→ President Eric Bachelet describes the most important investments CFM is making for customers

Page 2

→ By the numbers: the Tech Insertion upgrade has fared well since its 2007 debut

Page 2

→ The advanced CFM56-7BE engine proves fuel efficiency gains, is ready for certification

Page 3

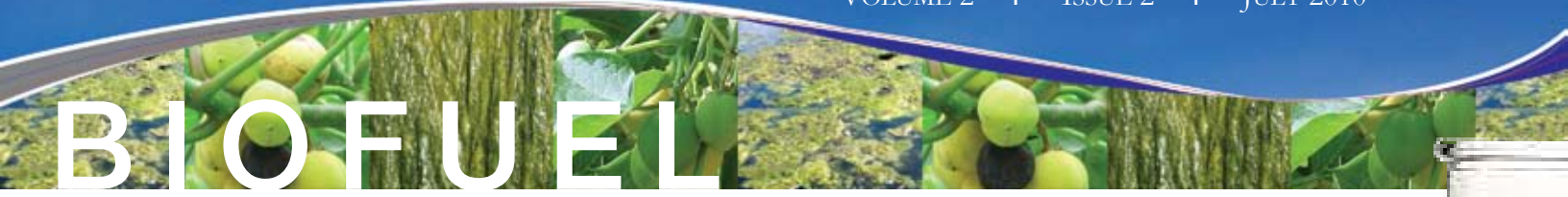
→ Boeing's P-8A Poseidon aircraft is one step closer to being in the hands of U.S. Navy warfighters

Page 4

cfm
THE POWER OF FLIGHT

NEWSLETTER

VOLUME 2 | ISSUE 2 | JULY 2010



BIOFUEL

South American airlines plan biofuel demonstration flights. The industry looks ahead to accelerating production.

Two CFM customers in Latin America are planning alternative fuel flight test projects within the next year.

Both Brazilian airline TAM and Mexico's Interjet plan to flight test a biofuels mixture derived from Jatropha later this year. Both test flights will be made with CFM56-powered A320 aircraft.

The lead-up to the test programs is valuable practice for the biofuel production chain as companies cultivate and refine the feedstock, fuel producers evaluate different production mechanisms, and the airlines evaluate long-term purchase agreements. "These flights tests are a catalyst to setting up the value chain," says Paul Nash, head of new energies at Airbus. "We're demonstrating biofuels, but at the same time we're speeding up production and commercialization."

Alternative fuel demonstration flights have now been completed in every other major region, including North America, Europe, the Middle East, Asia, and the Pacific.

Within the next 9 months, 50/50 blends of Hydrotreated Renewable Jet biofuels (HRJ or Bio-SPK) are expected to receive ASTM (American Society for Testing and Materials) specification approval. After that point, all products designed to operate with standard Jet-A fuel will be able to use up to 50 percent blends of biofuels produced to the new specification standards. The industry will then move on to evaluating other synthetic sources of jet fuel. To receive commercial certification, biofuels must satisfy a very broad range of performance criteria, such as: freezing point, energy density, lubricity and many other characteristics that make fuel safe for aviation use.

"The work the industry has done over the past year and a half, both in the lab and during test flights, verifies that synthetic fuels will give operators at least equivalent performance to Jet-A," says Steve Csonka, director of environmental strategy at GE Aviation, one of CFM's parent companies.

The next big hurdle: commercialization

Although aviation biofuels have proven themselves as fully viable from a technical perspective, it remains a challenge to produce enough feedstock for widespread biofuel introduction. The worldwide aviation industry consumes about 70 billion gallons of jet fuel every year.

Governments around the world need to a take a leading role in shaping and accelerating biofuel development, according to Billy Glover, managing director for environmental strategy at Boeing.

"We're demonstrating biofuels, but at the same time we're speeding up production and commercialization."

government incentives and loan guarantees for feedstock production and development "essential" if the airline industry is to achieve a goal of 25% of fuel from biofuels by 2030.

"If governments don't play a role, it may be a very long time before we achieve these figures," Glover warned, noting that nations have not supported energy crops with loan guarantees but that the US is moving in that direction. He also urges governments to give priority to feedstocks suitable for aviation fuel, pointing out, "Ground transport has other options, aviation does not."

continued on page 2

continued from page 1

Are aviation biofuels in high demand?

Alternative fuels will hold a strong appeal for aircraft operators as long as they are competitively priced with traditional jet fuel.

The way to drive down biofuel costs is to speed up commercialization, says Nash. This will happen when more companies set up refineries. What will entice them?

“Sustainable projects that attract investors, and airlines that commit to buying large quantities of biofuel,” he says.

More research and development will also help define more efficient materials and ways to create biofuel. The more the better, Nash says: “If refineries and processes are in place all over the world, we won’t rely on one material, such as fossil fuels, and we won’t be controlled by one organization.”

Aircraft operators have a strong interest in biofuels, says Csonka, and are interested in seeing the fuel succeed from a few perspectives:

First, to ensure a predictable fuel supply; second, for price stability against kerosene fuel’s sometimes wild price swings; and finally, to achieve the C02 reduction that comes with using biofuels.

“As political and economic pressure builds, it’s clear that customer demand for biofuels will grow,” says Csonka. “For someone who is going to be faced with ETS charges [the EU Environmental Trading Scheme] in 2012, the use of renewable fuels like HRJ might be very important to them.”

Letter from the President

Welcome to the latest edition of our CFM Newsletter

Dear CFM Customers,

As the aviation industry emerges from the impact of the most severe recession in decades, the advances recorded on a number of CFM’s programs bear testimony to our commitment to keep investing in our products. Our philosophy is to pursue continuous improvements for short-term benefits on the current CFM56, but also a *step change* with a brand new engine, the very ambitious LEAP-X program scheduled to enter service in 2016:

Tech Insertion has been the production standard since 2007 for both the CFM56-7B and CFM56-5B. The fleet leaders have now reached 4000 hours and the data we have accumulated support the performance retention that we were targeting with this program.

The development program of the CFM56-7BE engine is nearing completion with FAR33 certification scheduled for the third quarter of this year. It will contribute at least a 1% fuel burn improvement to a total 2% aircraft performance improvement delivered by Boeing by mid-2011 on the 737NG.

Our new engine program, LEAP-X, aims at providing a step contribution to airline operations. The targets are ambitious: a 15% improvement in fuel efficiency compared to the best current CFM56 engines; a 15 EPNdB reduction in noise; and 50% lower NOx emissions than the most stringent regulations. The development is making great strides with two demonstrators running: MASCOT, a fan equipped with composite blades manufactured from 3D woven carbon fiber (preforms injected with resin); and the advanced eCore Demonstrator 1. MASCOT has successfully passed major component tests, including six-pound bird ingestion and blade-out tests, and is now in an endurance campaign. eCore Demo 1 successfully completed two phases of testing, totaling 150 hours, in a unique altitude test facility.

These programs represent the greatest technology investment in CFM’s 35-year history. You have my commitment that we will continue to bring our customers even greater value as the industry continues to improve.

Warmest regards,

Tech Insertion fleet performance

.....by the numbers

180

Unique operators of Tech Insertion engines

8.6 million

Aircraft cycles

3,800

Engines in service

The advanced CFM56 Tech Insertion configuration is providing operators worldwide with lower fuel consumption, longer on-wing life, lower maintenance costs, and lower emissions*.

CFM56 Tech Insertion became the production configuration for all CFM56-7B and CFM56-5B engines and entered service on the Boeing 737 and Airbus A320 aircraft families in 2007.

CFM56 Tech Insertion provides operators with up to 1 percent better specific fuel consumption over the life of the product; longer time on wing through a 15 - 20°C additional exhaust gas temperature margin; and between 5 and 15 percent lower maintenance costs (depending on the thrust rating) through enhanced durability.

*Fleet statistics as of May 2010
Compared to engines it replaces

Advanced CFM56-7BE completes ground testing, ready for certification

All technical requirements have been met for the new CFM56-7BE engine, and the model is set to receive engine certification.

Ground testing, including a 150-hour block test and a nearly 60-hour flight test program completed in June 2010, went "incredibly well," says Kris Shepherd, CFM director of Boeing programs.

"All testing for engine certification is behind us,"says Pierre-Yves Bourquin, also a CFM Boeing program director. "We now have two challenges ahead: aircraft-level certification and the production ramp-up."

The CFM56-7BE engine enhancement program is scheduled to enter airline service in mid-2011 to coincide with Boeing Next-Generation 737 airframe improvements. The way is paved for flight tests on the Next-Generation 737 next year, followed by aircraft certification and entry into service in mid-2011.

The enhanced airplane/engine combination will provide a 2 percent improvement in fuel consumption and up to 4 percent lower maintenance costs.

CFM's objective was to improve the engine's contribution to fuel efficiency by 1.1 percent, and multiple CFM56-7BE engines have performed even better during testing. "All metrics indicate that the new hardware is slightly exceeding our efficiency commitment," says Shepherd.

These improvements will come with no regression to current CFM56 noise, emissions or reliability standards.

"We are making sure the hardware we introduce is as good as previous hardware at entry into service," says Bourquin. "There should be no durability surprises in the mid- or long-term."

Next up: 10,000 extreme endurance cycles

Although the CFM56-7BE has already met authorities' requirements for engine-level certification, it will complete an additional 10,000-cycle endurance ground test program in France and the U.S. before mid-2011.

One endurance cycle replicates in a short time what happens when an aircraft makes a takeoff and landing. The CFM56-7BE is held at takeoff power for three minutes then dropped to ground idle. The simulated cycle takes about fifteen minutes, after which engineers shut down the engine and continue to repeat the test until they have logged 10,000 cycles.

"It's an extreme test profile," says Shepherd. "This is a CFM best practice that should uncover any possible durability problems before the engine ever hits the production line."

As the engine progresses through the 10,000 cycles, CFM engineers in France and the U.S. will systematically use borescope inspections to verify the durability of each part.

"Our endurance testing goes well beyond certification requirements," says Dan Oehrle, CFM systems integration manager. "But it is critical from a customer standpoint because it demonstrates both engine reliability and our very high engineering standards."

15.3 million

Flight hours

0

In-service issues related to Tech Insertion

CFM completes Phase Two tests on all-new LEAP-X core

Rigorous program focuses on reliability, performance

In May 2010, CFM completed Phase Two testing of eCore Demonstrator 1, the first of three engineering cores that will be built and tested as part of the LEAP-X development program.

LEAP-X is a totally new centerline engine launched to power the next generation of short-to-medium range aircraft. The LEAP-X1C was selected as the sole Western powerplant for China's new C919 airplane scheduled to enter commercial service in 2016.

The LEAP-X core represents the latest step in the evolution of engine technology, bringing to bear hundreds of millions of hours of experience from both wide-body and single-aisle operations to deliver outstanding performance, operability and emissions utilizing proven materials, advanced 3D aerodynamics, and lean-burn, low-emissions combustion technology.

During the eCore Demo 1 test program, operating conditions were simulated at extremes the hardware would never encounter in typical commercial airline service, says Ron Klapproth, LEAP program director at CFM.

Engineers monitored the heavily instrumented core for about 2,000 different engine parameters as it ran for 150 hours in a special altitude test facility. The tests focused on the core's reliability to ensure the LEAP-X will maintain the CFM56 engine's reputation for stall-free operation.

"Our engines operate eight to ten cycles per day and, in that environment, reliability simply cannot be compromised," Klapproth says.

"That is why we will be running multiple core tests over the next few years," he adds. "We will complete these tests well in advance of the earliest entry into service to ensure our customers that we will provide their operations with absolutely the highest levels of reliability."

By focusing on the core, CFM can simulate ground and altitude conditions over a much greater operating range than could be achieved with a full engine test. All of the data collected from eCore Demo 1 tests will feed into eCore Demo 2, which is on schedule for ground tests in mid-2011.

Klapproth says the core's demanding test regime is leading up to the first full LEAP-X engine test in early 2013.

P-8A Poseidon

Boeing P-8A Poseidon completes 1st in-flight test of mission systems

The P-8A Poseidon team is one step closer to getting the military aircraft into the hands of warfighters.

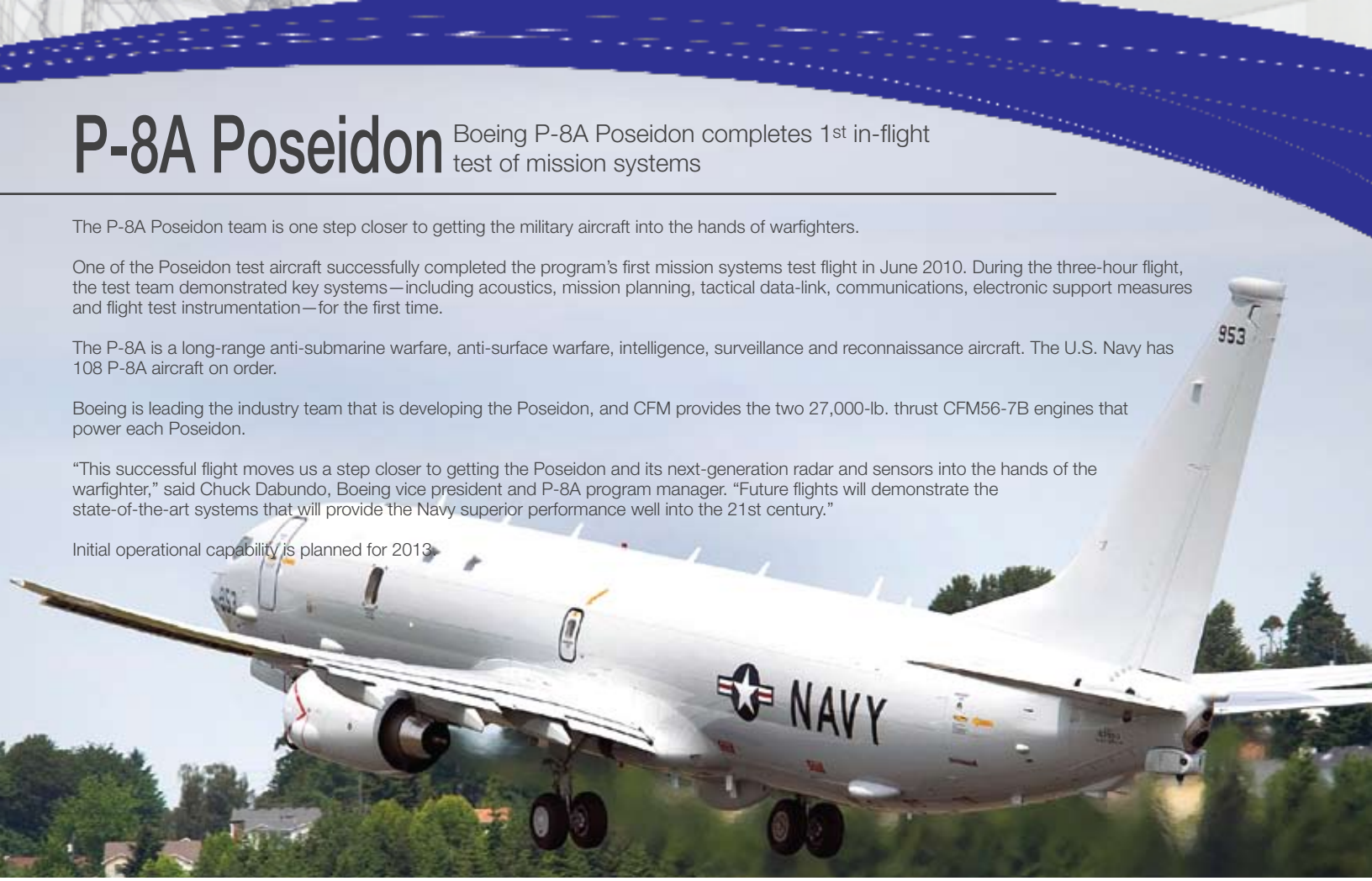
One of the Poseidon test aircraft successfully completed the program's first mission systems test flight in June 2010. During the three-hour flight, the test team demonstrated key systems—including acoustics, mission planning, tactical data-link, communications, electronic support measures and flight test instrumentation—for the first time.

The P-8A is a long-range anti-submarine warfare, anti-surface warfare, intelligence, surveillance and reconnaissance aircraft. The U.S. Navy has 108 P-8A aircraft on order.

Boeing is leading the industry team that is developing the Poseidon, and CFM provides the two 27,000-lb. thrust CFM56-7B engines that power each Poseidon.

"This successful flight moves us a step closer to getting the Poseidon and its next-generation radar and sensors into the hands of the warfighter," said Chuck Dabundo, Boeing vice president and P-8A program manager. "Future flights will demonstrate the state-of-the-art systems that will provide the Navy superior performance well into the 21st century."

Initial operational capability is planned for 2013.



CONTACTS AT CFM

- Bill H. Brown
  General Manager, Marketing, CFM56
  bill.h.brown@ge.com
- Stéphane Garson
  General Manager, Marketing, CFM56
  stephane.garson@snecma.fr
- Jamie Jewell
  Director, Strategic Communications
  jamie.jewell@ge.com
- www.cfm56.com

cfm
THE POWER OF FLIGHT

CFM-1269 (07/10) Printed in USA