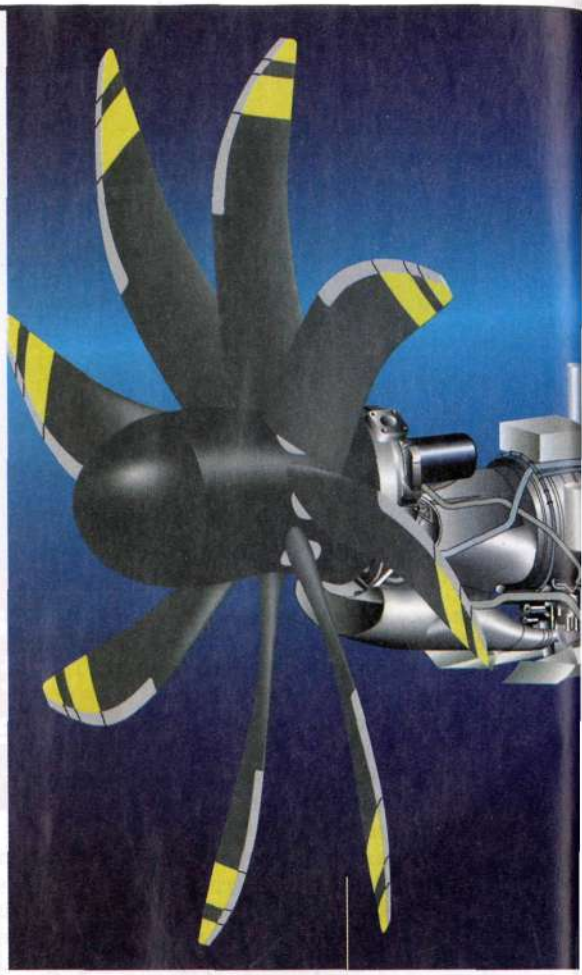
POWER STATION

For the A400M EuroProp International is developing the most powerful turboprop ever to grace a Western production aircraft

GUY NORRIS / TOULOUSE



EuroProp International (EPI) is made up of Rolls-Royce, Snecma, MTU Aero Engines and ITP (Industria de Turbopropulsores) and is focused on development, test and production of the 10,000shp (7,500kW)-class TP400-D6 turboprop in a relatively compressed timescale. Based on a triple-shaft architecture, the engine will drive a 5.33m (17.5ft)-diameter, eight-bladed Ratier-Figeac FH386 propeller through an offset Avio gearbox.

"We have designed a completely new core with three-spool technology," says EPI managing director and former BMW Rolls-Royce pioneer Gunther Kappler. "We are well into the process of becoming a certificated engine design company, and nobody will be able to anything with other versions of this engine but us. Some derivatives could be developed and we had this in mind when we designed it."

The overall development timescale for the A400M paces the TP400-D6 masterplan, which calls for the first run of the MTU-designed five-stage intermediate pressure compressor (IPC) on 30 November. The compressor will run at MTU's Munich test site in Germany "right on time as agreed", promises Kappler. The first full engine to test is scheduled to fire into life at the German engine maker's Ludwigsfelde site close to Berlin at the end of August 2005.

The initial test engine will not be fitted with a propeller, however, but will instead be attached to a water brake to represent the equivalent load. In all, there will be nine test engines, with the first fully representative propeller-equipped engine due to run by the end of 2005.

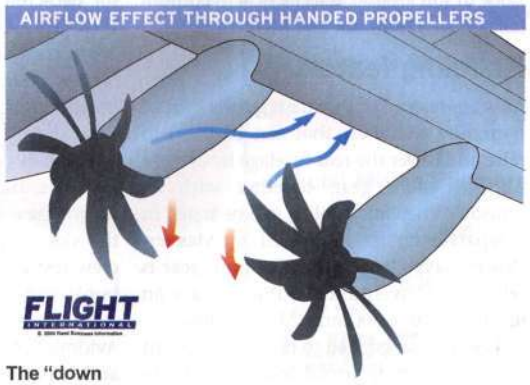
Although EPI has told AMC that it feels no flying testbed is required, "Airbus has always had a tradition of testing a new engine and new airframe combination by using a flying testbed first", says Kappler. A decision on the type of flying testbed is expected as *Flight International* closes for press, but the choice is between Airbus's original A340-300 test airframe, a Lockheed Martin C-130 or an Ilyushin Il-76. Perhaps surprisingly, the A340 has adequate ground clearance for the job, says systems head Jean-Michel Billig. Given this, the availability of the asset and the need to test the engine at the A400M's Mach 0.72 maximum cruise speed, the adoption of the A340 is therefore widely expected.

Few technical risks

As well as providing input on the overall design, including its trademark three-shaft configuration, Rolls-Royce is leading development of the six-stage high-pressure compressor (HPC), which also has only two variable stages. Driving the HPC is a Snecma-designed, single-stage high-pressure turbine (HPT) with "a lot of M88 heritage", says Kappler. "Nobody wanted to take much of a technical risk with anything on this," he adds. Similarly, the combustor is largely M88-based, although scaled down to reflect the reduced flow of the TP400-D6.

Aft of the HPT is the MTU-developed intermediate pressure turbine (IPT), which is heavily derived from the RB199 and EJ200 fighter engine designs, as is the hot strut that carries the main bearing structure. The bearings, which are based on Trent technology, support the engine's extremely long shaft, which Kappler describes as "a very critical aspect of the design". Aft of the IPT is the three-stage, ITP-developed low-pressure turbine (LPT), which is derived from BR715 and Trent family design heritage.

Rated in the 10,700shp range, the engine is designed with built-in growth capacity for 10% more power through a relatively straightforward throttle push, says Kappler. Additional growth of a further 10% is also feasible within the existing architecture, he adds, through HPT material changes and flow adjustments to the blades in the compressor.



The "down between engine" innovation produces symmetric airflow, improving lift and stability

A key aspect of the TP400-D6 is the full-authority digital engine control (FADEC), which manages both engine and propeller control through a single lever per engine. The Hispano-Suiza control unit incorporates engine management, autothrust/autothrottle, automatic and manual engine start, auto relight, overspeed protection, surge detection and recovery, and health monitoring functions. Working with MTU