Pratt & Whitney
www.pw.utc.com

GEARED TURBOFAN

ONE OF THE MAIN WAYS THAT AVIATION EFFICIENCY HAS ADVANCED OVER THE YEARS IS THROUGH THE DEVELOPMENT OF NEW, LESS FUEL-HUNGRY ENGINES THAT PRODUCE LESS CO_2. AMERICAN ENGINE MAKER PRATT & WHITNEY HAS PLAYED ITS PART IN THIS PROGRESS WITH THEIR NEW ENGINE.

Following 20 years and a $10 billion investment, Pratt & Whitney's PurePower Geared Turbofan engine family is expected to come into service towards the end of 2015 on the Airbus A320neo aircraft. Thereafter, in early 2016 the engine will enter service on the Bombardier C Series. And, in the future, it is slotted for production on the Embraer E2, the Mitsubishi Regional Jet and the Irkut MC-21.

Rather than being more complex than previous engines, it actually relies more on simplicity, with fewer parts being used. A gear system separates the engine fan from the low pressure compressor and turbine, leaving each of these parts unhampered by the others. This means that the fan can rotate slower, burning less fuel, and leaving the compressor and turbine to operate at a high speed, which is optimal for all of the components. Of course, the lighter weight produced by fewer components also provides CO_2 savings and the fact that the two major components are separated makes them easier to remove for maintenance.

The materials used are, of course, state of the art, with lightweight, heat-resistant composite materials featuring heavily. The manufacturing process, too, has become greener, with fewer hazardous chemicals being used due to Pratt & Whitney's investment in developing superior non-hazardous substitute materials.

16% REDUCTION IN CO_2 COMPARED TO PREVIOUS MODELS.

Rolls-Royce
www.rolls-royce.com

TRENT XWB

AEROSPACE MANUFACTURERS HAVE A STRONG TRACK RECORD OF CONTINUOUSLY IMPROVING THEIR PRODUCTS. IN 2014, ROLLS-ROYCE, FOR EXAMPLE, INVESTED NEARLY $2 BILLION IN RESEARCH AND DEVELOPMENT, AROUND TWO-THIRDS OF IT IN IMPROVING ENVIRONMENTAL PERFORMANCE INCLUDING LOWERING EMISSIONS AND NOISE.

The fuel efficiency of the Rolls-Royce "Trent" engine family has improved by about 1% per year. This culminates in the Trent XWB, the sixth generation of the 3-shaft Trent family, which is over 15% more fuel efficient than the first Trent engine. It is the engine maker's most efficient - and lowest carbon emission - jet engine flying today.

Work on the engine started in 2005 when Rolls-Royce sat down with Airbus to look at how it could improve the performance of the A350 aircraft they were designing.

While design for low fuel-burn and CO_2 emissions is essential, a wider view has also been at the heart of all design activity, to deliver the right balance between fuel burn and life cycle costs, and ensuring high reliability and durability in all conditions.

Compressor blisk (a disk with incorporated fan blades) technology has enabled compression module weight savings of 15% as well as aerodynamic efficiency improvements, while an optimised internal air system reduces cooling and sealing air demand, which also reduces fuel burn. The engine has even higher operating temperatures to improve efficiency and reduce fuel burn, while the latest generation material technologies enable this improvement to be achieved without degrading reliability.

The swept hollow titanium fan blades have exceptional levels of aerodynamic performance and low noise, while being extremely light and strong enough to withstand multiple bird strikes.

CO_2 SAVINGS OF AROUND 10,000 TONNES PER AIRCRAFT PER YEAR COMPARED TO ITS IMMEDIATE PREDECESSOR.