The McGraw-Hill Companies www.aviationweek.com/awst April 19, 2010

AVIATION WEEK & SPACE TECHNOLOGY

PROPULSION

Turning Point

Key decisions, many out of Pratt's hands, are set to make 2010 a watershed year for the company

GUY NORRIS and MICHAEL MECHAM/EAST HARTFORD, CONN.

Pratt & Whitney is facing its most critical period since the early 1990s, with key developments looming in commercial and military propulsion that will affect its destiny for the next decade or beyond.

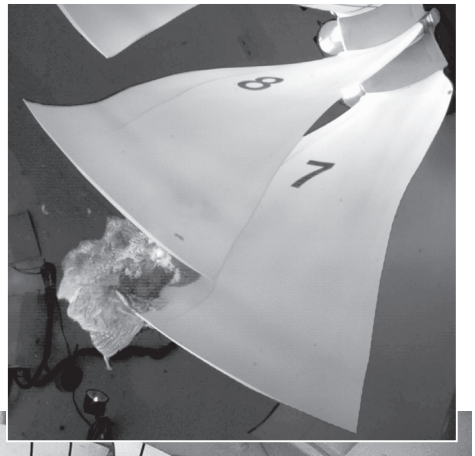
Key fan and first-engine tests mark the start of a pivotal period for development of the PW1000G geared turbofan (GTF). Meanwhile, lurking like the proverbial 800-lb. gorilla in the room is the soon-to-be decided question of how that engine might be adopted under the International Aero Engines (IAE) banner as a lead candidate for a mid-decade reengining of the Airbus A320 and Boeing 737 families.

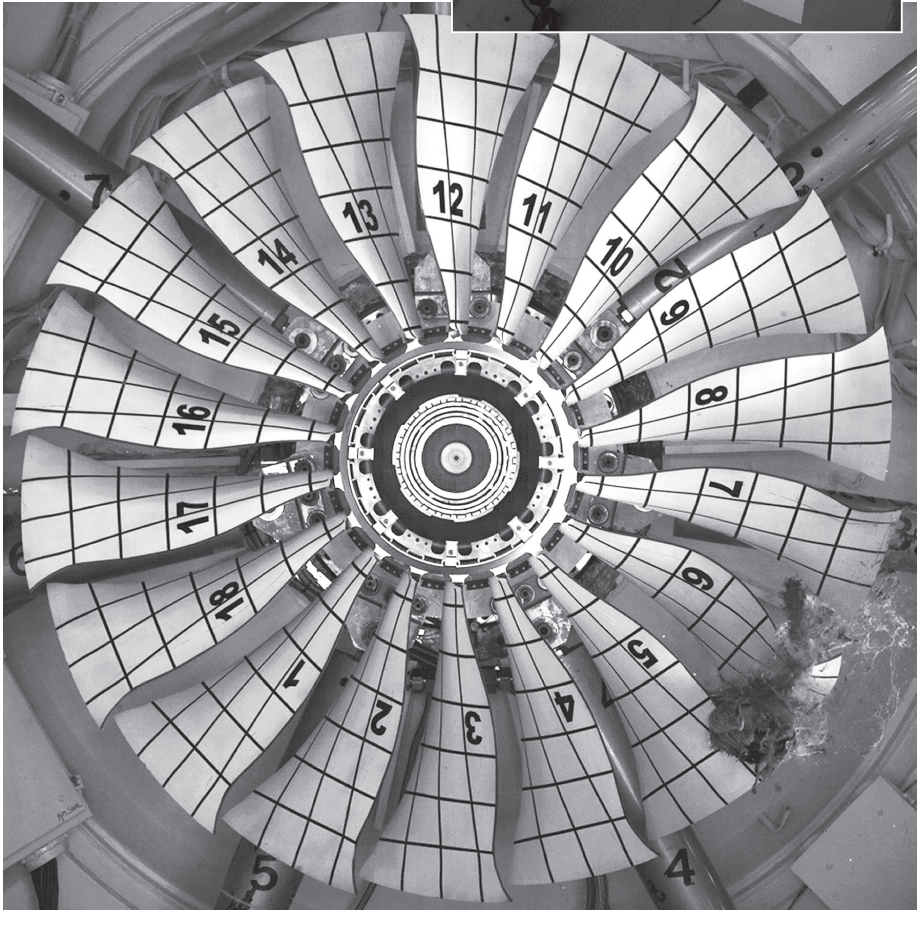
On the military side, Pratt is executing the final phases of its F135 development plan for the troubled Lockheed Martin F-35 Joint Strike Fighter. The F135 continues to face schedule and cost uncertainty as the alternate engine debate nears another key decision in Congress.

Both programs form the vanguard of what Pratt & Whitney President David Hess says will be a rebound year following the 2009 aviation downturn, which saw the company lose 10% in revenues and 8% on earnings before taxes. "It was pretty ugly," says Hess of last year's business climate. Pratt's $12.6 billion represented 24% of parent United Technologies Corp.'s $52.9-billion 2009 revenues.

Hess says a focus on business fundamentals will serve the engine maker well. "We are positioned for a leaner cost structure, so we're in a great position for the eventual turnaround."

Around 55% of Pratt's revenue stream





PRATT & WHITNEY

These wide- and close-up views of high-speed analysis footage show the 73-in. hybrid metallic fan blades on the PW1500G development engine successfully withstanding bird strikes in tests at Pratt's & Whitney's Middletown (Conn.) Engine Center in March. Pratt's engine saves weight by using 18 blades. In contrast, IAE's V2500 has 22.

The F-35B Stovl variant recently completed its first vertical landing powered by the Pratt & Whitney F135.

LOCKHEED MARTIN

comes from military and civil maintenance, repair and overhaul operations. The company does not break down its revenues by sector, but says the combination of its Pratt & Whitney Canada and Commercial Engines & Global Services units accounts for 60% of the total, with the rest flowing from Pratt & Whitney Rocketdyne, P&W Power Systems and Military Engines.

Through its partnership with some aggressive airframe manufacturers, Pratt has been setting the pace for regional and single-aisle commercial jets this decade with its PW1000G design. Initially, the GTF concept represents Pratt's desperately needed entree as a leader in the regional and single-aisle jet market (those aircraft requiring 10,000-40,000 lb. thrust). Longer term, the design is seen as the gateway for Pratt to reenter the large-turbofan market with a replacement for its PW4000 family.

Pratt achieved its first order for the GTF when it was selected for the 70-90-seat Mitsubishi Regional Jet (MRJ) in a 15,000-17,000-lb.-thrust range (*AW&ST* Oct. 15, 2007, p. 44). In short order, Bombardier named it as the powerplant for the 100-150-seat CSeries in a 21,000-23,000-lb.-thrust range. Late last year, Russia's Irkut pushed the power demand to 25,000-32,000 lb. thrust for the 150-212-seat MC-21 series.

Of these, the CSeries is creating the biggest stir. It was announced in July 2008 as the price of oil peaked at more than $140 per barrel. The volatility of prices has re-energized the aviation market's demand for fuel efficiency.

Pratt's potential clean-sweep of new platforms was broken last year when CFM International's LEAP-X was selected by Commercial Aircraft Corp. of China (Comac) for its 168-190-seat C919 series. Like Irkut, Comac is ready to take on Airbus and Boeing in the heart of their single-aisle families; Bombardier's approach centers on the lower end of the single-aisle market, where Airbus and Boeing record few sales. Nonetheless, the Canadian company's continuing success in attracting customers has not escaped its bigger competitors' notice. Both have made it clear they do not intend to sit by while a challenger weakens them from below (*AW&ST* March 22, p. 40).

Egged on by cash-strapped customers, Airbus and Boeing are therefore reluctantly considering reengining designs of their A320 and 737 families in advance of the launch of new successors. That prospect may open the big-prize box for Pratt. But it also sets the stage for a battle royal this summer between Pratt and Rolls-Royce as IAE's principal partners over how, or whether, that engine alliance's successor to the V2500 will be shaped as a candidate to power the upgrade of the two airplane families.

Airbus wants an IAE solution for any reengining program, not a new engine series from either Rolls or Pratt because it has built the A320 family on the familiarity of the IAE and CFMI brands. CFMI's partners—GE Aviation and Snecma—are in lockstep on the LEAP-X program as a successor to the CFM56. They announced it as oil prices spiked in 2008 and have reported steady progress in testing ever since.

But for both Rolls and Pratt, their competing next-generation engine designs represent more than a big strike in the single-aisle market. They are the foundations for successor engines across each manufacturer's commercial jet offerings. Rolls sees its RM285 technology as the best design for small commercial jets and as a successor to the Trent, which the company succeeded in placing on the initial Boeing 777 jets, the 787, Airbus's A380 and A350. Pratt needs a new powerplant for future wide-body aircraft to succeed its heritage PW4000, which hangs on only the early 777s.

On the other hand, General Electric commands most 777 orders with the GE90-115B, has the most orders on the 787 and is sole source on the 747-8; in addition, Boeing uses the GE/Snecma CFM partnership as sole-source on the 737.

Thus far, Pratt and Rolls executives politely say they are always in talks as longtime collaborators on the V2500. But there is no evidence they have reached a compromise that will satisfy each one's ambitions.

Still, Pratt's GTF work rolls forward. "We've spent $20 billion over 20 years on GTF development," says Hess, "and now we've tested everything on a module level to verify the technology and the architecture. He lists the first tests of the PW1200G for the MRJ and PW1500G for the CSeries as major milestones for the program coming in the second half of the year.

Pratt has accumulated 400 firm and option GTF engine orders across the three initial applications. But Hess is looking for many more as he enters the A320 and, possibly, 737 reengining fray later this year.

Farther north, Pratt & Whitney Canada is likely to be in a trough in 2010, since business and regional jet aircraft fleet levels fell from the second quarter last year. But Hess sees a bright spot in the upturn in business jet use rates, although he expects the Canadian operations' overall performance "to be down a little bit this year."

Pratt Canada is looking to the GTF to help revive its depleted fortunes as it continues testing of the PW800. Aimed at the 10,000-lb.-thrust business jet arena, the engine is regarded as a way to expand into larger bizjets from the company's foundation in midsize aircraft. Vice President Richard Dussault, who heads strategic planning and marketing,

says potential bizjet aircraft makers "really like the idea that the fleet leaders will be the MRJ and CSeries, so that's why we're sticking to our plan to have the same hardware and design" for their aircraft.

The PW800 also is playing a key role in a plan to offer a new generation of turboprops for larger airliners being studied by ATR, Bombardier, Embraer and Xian of China. "We're looking at refreshing the PW100 and/or the PW150 families, both of which have had remarkable resurgences since 2003," says Dussault. "We're in the process of laying out the product attributes, which are clearly improvements in reliability, fuel economy and maintenance costs. We're looking at what technology suite we can get from the PW800 and other product lines."

For the military division, the year holds development and acquisition decisions that will affect areas ranging from F135 production costs to the start of viable hypersonic propulsion systems.

While Hess awaits the outcome of the ongoing funding saga for the GE/Rolls-Royce F136 alternate engine, he makes no secret of his feelings about the validity of the contest. "The customers who might use a second engine don't want it—they don't want to spend the money. I take the same position as the taxpayer. It will take another $2.9 billion over the next 5–6 years to complete development of a second engine," he says.

Stressing the increase in test hours on the initial F-35s—including the recent first vertical landing of the F-35B short-takeoff/vertical landing (Stovl) version—Hess says the F119-derived F135 continues to provide the basis for a lower-risk solution. Referring to 130,000 operational hours amassed on the F119-powered F-22, he says: "You've already got a great engine—you don't need another, and you don't need a $2.9-billion insurance policy."

In Hess's view, there is no long-term economic benefit of two competing engines. "Forgetting what's been sunk already—even with the most optimistic of forecasts—it doesn't pay back even over the next 30–40 years of production of the program."

Initial service release tests of the Stovl F135 variant are underway as Pratt begins a steady ramp-up of production engines for Lockheed Martin's Fort Worth assembly line. The first production F135 for a conventional-takeoff-and-landing F-35 was delivered on Jan. 31. The initial service release was in March with the completion of 3,471 military qualification verification tests.

"It's in production. Development of that engine is over and it's moving into the component improvement program [CIP]," says P&W Military Engines President Warren Boley. "Now we're doing the same for the Stovl engine, and we're mounting endurance and performance engines in Florida."

The unanswered acquisition questions will determine the ramp-up and affect "our cost and capacity planning, so [funding of the alternate engine] is a significant decision," says Boley. The production rate is now around two per month, with 24 engines due for delivery in 2010. But it is slated to rise gradually through steps of three, four, five and so on until eventually reaching 20 per month. The four-per-month rate is targeted for F-35 LRIP 5 (low-rate initial production) in 2012-13.

"However, with the program's structured change, we don't get to 250 per year until 2016 and Lot 9. Whether we are building all 250 depends on the alternate engine; so by then we could be making either 10 per month or 20."

The next few months should see other key events with potential implications for Pratt's military future, including the first test flight of the Pratt & Whitney Rocketdyne SYJ61-2 scramjet-powered X-51A WaveRider hypersonic demonstrator. If successful, the trials will accumulate more air-breathing hypersonic test time in one 300-sec. flight than have been amassed during the previous 50 years of research. As such, they could pave the way for the first practical missile applications of the Mach 5-plus technology.

Another event with promise for Pratt's UAV ambitions is the first flight of the F100-220-powered Northrop Grumman Naval UCAS-D unmanned combat air system demonstrator. The initial flight of the X-47B—delayed from late last year by issues with brake-control software and the exhaust system—is expected this summer. The first carrier landing is scheduled for late 2011.