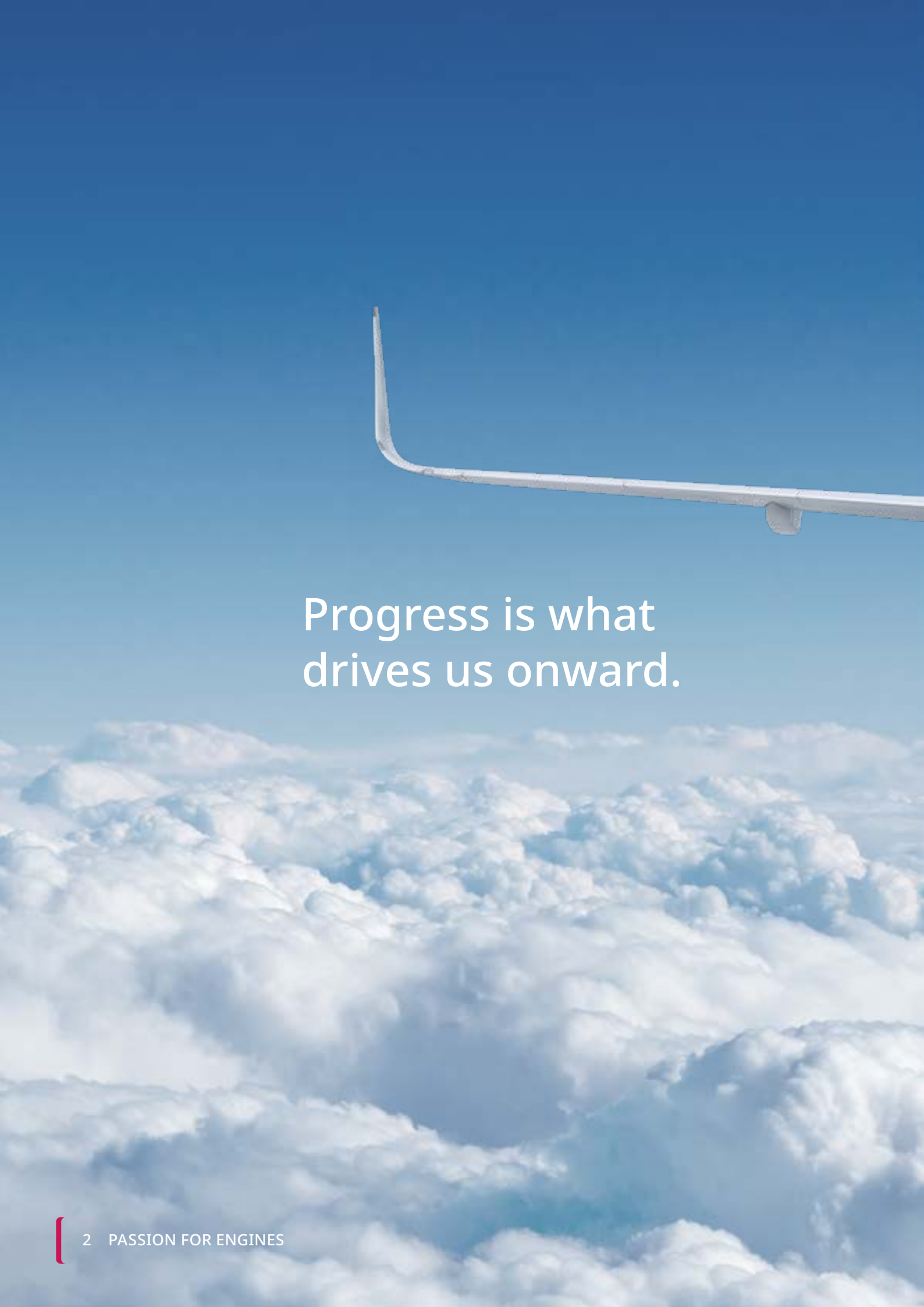
MTU Aero Engines

PASSION FOR ENGINES

ENGINE PROGRAMS


Progress is what
drives us onward.

It all started with the dream of flying. And even though that dream has long been a reality, it still drives us. For over 90 years, we've been developing technologies for the future of aviation—for greater safety, efficiency, and sustainability.

We keep the world moving. For us, standing still is not an option. From the smallest detail to the big picture, we work with the utmost precision to continuously develop propulsion systems.

What unites us worldwide is the conviction that progress happens when expertise meets passion, responsibility, and the demand for technological excellence. Or as we call it:

Passion for Engines.

We develop today what will fly tomorrow.

At MTU Aero Engines, roughly 14,000 people on five continents are working on the propulsion technologies of tomorrow. We develop and support commercial and military engines that get thousands of aircraft safely into the air every day—today and in the future.

Our focus is on technologies for reducing emissions and energy consumption, from further development of the geared turbofan to revolutionary future concepts such as the Flying Fuel Cell™. The result is progress that redefines aviation.

MTU has also been the industrial lead company to the German Armed Forces for decades and is the driving force behind Europe's most important military engine programs. In this way, we play a key role in securing the technological sovereignty and operational capability of European aviation.

MTU Aero Engines
at a glance
www.mtu.de/about-us

Hightech.
Made by MTU.

In the world of aviation, three letters stand for world-class technology: MTU. In close cooperation with industry and research, we develop innovative solutions and propulsion concepts that set new standards in sustainable flying.

Our focus here is on further developing our core competencies—high-pressure compressors, low-pressure turbines, and turbine center frames—as well as cutting-edge, automated manufacturing and repair processes.

To deliver on this claim, we continuously invest in our sites, expertise, and the highest quality standards.

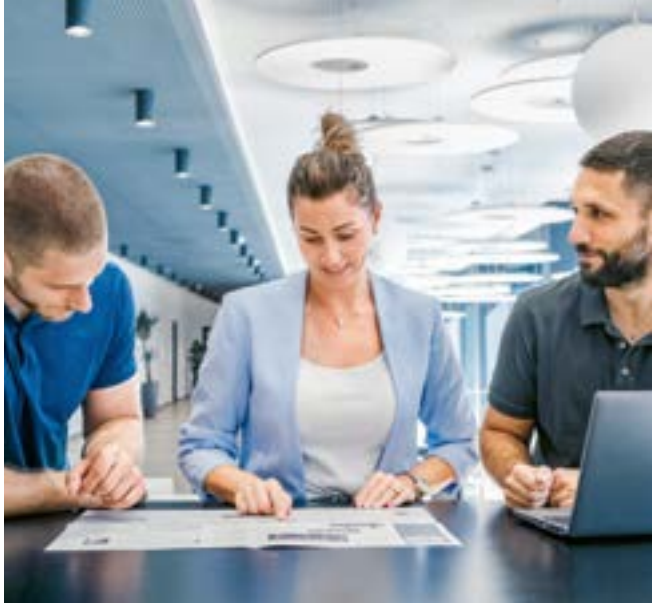
Hightech.
Craftsmanship.
Dedication.

Our initiatives in
research & development
www.mtu.de/innovation

Engines run better when we're around.

MTU technology provides reliable thrust in one-third of the world's commercial aircraft. As a global player with strong roots in Germany, we cover the entire value chain: from development and manufacturing to final assembly and maintenance. With the broadest MRO portfolio on the market and over 1,500 shop visits per year, we ensure operational readiness worldwide.

Our portfolio
at a glance
www.mtu.de/engines



> At MTU, we work together for a better future.

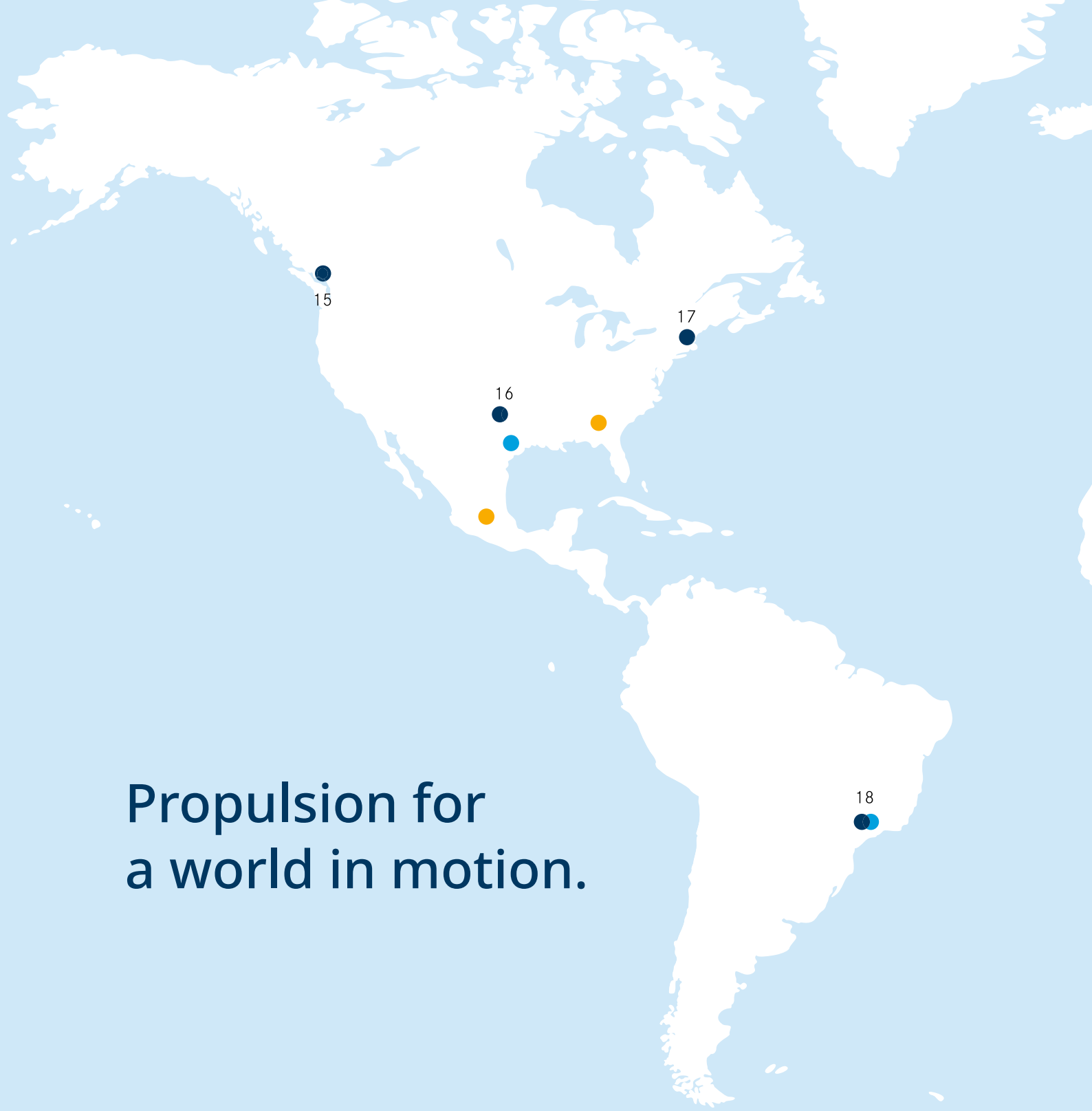
People who make the difference.

Behind every component, every technical innovation, and every decision are people who think ahead, take a closer look, and rigorously implement the highest standards.

Our strength lies in the expertise, diversity, and mindset of our employees. This is why we encourage development, responsibility, and teamwork across all our sites—supported by a corporate culture that underpins our daily activities with respect, tolerance, and team spirit.

As a result, we create solutions that are not only technologically impressive, but also meet our standards of quality, sustainability, and integrity.

Your future at MTU
starts here
www.mtu.de/careers



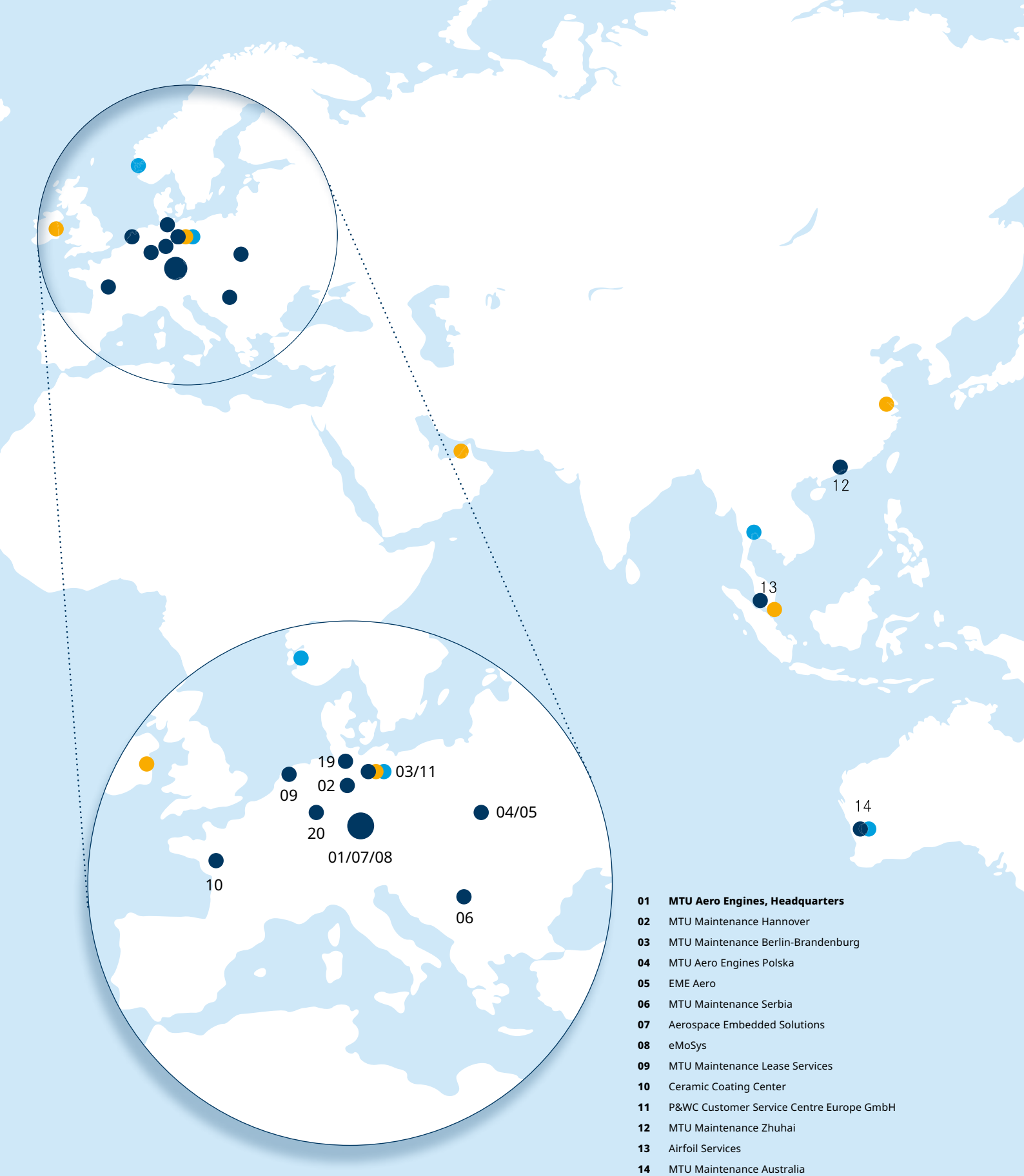
Propulsion for a world in motion.

Our global site network puts us at the heart of all key regions and markets—guaranteeing customer proximity and reliable service around the clock. That's how we combine presence with technical excellence.

As an OEM partner, we develop and manufacture key components for state-of-the-art engines. And as an MRO specialist, we ensure that these engines remain reliable—anywhere, anytime.

Our portfolio includes commercial and military engines of all thrust and power classes, as well as stationary gas turbines (IGT). From development to production to maintenance—we have each engine's entire lifecycle in view.

Decades of experience, high-end research, and an international network empower us to create reliable solutions for today that meet the requirements of tomorrow.



- Locations
- IGT Service Center
- Representative Offices

01 **MTU Aero Engines, Headquarters**
02 MTU Maintenance Hannover
03 MTU Maintenance Berlin-Brandenburg
04 MTU Aero Engines Polska
05 EME Aero
06 MTU Maintenance Serbia
07 Aerospace Embedded Solutions
08 eMoSys
09 MTU Maintenance Lease Services
10 Ceramic Coating Center
11 P&WC Customer Service Centre Europe GmbH
12 MTU Maintenance Zhuhai
13 Airfoil Services
14 MTU Maintenance Australia
15 MTU Maintenance Canada
16 MTU Maintenance Fort Worth
17 MTU Aero Engines North America
18 MTU Maintenance do Brasil
19 3D.aero
20 AeroDesignWorks

Concentrated engine expertise.

World-class technology for commercial engines.

Core MTU components can be found in all common aircraft types—from engines for business jets to the world's most powerful propulsion systems—for efficient performance in every flight.

Military propulsion – powered by MTU.

With excellent technologies, products, and services, we ensure full operational readiness for our military partners. As industrial lead company for almost all the German Armed Forces' aircraft engines, we apply our expertise right where it counts—for reliable performance on every mission.

Maintenance that sets standards for service.

MTU Maintenance is the world's leading provider of tailored services for commercial aircraft engines. We have more than 45 years of MRO experience, support over 270 airline customers, and offer a portfolio of more than 30 engine types.

Commercial engines

	Widebody jet	Narrowbody / regional jet	Business jet
Development / Manufacture	CF6	GTF engine	PW300
	GE9X	JT8D-200	PW500
	GEnx	PW2000	PW800
	GP7000	V2500	
	PW4000		

	Widebody jet	Narrowbody / regional jet	Business jet
Maintenance	CF6-80C2[1]	CF34-8/-10E	PW300
	GE90-110B/-115B	CFM56-5B/-7B	PW500
	GE9X - TCF MRO (planned)	GTF engine	PW800
	GEnx - TCF MRO	LEAP-1A/-1B	
	GP7000 - NDT MRO	V2500-A5[1]	**Helicopter**
			PW200

Military engines

	Fighter aircraft	Helicopter	Transport aircraft
Development / Manufacture	EJ200	MTR390	TP400-D6
	F110	T408	
	F414	T64	
	Larzac 04		
	RB199		

	Fighter aircraft	Helicopter	Transport aircraft
Maintenance[2]		T64	TP400-D6

	Fighter aircraft	Helicopter
MRO under the cooperation with the German Armed Forces	EJ200	MTR390
	RB199	

[1] incl. military applications: F138 or V2500-E5 [2] Maintenance is carried out at MTU Aero Engines [3] Cooperation with the German Armed Forces = Maintenance, repair and overhaul under the cooperation with the German Armed Forces. LPT = low-pressure turbine, LPC = low-pressure compressor, HPC = high-pressure compressor, HPT = high-pressure turbine, TCF = turbine center frame, IPC = intermediate-pressure compressor, IPT = intermediate-pressure turbine

Commercial engines

CF6

Widebody jet

This success story is one of the best-selling engines in its class and is used in medium- and long-haul widebody aircraft. MTU manufactures parts of the CF6 turbine and compressor—and has now produced over a million of these components.

CFM56 -5B/-7B

Narrowbody / regional jet

The CFM56 engine family comprises five different models, two of which are looked after by MTU Maintenance. CFM International, a 50/50 cooperation between GE and Safran Aircraft Engines, has delivered more than 30,000 engines to date.

CF34 -8/-10E

Narrowbody / regional jet

The CF34-family is the world's most common and best-selling engine familiy in its class. It has logged more than 200 million flight hours since its entry into service. MTU Maintenance Berlin-Brandenburg looks after the CF34-8 and CF34-10E models.

Application	e.g. Airbus A300, Boeing 747, C-5M Super Galaxy	e.g. Boeing 737, Airbus A320 family	e.g. Embraer 170/190, Bombardier CRJ700/900/1000
Thrust category	41,500–69,800 lbf	18,500–34,000 lbf	13,800–20,400 lbf
EIS	1971	1982	2001
Development	–	–	–
Manufacture	Components of LPC/HPC and HPT	–	–
Maintenance	Engine MRO	Engine MRO	Engine MRO

GEnx

Widebody jet

The GEnx is designed for medium-capacity long-haul aircraft. It is based on the proven architecture of the GE90 and is set to replace the highly successful CF6. MTU is responsible for the development, manufacture and repair of the turbine center frame.

GE9X

Widebody jet

The GE9X will be the engine for the new Boeing 777X long-haul aircraft. MTU is responsible for the development, manufacture, assembly and repair of the turbine center frame.

GE90 -110B/-115B

Widebody jet

The GE90 Growth is one of the largest and most powerful engines in the world. MTU Maintenance Hannover is one of the first maintenance providers worldwide licensed to repair and undertake overhaul of the GE90 Growth. It also provides comprehensive MRO and ON-SITE[Plus].

Application	Boeing 787 Dreamliner, Boeing 747-8	Boeing 777X	Boeing 777-200LR/-300ER/Freighter
Thrust category	66,500–76,100 lbf	100,000 lbf	100,000 lbf
EIS	2012	planned	2004
Development	TCF	TCF	–
Manufacture	TCF	TCF	–
Maintenance	TCF MRO	TCF MRO (planned)	Engine MRO

GP7000

Widebody jet

The GP7000 is used in the long-haul sector and powers what is currently the world's largest passenger aircraft, the Airbus A380. It is lead developed, produced and distributed by the Engine Alliance. MTU is involved in the development and manufacture of various components.

GTF-Engine

Narrowbody / regional jet

The Pratt & Whitney GTF™ engine family is among the most eco-efficient engines on the market today. MTU's share is as much as 18 percent, depending on the application. MTU's contributions include the high-speed low-pressure turbine and the forward four stages of the high-pressure compressor.

JT8D-200

Narrowbody / regional jet

The JT8D family is one of the world's best-selling jet engine families and has already logged more than 675 million flight hours since entering service. MTU is involved in the -200 series and is responsible for manufacturing individual parts of various assemblies.

Application	Airbus A380	Airbus A320neo, Airbus A220, Embraer E-Jets E2	Boeing MD-80
Thrust category	70,000–81,500 lbf	14,000–33,000 lbf	18,500–21,700 lbf
EIS	2008	2016	1980
Development	NDT, TCF	Various stages HPC, LPT, brush seals	Modifications on LPT
Manufacture	LPT, TCF, HPT components	Various stages HPC, LPT, brush seals	Range of LPT parts, HPC parts, HPT parts, housings
Maintenance	LPT MRO	Engine MRO	–

LEAP-1A/-1B

Narrowbody / regional jet

The LEAP engine family from CFM International—a consortium comprising GE Aerospace and Safran Aircraft Engines—includes three different models covering a thrust range from 28,000 to 35,000 pounds. Among the aircraft they power are the Airbus A320neo and the Boeing 737 MAX.

PW200

Helicopter

Pratt & Whitney Canada's PW200 is an engine for light and medium helicopters. Its features include a simple and robust design and digital control.

PW300

Business jet

The PW300 family offers a wide range of applications for business and regional jets. MTU has been collaborating with Pratt & Whitney Canada on this engine family since 1985. MTU's involvement covers the PW305, PW306 and PW307 models.

Application	Airbus A320neo, Boeing 737 MAX	e.g. Airbus Helicopters H135, Bell 427	e.g. Dassault Falcon 7X/8X
Maximum power	–	700 shp	–
Thrust category	28,000–35,000 lbf	–	4,700–7,000 lbf
EIS	2016	1998	1992
Development / Manufacture	–	–	LPT, housing
Maintenance	Engine MRO	Engine MRO	Engine MRO

PW500

Business jet

The PW500 engines are two-shaft turbofans. MTU is contributing the development and production of the entire low-pressure turbine, including the exit case and mixer, for the PW530 and PW545 models.

PW800

Business jet

The PW800 engine features the same proven core technology as the efficient Pratt & Whitney GTF™ engine family. MTU's workshare in this engine encompasses the high-pressure compressor and the low-pressure turbine–its flagship products.

PW2000

Narrowbody / regional jet

The PW2000 engines are used in commercial and military applications for medium- and long-haul operations. MTU's low-pressure turbine for the PW2000 was the first the company had developed independently for a commercial application.

Application	e.g. Cessna Citation Bravo/ Excel/ XLS	Gulfstream G400/G500/G600, Dassault Falcon 6X	Boeing 757, Boeing C-17 Globemaster III
Thrust category	3,000–4,500 lbf	10,000–20,000 lbf	37,500–43,000 lbf
EIS	1997	2018	1984
Development	LPT, exit case, mixer	LPT, various stages HPC	LPT, turbine exit case
Manufacture	LPT, exit case, mixer	LPT, various stages HPC	e.g. range of LPT parts, turbine exit case, HPC parts
Maintenance	Engine MRO	Engine MRO	

PW4000

Widebody jet

The PW4000 is one of the largest and most powerful engines in the world. MTU is responsible for its seven-stage low-pressure turbine–the largest ever developed by MTU.

V2500

Narrowbody / regional jet

MTU develops and manufactures the IAE V2500 in cooperation with Pratt & Whitney and Japanese Aero Engines Corporation. The engine has already logged more than 300 million flight hours and is maintained at various MTU locations.

Application	Boeing 777-200/-200ER/-300	Airbus A319/320/321, Boeing MD-90, C-390 Millennium
Thrust category	74,000–98,000 lbf	22,000–33,000 lbf
EIS	1995	1989
Development	LPT, turbine exit case	LPT, housing, accessories, externals
Manufacture	Range of LPT parts	Range of LPT parts, housing
Maintenance	–	Engine MRO

Military engines

EJ200

Fighter aircraft

The EJ200, which powers the Eurofighter, is built by EUROJET Turbo GmbH, a consortium with MTU, Rolls-Royce, Avio Aero and ITP Aero as stakeholders. It was for the EJ200 that MTU first engineered compressor stages in blisk design; these are now also used in MTU components for commercial engines.

F110

Fighter aircraft

The F110-GE-129 powers the Boeing F-15 and Lockheed Martin F-16 fighter aircraft and has established itself as one of the most successful engines for combat aircraft in the history of the U.S. Air Force. MTU manufactures turbine disks for the low-pressure compressor for the F110-GE-129.

F414

Fighter aircraft

The F414 powers Boeing's F/A-18 Super Hornet twin-engine fighter and the E/A-18G Growler electronic warfare version, among others. MTU produces various parts of the F414's high- and low-pressure turbine.

Application	Eurofighter Typhoon	Lockheed Martin F-16, Boeing F-15	e.g. Boeing F/A-18 Super Hornet, Boeing EA-18G Growler
Thrust category	20,000 lbf	29,000 lbf	22,000 lbf
EIS	2003	1986	1995
Development	LPC, HPC, digital engine control and monitoring unit	LPC disks stage 2+3	–
Manufacture	LPC, HPC, digital engine control and monitoring unit	LPC disks stage 2+3	HPT+LPT parts
Maintenance	Cooperation with the German Armed Forces[3]	–	–

Larzac 04

Fighter aircraft

The Larzac 04 powers the Alpha Jet trainer and light ground-attack aircraft. MTU took over the production of about 25 percent of the parts and the development engineering support. MTU's manufacturing share primarily covers the hot section of the engine–from the combustor inlet to the turbine exit.

MTR390

Helicopter

This turboshaft engine powers the Tiger support helicopter co-developed by France and Germany. In 2011, an uprated version of the engine (the MTR390-E) was developed that delivers 14 percent more power. MTU develops and manufactures the high-pressure turbine and combustor, among other things.

RB199

Fighter aircraft

The RB199 was developed and produced to power the Panavia Tornado multirole fighter jet. This successful engine marked the first time that MTU had contributed independently developed and built components, such as the intermediate-pressure and high-pressure compressor and the intermediate-pressure turbine.

Application	Dornier-Dassault Alpha Jet	Airbus Helicopters Tiger	Panavia Tornado
Maximum power	–	1,467 shp (MTR390-E)	–
Thrust category	3,000 lbf	–	16,000–17,000 lbf
EIS	1979	2013 (MTR390-E)	1979
Development	–	Combustor, HPT, TCF, engine control and monitoring unit (-E)	e.g. IPC, IPT, HPC, digital engine control and monitoring unit
Manufacture	Combustor, HPT, housing	Combustor, HPT, TCF, engine control and monitoring unit (-E)	e.g. IPC, IPT, HPC, digital engine control and monitoring unit
Maintenance	–	Cooperation with the German Armed Forces[3]	Cooperation with the German Armed Forces[3]

TP400-D6

Transport aircraft

The TP400-D6 is the most powerful turboprop in the West. It offers impressive robustness, efficiency and low lifecycle costs in tactical and strategic operations. MTU developed the TP400-D6 with ITP Aero, Rolls-Royce and Safran Aircraft Engines as part of the Europrop International (EPI) joint venture.

T408

Helicopter

The T408 is a turboshaft engine that has so far been installed in the U.S. Marine Corps' Sikorsky CH-53K heavy-lift helicopter. MTU contributes the power turbine.

T64

Helicopter

The T64 powers medium-weight transport helicopters. A total of 247 T64 engines were delivered. MTU manufactured its high-pressure turbine and high-pressure compressor, among other components. Today, MTU's T64 activities focus on maintenance.

Application	Airbus A400M	Sikorsky CH-53K	Sikorsky CH-53G, GS, GA, GE
Maximum power	–	7,510 shp	4,330 shp
Power (at sea level)	11,000 shp	–	–
EIS	2013	2019	1972
Development / Manufacture	Intermediate-pressure compressor, turbine and shaft	Power turbine	HPC, combustor, HPT, gearbox
Maintenance	Engine MRO[2]	–	Engine MRO[2]

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