



The first CFM56-5B Tech Insertion engine, designated CFM56-5B/3, left the Villaroche assembly line in late August 2007. It will be delivered to Italian carrier Air One.

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Assembly of a CFM56-5B.

## PROGRAM MILESTONES

> **September 2004:** official launch of the Tech Insertion program, using technologies developed through the Tech56 demonstrator.

> **November 2005:** flight tests on General Electric's Boeing 747 flying testbed based at Victorville, California. Ground tests follow at Snecma's Villaroche plant. A total of six engines are used for these tests, logging a total of 1,150 hours.

> **September 2006:** certification by the European Aviation Safety Agency (EASA) and the FAA of the United States.

> **May 2007:** service entry of Tech Insertion standard engines on Boeing 737 Next Generation jetliners.

> **September 2007:** service entry of Tech Insertion standard engines on Airbus A320 family jetliners.

**COMMERCIAL ENGINES.** The CFM56 technology improvement program, dubbed "Tech Insertion", enables airlines to reduce engine maintenance costs, NO<sub>x</sub> emissions and fuel consumption.

# TECH INSERTION: ETERNAL YOUTH FOR THE CFM56

An Airbus A320 took off this summer powered by CFM56-5B engines built to the new Tech Insertion standard. Directly derived from the Tech56 research program, the upgraded Tech Insertion version offers a number of advantages to airlines operating CFM56-5B or -7B engines. "We launched the Tech56 research program at the end of the 1990s because we expected the new generation of Airbus and Boeing single-aisle jetliners to make their appearance towards 2005," explains Jean-Pierre Cojan, head of the Commercial Engines division at Snecma (Safran Group). But since the two plane-makers didn't seem ready to develop any new-generation planes at the time, Snecma decided to apply the technologies developed through this program to the two current CFM International best-sellers, the CFM56-5B and CFM56-7B.

"We looked at the possibilities offered by these new technologies," says Cojan, "and applied them to existing engines."

The aim is to add value for CFM International customers through continuous improvements to their engines, whether new or already in service, allowing them to cut maintenance costs and fuel consumption. "This program concerns at least ten thousand engines," adds Cojan. "It will also enable us to keep them in service once the new ICAO [International Civil Aviation Organization] emission standards for oxides of nitrogen, or NO<sub>x</sub>, take effect in 2008. The resale value of both engines and aircraft will benefit directly from Tech Insertion. Airplanes are a bit like cars; the older ones lose their value faster than new ones, so it's to our advantage to maintain engines to the most recent standard."

## Enhanced efficiency and longevity

All new CFM56-5B and -7B engines will now be built to the Tech Insertion standard. Engines already in service can also be fitted with upgrade kits during general overhauls by Snecma Services or General Electric Services. As Jean-Pierre Cojan notes, "Starting now, all customers will receive Tech Insertion versions of these engines. We are no longer producing the former version, except of course spare parts for customers who choose not to modify their engines to the new standard."

Improvements to the CFM56 focus on the low-pressure compressor, combustor (combustion chamber) and the high- and low-pressure turbines. CFM International has developed new HP compressor blades, using advanced 3D aerodynamic design and analysis methods. The new design not only improves engine efficiency, it also

minimizes parts wear and reduces sensitivity to clearances. By using advanced analysis tools developed for the twin-annular pre-swirl (TAPS) type combustor, CFM International also improved cooling of the CFM56's annular combustors, which reduces NO<sub>x</sub> emissions and gives sufficient margins in relation to new environmental protection standards.

Tech Insertion engines will offer longer life "on-wing" (without removal for servicing), reduce maintenance costs by about 5%, decrease nitrogen oxide emissions by 15% to 20%, and significantly decrease fuel consumption. In other words, Tech Insertion rejuvenates the best-selling CFM56 family, while awaiting the advent of its successor, derived from technologies developed through the new Leap56 research program and expected to hit the market towards 2015. ■

A. ANGRAND