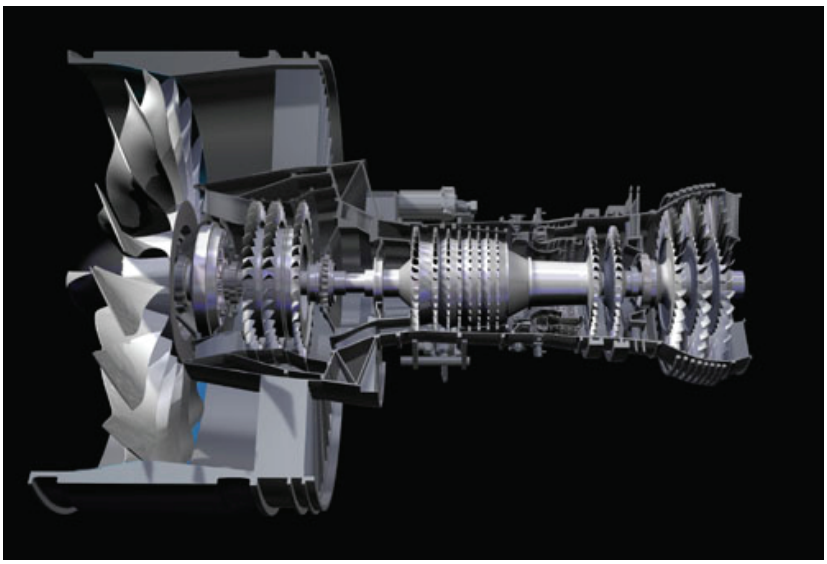
It's No American Dream: Pratt & Whitney GTF Engine Now a Reality...

and chosen in Time's November issue one of "The 50 Best Inventions of the Year"

In the August 2008 issue of *Gear Technology*, we ran a story ("Gearbox Speed Reducer Helps Fan Technology for 'Greener" Jet Fuel Efficiency') on the then ongoing, extremely challenging and protracted development of Pratt & Whitney's geared turbofan (GTF) jet engine. If successful, the engine would provide a 20 percent reduction in carbon emissions and fuel burn and up to 50 percent in general noise reduction. The targeted market and application for the engine was the narrow-body commercial airline industry—until now a dormant market for P&W—which had long demanded a total plane package that would achieve reduced maintenance, lower emissions, better fuel burn, greater reliability and operating costs—all for a better price.



The long-awaited Pratt & Whitney GTF (PurePower PW1000G) jet engine is now a reality, with customer orders now in production (courtesy Pratt & Whitney).

And doesn't that sound familiar?

Today—despite this daunting challenge—Pratt & Whitney is working to fill orders from France's Airbus for 600 GTFs for three of its customers, including Lufthansa. Also known as the PurePower PW1000G, Pratt's successful development of the engine also led to an agreement announced in October that Pratt & Whitney and Rolls-Royce will jettison their former mutual joint venture company—International Aero Engines (IAE)—and begin anew with the mission of the design and development of engines for new mid-size aircraft in the 120–230 seat size.

And with its recent success, Pratt says that while the focus is on the narrow-body commercial market, the United Technologies-owned company is believed to be negotiating with Airbus and Boeing over exploring the potential to upsize the GTF to an A380-size.

Pratt & Whitney's PurePower Geared Turbofan engine has been selected as exclusive power for the Bombardier CSeries aircraft and Mitsubishi Regional Jet. It will also power the Airbus A320neo aircraft, as well as the Irkut MC-21 narrow-body aircraft. Pratt & Whitney has received orders, including options, for more than 2,000 PurePower Geared Turbofan engines from 26 airline and lessor customers. The PurePower engine is not an option on the Boeing 787 Dreamliner program, as previously reported in this publication.

Pratt had to be all-in regarding its confidence in the success and future of its GTF technology—a gamble not to be taken lightly, as failure may have done irreparable harm to the company. Rivals like GE and others were sharking about with designs and prototypes of their own for an engine with the desired industry-tasked capabilities.

For those who can't recall how the GTF works, here's a piece lifted from the 2008 *Gear Technology* article explaining—with help from Robert Saia, Pratt & Whitney vice president, next-generation products—what makes it leading edge:

(What's unique) is the addition of a reduction gear box—or transmission system—comprised of a star gear system with five stationary gears. As Saia explains, the gear box decouples the fan from the turbine so that each component can turn at its optimum speed while also allowing for a lighter, more efficient turbine to turn at a higher speed in driving a much larger, slower-turning fan. The marrying of a faster-turning turbine with a slower-turning fan results in newfound fuel efficiency at a much-reduced noise level. In fact, the addition of the gearbox provides a low-pressure turbine speed of three times that of the fan.

Saia says, "Consider that with a typical, direct-drive turbofan engine the limitation is that its turbine is most efficient, i.e.—creating the most power for the least fuel consumption—when it is rotating at optimum speed. And, as mentioned, this type of engine's turbine and fan are unalterably linked, presenting an unavoidable compromise in speed.

"The GTF engine breaks this paradigm. This game-changing engine architecture introduces a reduction gear system allowing both the fan and turbine to operate at their optimum speed. By turning a large fan—increasing the bypass ratio of the engine—fuel efficiency is improved by more than 12 percent. This is directly related to a 12 percent improvement in CO_2 emissions. The slower-moving fan produces much less noise—50 percent less than today's engines. We've also introduced an advanced combustor to reduce (nitrogen oxide) emissions by 55 percent."

So there you have it—of late an all-too-rare American design and manufacturing success story—imagined, executed and manufactured right here in the U.S. of A.

(Sources for this article include "Engine Technology" by Karen Walker, ATW *magazine, Nov. 1, 2011; "How to Build a Job Machine" by Bill Saporito,* TIME*, May 9, 2011; and "Revolutionary New Boeing Dreamliner Takes Off Wednesday" by Charisse Jones,* USA TODAY*, Oct. 21, 2011.)*