a series of engine, pressurization, and environmental control checks. At its maximum first-flight altitude of 41,000 ft, basic engine and handling characteristics were again tested.

The flight took place from Bombardier's Montreal-Trudeau International Airport facility loaded with 12,500 lb of fuel for a takeoff weight of 38,734 lb. It reached a maximum true airspeed of 420 knot during the staged climb.

Following several flights in Montreal, the aircraft will relocate to Bombardier's Flight Test Center in Wichita, KS, for a 200-h flight test and certification program. **Transport Canada** certification is expected in the fourth quarter of 2006,

The Bombardier Challenger 605 business jet is scheduled to enter service in the third quarter of 2007 after anticipated certification by Transport Canada in the fourth quarter of 2006.



TOP GUN

**ANY MARK. ANY PART.
ANY TIME.**

Introducing DataMan™ 7500,
the new performance standard for
direct part mark (DPM) identification.
DataMan is the only truly all-in-one DPM
reader, thanks to its award-winning IDMax™
decoder software and patent-pending illumination
system. DataMan delivers incredible read rates on
degraded DPM marks – on almost any material,
shape, size, or surface – regardless of the marking
method used. This breakthrough reader is not
only fast and accurate, it's built tough, too, with
an impact-resistant housing. Get your hands on
DataMan as fast as you can.



COGNEX
ID PRODUCTS

See an online demo at cognex.com/dpm or call 1-800-677-2646

and the aircraft is scheduled to enter service in the third quarter of 2007. The Challenger 605 features the **Rockwell Collins** Pro Line 21 avionics suite, which is fully configurable and offers pilots instant, intuitive access to critical flight information. The integrated avionics package includes four 10- x 22-in vertically aligned next-generation LCD screens, in-

creasing the display area by 55% over the current flight deck.

The aircraft also includes Rockwell Collins' Integrated Flight Information System (IFIS) as standard equipment. The IFIS enables electronic charts, allowing pilots to call up approach plates, airport diagrams, and procedures (such as standard instrument departures and standard

terminal arrival routes) via customizable multifunction displays. The flight deck is also equipped with a co-pilot side display touch screen, which enables a second copy of electronic charts for paperless electronic chart operations.

Patrick Ponticel

Coal-based jet fuel

A jet fuel comparable to Jet A or military JP8, but derived from at least 50% bituminous coal, has successfully powered a helicopter jet engine, according to

Harold H. Schobert, Professor of Fuel Science and Director of **Penn State's** Energy Institute. "We have shown in tests that the mix can go to at least 75%," he said.

Currently designated JP900, the fuel is produced via light cycle oil, which is a petroleum byproduct, and coal-derived refined chemical oil, a byproduct of the coke industry. The two oils are mixed and hydrogen is added. When distilled, jet fuel comes off as a distillate.

The process can be carried out in existing refineries with some retrofitting, and small amounts of the leftover components will feed into various portions of the petroleum stream. The lighter portions will go to the pool of chemicals that make gasoline, and the heavier ones go to the diesel or fuel oil streams.

According to Schobert, combustion tests confirm that "JP900 meets or exceeds almost all specification for JP8 and Jet A." The tests also showed that JP900 has a flash point higher than required for JP8, a lower viscosity and freezing point, and a higher smoke point. The coal-

based fuel is also lower in aromatics such as benzene and toluene than conventional jet fuels and is almost sulfur-free. From an energy point of view, JP900 produces almost exactly the same BTUs as JP8.

Not only does JP900 meet most of the specification for JP8, but it also has the high flash point required of JP5, naval jet fuel, and the thermal stability of JP7, a high-performance fuel.

"The fact that our fuel is almost dead on to JP8 is something that the **U.S. Air Force** likes," said Schobert. "This fuel was intended to be a high heat sink fuel, which it is, but it can also be used in existing engines."

The project began originally as an attempt to develop jet fuel for next-generation, high-performance aircraft that require more thermally stable fuels. But with rising fuel costs has come a major shift in thinking about fuel and its sources.

The project now targets coal-based replacement for existing fuels with the hope that this will interest both commercial and military users. So far the Penn State project has produced 500 gal of fuel in a pilot plant operated by **Intertek** of Warren, PA. Schobert would now like to produce about 4500 gal, or about 100 barrels, of the fuel for future testing by the USAF and others.

Jean L. Broge



"Because the fuel is 50% derived from coal, it could reduce our use of imported petroleum for this purpose by half," said Harold Schobert, Professor of Fuel Science and Director of Penn State's Energy Institute.



Researchers at Penn State have developed a jet fuel designated JP900 that is derived from bituminous coal and meets or exceeds almost all specifications for JP8 and Jet A.

Trent runs on schedule

The first testbed run of **Rolls-Royce's** Trent 1000 being developed as the launch engine for the **Boeing** 787 Dreamliner was completed in February. This engine is the first of the aircraft's powerplants to run, and will also be the first to take off on Rolls-Royce's 747 flying testbed early next year.

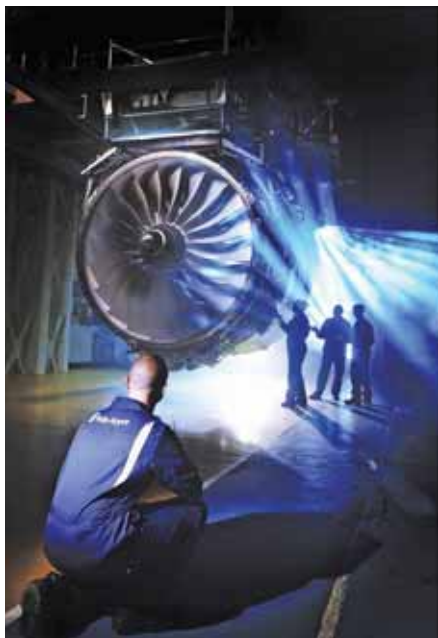
The engine features a new design

called IP Power Offtake, which involves dual-use starter-generators that act as both electrical starters on the ground and power generators while airborne. In flight, power is created by mechanically driving the generators using the engine's intermediate pressure compressor, including power for the cabin environmental conditioning system, rather than taking

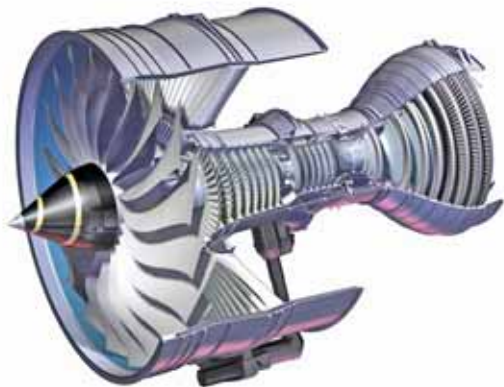
conventional bleed air. Each Trent 1000 is capable of generating around 0.5 MW to power the increased number of electrical systems used in the 787.

The first engine is one of seven to be used in ground testing, while a further nine are earmarked for the flight test program.

With a range of thrust from 53,200 to



As launch engine on the Boeing 787, Rolls-Royce's Trent 1000 is the first of the aircraft's powerplants to run.



The Trent 1000 is the fifth member of the Trent series, the first of which entered service in 1995.

75,000 lb, the Trent 1000 will be capable of powering all versions of the 787.

According to Rolls-Royce, the engine has 15% lower fuel burn than those of a decade ago, and delivers 40% lower emissions than required by current international legislation. Partners on the Trent 1000 include **Carlton Forge Works**, fan case; **Goodrich**, engine control system; **Hamilton Sundstrand**, gearbox; **ITP**, low-pressure turbine; **KHI**, intermediate compressor module; and **MHI**, combustor and low-pressure turbine blades.

Jean L. Broge

IEEE is VALUE.

Beth depends on IEEE publications to bring her organization the latest technology research.

Not only do IEEE publications provide Beth with over 1.2 million online documents – including top-cited journals, cutting-edge conferences and vital standards – they do it for a reasonable price.

Research shows that IEEE journals are just 57% of the average journal price in the field on a page-for-page basis. That's why 87% of IEEE customer are satisfied or highly satisfied with the value of IEEE content. And why Beth has the reputation for spending her budget so wisely.

To Beth, IEEE is value.
Discover what IEEE can be for you.

Go here.



www.ieee.org/discover-research

Download the Free White Paper
"IEEE and Patents"
by 1790 Analytics, LLC



IEEE INFORMATION DRIVING INNOVATION

F-35 passes fuel test

In late March, the **Lockheed Martin** F-35 Joint Strike Fighter completed "leak-free" fuel-system testing after engineers and technicians performed an extensive fuel-system checkout.

The fuel-system tests included methodically filling, measuring, weighing, and emptying each internal tank with jet fuel, leading up to filling all tanks at operational pressure. The air-refueling system also was checked for proper function. Throughout the testing process, the fuel system proved to be free of leaks, which

tend to be a typical problem for high-performance fighter aircraft, according to Doug Pearson, Vice President of the F-35 Integrated Test Force.

"The F-35 is a stealthy aircraft built with very tight tolerances, and it is remarkable that during the entire comprehensive fuel-system testing there were no external leaks from any of the fuel tanks," said Pearson.

The fuel-system checkout took less than a third of the time to complete than in other recent developmental aircraft pro-

grams. The F-35 was then moved to a Lockheed Martin run station to begin equipment and component installations for structural-coupling testing and ground-vibration testing.

Structural coupling is the interaction between the flight-control system and the structural dynamics of the airframe. It is tested to ensure that F-35 flight controls do not interact with structural vibrations within the aircraft. Ground-vibration tests certify the airframe is resistant to flutter, which can cause sudden, destructive vibration levels in an aircraft.

The inaugural flight of the first F-35, a conventional takeoff and landing version, remains on schedule for this fall. The aircraft is the first of 15 F-35s that will be flight-tested, and another seven that will undergo a battery of ground-based tests. Additionally, a full-scale, high-fidelity F-35 model will be used to validate the aircraft's stealth properties.

Jean L. Broge

Lockheed Martin's first F-35 Joint Strike Fighter successfully completed its fuel-system checkout on schedule, and began structural testing on March 24. The aircraft is shown in a run station at Lockheed Martin in Fort Worth, TX.



At Kavlico
We Put The Custom
in Customer !

For nearly 50 years, our innovative design and manufacturing engineering teams have started with the ABC's of sensing fundamentals.

Application - Define the measurement
Build - Upon a proven technology
Customize - The sensor package to fit the need

This basic, yet often over-looked philosophy is what sets Kavlico apart from other sensor suppliers.

By matching sensor technology to your application-specific criteria, Kavlico minimizes cost and maximizes sensor performance. This essential element of our approach supports your program development and creates a long-term strategic partnership.

Our sensor technologies assure you... the customer, the technology and the sensor that fits your application time and time again.

14501 Princeton Avenue • Moorpark, CA 93021
Tel: (805) 523-2000 Fax: (805) 531-8530 • Web: www.kavlico.com • E-Mail: info@kavlico.com

KAVLICO
CORPORATION

Lytron extends test capabilities

Lytron has added a 21,000-ft³/min wind tunnel and blower to its Woburn, MA, facility to test heat exchangers for various applications, including military and aerospace, medical and industrial lasers, medical imaging, analytical instrumentation, power electronics, semiconductor equipment, machine tools, and telecommunications.

data-recording capabilities with the addition of a **National Instruments** data-acquisition system and high accuracy sensor system. All physical parameters in wind-tunnel testing are obtained and recorded with 16-bit resolution using a 32-channel chassis with onboard multiplexer.

Custom programs calculate product

performance and can detect the condition of a test setup in minutes. The data-acquisition system and software are currently being used to test many Lytron standard and custom products including heat exchangers, cold plates, and chillers for OEMs in the U.S. and internationally.

Jean L. Broge



Lytron, which designs and manufactures cold plates, chillers, cooling systems, and heat exchangers, has added a second wind tunnel at its facility to test liquid-to-air heat exchanger systems.

The wind tunnel, which has flow rates ranging from 150 to 21,000 ft³/min, is equipped with a variable frequency drive to control the blower. It also has an electronically controlled damper for fine-tuning. The airside frontal area has up to a 6- x 6-ft test section capability, with minimums depending on configurations. Flow rates are measured by a 24- or 6-in venturi tube, both with 0.25% accuracy. The system measures pressure drop using capacitive-type pressure transducers that are accurate to within 0.025% of measurement.

To test liquid-to-air heat exchanger systems, a 40-kW hot oil pump stand is used in conjunction with the wind tunnel. It is capable of pumping up to 125 gal/min. The pump stand uses solid-state proportional control to supply accurate and stable oil temperatures. The wind tunnel and hot oil pump stand systems can be operated together or independently for customized testing capabilities.

In conjunction with the wind tunnel and hot oil stand, Lytron has expanded its



Your work demands the right moves.

We have the motion solutions.™

Moog Components Group has innovative solutions for your motion needs. We are a world leader in slip ring technology, servomotor and resolver design and fiber optic rotary joints for high bandwidth applications.

Models are available in housed, through-bore, pancake and single or multi-channel fiber optic configurations. Standard, off-the-shelf designs are ready for quick delivery or products can be customized for your unique projects.

Reliability is built into each product. Extensive life testing means our products are designed and manufactured to offer long life. With over 50 years of experience, our engineers work together with your design team to select just the right match.



Aerospace Products:

- ✓ Slip Rings
- ✓ Torque Motors
- ✓ Actuators
- ✓ Resolvers
- ✓ Fiber Optic Rotary Joints
- ✓ Build-to-Print Solutions

Motion Technology | Fiber Optics | Electronic Systems

800/336-2112, ext. 279

Fax 540/557-6400

mcg@moog.com

www.moog.com

MOOG
COMPONENTS GROUP

Airbus shows off A350 cabin

Last month **Airbus** unveiled a full-scale 12-m mock-up of its A350 cabin, the design of which is the result of a cooperation between Airbus design teams in Hamburg and Toulouse and London-



A state-of-the-art lighting system in the A350 will be used to create an array of moods and atmospheres to suit any time of day or night, while natural light will be increased due to larger windows.

based design firm **Priestman Goode**.

The entrance area features a new circular design that allows for the integration of fittings, such as galleys, wash rooms, and social areas. New materials based on nanotechnology for the side-walls and ceilings, larger windows for more natural light, and an advanced mood light system are expected to enhance passenger comfort.

New projection technologies allow for



Airbus says that the overhead storage bins of the A350 will be better integrated into the side walls and ceiling panels, allowing for more storage volume while providing passengers with more headroom.

the display of virtual images on the ceiling. An improved overhead bin design is expected to allow more than two standard roller-bags per passenger in business class and "more than one roller-bag per economy class passenger," according to Airbus.

"Snap and click" technology with common attachment points will be featured on the A350, allowing airlines to reconfigure seating, lavatory, and galley positions quickly depending on their strategy and market demands.

When it enters service in 2010, the A350 will offer wireless access to the Internet. Airbus also says that passengers will be able to use their mobile phone and all related services on board—a technology Airbus expects to introduce next year on A320 aircraft. To enhance the in-flight entertainment system, A350 passengers will be able to enjoy an on-board satellite TV with multi-channel packages.

The A350 family will initially include two members. The A350-800 will carry up to 253 passengers in a three-class configuration up to 8800 nmi. The A350-900 will accommodate as many as 300 passengers in a three-class layout up to 7500 nmi.

Jean L. Broge

Lots faster than dial-up

Using processes similar to Digital Subscriber Line technology that expands the data-carrying capability of ordinary telephone lines for Internet service, **Data Device** (DDC) has developed a high-performance MIL-STD-1553 data bus that can transfer electronic data at least 40 times faster than current data bus

technology. Called HyPer-1553, it was tested recently in **Boeing's** F-15E1 Advanced Technology Demonstrator.

The new technology helps increase bandwidth between subsystems, which is becoming increasingly necessary for network-centric operations and sensor fusion applications. Because it works with

existing MIL-STD-1553 infrastructure, HyPer-1553 could prove to be a cost-effective path to avionics system upgrades because no new wiring is needed.

During the test, Boeing Phantom Works engineers used the HyPer-1553 data bus to transmit digital imagery data between a chassis mounted in the forward equipment bay of the F-15E and a modified Joint Direct Attack Munition weapon mounted on a wing pylon station. DDC's circuit card with the HyPer-1553 interface was mounted to a **Honeywell** general-purpose processor on each end of the interface.

During the test, the team successfully transferred data at 40 Mb/s over an existing 1553 data bus infrastructure in parallel with MIL-STD-1553 data being transmitted at 1 Mb/s. The team also transferred data at 80 and 120 Mb/s on a second 1553 bus dedicated to the higher speed data.

Barry Rosenberg



The Boeing F-15E1 aircraft takes off during a flight test of a new technology that speeds up the transmission of tactical aircraft data.

Heim improves airborne data acquisition

A new version of the D5000 Series specifically targeting applications requiring compatibility with the IRIG106 Chapter 10 standard has been introduced by **Heim Data Systems**. The standard defines the data formatting, control interfaces, and media directories of airborne data-acquisition systems such as flight test recorders.

The single-box Heim data-acquisition product now can be used for PCM telemetry, avionics bus, and sensor data acquisition in applications requiring compliance. It is compact, lightweight, and rugged,

according to the company. It provides a digital recording replacement for both legacy tape-based video and avionics data-acquisition systems, combining both functions into a single box.

With modular signal interfacing and interchangeable media cartridges, the D5000 Series provides highly flexible, COTS solutions that can easily adapt to the changing requirements of airborne applications, according to the company. With up to 256 Mbit total system data rate, and available with hard drive or



The D5000 Series provides highly flexible, COTS solutions that can easily adapt to the changing requirements of airborne applications.

solid state media, the cartridges have front-mounted IEEE-1394b interfaces allowing rapid post-mission verification and download of data.

Patrick Ponticel

SAE makes blanket statement on test procedure

SAE International is helping to reduce the possibility of onboard fires in aircraft via Aerospace Recommended Practice 5627—Flammability Test Method for Aircraft Comfort Blankets.

While not a widespread problem, the flammability of comfort blankets has been linked to the spreading of fires in overhead storage compartments on aircraft in at least one instance. The new SAE standard offers a simple test to help

identify potential risks before they become problems.

Although test procedures for blanket flammability have been around since the 1990s, the SAE standard makes it a recommended practice, thereby ensuring wider use of the procedure.

"The test was available, but not being used," said Dave Rich, an aerospace engineer in aircraft certification activities at **FAA** Headquarters who is sponsor of

ARP5627. "The committee thought that if we make it a recommended practice, then more airlines would use it."

The test is accurate and easy to perform, Rich added. "It's very similar to what was already available, but provides some definite improvements."

ARP5627 was written and created by SAE International's S-9 Cabin Safety Provisions Committee.

Patrick Ponticel



Welcome onboard. Our flight time is 30,000 hours.

Many factors contribute to the success of the Airbus. Every detail in design must meet stringent requirements to achieve optimum performance. Busak+Shamban advise on sealing technology and have been responsible for the development of specific solutions in demanding applications. An example is the Tandem VL Seal® Rod Sealing System in the primary flight controls (aileron) of the Airbus 340 wings. This withstands a minimum of 30,000 flight hours at pressures up to 3,000 PSI.

Benefits:

- High quality sealing
- Low friction
- Exceptionally long operating life

Your Partner for Sealing Technology



Busak+Shamban Americas
Telephone (800) 877-3257
mail@busakshamban.com

www.busakshamban.us