MTU Aero Engines – Lifetime Excellence

February 2020
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Our environment

We shape the future of aviation!
A passenger aircraft is made up of up to 6 million components.

Active fleet to double to 46,000 aircraft by 2036.

Fuel consumption per 100 passenger kilometers: 2.9 liters of kerosene.

~ 2 billion people out of 7 billion have flown in an aircraft to date.

The geared turbofan reduces 75% of the noise footprint.
We shape the future of aviation!

<table>
<thead>
<tr>
<th>What we do</th>
<th>How we do it</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Design, development, production</strong> and support of aircraft engines in all thrust categories</td>
<td><strong>People:</strong> More than 11,000 engine experts at 15 locations</td>
</tr>
<tr>
<td><strong>Commercial business:</strong> 30% of aircraft have MTU technology on board</td>
<td><strong>Partnerships:</strong> with all OEMs, airlines and the German Air Force (program shares from 5% up to 40%)</td>
</tr>
<tr>
<td><strong>Military business:</strong> full system capability, for more than 80 years</td>
<td><strong>Technology:</strong> 150 technology projects, 400 patents and 200 invention disclosure reports per year</td>
</tr>
<tr>
<td><strong>Commercial MRO:</strong> worldwide leader in customized engine service solutions</td>
<td><strong>Products:</strong> High-pressure compressor, low-pressure turbine, turbine center frame</td>
</tr>
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<td><strong>MRO portfolio:</strong> 1,000 shop visits per year for more than 30 different engine types</td>
<td><strong>Process:</strong> Lifetime Excellence (lifecycles from 25 to 50 years)</td>
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<tr>
<td><strong>Fiscal year 2019:</strong> Revenue € 4.63 billion, EBIT adj. € 0.76 billion</td>
<td><strong>Culture:</strong> innovative and competent</td>
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</table>

~ **twelvefold*** increase in share value since 2005

**€ 4 billion** invested in approx. 10 years

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* Basis: 30 December 2019
The Geared Turbofan Is Setting New Standards

**Noise Footprint**

- Without Geared Turbofan
- With Geared Turbofan

**MTU Contribution**

- High-speed low-pressure turbine
- High-pressure compressor

**Chosen for five Airframes**

- Munich International Airport (MUC)

Geared Turbofan reduces:
- Noise footprint by 75%
- Fuel consumption and CO₂-emissions by 16%
- NOₓ-emissions by 50%

Noise Simulation: Pratt & Whitney SEL Contour Source: Wyle Laboratories
MTU pursues a sustainable growth strategy in all of its business segments - based on stable and long-term customer relationships

- Balanced portfolio
- Leading technology
- Benchmark competitiveness
- Innovative culture

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Partners and customers appreciate MTU’s excellence.

Our track record

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MTU looks back on many important names from the German industrial history – from 1934 to date

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1934</td>
<td>BMW Flugmotorenbau GmbH is founded</td>
<td></td>
</tr>
<tr>
<td>1965</td>
<td>MAN takes over BMW Triebwerkbau</td>
<td></td>
</tr>
<tr>
<td>1969</td>
<td>MTU 50% Daimler Benz 50% MAN</td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td>MTU becomes an affiliate of Deutsche Aerospace, later renamed DaimlerChrysler Aerospace (DASA)</td>
<td></td>
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<tr>
<td>2005</td>
<td>MTU goes public</td>
<td></td>
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<tr>
<td>Today</td>
<td>MTU Aero Engines is admitted to the DAX, Germany’s primary stock index</td>
<td></td>
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</tbody>
</table>

Focus on **military** applications

Focus on **commercial** applications

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MTU is an essential partner in the engine value chain

Material suppliers*

Engine component suppliers*

Subsystem/module suppliers*

Engine OEMs*

Airframers*

Airline operations

*selected market participants

OEM market

Aftermarket

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A balanced portfolio and products in all thrust categories ensure MTU’s long-term success.
Our track record: partners and customers appreciate MTU’s excellence

<table>
<thead>
<tr>
<th>Commercial OEM business</th>
<th>Military OEM business</th>
<th>Commercial MRO business</th>
</tr>
</thead>
<tbody>
<tr>
<td>Share of total revenues ~ 33 %</td>
<td>Share of total revenues ~ 9 %</td>
<td>Share of total revenues ~ 58 %</td>
</tr>
<tr>
<td>Balanced product portfolio in all thrust categories</td>
<td>European and U.S. engine programs</td>
<td>Services: maintenance, leasing and asset management</td>
</tr>
<tr>
<td>Decades of partnership with OEMs</td>
<td>Full system capability</td>
<td>Global network</td>
</tr>
<tr>
<td></td>
<td>Leading partner of the German Armed Forces</td>
<td>Direct customer business, partner of OEMs and airlines</td>
</tr>
</tbody>
</table>

**MTU group fiscal year 2019:**

- Revenue € 4.63 billion / EBIT € 0.76 billion
MTU possesses unique capabilities and has a wealth of know-how.
Boasting comprehensive system expertise, MTU focuses on five core engine competencies - three core components and on unique manufacturing and maintenance processes:

- High-pressure compressor (HPC)
- Low-pressure turbine (LPT)
- Turbine center frame (TCF)

Manufacturing

Maintenance
The geared turbofan is setting new standards - together with our partners, MTU will continue to expand its technological leadership in the future

1st generation geared turbofan - today

- 16% reduction in fuel burn
- Appro. 75% reduction of the noise footprint
- Fewer emissions CO₂ / NOₓ
- MRO cost savings 25% fewer stages, 45% fewer blades, lower operating temperature

2nd generation geared turbofan – EIS 2030+

- Lowest fan-pressure ratios at very high bypass ratios BPR 14-20*
- Temperature-resistant lightweight materials
- High-speed, highly efficient expansion system

Source: P&W | * BPR = Bypass Ratio | ** OPR = Overall Pressure Ratio

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We boast more than 11,000 innovative and competent engine experts

More than 60 different nations work under the umbrella of MTU Aero Engines

Approx. 20 years is the average job tenure of MTU's workforce (in Germany)

Approx. 80% of the total workforce are engineers or technicians*

350 apprentices at German locations

*incl. scientists

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With our locations worldwide we are close to our customers
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For questions relating to...

...our company

...our commercial engine business

...our commercial service portfolio

...our military engine business

...our military service portfolio

...our technological expertise

...the sustainability of our products

...our financial figures

...job opportunities at MTU

Click the relevant icon for more information
Let’s shape the future together!
Thank you.

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