

PROPULSION. Safran continuously improves the M88 engine powering the Rafale fighter to keep pace with customer expectations.

MORE POWERFUL, MORE ECONOMICAL ENGINES FOR THE RAFALE FIGHTER



The two M88 engines get the 15-ton Rafale off the flight deck in a hurry!

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The Safran M88 engineering department knows this powerplant inside out. These engineers offer all the skills and expertise needed for a state-of-the-art fighter engine, and are used to working closely with the French armed forces that deploy the Rafale multirole fighter. Week after week, they analyze the rich lode of data generated by the aircraft's missions. "Feedback from this M88 fleet – now totaling over 100,000 flight-hours – flows directly into the current and future developments of this engine, and also helps bolster its reliability," notes Jacques Dufau, M88 engineering manager at Snecma.

Solid foundations

The next major upgrade to the engine is the M88 TCO Pack (total cost of ownership package), addressing operational requirements of French armed forces. "Our customer, the French government, wanted to retain the same thrust but improve the engine's operating life and maintainability," explains Dufau. Safran's engineering teams responded by drawing up the specifications for this upgraded engine.

"The development of the new version was built on very solid foundations," points out Marcel Charrier, M88 TCO Pack program manager. "We don't start anything unless we're sure that the technology is mature. In this case, about 20 percent of the engine will change, including the rear section of the high-pressure compressor and the high-pressure turbine. We largely revamped the

VIEWPOINT



JACQUES DUFAU,
M88 ENGINEERING MANAGER, SNECMA

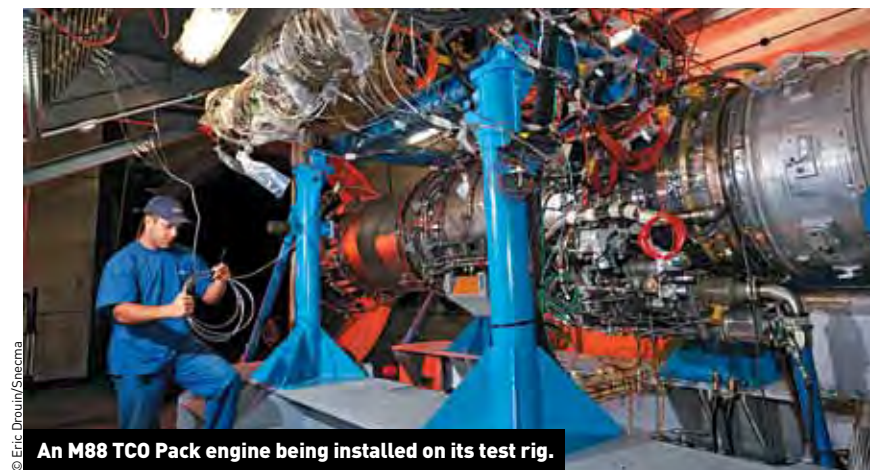
M88 TCO Pack under test

"Everything is proceeding perfectly. We started ground tests of the first of five engines needed to develop the TCO Pack variant, and right from the second day we achieved full thrust. We will need about two weeks of testing to check the engine's mechanical integrity and acceleration, so we can gradually adjust the fuel control laws. We're already very satisfied with temperature readings, since they're fully in line with our predictions. The engine will then undergo testing in a simulated altitude chamber to simulate actual conditions and its ability to restart under these conditions. At the same time, a second engine will be installed on a test rig for mechanical endurance tests, operating for the equivalent of more than 1,600 hours of service use (about eight years). The following engines will then be used for vibration tests and flight testing."

turbine production process, incorporating a new design and new materials. On August 29 the first TCO version of the M88 made its first ground test, a milestone on the road to qualification, planned for 2011. "We have to efficiently manage the risks that are inevitable in any development program," adds Charrier, "especially because we are cutting metal for the first production-standard parts well in advance, so we can deliver complete engines as soon as the TCO version is qualified."

In synch with the customer

Over the last six month engineering teams have made several trips to the United Arab Emirates, a potential Rafale customer. At the 2009 Paris Air Show in June the UAE indicated that they would like an engine in the "9-ton" thrust class (20,000 lb), rather than the current 7.5 tons (16,500 lb). "Before kicking off the development of a new engine we first try to understand the customer's requirement and optimize the engine for the specified range of missions," explains Jacques Dufau. It should take only about 36 months to develop a new "M88-X" incorporating the advances of the TCO Pack. "Studies are underway," says Bruce Pontoizeau, M88-X program manager. "And they are focusing on an enhanced low-pressure compressor. At the same time, we're working with Dassault to integrate the engine in the airframe, including several changes around the air inlets." But even this new initiative won't signal the end of M88 developments, since this engine still harbors room for improvement over the many years of service that stretch out ahead. ■



An M88 TCO Pack engine being installed on its test rig.

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