The geared turbofan (GTF) is the result of the collaboration between Pratt & Whitney and MTU Aero Engines. MTU’s total program workshare is up to 18 percent.

The GTF engine PW1000G sets the basis for a new engine family. MTU contributes the high-speed low-pressure turbine to the GTF, one of its key components. Germany’s leading engine manufacturer is the sole manufacturer in the world capable of offering this technology. Moreover, Pratt & Whitney and MTU have collaborated to design a new high-pressure compressor. MTU is responsible for the forward four stages and Pratt & Whitney for stages five to eight.

The innovative compressor is a 100-percent blisk construction. Blisks (blade integrated disks) are a high-tech rotor design in which the disk and blades are produced as a single piece, eliminating the need for blade roots and disk slots. This lowers weight.

PurePower® PW1000G engine. The MTU components, parts of the high-pressure compressor (left) and the complete low-pressure turbine are coloured in blue.
Applications

5 aircraft manufacturers

60 airlines

7,000 orders

The concept is catching on with airframers: Airbus is offering the geared turbofan engine for its re-engined A320neo. Bombardier has selected the GTF as the exclusive engine to power its new CSeries; Mitsubishi will equip its MRJ with this new type of propulsion system; Irkut has chosen it for its MS-21, and Embraer has picked the GTF engine for the upgraded versions of its E-170 and E-190 family of aircraft. To date, over 60 airlines worldwide have ordered more than 7,000 geared turbofan engines.

Advantages of the GTF

Reduction in CO₂ emissions by

15 %

Reduction of perceived noise levels by almost

50 %

The new technology holds the promise of reducing fuel consumption and CO₂ emissions by 15 % each, and of cutting present perceived noise levels by almost 50 % compared with today’s engines. And it is expected that even more savings – of up to 40 % less fuel consumption and CO₂ emissions – can be achieved in the future.

Noise reduction as illustrated by the noise contour map for the area around Munich Airport: Overall, the noise contour of the aircraft is reduced by up to 72 % thanks to the geared turbofan engine.

The areas of noise generation up to 95 dB are marked in red. Areas with a noise of up to 80 dB are indicated in light blue, and those with a noise of up to 75 dB in dark blue.
New engine architecture

What sets the new GTF propulsion system apart is that it features a reduction gearbox between the fan and low-pressure turbine. The two components are seated on a common shaft, and the turbine drives the fan. The gearbox allows the fan with its large diameter to rotate more slowly and the turbine to rotate much faster. This lets the individual components achieve their respective optimum speed, greatly boosting the geared turbofan's efficiency. The result is a significant reduction in fuel consumption, emissions of carbon dioxide and noise; moreover, the propulsion system is much lighter than a conventional engine as it has fewer compressor and turbine stages, and hence a lower parts count.

New material, new manufacturing method

The PW1100G-JM to power the A320neo plays a special role within the GTF engine family: For the first time ever, MTU used for the high-speed low-pressure turbine a new, additive manufacturing method, plus a new material - titanium aluminide. The high-speed low-pressure turbine for the PW1100G-JM is the first one produced that comes with 3D-printed borescope bosses. The second innovation is the third rotor stage of MTU’s three-stage, high-speed low-pressure turbine with specially made titanium aluminide blades.

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