Boarding a plane to fly from one continent to another within hours has become an everyday event for us. Behind that are over a hundred years of aviation history and a great deal of high tech, such as engines produced by MTU Aero Engines. In its quality assurance, MTU relies on the power of measuring systems by Hexagon Metrology.

MTU Aero Engines develops, produces, sells and maintains civil and military engines for airplanes and helicopters, as well as industrial gas turbines. A key success element in the MTU portfolio is the geared turbofan jet engine, a joint venture project with the USA-based aviation company, Pratt & Whitney.
MTU takes care of the first four stages for the high-pressure compressor - a blisk construction amongst others - and contributes the fast-turning low-pressure turbine. From a production technology point of view, blisks are complex components in which blades and disks are integrated in one component.

Pratt & Whitney is happy that its order books are continually swelling. The increase in orders presents a challenge for MTU: it is intended to increase the production of the technically sophisticated blisks at the main MTU facility in Munich from 600 to 3,500 pieces by 2016. A steep ramp-up.

**Metrology experts required**
In order to be able to cope with the order volume, MTU has built a 10,000 square metre large building on the company site in Munich especially for this purpose. The infrastructure in this building, including the measuring room, has been designed to exactly suit the work processes.

„Our basic philosophy is to have very stable production processes“, explains Stefan Hertling, Director Quality Inspection Production at MTU. „To achieve that, we need metrology which we can use to check the blisks as efficiently as possible. Short measuring times, reduced measurement uncertainty, process stability and evidence of test instrument capability were the main criteria in the search for a metrology partner."

In preparation for the new blisk competence centre, MTU organised a competition in which ten measuring system manufacturers took part. It was a fair competition in which Germany’s leading jet engine manufacturer commissioned the participants to carry out critical metrology tasks on a sample component with typical
characteristics and profile errors. In the end, Hexa-

gon Metrology PTS prevailed as the winner.

Hexagon Metrology PTS proposed a high-precision
Leitz PMM-C coordinate measuring machine with in-

tegrated rotary table, the flexible QUINDOS software
and the option for offline programming using the I++
Simulator.

**Drastically improved**

With the winning system, it was possible to dras-

tically shorten the measuring times stipulated by

MTU. When measuring the sample component,

Hexagon Metrology PTS achieved an overall measu-

ring time that was reduced by 65% while mainta-

ining test process capability. The measuring time for

the blade profiles was reduced even more - by 75%.

Stefan Hertling: „The option of being able to produce
measuring programmes offline is also a massive im-

provement. This means that we can use the measu-

ring machines exclusively for our own measuring
tasks.“ Thanks to the offline programming, MTU is

no longer tied to the production cycle. They no longer

need the operator, the machine or the blisk in its

physical form to produce a programme. The measu-

ring process is completely programmed and opti-
mised in the virtual measuring environment, which is

a 100 percent representation of the real measuring

situation, including the machine, the component,

fixturing and probe configurations etc. This is where

the I++ Simulator software package by Hexagon

Metrology PTS is useful.

**Close cooperation**

Both partners opted for very close cooperation right

from the very start. Hexagon Metrology PTS also provi-
ded much support at the programming stage. „We are
determined to produce efficient measuring program-

mes that are available in time for blisk production. In

order to ensure this in the face of this steep ramp-up,
it was clear that we would need expert support for this

software, which is new for us. The cooperation was

very close and successful“, says Hertling.

The geometries to be included in the programme were

not just of the standard type. Helmut Müller, Mana-
ging Director of Hexagon Metrology PTS, followed
the project very closely: „Measuring blisks is highly
complicated. In addition to normal geometries, there
are free-form surfaces, blade profiles, the position of
the blades and other characteristics to be taken into
account. The objective was to be able to run each blisk
programme on each coordinate measuring machine. At
the same time it was important to keep the operation
manageable – in spite of the fact that the underlying
software is very versatile. Furthermore, we aimed to
have as few different key combinations as possible.
We had to do much preparatory work to establish this
infrastructure.“

The effort has proved to be worth it. The total of eight
Leitz PMM-C measuring machines are being installed

step by step and in the same configuration. Using a
standard fixturing system, the ten-strong metrology

team of MTU Aero Engines is able to clamp all types of
blisks, as well as measure these items during produc-
tion and carry out a final inspection. MTU is ready for
departure thanks to the measurement concept provi-
ded by Hexagon Metrology PTS.
Hexagon Metrology offers a comprehensive range of products and services for all industrial metrology applications in sectors such as automotive, aerospace, energy and medical. We support our customers with actionable measurement information along the complete life cycle of a product – from development and design to production, assembly and final inspection.

With more than 20 production facilities and 70 Precision Centers for service and demonstrations, and a network of over 100 distribution partners on five continents, we empower our customers to fully control their manufacturing processes, enhancing the quality of products and increasing efficiency in manufacturing plants around the world.

For more information, visit www.hexagonmetrology.com

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