

Investor & Analyst Day 2017

MTU Aero Engines AG

Munich, 12th December 2017

Agenda – MTU Investor and Analyst Day 2017

Time	Agenda	Speaker
11:00 – 11:10	Welcome	Michael Röger, VP Investor Relations
11:10 – 11:30	MTU's Market Environment: No Clouds in Sight	Reiner Winkler, Chief Executive Officer
11:30 – 12:30	Leading Technology & Cost Leadership Technology Roadmap & Key Enabler	Dr. Rainer Martens, Chief Operating Officer Lars Wagner, EVP OEM Operations
12:30 – 13:30	Lunch	
13:30 – 15:00	Shoptour: Blisk Facility, GTF Assembly Line, GTF Testcell	
15:00 – 16:00	MTU goes Digital Military: Defense Budget - Driver for Future growth? MRO Strategy: Mastering Future Growth Introduction of the GTF: Keeping a Long Term Perspective	Michael Schreyögg, Chief Program Officer
16:00 – 17:00	Financials: Ramping up cash conversion MTU's route 2030	Peter Kameritsch, SVP Finance Reiner Winkler, Chief Executive Officer



MTU's Market Environment: No Clouds in Sight

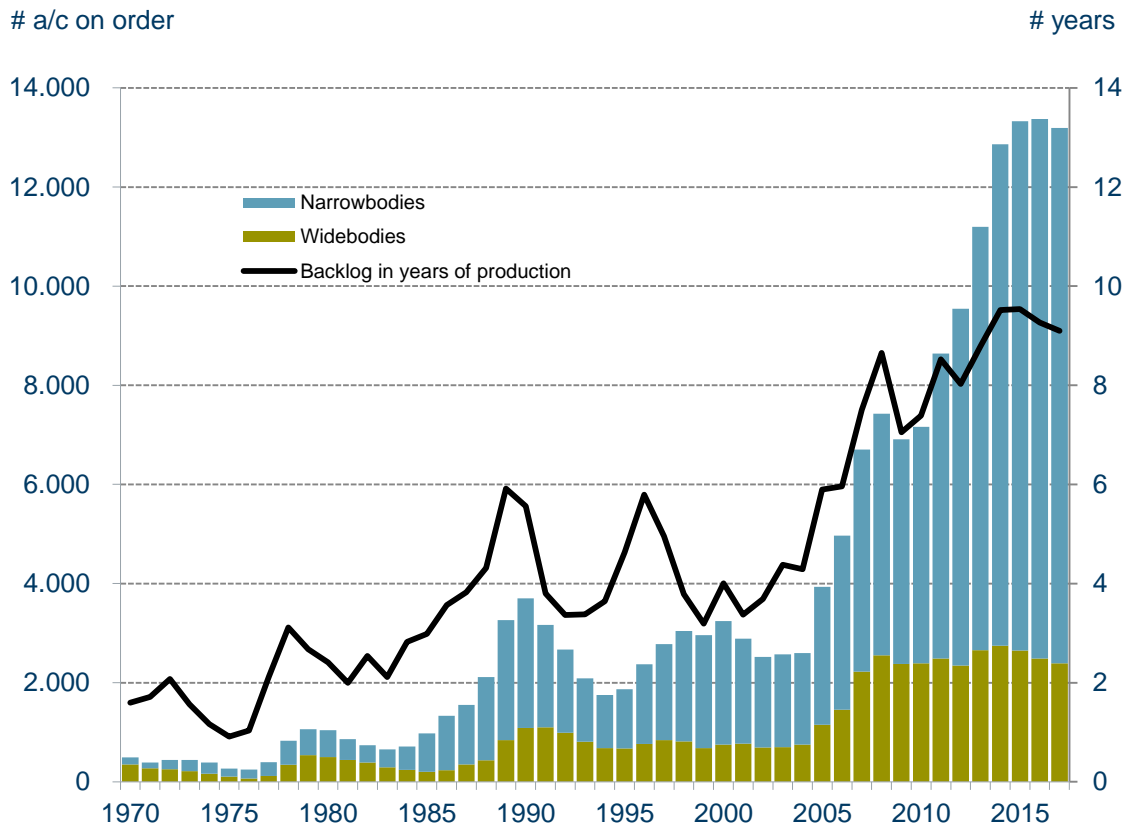
Reiner Winkler, Chief Executive Officer

Munich, 12th December 2017

Not much has changed since last year – key indicators remain in excellent shape

Demand indicators	Early '00s	Mid-late '00s	Today	Influence on demand
1 Backlog	4 yrs 😐	8 yrs 😊	9 yrs 😊	✓ Higher rates needed to meet orders
2 Technology status	'90s 😊	'90s 😐	'10s 😊	✓ Step change in efficiency achieved
3 Cost of debt	high 😞	mid 😐	low 😊	✓ Easier access to financing options for airlines
4 Oil	30 😊	80 😐	50 😊	✓ Below \$80, continued traffic stimulation

Overall backlog represents 9 years of production

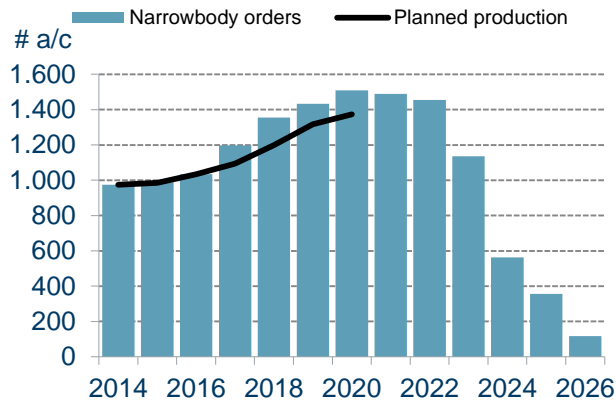


- Higher production (currently 1,450 p.a.) required is naturally turning the backlog into deliveries
- Recent cancellation and deferral data as a share of backlog shows no reason for concern (not higher than average of last 10 years)

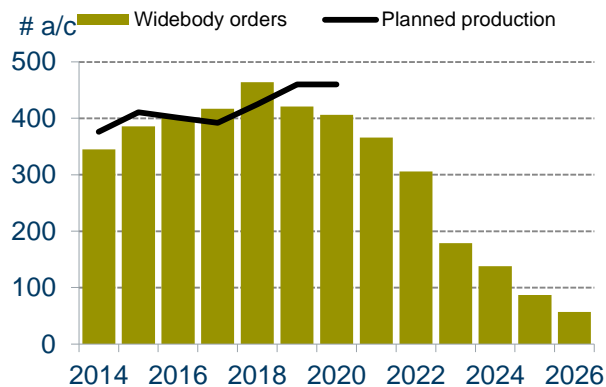
Source: Fleet Analyzer, western-built narrowbody and widebody airframes only (no RJ and TP), excludes Lols, gross orders shown

Production plans are justified by backlog

Backlog distribution vs. production plans



- Narrowbody backlog equates to 10 years of production alone
- By 2020, Airbus and Boeing plan a production rate of 60 and 57 aircraft per month respectively
- Production rates currently justified by orders



- Widebody backlog equates to 6 years of production and has declined since 2014
- 777X to begin in 2019, expected to become largest twin-engine widebody
- 787 is the current bestseller, the production rate 14 per month in 2019-20 is backed up by orders

Source: Ascend firm orders and Lols, OEM announced production rates, Airbus and Boeing aircraft only

Technology status – MTU applications bring required step change in cost, performance and comfort

**Gulfstream G550
(RR BR710)**



Larger cabin
New generation flight deck
Speed up to Mach 0.925 vs 0.885

**Gulfstream G600
(PW800)**



**A319ceo
(V2500)**



C Series: first single-aisle clean
sheet design since 1980s
15% fuel burn advantage/trip

**C Series
(PW1500)**



**Embraer 190 E1
(GE CF34)**



Double-digit-% reduction in fuel
burn and maintenance costs
Increased range by 500 miles
More seats (108 vs. 98)

**Embraer 190 E2
(PW1900)**



Technology status – MTU applications bring required step change in cost, performance and comfort

**A320ceo
(V2500)**



15-17% fuel burn improvement
75% lower noise footprint
New routes: 3.700nm vs.
3.300nm

**A320neo
(PW1100G-JM)**



**767
(CF6-80C)**



130 new non-stop routes since EIS
20% lower fuel consumption
60% of 787s powered by GE9X

**787
(GE9X)**



**777-300ER
(GE90)**

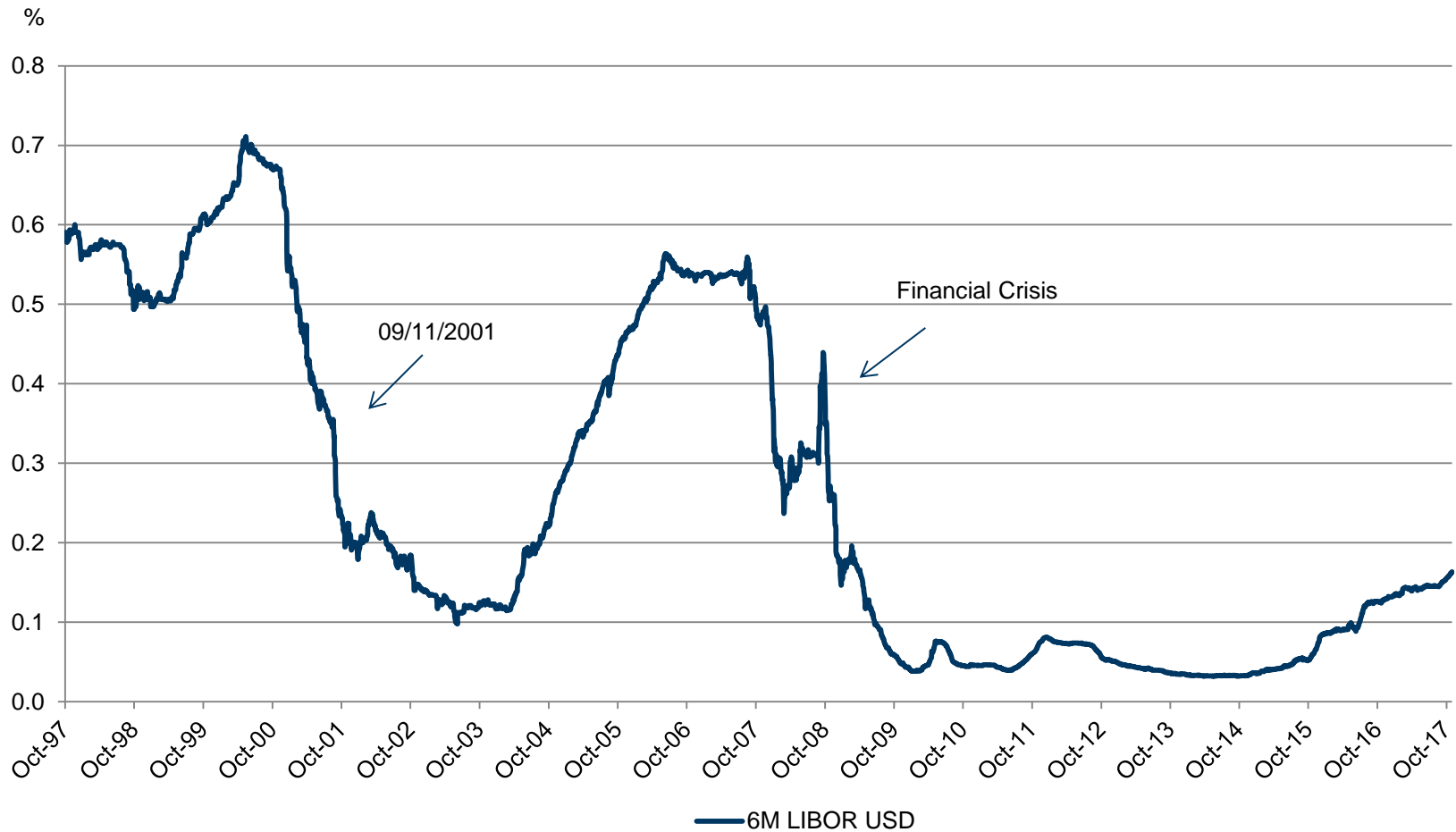


Brings twin-engine economics to
large capacity twin-aisle
777X will be the largest and most
efficient twin-engine jet

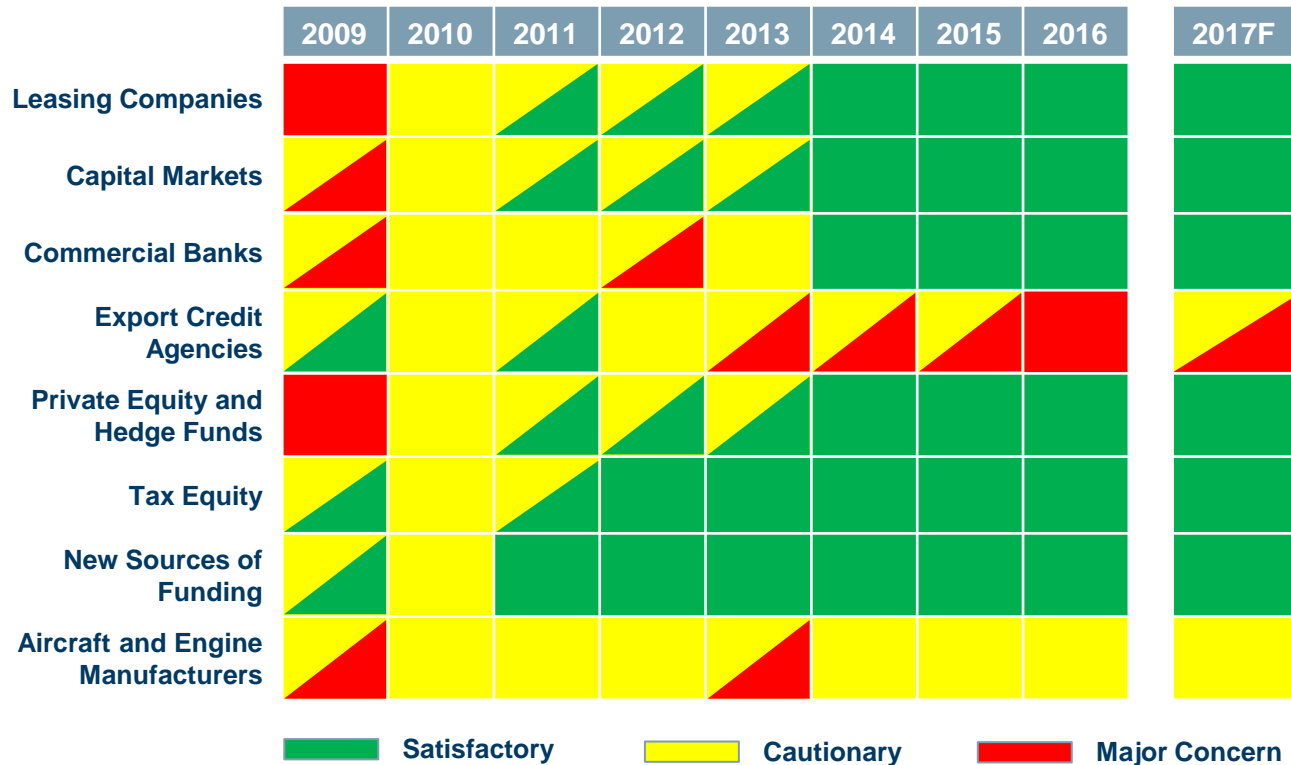
**777X
(GE9X)**



Cost of debt still historically low



Airlines continue to enjoy ample funding options and cheap access to money

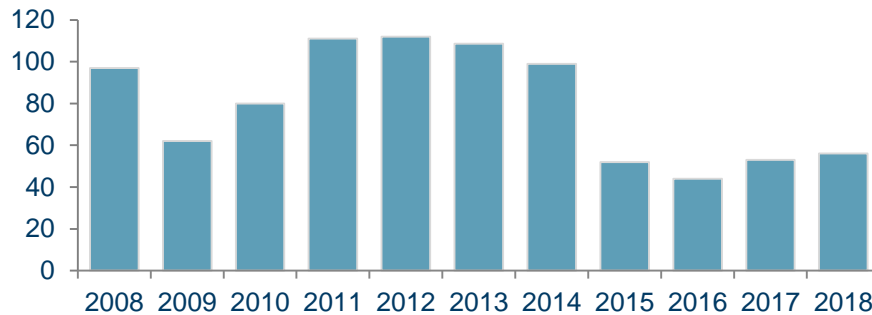


Source: Boeing Current Aircraft Finance Market Outlook

Oil - strong traffic demand in a low fuel price environment supports the high utilization of MTU engines

Crude oil price

US Dollars per Barrel (Brent)

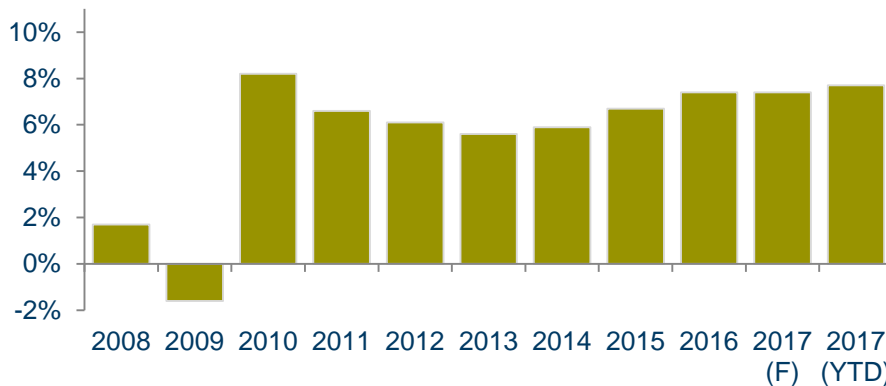


Source: US Energy Information Administration (EIA)

- EIA forecasts another year of low fuel prices with \$56 for Brent in 2018 (in line with EIU and Oxford Economics forecasts)

Traffic growth

Passenger traffic (RPK) growth in %

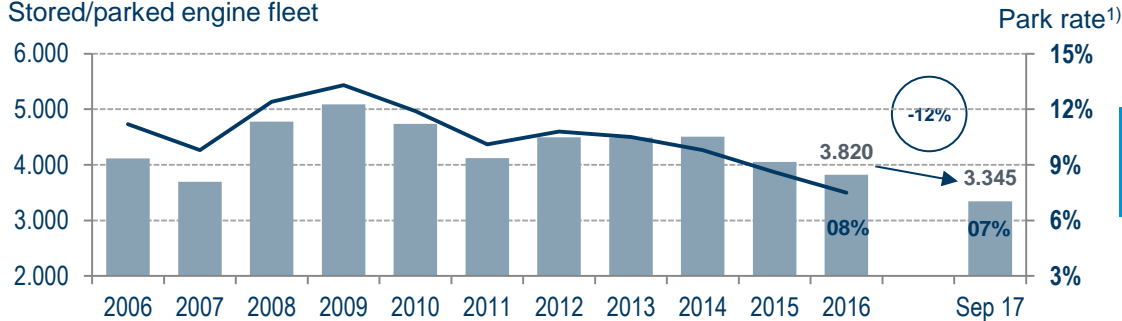


- Demand continues to be supported by strong economic activity and lower airfares

Park rate at a record low and substantially less retirements

Industry

Stored/parked engine fleet

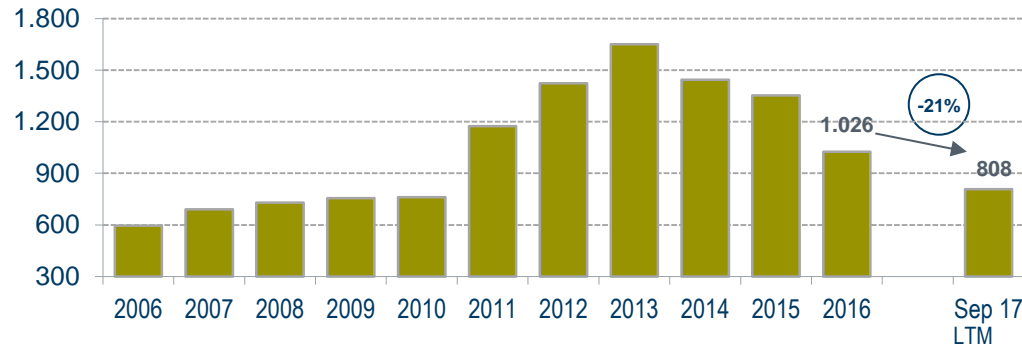


MTU outperforms overall industry with a park rate of 6.6%

Source: Fleet Analyzer 1) % of total fleet (active+stored/parked)

Industry











Retired engines ¹⁾



Fewer aircraft have been retired since 2013 benefiting aftermarket

Source: Fleet Analyzer 1) based on aircraft retirements (installed engines), does not cover spare engine retirements

Key indicators status November 2017

Status	Indicator	2015	2016	2017	Trend
	Traffic	+7.3%	+7.4%	+7.5%	
	Airline Profits	\$36 bn	\$35 bn	\$35 bn	
	Oil (Brent)	\$52	\$44	\$53	
	Airliner Deliveries	1,397	1,443	~1,500	
	Airliner Backlog	13,400	13,400	13,200	

Source: IATA, Ascend, EIA

Corporate Strategy





Leading Technology: Status Development Programs and Operations

Dr. Rainer Martens, Chief Operating Officer

Munich, 12th December 2017

Update: Development milestones of new engine programs

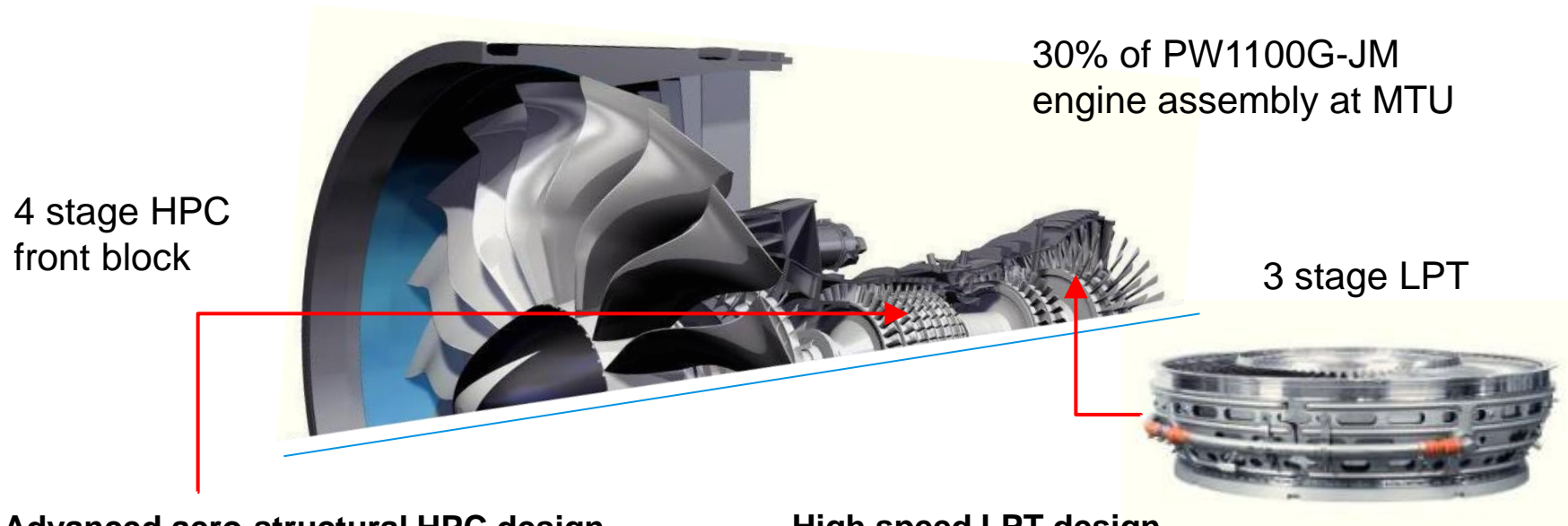
	PW1500G C-Series	PW1100G A320neo	PW1200G MRJ	PW1400G MS-21	PW1900G E-Jets 2nd Gen	PW800 G500 / G600	GE9X B 777X	T408 CH-53K
								
First engine to test	✓	✓	✓	✓	✓	✓	✓	✓
Tested in flying testbed	✓	✓	✓	N/A	✓	✓	2017	N/A
Engine certification	✓	✓	✓	✓	✓	✓	2019	2018*
First flight	✓	✓	✓	✓	✓	✓	2019	✓
Entry into service	✓	✓	2021	2019	2018	2018	2020	2019

* T408: Certification of whole aircraft system after flight testing

With PW1200G and PW1900G two more Geared Turbofan engines were certified in 2017

MTU's contribution to the Geared Turbofan (GTF) family

Key components of GTF technology



Advanced aero-structural HPC design

- High efficiency
- Robust dynamic behavior
- Minimum weight

High speed LPT design

- Minimum stage and airfoil count
- Low aero loading and high efficiency
- High blade interaction frequency and natural low noise design

Low fuel consumption and less noise plus advanced maintainability based on latest MTU technology

MTU's contribution to the Geared Turbofan (GTF) family

A very successful product family

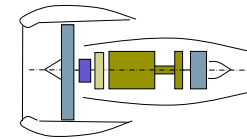
Medium bypass
direct drive turbofan

High bypass
geared turbofan

Large core

PW1100G-JM: Airbus A319neo, A320neo and A321neo
PW1400G-JM: Irkut MS-21

~81" Fan

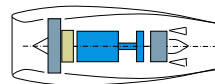


Medium core

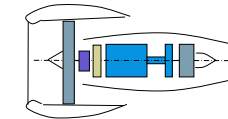
PW814: Gulfstream G500
PW815: Gulfstream G600

PW1900G: Embraer E190-E2
PW1500G: Bombardier C-Series CS100 and CS300

~50" Fan



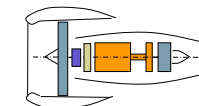
~73" Fan



Small core

PW1200G: Mitsubishi Regional Jet
PW1700G: Embraer E175-E2

~56" Fan



The GTF product family powers eleven different aircraft and provides a wide range of thrust

GTF in-service and flying

Deliveries and in-service experience




- 18 airlines are now operating 111 aircraft powered by GTF engines
- The engines have already accomplished more than 400,000 flights
- Dispatch reliability is still high at 99.9%
- Flight test program for other GTF applications (MRJ, MC21 and E2) is on track
- Focus is on
 - Ramp-up of the supply chain and delivery performance
 - Progress re early technical removal engines: integration of new bearing no. 3 seal and advanced combustion chamber
 - Lease engines for airlines

111 Geared Turbofan aircraft are in-service at 18 airlines

OEM production status and ramp-up

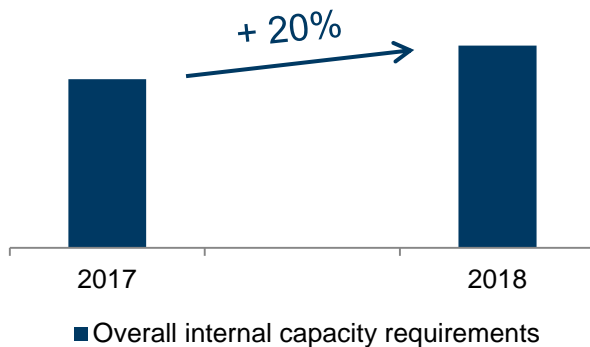
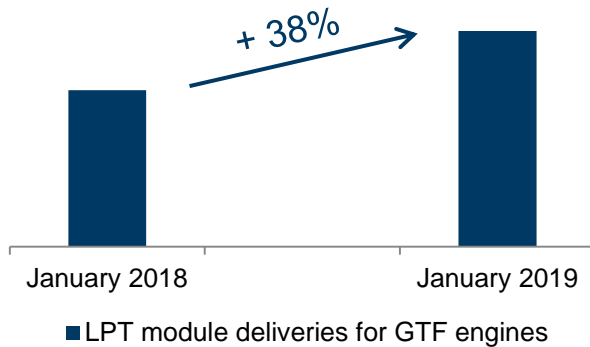
Ramp-up figures

		2009	2017	2020
Turbines		800	1,300	1,750
Compressors		200	750	1,650
Turbine Center Frames		50	250	300
Engine Assembly		50	150	300
Total		1,100	2,450	4,000

Volume increases by a factor of 4 in one decade

OEM production status and ramp-up

Achievements and lessons learnt

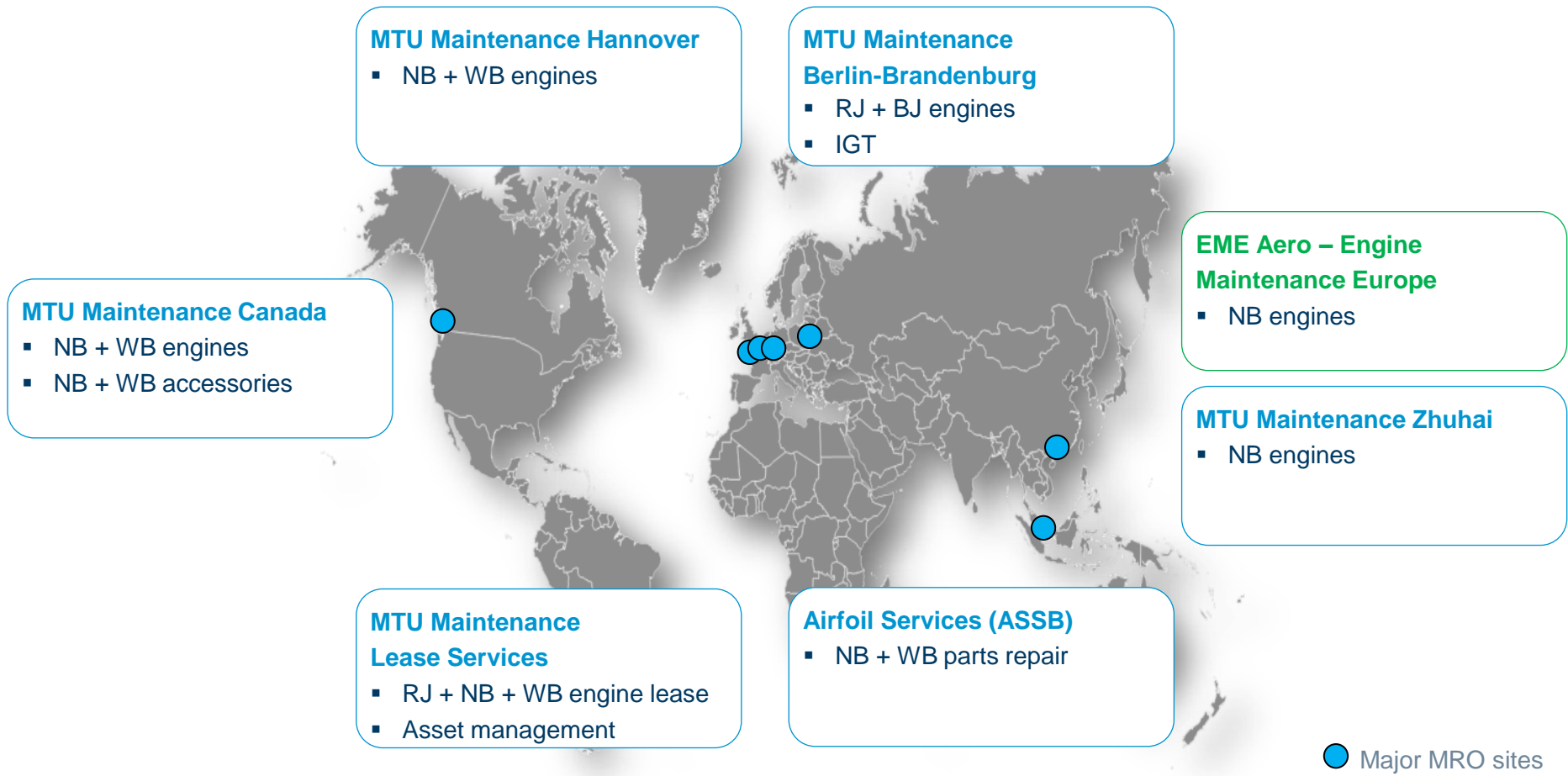


- Quality is at a high level, internal production challenges have been fixed
- Capacities and workload are continuously rising according to the OEM production strategy
- Internal capacity requirements will grow 20% in 2018
- Actions such as advancing and increasing in-house capacity and buffer material were initiated

OEM production growth rate will be at its maximum in 2018 and 2019

MRO status and ramp-up

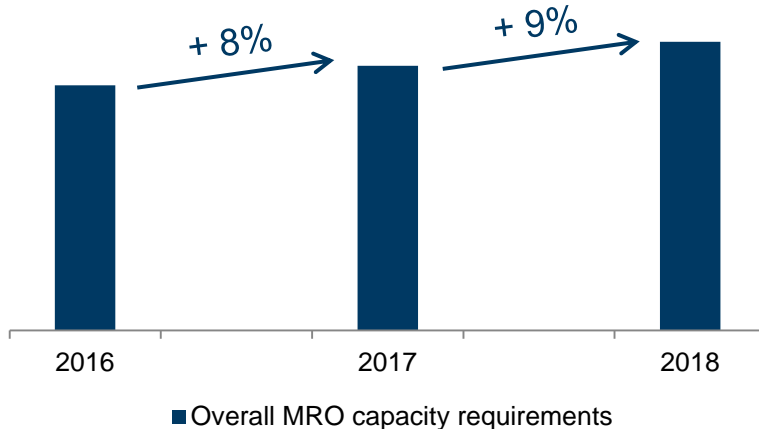
Major MRO sites



Four active facilities for engine MRO with one more in the near future – EME Aero

MRO status and ramp-up

Achievements and lessons learnt

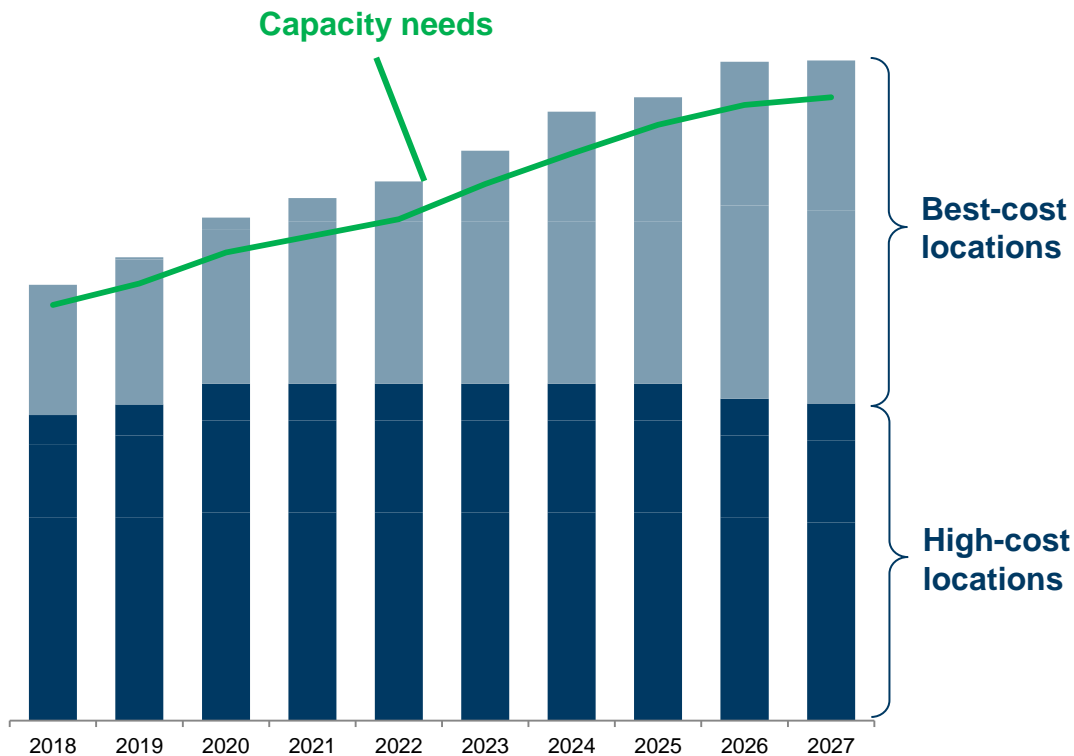


- High workload and utilization at all MRO sites due to high customer demand
- MRO production strategy was updated to implement the best allocation of engines
- PW1100G-JM warranty program established at MTU Hannover
- Actions to secure a high production output such as infrastructure and workforce expansion were initiated

MRO sites will have a high workload in 2018

MRO expansion strategy

Expansion of MRO capacity with focus on best-cost

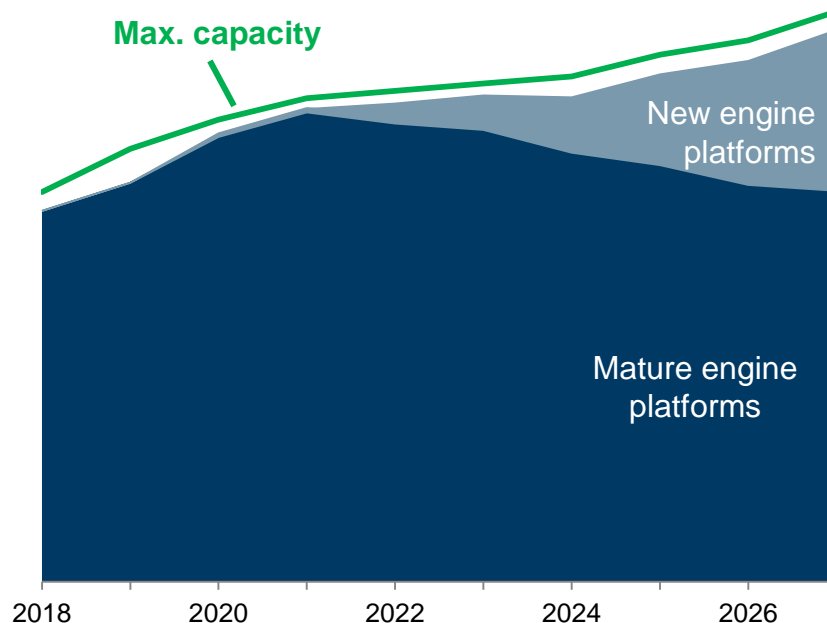


- Total capacity increase ~50%
- High-cost countries: short-term increase of workforce
- Best-cost countries: doubling of capacities
- Best-cost share will raise from 30% to 50%

Long-term growth will be at best-cost sites within the MRO network

MRO expansion strategy

MTU Zhuhai: Growing portfolio and customer base requires increase of capacity



- 50:50 JV with China Southern since 2001
- Current capacity ~300 shop visits after extension in 2012 (+50%)
- Workforce ~800
- ~50% of visits are from 3rd party airlines
- Growing customer base
- Current portfolio: V2500 and CFM56
- Target to expand to new engine platforms
- Increase capacity by another 50%

Today: no.1 MRO Shop in China and most efficient NB MRO shop world-wide

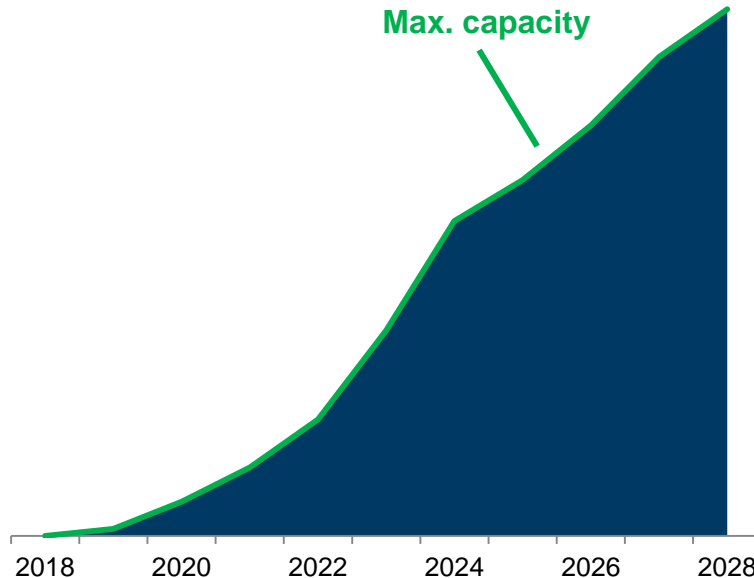
MRO expansion strategy

EME Aero: New GTF MRO facility

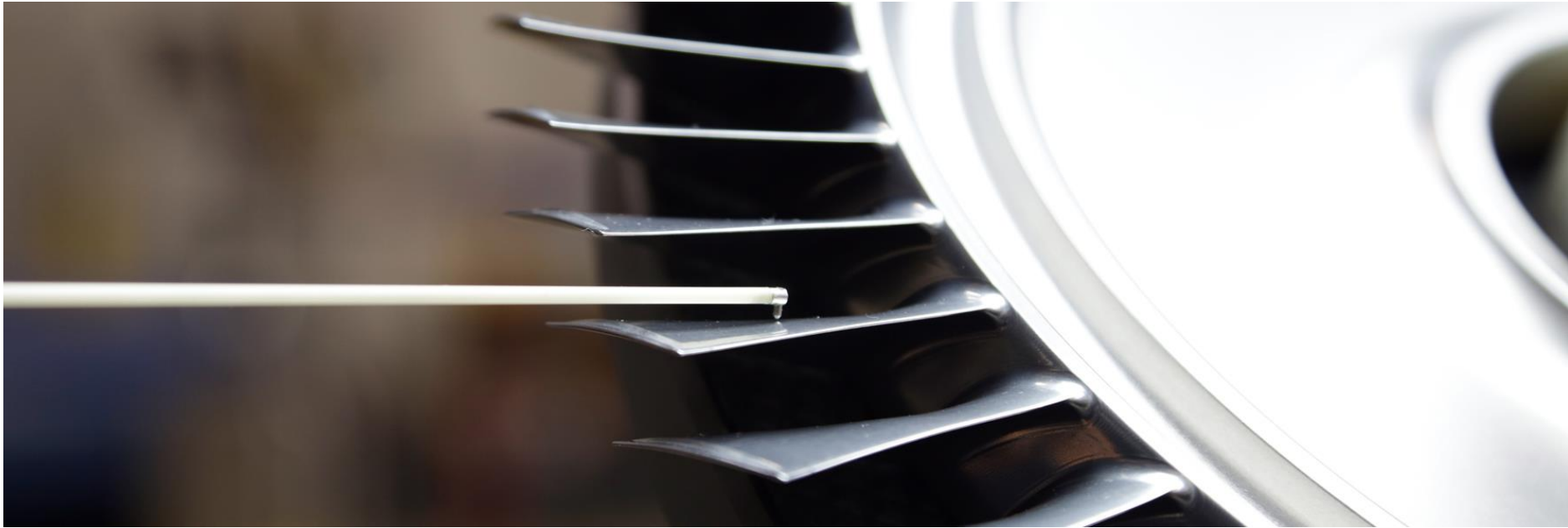
EME AERO

ENGINE MAINTENANCE EUROPE

- Company founded December 2017
- 50:50 joint venture with LHT
- Total investment of €150m
- One product shop: GTF only
- Start of operations in 2020
- Work force max. ~ 800 employees
- Full utilization of capacity in 2028



The new shop will have a key role in the GTF MRO network



**Cost Leadership:
Higher Automation and Flexibility at MTU Munich
Dr. Rainer Martens, Chief Operating Officer**

Munich, 12th December 2017

OEM production strategy

Strategic set-up



MTU Aero Engines Munich: High-tech

- Sophisticated parts and production processes
- [Automation](#)
- [Development of new production technologies](#)
- Know-how to support all MTU sites and suppliers



MTU Aero Engines Polska: Mid-tech

- Adopting established parts and production lines
- Improvement of parts and production processes
- Module assembly improved with know-how transferred from automotive industry



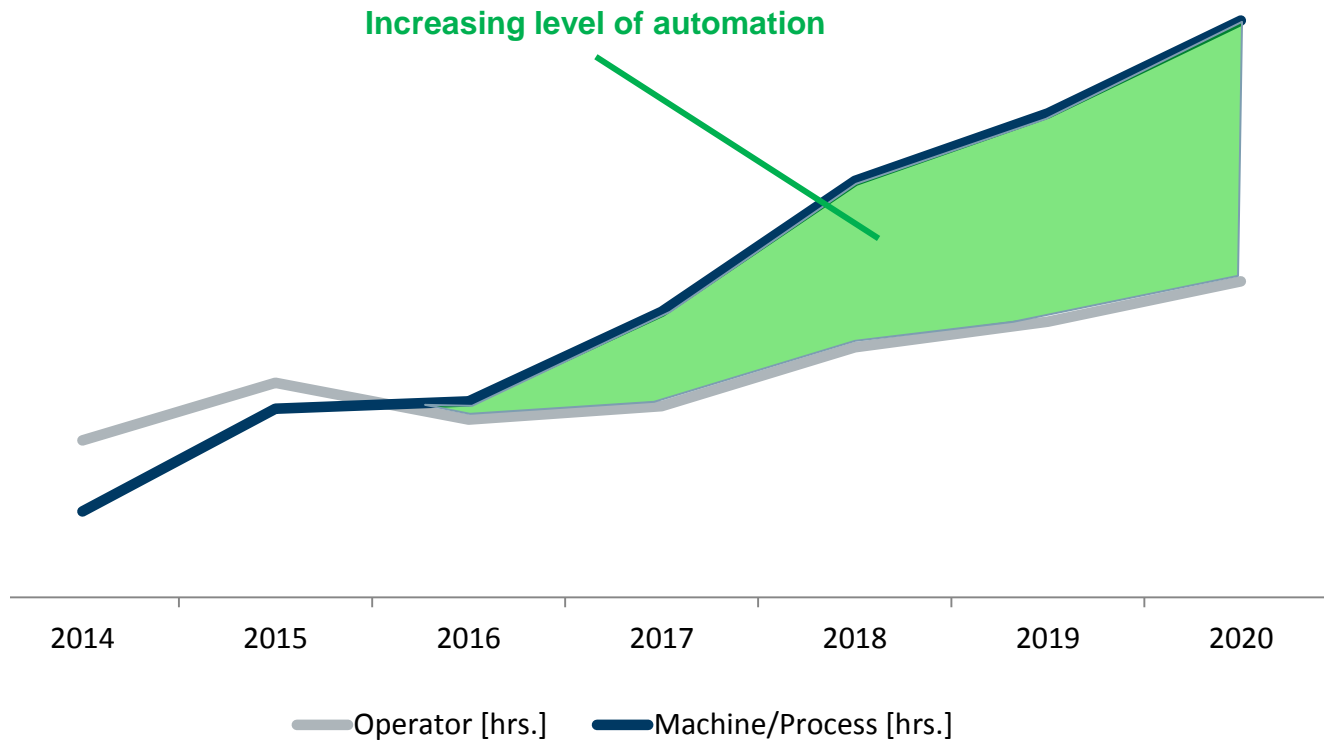
Suppliers: Raw material, mid and low-tech

- Raw parts
- Finished parts as second source
- Low-tech parts from best-cost countries

Automation and new production technologies are strategic goals for MTU Munich

High level of automation

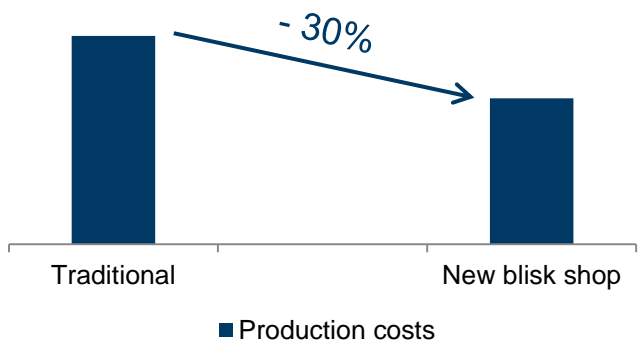
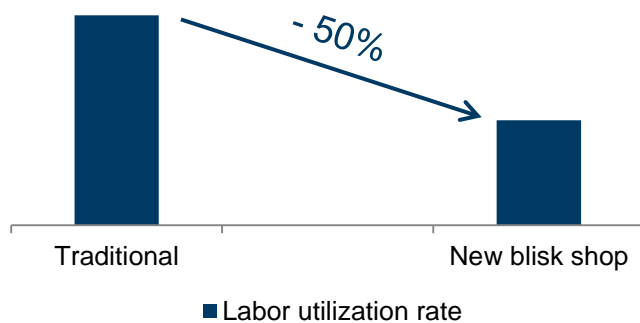
Increase in capacity demands higher operator and machine/process hours



Level of automation was continuously increased in recent years

High level of automation

Key elements of the new blisk machining shop



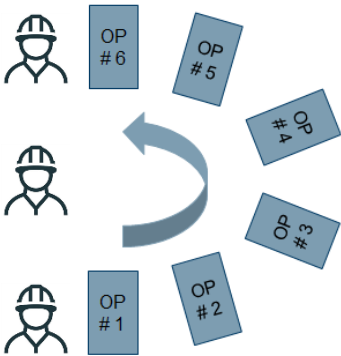
- Blisk = Blade Integrated Disk
- One-piece-flow
- High level of process control
- More-machine-operation for every employee
- Machine running time more than 6,000 hours p.a.
- Centralized logistics and automated system
- Centralized cooling fluid supply and chip removal
- Well water used for climate control and energy retrieval

Blisk production capabilities are state of the art

High level of flexibility with newest production technologies

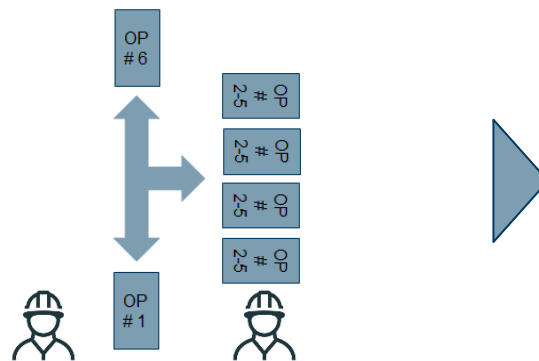
Flexible manufacturing system for blades and vanes

Traditional set-up



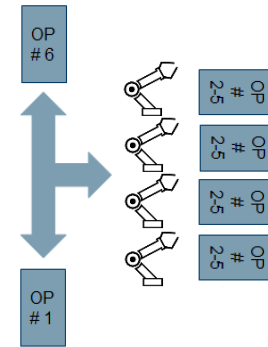
- Fixed tact
- One machine for one operation
- No data collection from processes
- Usual machine running times > 5,000 hours p.a.

Advanced set-up



- Variable tact
- One machine for several operations: finish cutting
- Data collection from processes implemented

Flexible manufacturing system

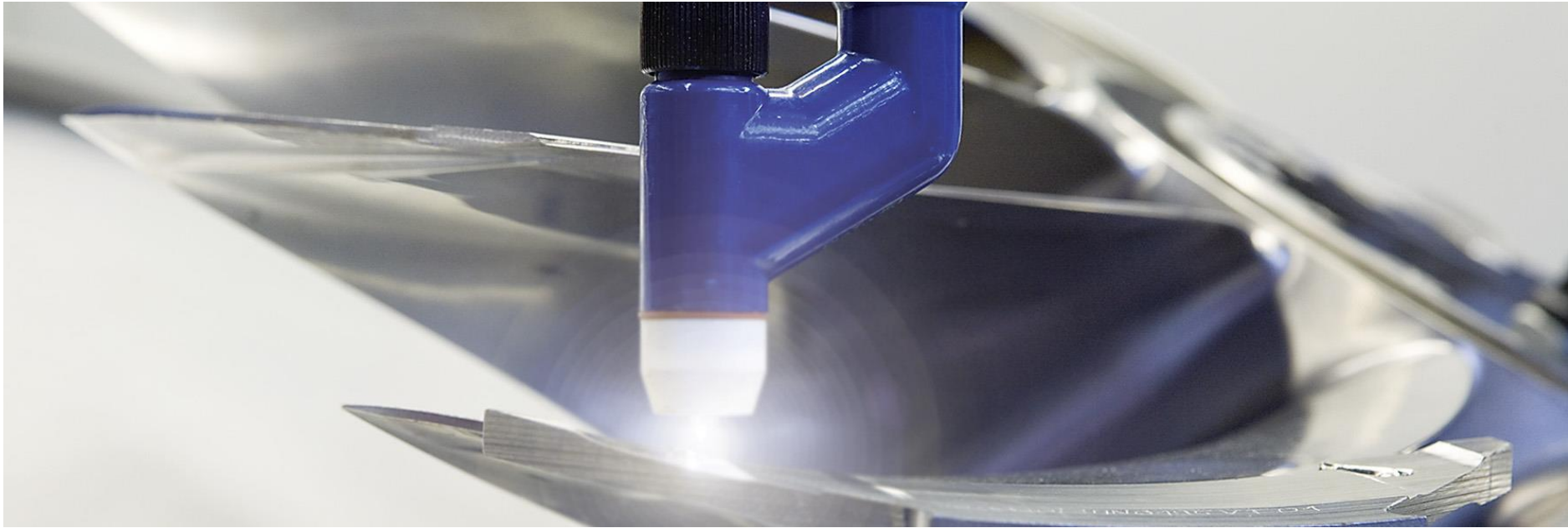


Same as advanced set-up

and:

- Automated retooling processes
- Unmanned production
- Extended machine running times ~ 7,000 hours p.a.

The flexible manufacturing system will be unique for this kind of engine parts



Technology Roadmap and Key Enabler

Lars Wagner, Executive Vice President OEM-Operations

Munich, 12th December 2017

Key technology drivers and enablers

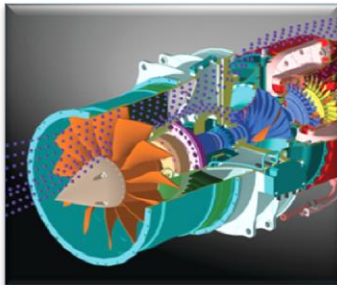
Continuous demand for innovation



- Ensure competitiveness based on reliable, attractive products
- Achieve aggressive production and maintenance target costs
- Strong IP management ensuring effective patent portfolio



- Meet challenging environmental goals for:
 - Fuel burn
 - Emissions CO₂ and NO_x
 - Noise

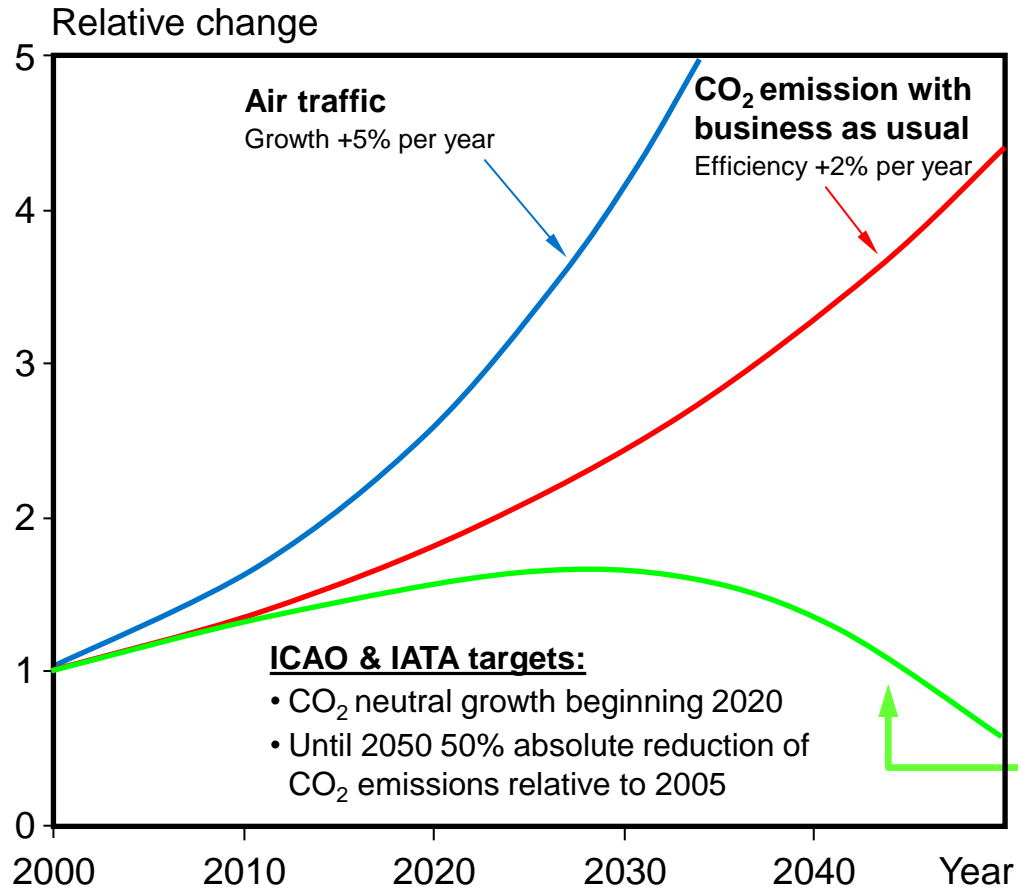


- Establish virtual engine capabilities and simulation methods
- Facilitate earlier prototype testing
- Leverage digitization, e.g. smart and shared data
- Encourage and stimulate creativity of our employees

Innovation is key for our success

Environmental challenges

CO₂ development as an example



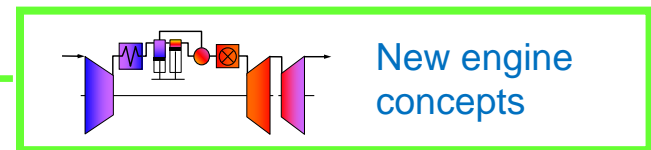
Highly-improved air traffic management



Alternative jet fuels



New aircraft concepts

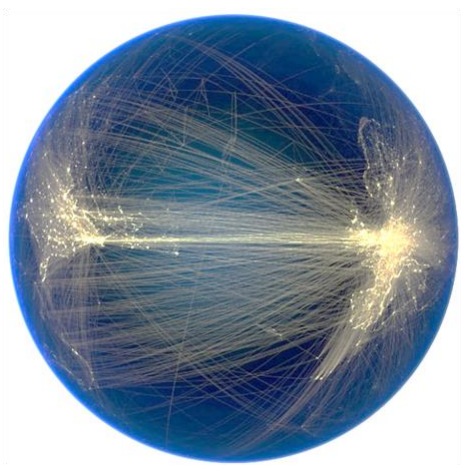


New engine concepts

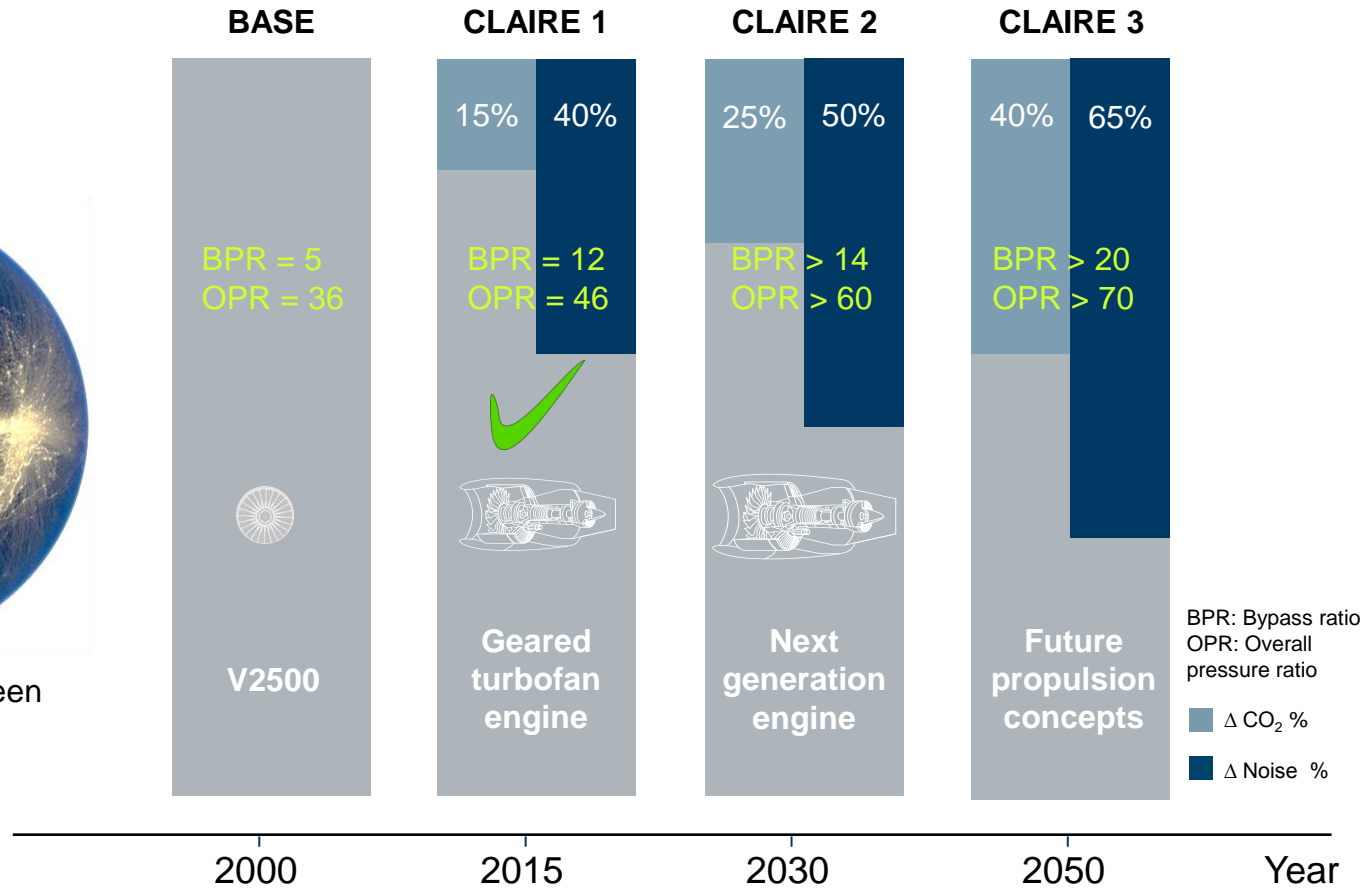
Highly demanding targets are only achievable with revolutionary progress

MTU's approach CLAIRE – Clean Air Engine

Vision 2020 and Flightpath 2050 targets



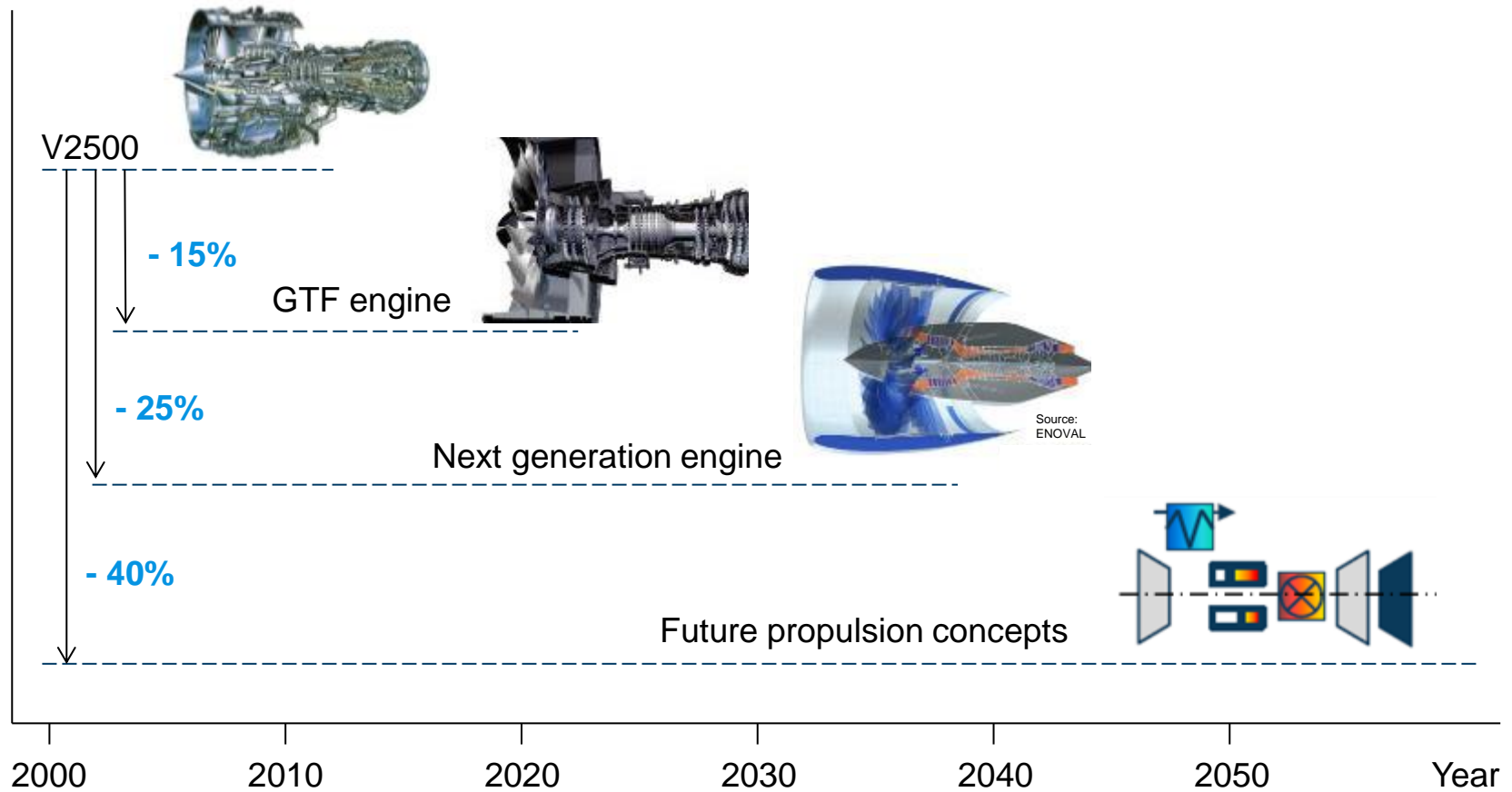
Today's air traffic between Europe and the US



Evolutionary development of engines until 2030, revolutionary ideas needed for 2050

Future propulsion system development

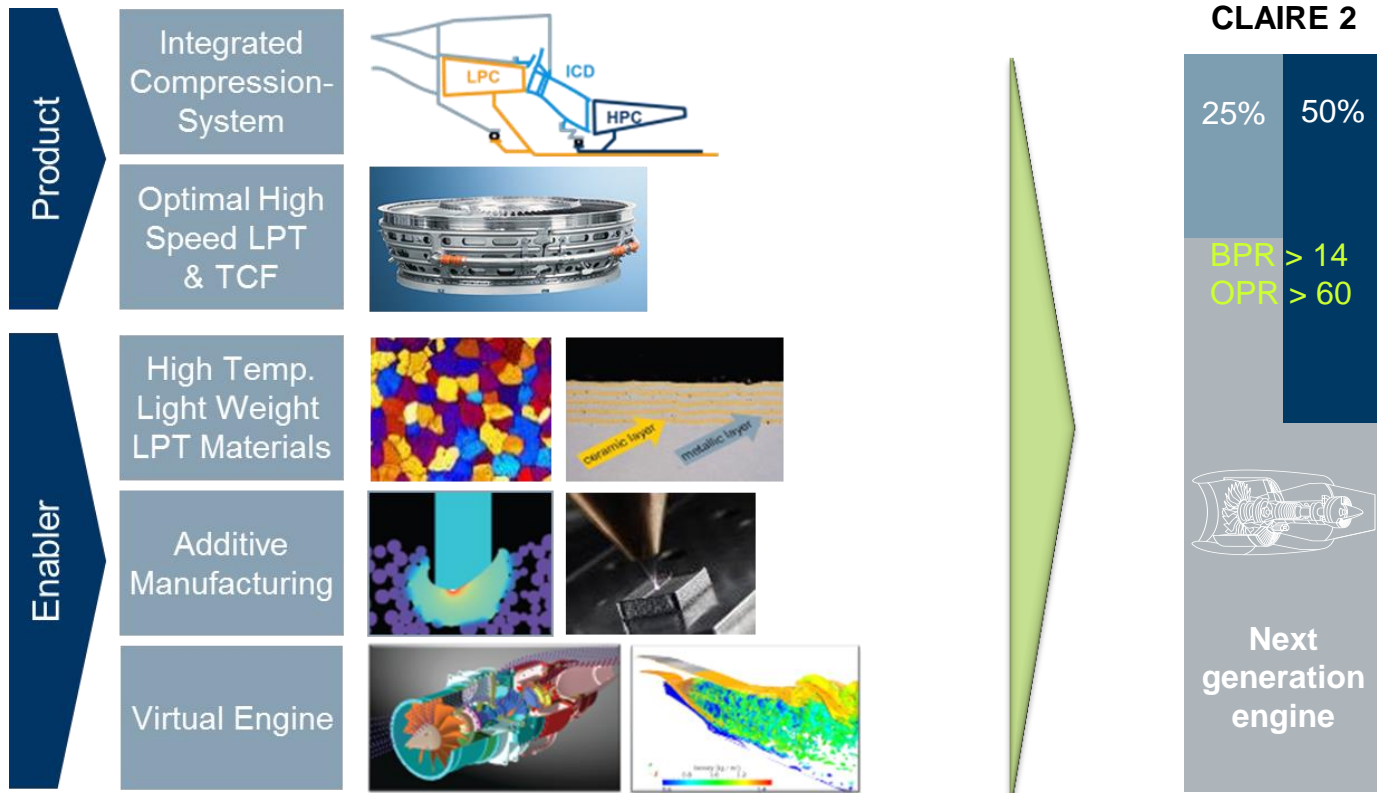
$\Delta\text{CO}_2 \%$ / $\Delta\text{SFC} \%$



The Geared Turbofan engine concept offers a substantial improvement potential

MTU's leading technology roadmap supporting engines for entry into service in 2030+

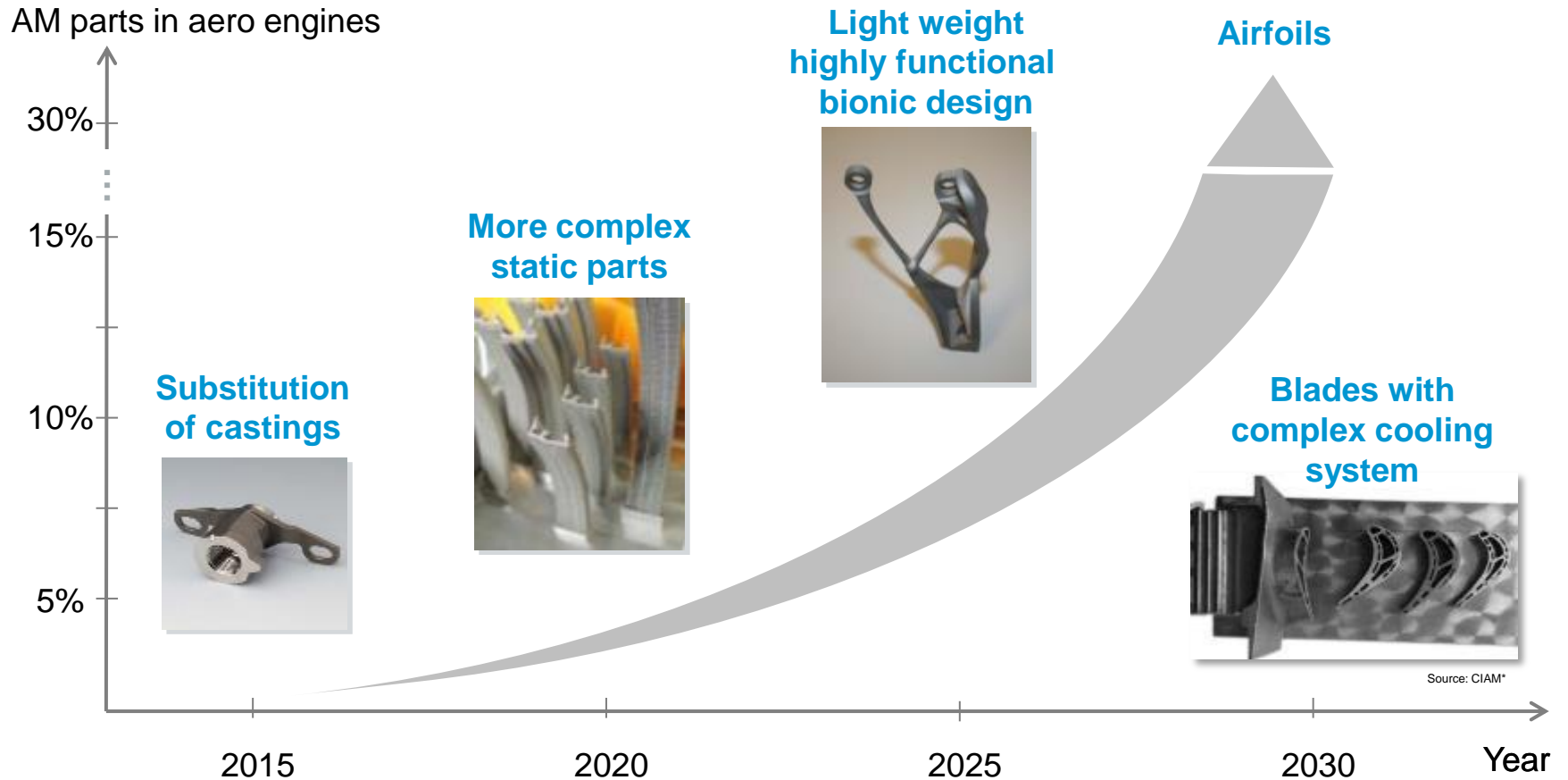
Additional 10% CO₂ and noise reduction relative to GTF engines



Technology roadmap established to achieve demanding next generation engine targets

Additive manufacturing

Increase of complexity and share of AM parts in aero engines



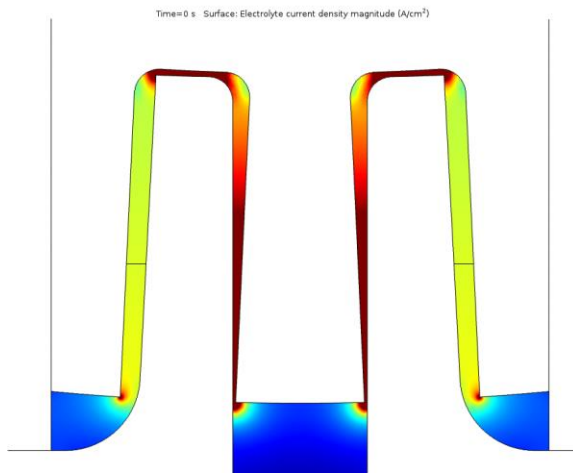
Additive manufacturing will be a key enabler for the new engine generation

Intensive use and development of simulation tools

Integrated computational manufacturing and materials engineering (ICM2E)

Manufacturing processes:

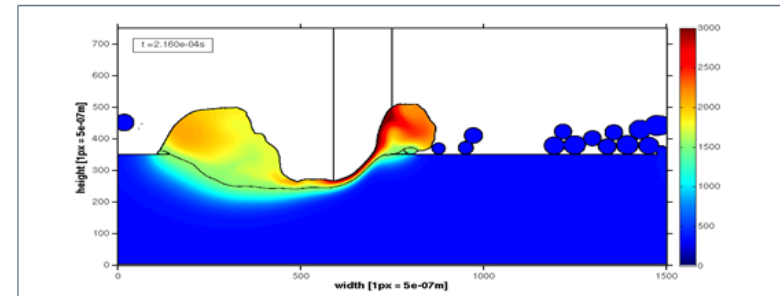
- Reduction of machining trials
- Optimization of tools and CNC processes
- Multi-scale approach



Simulation of electro-chemical machining

Material development:

- Numerical design of new materials
- Predict texture and microstructures
- Generate material characteristics



Simulation of additive manufacturing

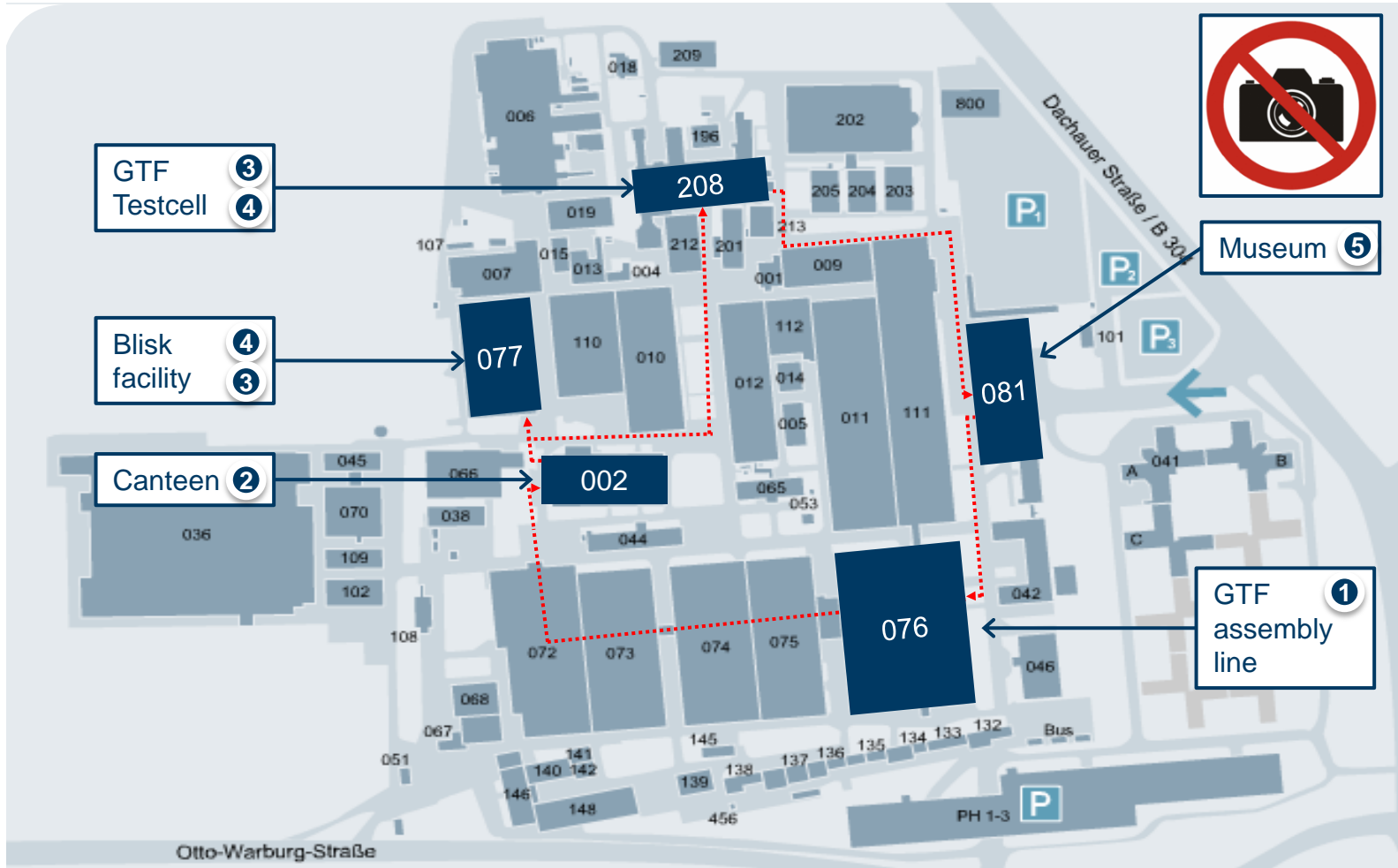
Simulation to optimize & develop manufacturing processes and materials much faster at less cost

Conclusion

- Development milestones for all new engine programs are secured
- GTF engines have proven their game changing performance
- Corrective actions have been implemented to increase GTF reliability and durability
- 2018 and 2019 will see highest OEM growth rates triggered by GTF
- MRO workload will continuously increase leading to further expansion strategy
- MTU's automation and best-cost initiatives secure high profitability
- MTU's high-sophisticated technology roadmap paves the way to the next gen engine

...looking forward to answering your questions!

Site plan of MTU in Munich



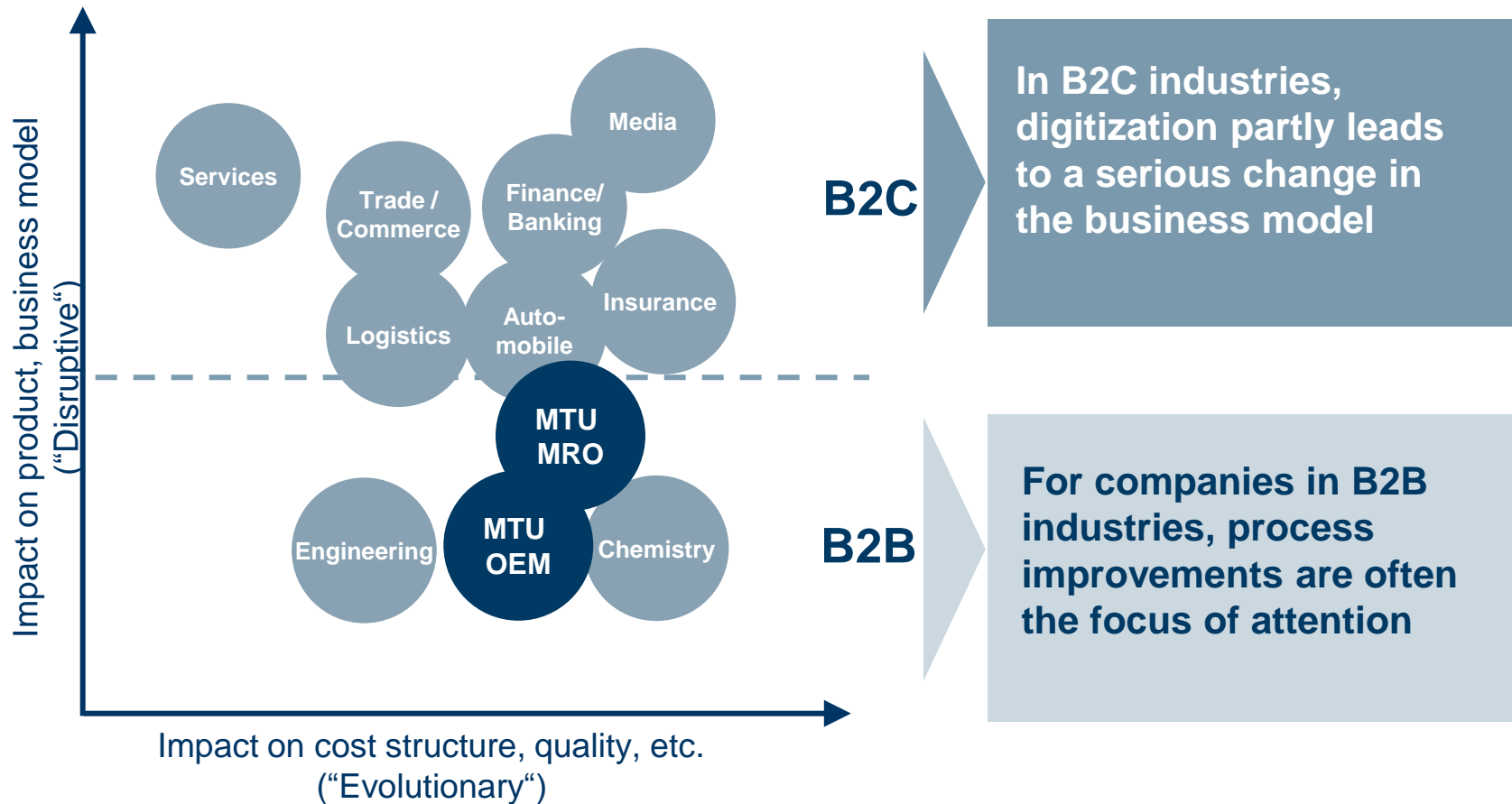


MTU goes Digital

Michael Schreyögg, Chief Program Officer

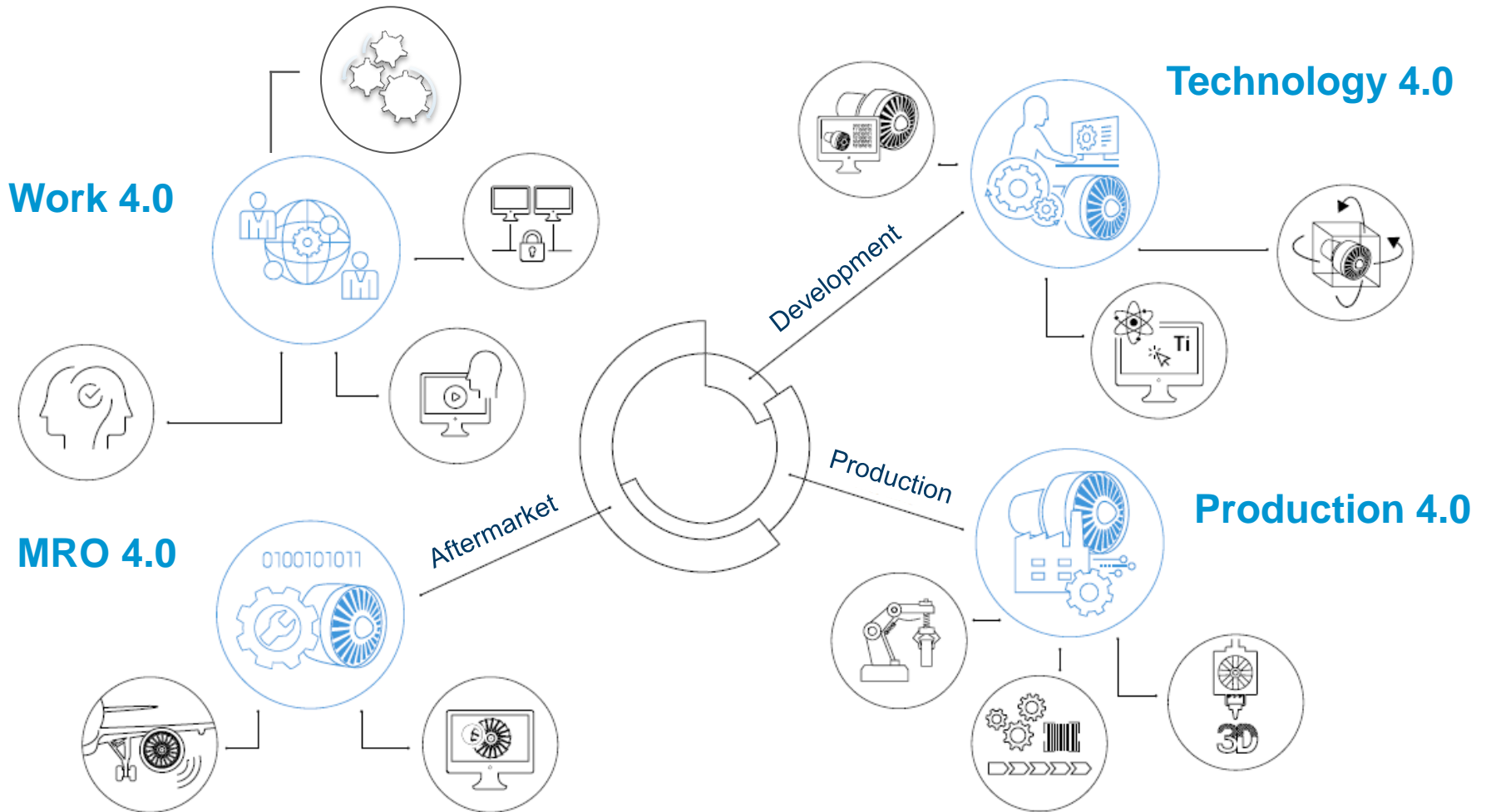
Munich, 12th December 2017

Impact of digitization on MTU's business model



Digitization will not fundamentally alter the business model of MTU in the medium term

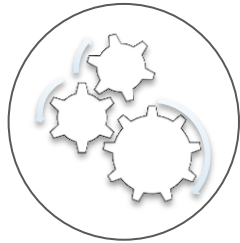
Digitization @ MTU focus on 4 areas of activity



Work 4.0

Robotic process automation

Automation of repetitive administrative tasks as well as ordering and procurement processes → increase in workflow efficiency and valuable tasks



IT security

Strengthening security precautions and digital collaboration



Unified collaboration & communication (UCC)

Continuous improvement of digital communication and collaboration, regardless of medium, place and device



E-learning

Developing innovative e-learning contents for employees

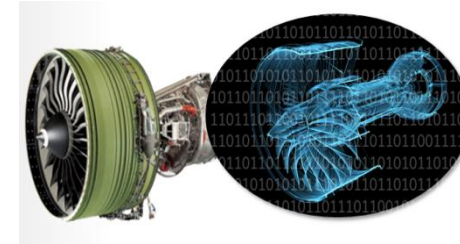


Technology 4.0



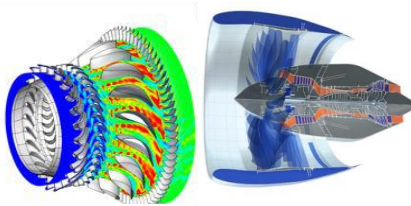
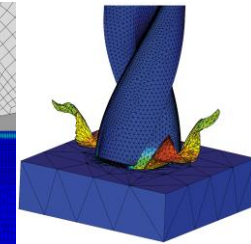
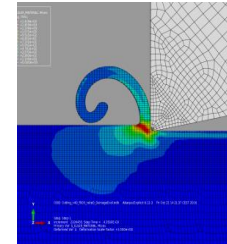
Digital twin

Pooling together value adding data from development activities to MRO



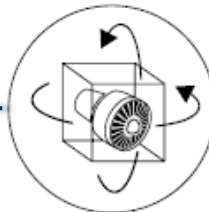
Material & manufacturing simulation

Achievement of considerable savings in development and testing of new materials and manufacturing techniques by simulation

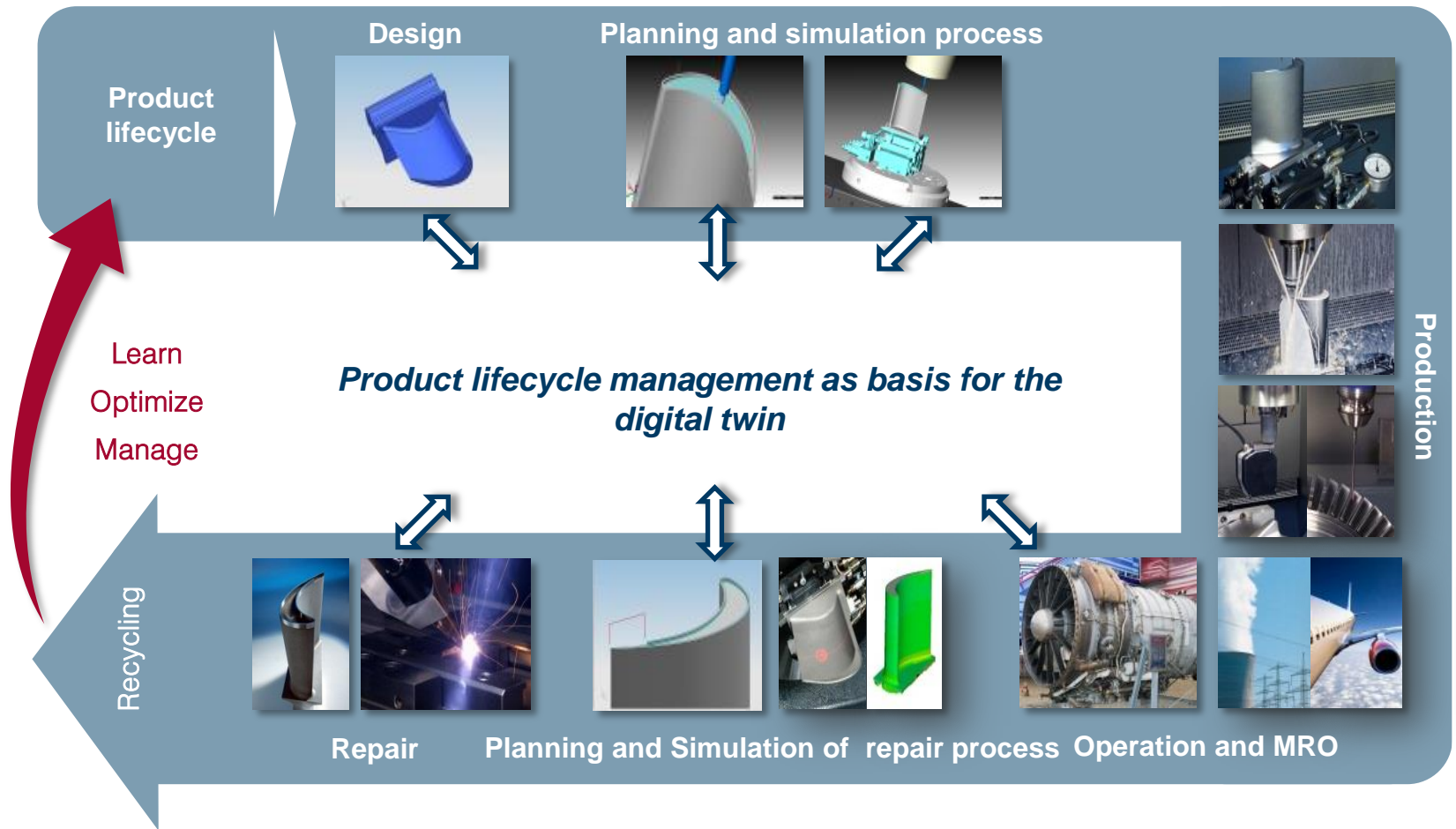


Virtual engine

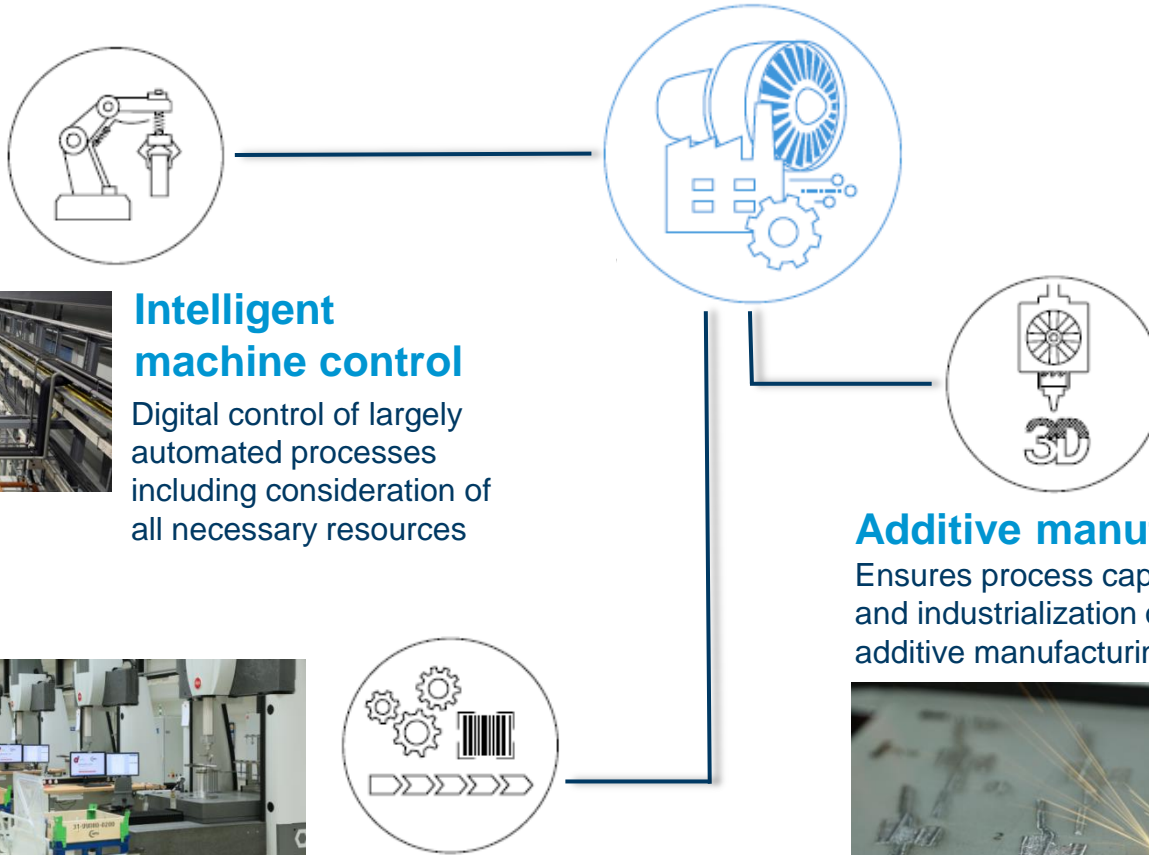
Design, development, manufacturing, assembly, certification and maintenance of engine components by virtual engine simulations



Digital twin – Enabler for efficient and adaptive production processes



Production 4.0



Intelligent machine control

Digital control of largely automated processes including consideration of all necessary resources

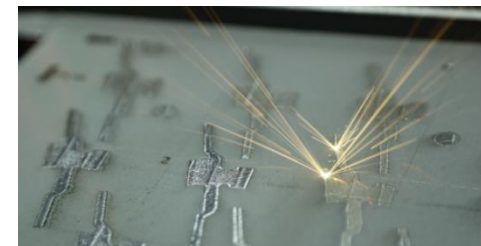


Optimized material flow/Logistics 4.0

Optimization of turn around times and inventories with increasing productivity and competitive production costs

Additive manufacturing

Ensures process capability and industrialization of additive manufacturing



MRO and aftermarket 4.0

Predictive maintenance (ETM)

Engine Trend Monitoring monitors the condition of engines during flight and after



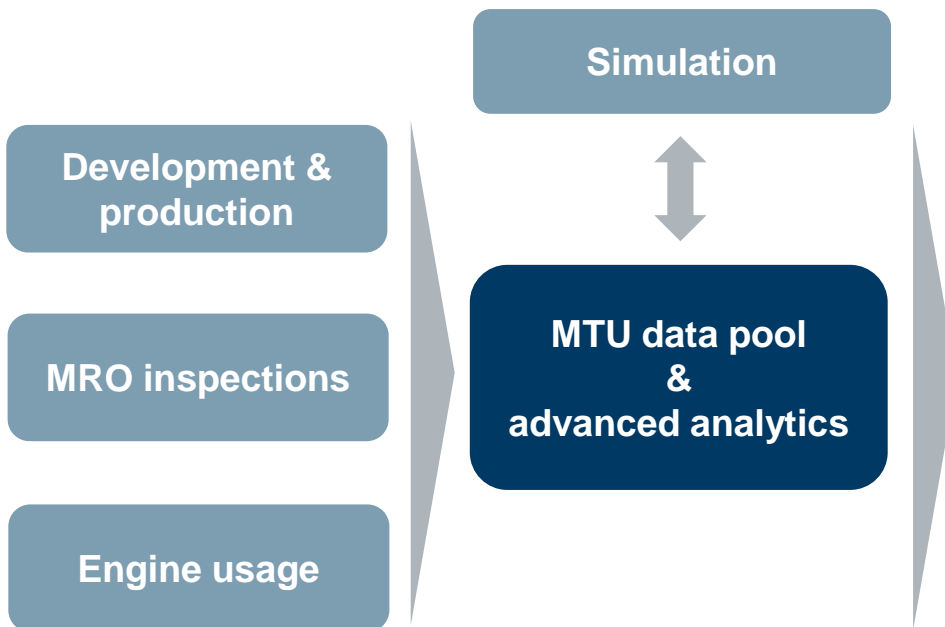
Predictive analytics

Analyze comprehensive and complex data volumes for patterns and correlations

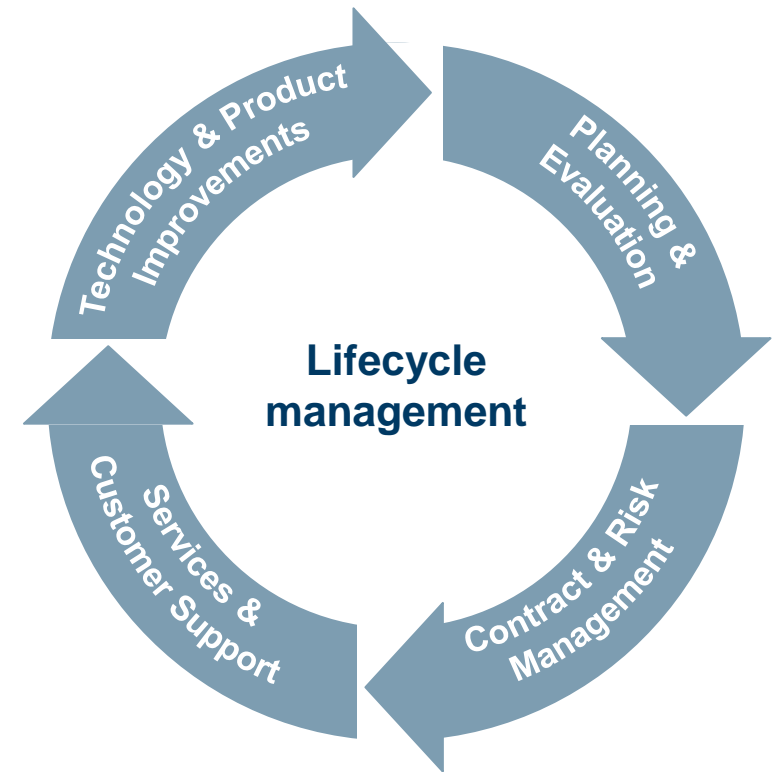
Predictive analytics improves engine lifecycle management

Data creation and usage within MTU

Data Sources



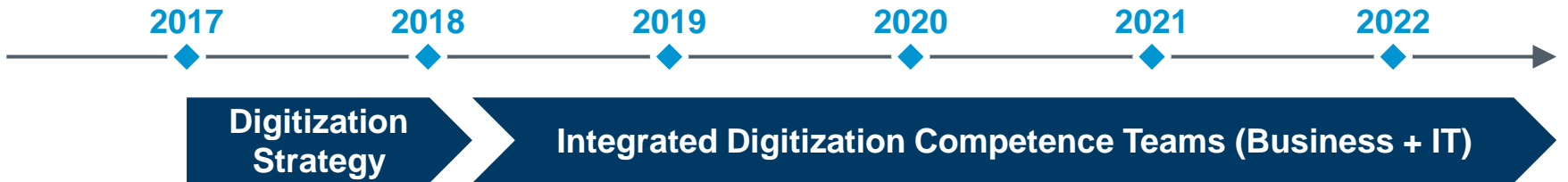
Data applications



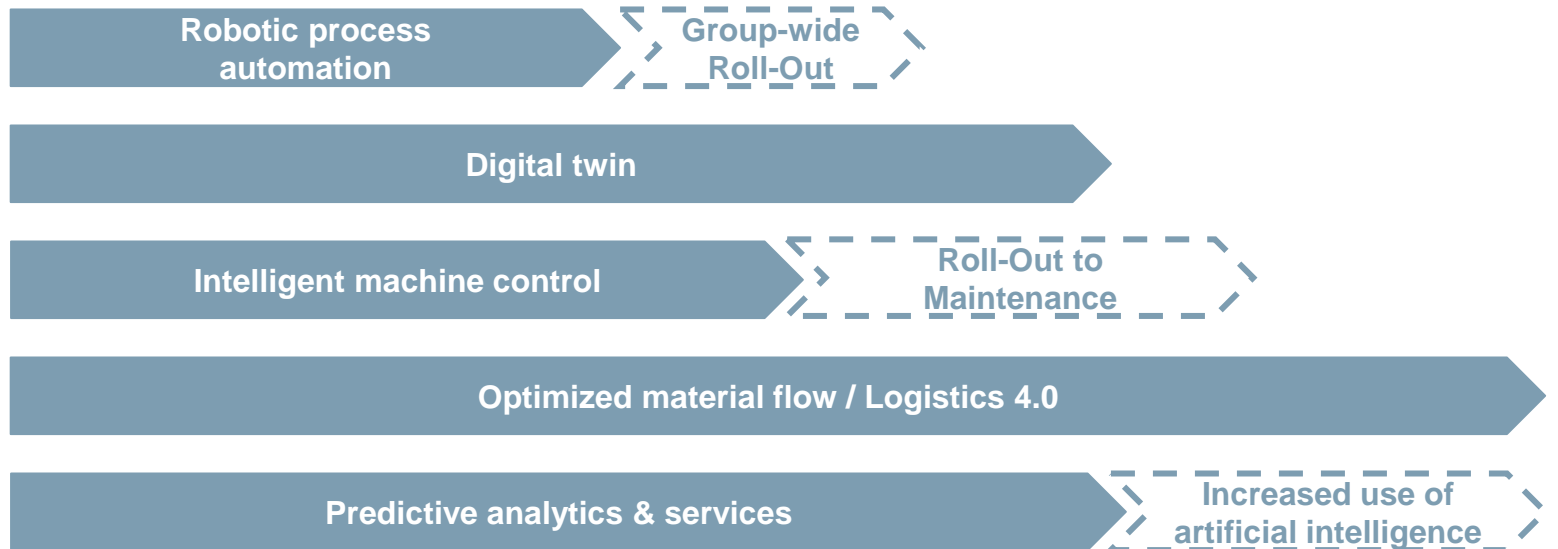
MTU leverages its big data pool and modern advanced analytics technologies to improve efficiency and quality in engineering, OEM contracts and MRO processes

The 'big five' digitization projects are already in implementation

Timeline overview



'Big Five' Projects

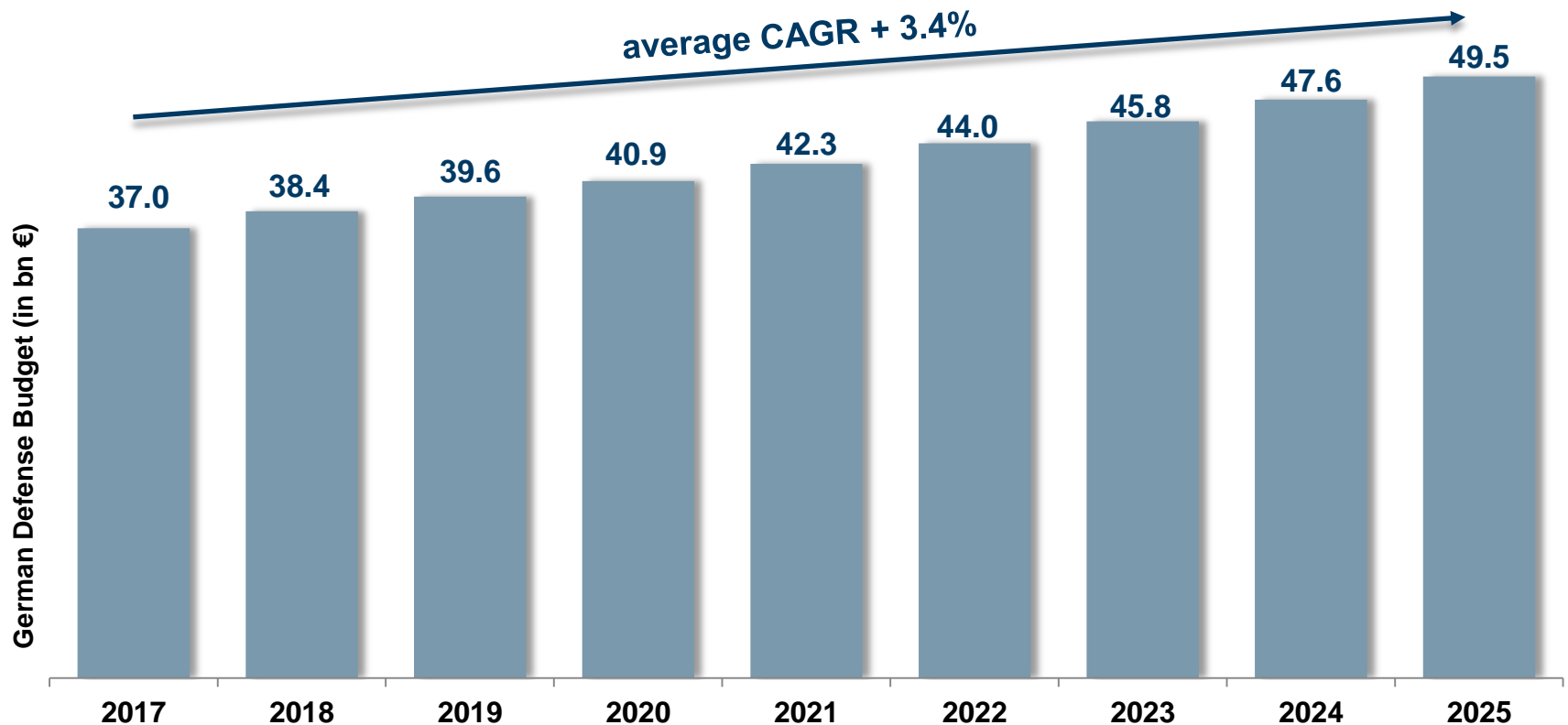




Military Business – Defense budget - driver for future growth? Michael Schreyögg, Chief Program Officer

Munich, 12th December 2017

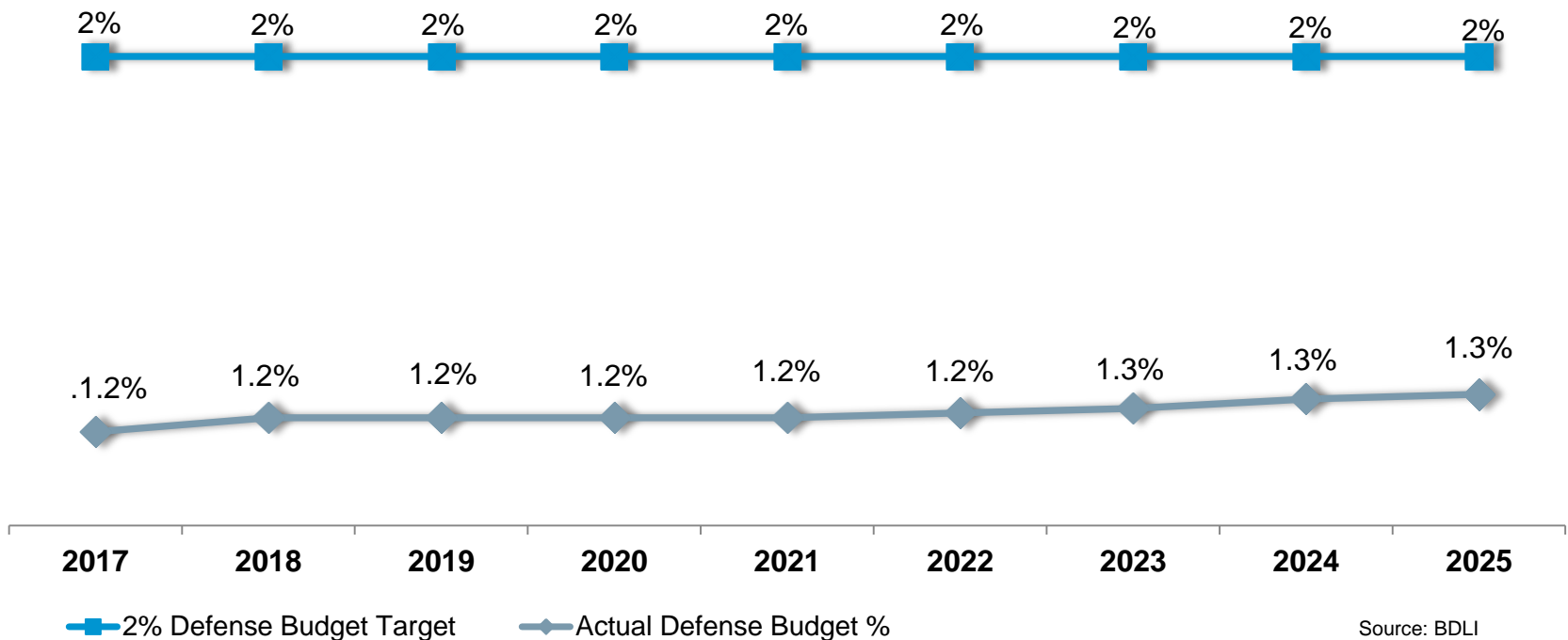
German defense budget 2018-2025 will increase in average by €1.3 bn or 3.4 % (nominal) annually



Source: BDLI; MTU estimates

German defense budget equals 1.2% of the GDP on average

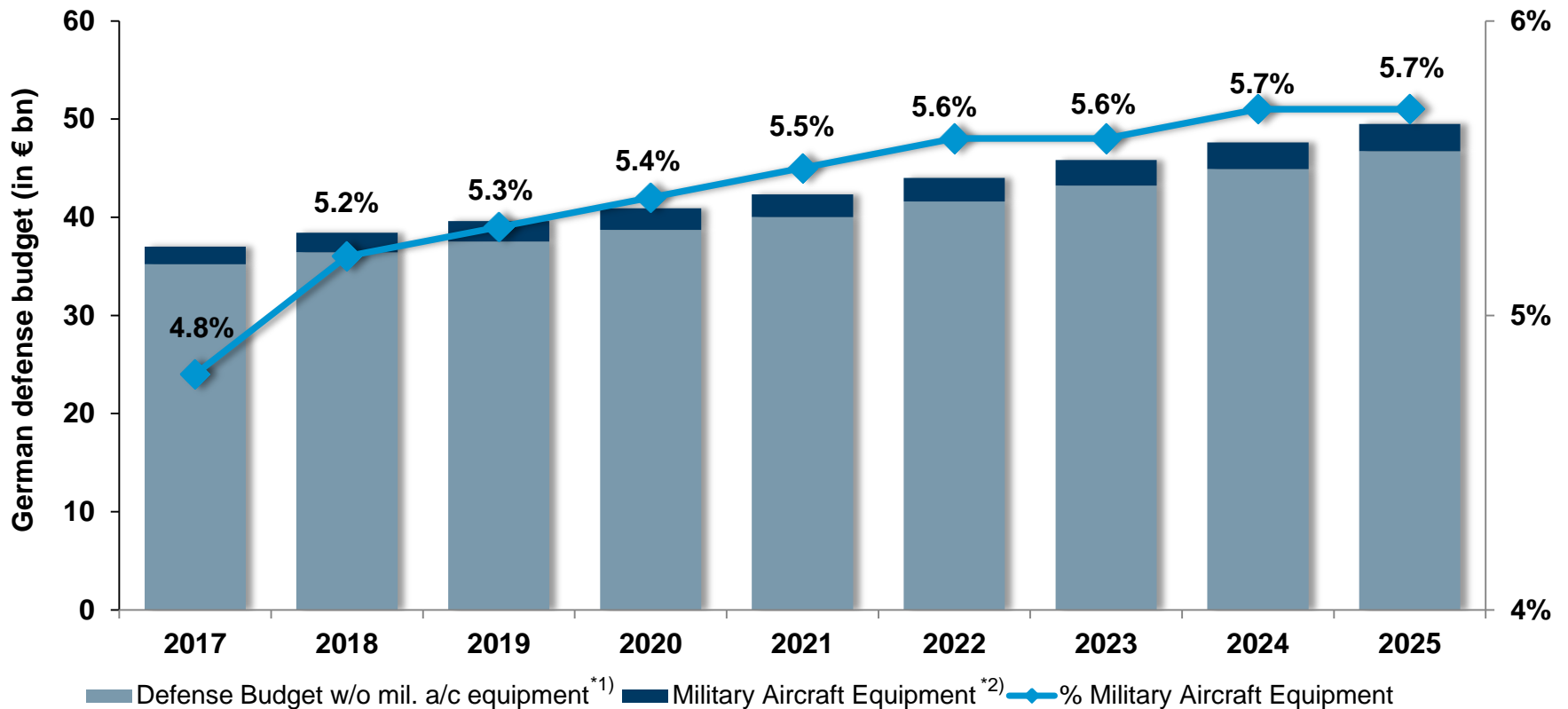
Annual growth rate of ~3.4% confirmed by German government



To reach the target of 2% GDP, the defense budget would have to grow by 17% or €9 bn annually

Military aircraft equipment equals 5-6% of total German defense budget

Investment in military aircraft equipment expected to increase by ~5% annually



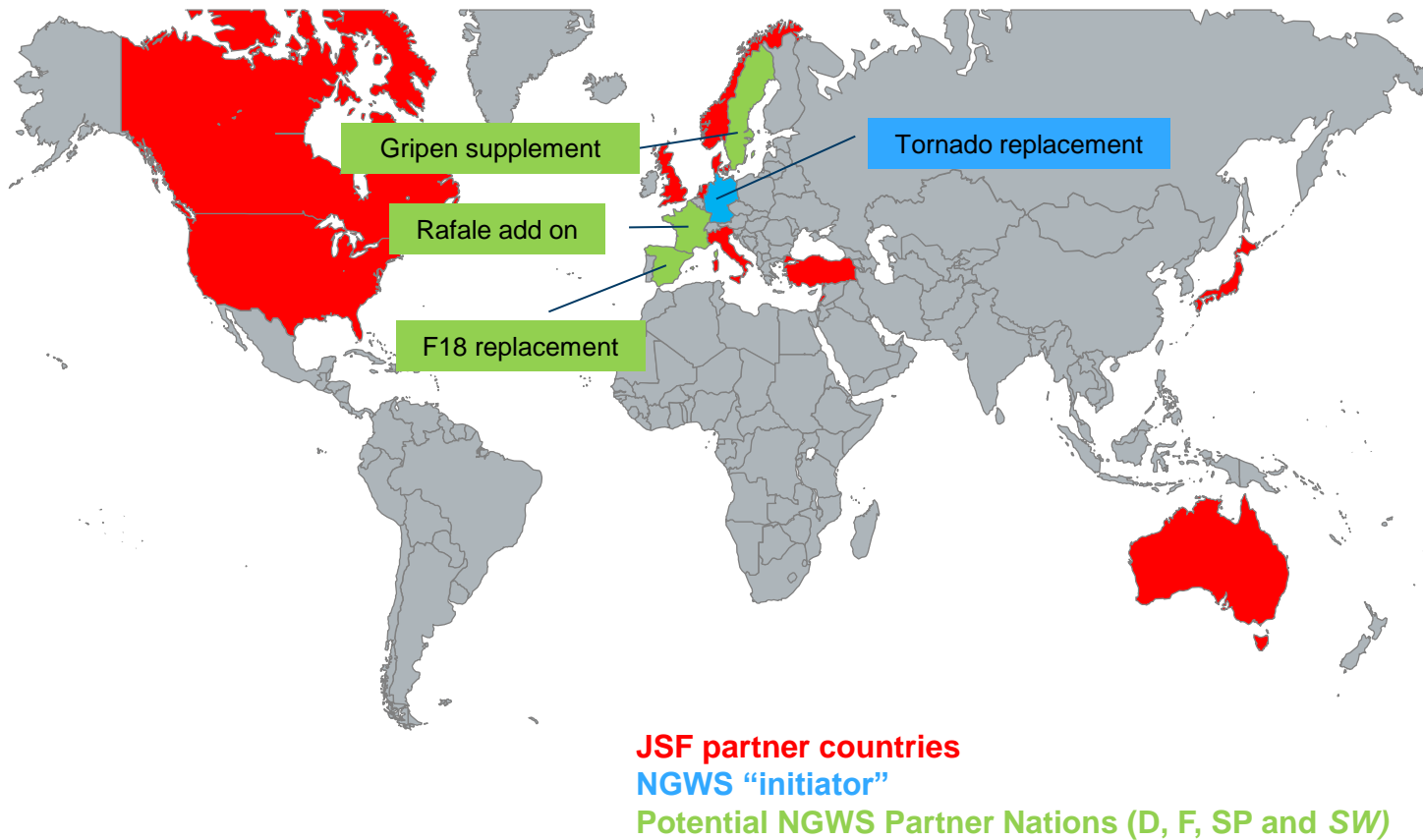
*1) MTU estimates for 2022 ff: nominal increase in German defense budget by ~3,4% annually

*2) MTU assumption for 2019 ff: nominal increase of mil. A/C equipment by 5% annually

Military business outlook

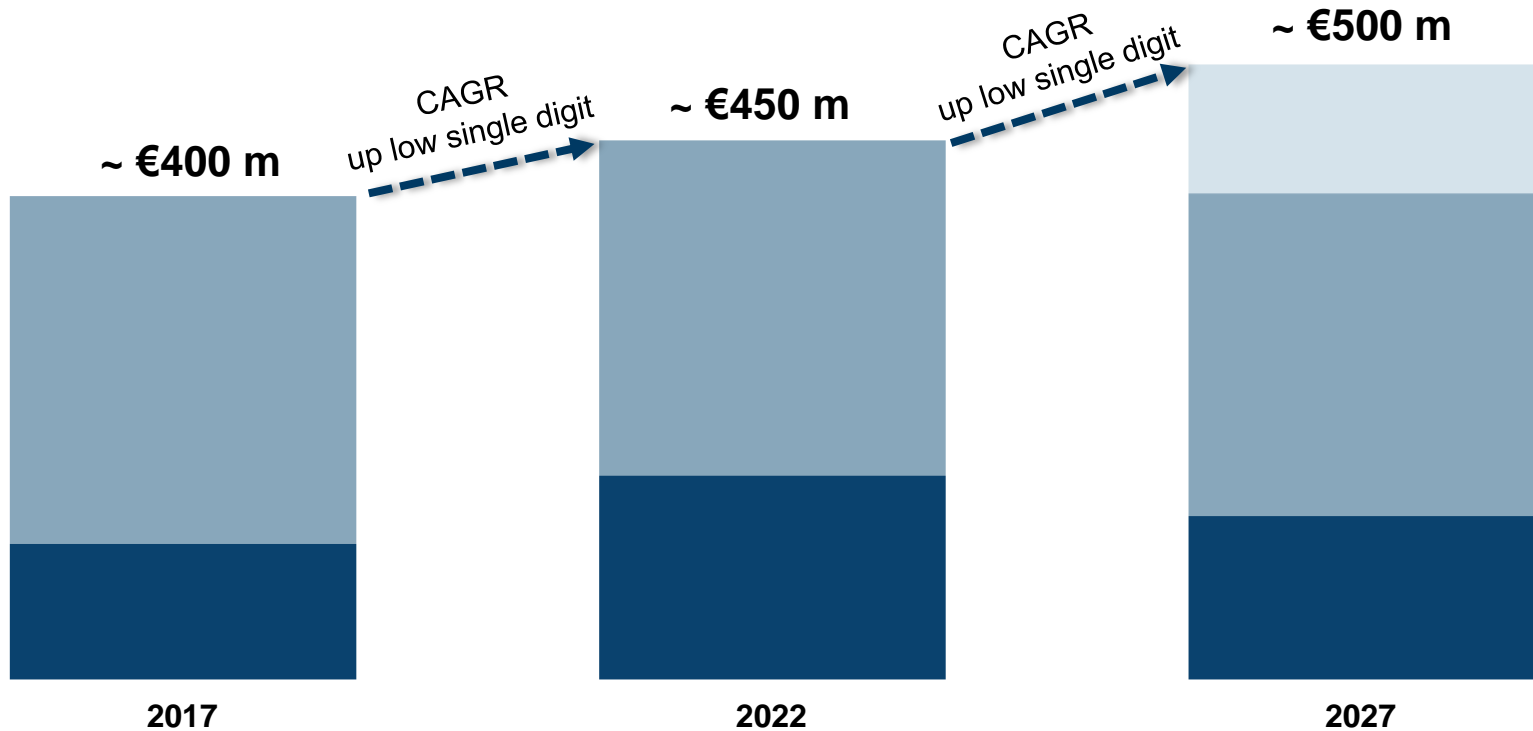
	2017	2020	2025	2030	2035	
Fighter, trainer	 Eurofighter EJ200 ✓		 Eurofighter Upgrade, Tranche 1 replacement			 NGWS
Transport	 A400M TP400 ✓	 KC390 V2500 ✓				
Helicopter			 CH-53K T408 ✓			
Export			 Eurofighter Kuwait, Qatar ✓ Saudi Arabia	 A400M Export potential	 CH-53K Export potential	

NGWS market landscape – potential partner countries



MTU Military revenue outlook 2017 to 2027 (in €m)

- Series
- Aftermarket/services
- Upside mainly through export



- TP400 ramped up

- T408 strong revenue contribution

- Strong export potential



MRO Strategy – Mastering future growth

Michael Schreyögg, Chief Program Officer

Munich, 12th December 2017

MRO revenues increased over proportional over the last 2 years

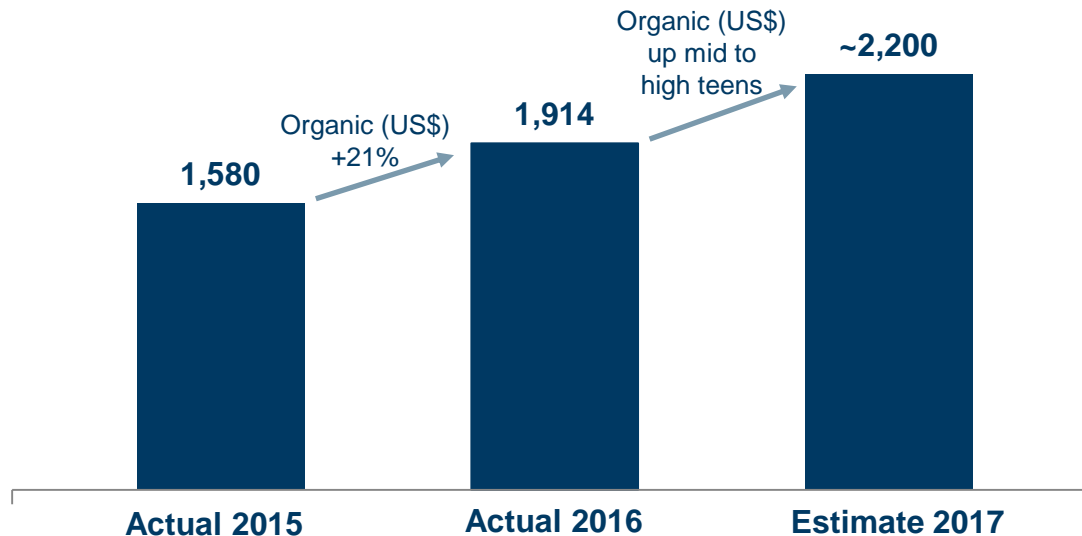
MRO revenues 2015 – 2017 (in € m)

CAGR 2015 – 2017 (organic (US\$))

Total Market High single digit

MTU-MRO Up high teens

- MRO revenues grew stronger than the market
- Main revenue driver: V2500, CF34, GTF
- Strong growth of engine lease and asset management business



MTU Maintenance centers of excellence

MTU Maintenance Hannover

- Revenue growth 2017 ~20%
- NB + WB engines

MTU Maintenance Berlin-Brandenburg

- Revenue growth 2017 ~20%
- BJ + RJ + IGT

MTU Maintenance Canada

- NB + WB engines
- NB + WB accessories

MTU Maintenance Zhuhai

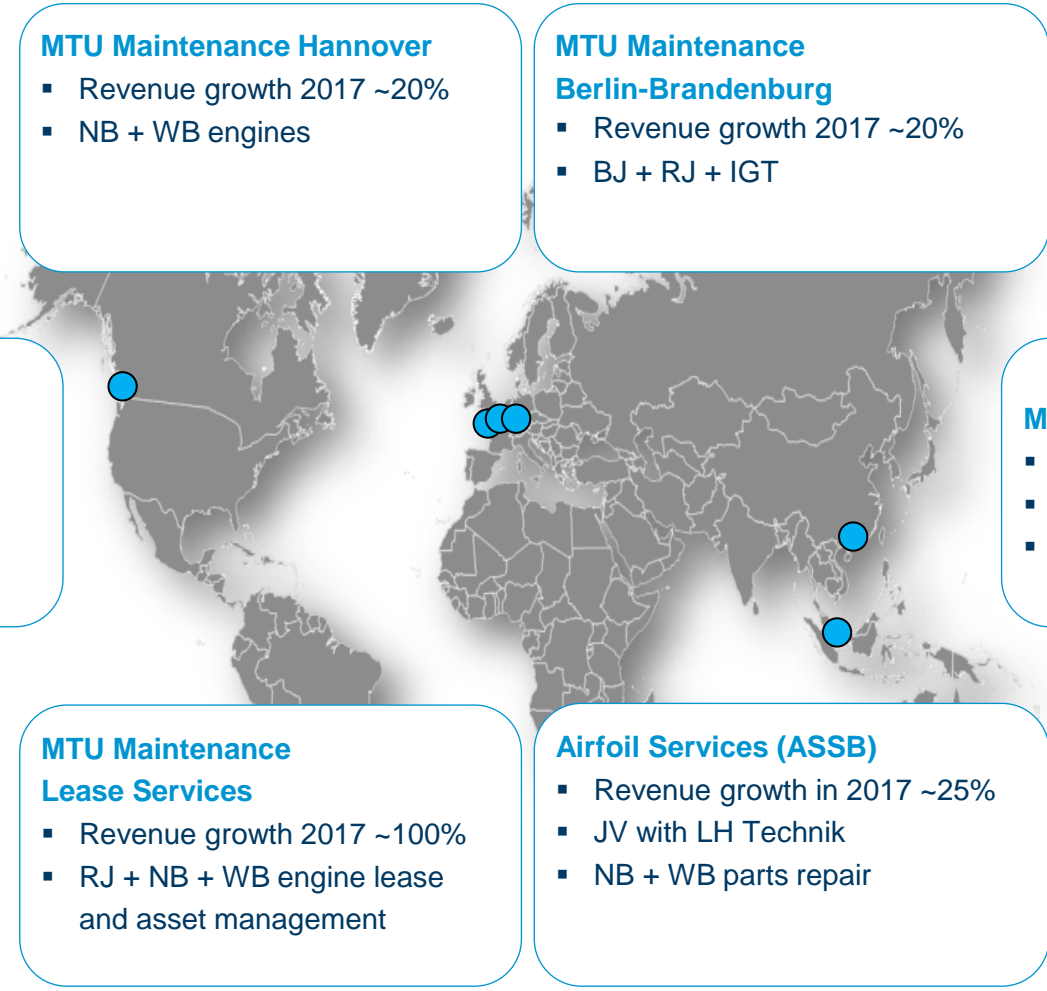
- Revenue growth 2017 ~20%
- No.1 MRO shop in China
- NB engines

MTU Maintenance Lease Services

- Revenue growth 2017 ~100%
- RJ + NB + WB engine lease and asset management

Airfoil Services (ASSB)

- Revenue growth in 2017 ~25%
- JV with LH Technik
- NB + WB parts repair

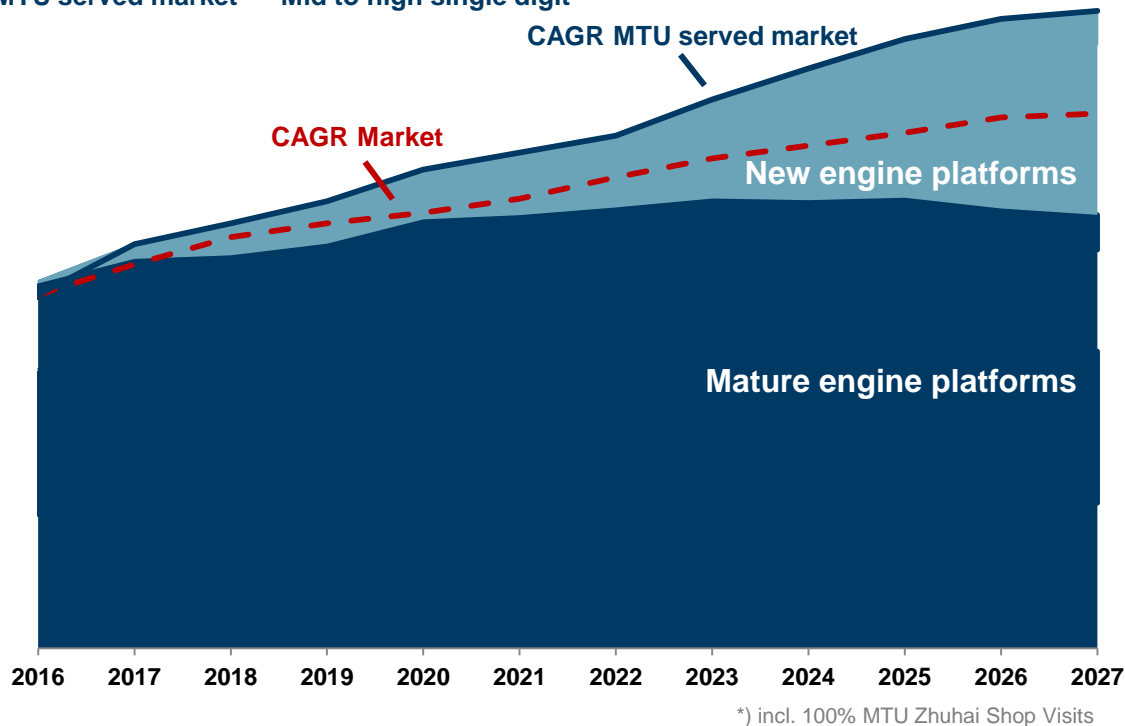


 Major MRO sites

Future MRO volume growth mainly driven by new engine platforms

No. of shop visits

CAGR	2016-2027
Market	Low single digit
MTU served market	Mid to high single digit

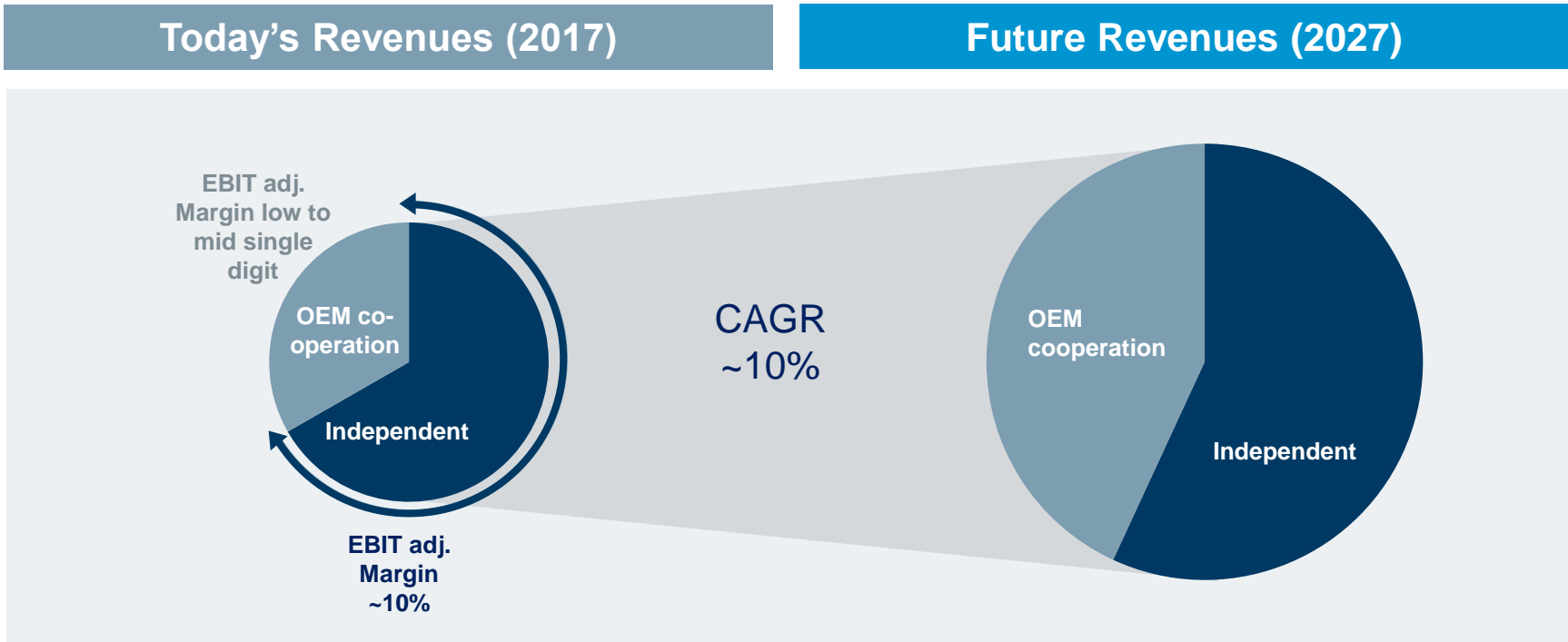


MTU is very well positioned in the MRO market:

- 2 different points of access: independent, OEM co-operation
- Largest engine maintenance portfolio worldwide with ~30 different engine types
- Strong position on growth platforms such as V2500, CFM56, CF34 and GE90G
- Stable development of mature engine platforms supported by environment of low oil prices
- Future growth mainly driven by new engine platforms

Expansion of MTU MRO network to cope with future growth volume

As the majority of new engine platforms are sold with OEM flight hour agreements more shop visits will be subcontracted by the OEM

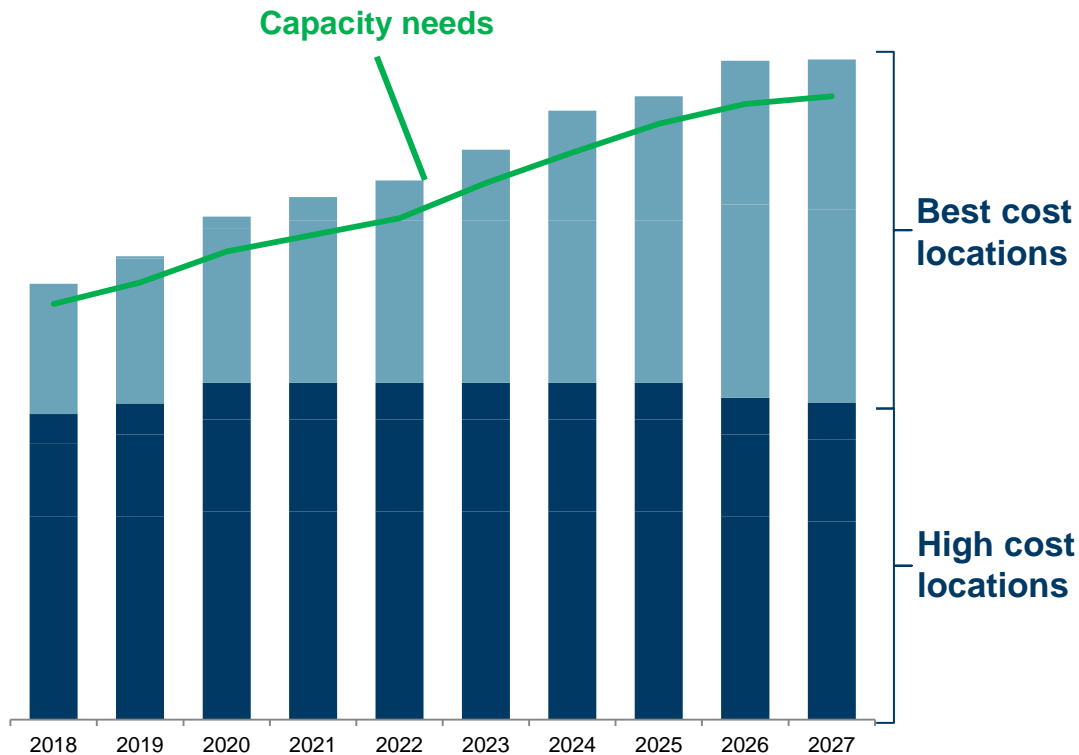


MTU expects to grow in both market segments with stronger growth in OEM cooperation business, leading to increasing pressure on profitability

incl. companies consolidated at equity

Expansion of MRO capacity with clear focus on best cost initiated

Capacity needs vs. availability



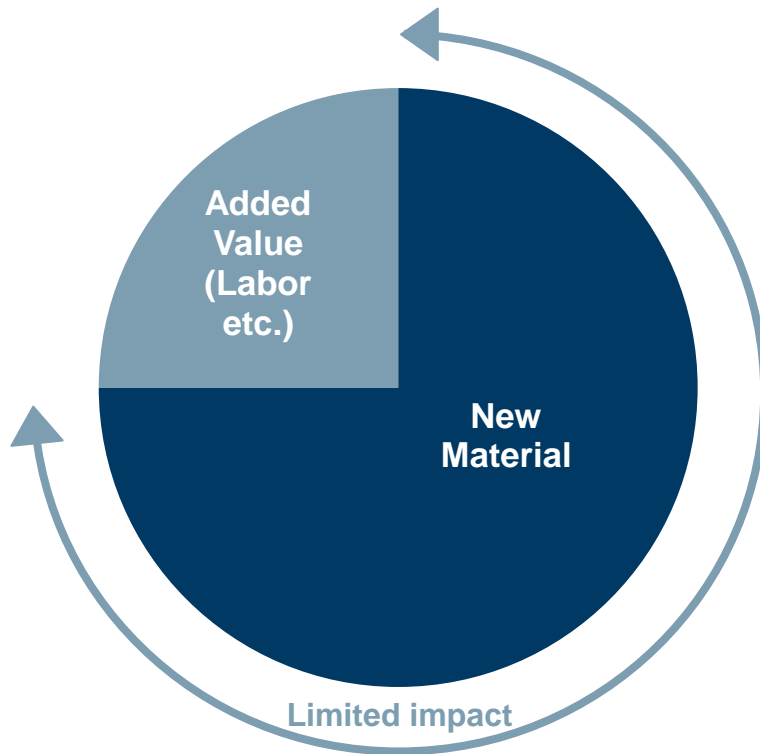
- Total capacity increase ~50%
- High cost countries: short-term increase of workforce
- Low-cost countries: doubling of capacity
- Low-cost portion to total capacity increases from 30% to 50%

Measures to increase profitability

Labor cost is not the only way to improve profitability

Cost structure MRO (i.e. V2500 Indep.)

Measures of cost reduction



Expand low-cost footprint ✓

Repair development, repair licences, low cost shops ✓

Gain access to used material through teardown engines ✓

LLP-Management, material deals, efficient workscoping ✓

MTU MRO “ Three X“ strategy addresses key elements to secure profitable growth

Sales strategy

Alignment of sales structure and focus on cooperations with airlines, lessors and OEMs.

Service portfolio

Offering TEC[®] and integrated solutions such as leasing, alternatives to MRO, engine life extension and end-of-life solutions.

Proposals

Customized proposals offering, ‘one stop shop‘ solutions, financially-optimized workscoping.

Purchasing

Cost reduction through LLP Management and material deals, teardown co-operations.

Operations

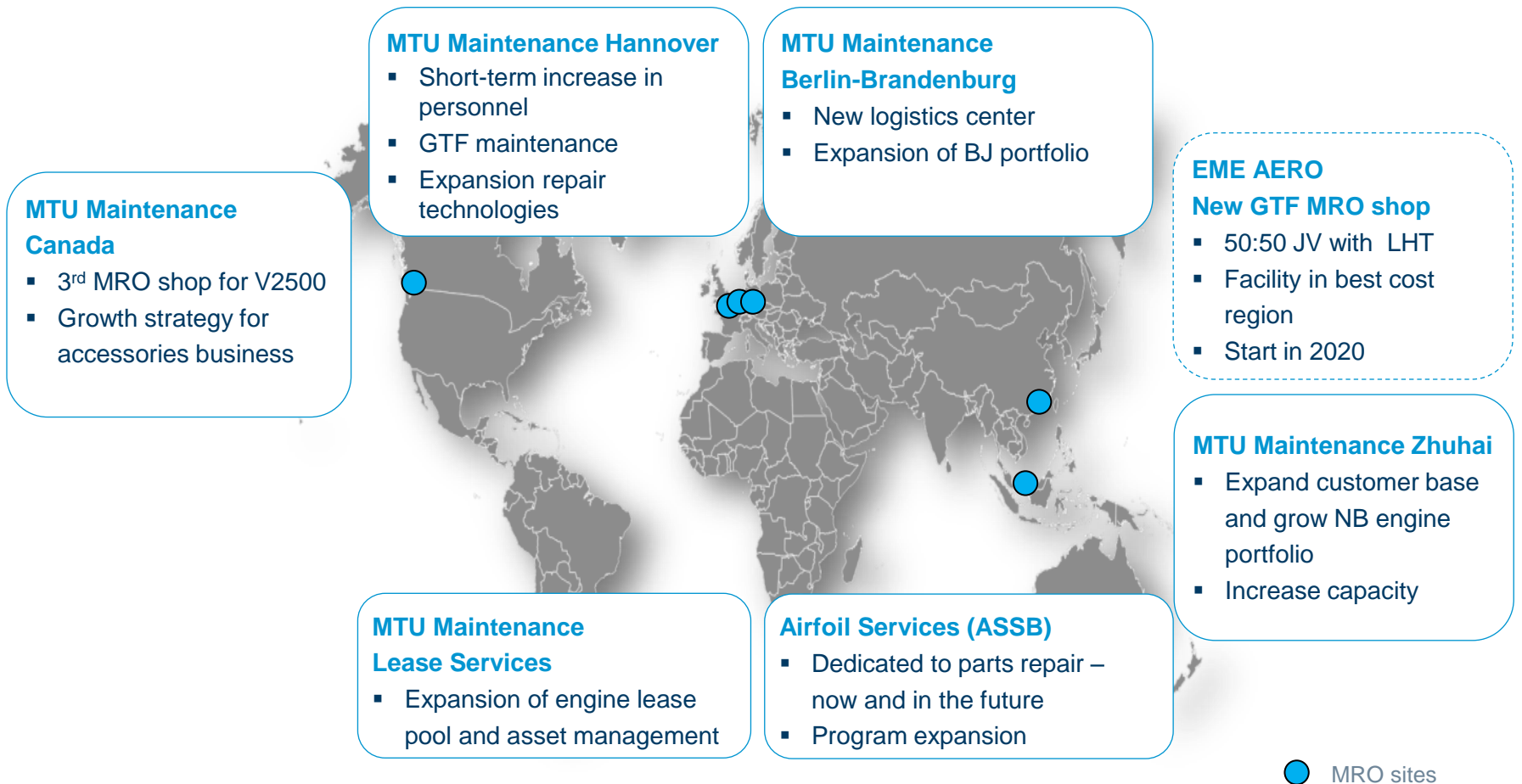
Expansion of low cost footprint and flexibility in operations. Use of digitization initiatives.

Repairs

Expansion of repair portfolio. Development of alternative part repair practices to avoid new material cost.

„Three X“ does not leave any stone unturned for long term success

Future landscape of MRO locations



All locations are getting ready to efficiently master future growth



Introduction of the GTF: Keeping a long term perspective (compared to the V2500)

Michael Schreyögg, Chief Program Officer

Munich, 12th December 2017

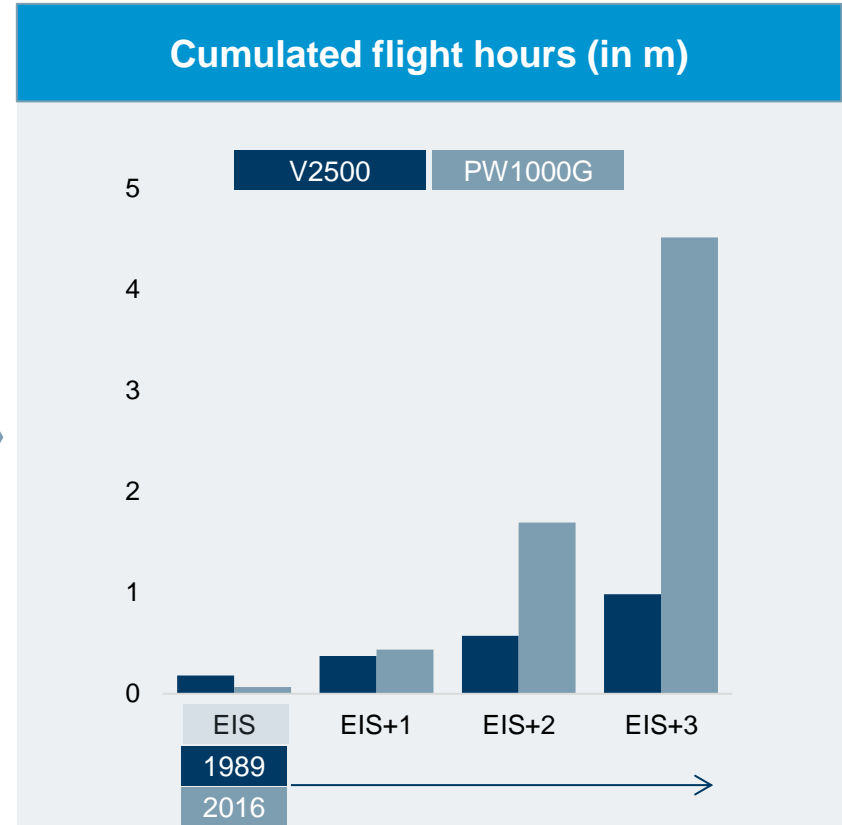
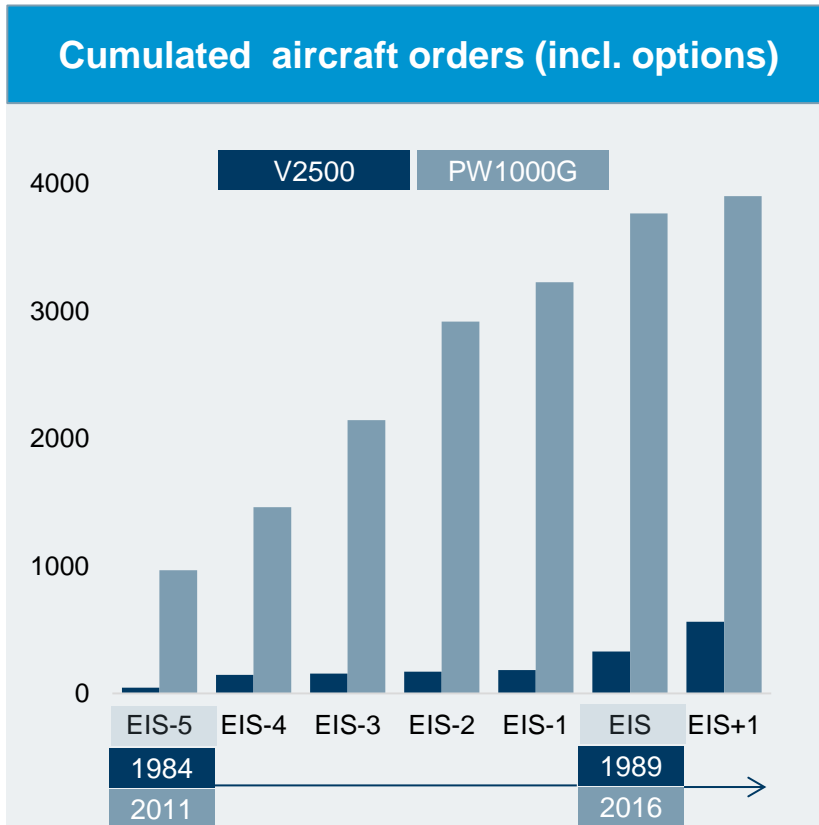
Bold technology required to deliver step changes in fuel burn, range and noise



Pioneering engine programs have rarely been exempt from introductory issues

	V2500	PW1000G
R&D	<ul style="list-style-type: none"> • 1983-88 • Early development shortcomings 	<ul style="list-style-type: none"> • 2011-15 • No major issues
EIS	<ul style="list-style-type: none"> • 100 engines delivered in first 2 years • Early technical removals and reconfigurations • High pressure compressor issues • Combustor upgrade to prevent premature engine removal • Level of durability does not meet customer expectations until “1992 standard” • ETOPS 120min in 1994 ETOPS 180min in 2006 	<ul style="list-style-type: none"> • 500 engines delivered in first 2 years • Early technical removals and reconfigurations • Motor to start time & nuisance messages solved • Combustor upgrades underway • Alternate design of no. 3 carbon oil seal • AOG situation solved • ETOPS 120min in 2016 ETOPS 180min in 2017

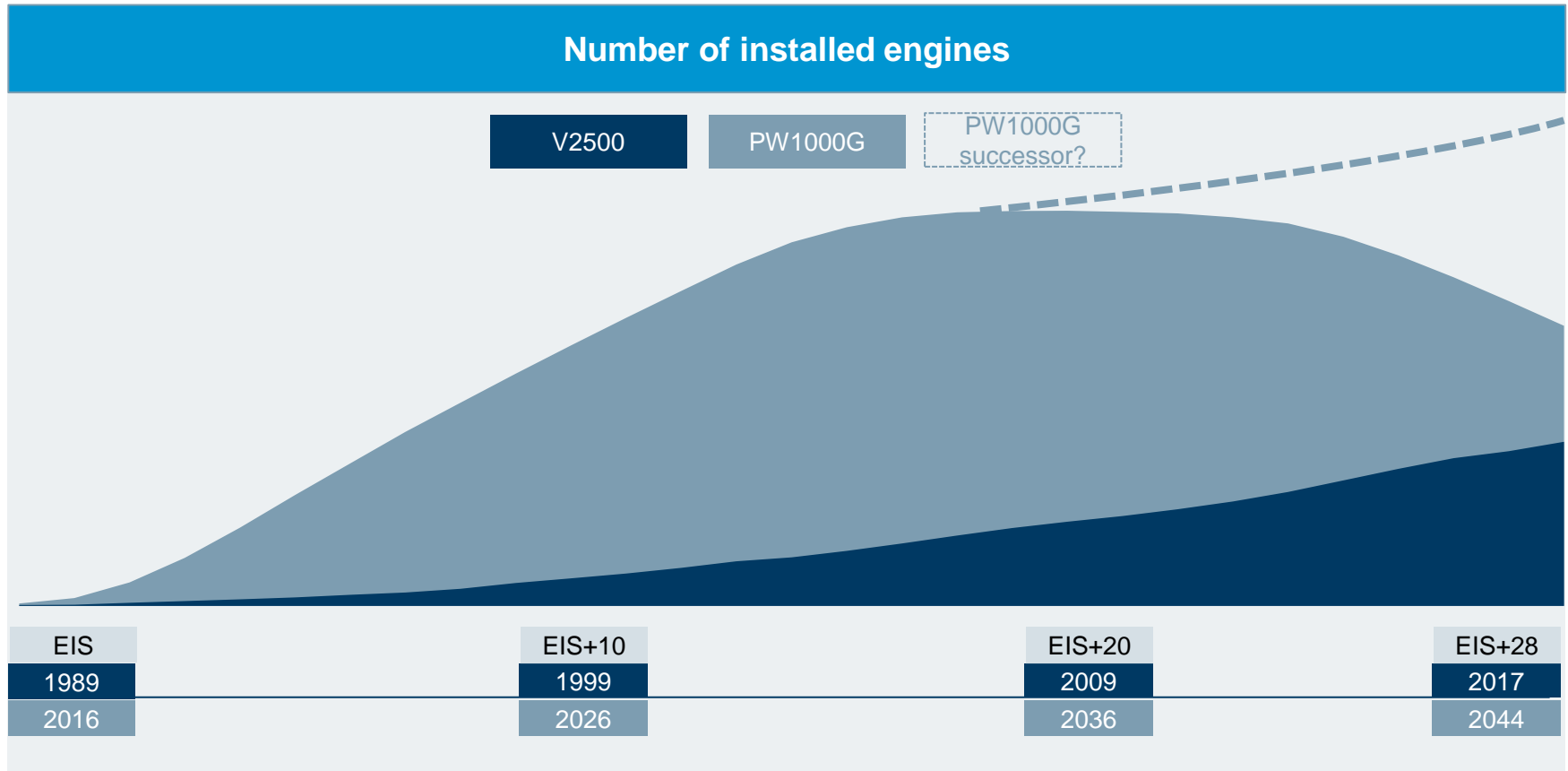
The GTF history in numbers



Unprecedented ramp-up for MTU and its partners, driven by bestseller A320neo and other aircraft applications

Source: Fleetanalyzer, MTU

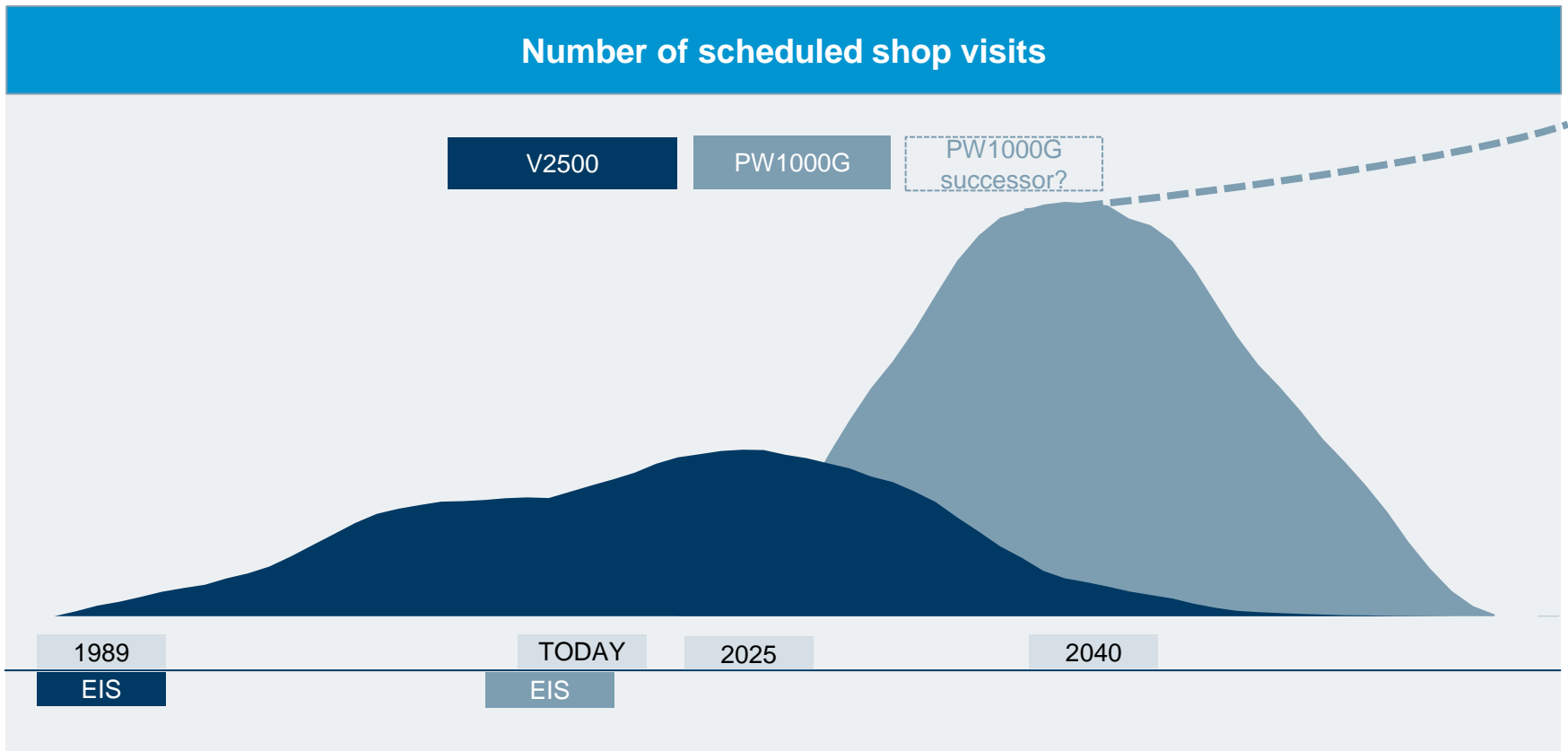
MTU expects the fast-growing engine fleet to peak at 15,000



The GTF engine fleet will outnumber its predecessors by a factor >2

Source: MTU

Fleet requirement will lead to unprecedented aftermarket demand

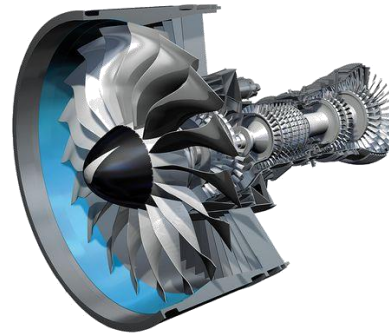


The GTF family is forecast to peak at 2 to 3 times what the V2500 is experiencing

Geared Turbofan @ MTU: The long term perspective

**~\$90 bn
Revenues**

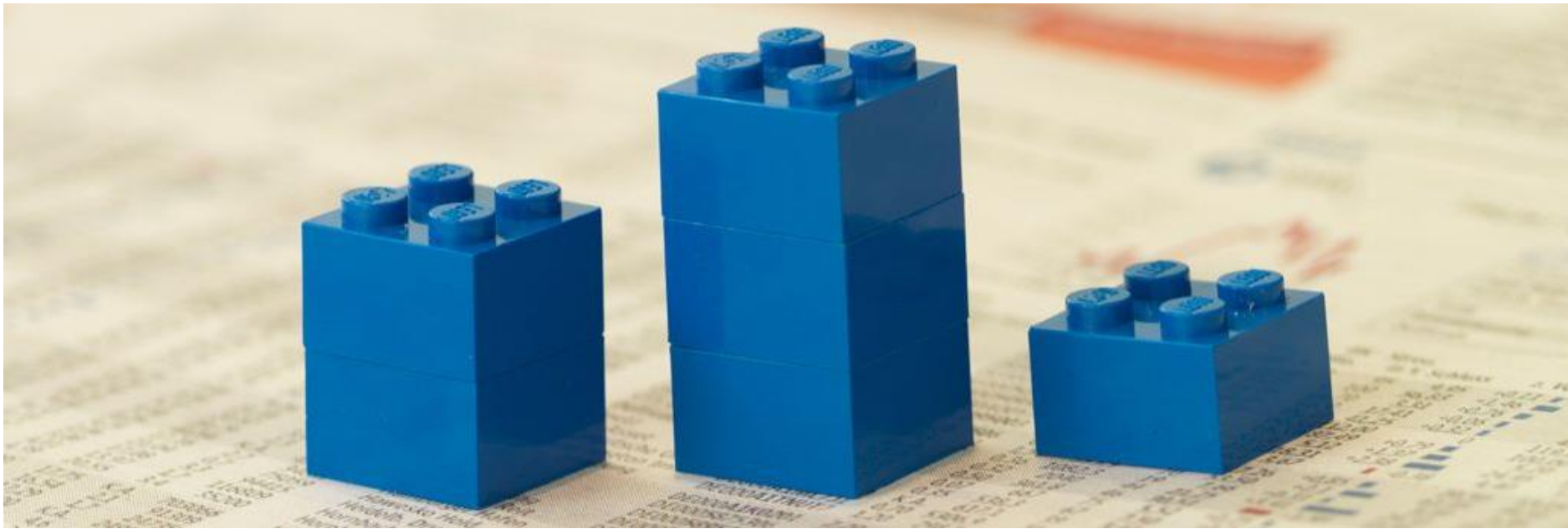
**~15,000
engines**



**~1 bn
flight hours**

**~50,000
shopvisits**

...looking forward to answering your questions!



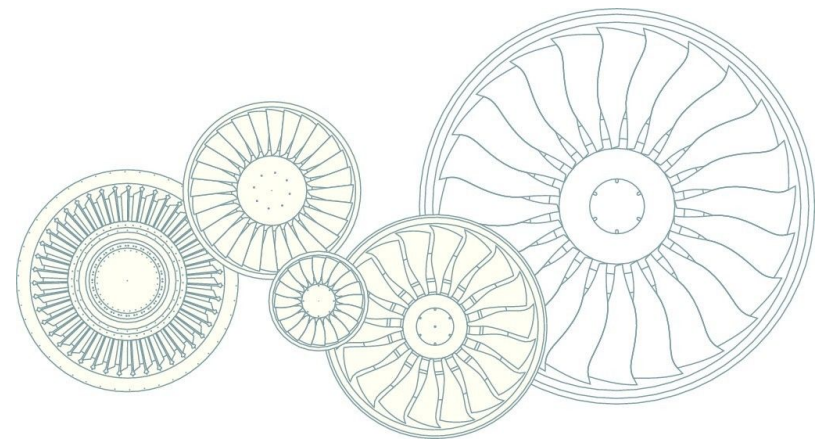
MTU's Financials and Outlook: Ramping up Cash Conversion

Peter Kameritsch, SVP Finance

Munich, 12th December 2017

Contents

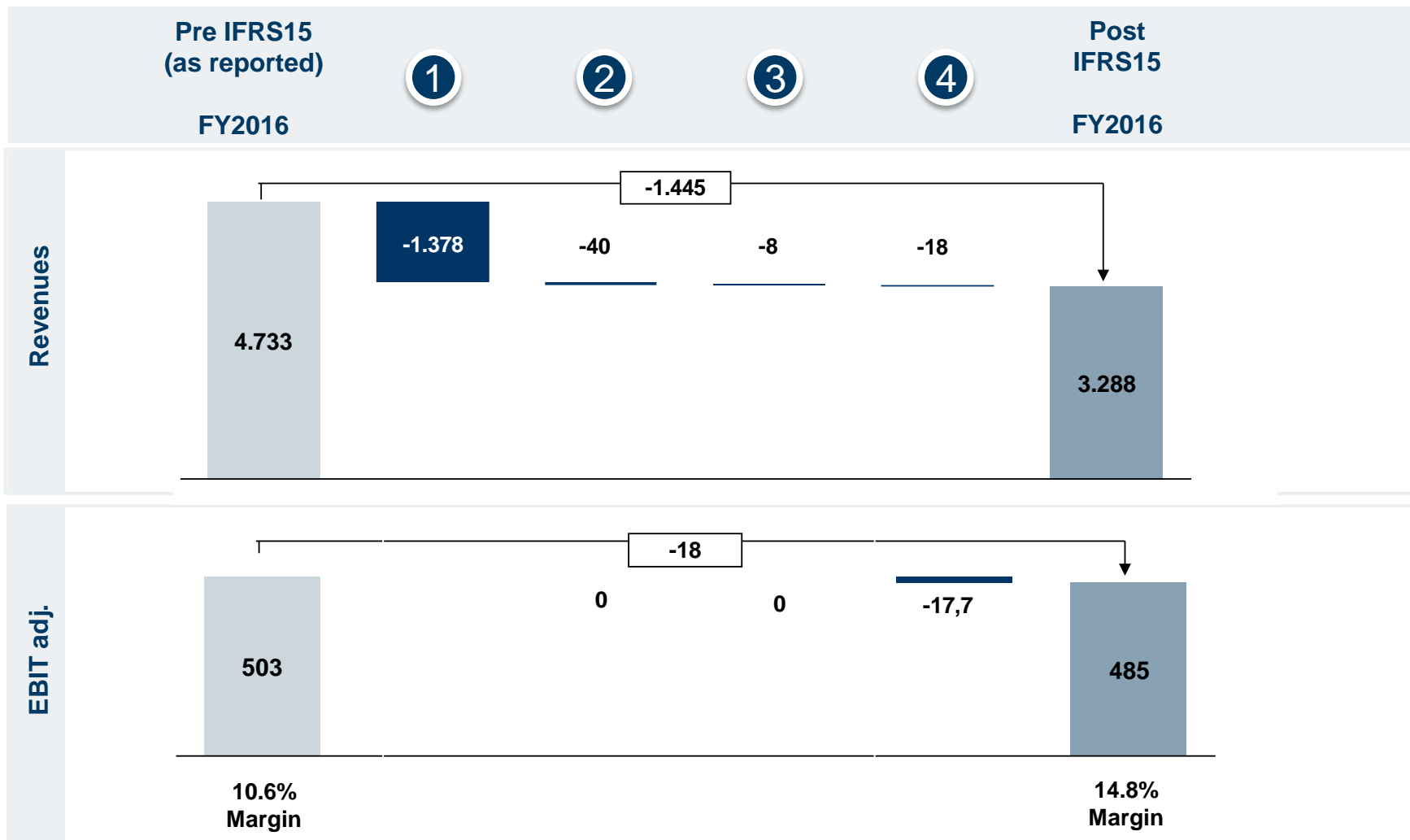
1. IFRS15 @ MTU
2. Updated Order Book Definition
3. Review Investment Phase 2014 – 2017
4. Outlook 2018
5. Long Term Outlook
6. Cash Deployment Strategy



IFRS 15 @ MTU – Implications on MTU accounts

	Main accounting issues	Current accounting	Future accounting
1	Payments to customer (OEM) to compensate program expenses, e.g. concessions	<ul style="list-style-type: none"> Cost of goods sold 	<ul style="list-style-type: none"> Reduction in revenue
2	Capitalized program entry fee and compensation payments for development costs	<ul style="list-style-type: none"> Amortization of capitalized payments over program term within Cost of goods sold 	<ul style="list-style-type: none"> Amortization of capitalized payments reducing revenues
3	Presentation of expensed R&D related to program development	<ul style="list-style-type: none"> R&D expense for payments to customers and in-house efforts 	<ul style="list-style-type: none"> Reduction of Revenue for payments to customers COGS for in-house efforts
4	Timing of revenue recognition (and corresponding COGS)	<ul style="list-style-type: none"> Over-time revenue recognition for military development and production Revenue recognition on delivery <u>from</u> MTU consignment stock 	<ul style="list-style-type: none"> Over-time revenue recognition for ongoing military development only Revenue recognition on delivery <u>to</u> MTU consignment stock

IFRS 15 @ MTU – reconciliation based on results FY 2016 (in € m)



Updated order book definition

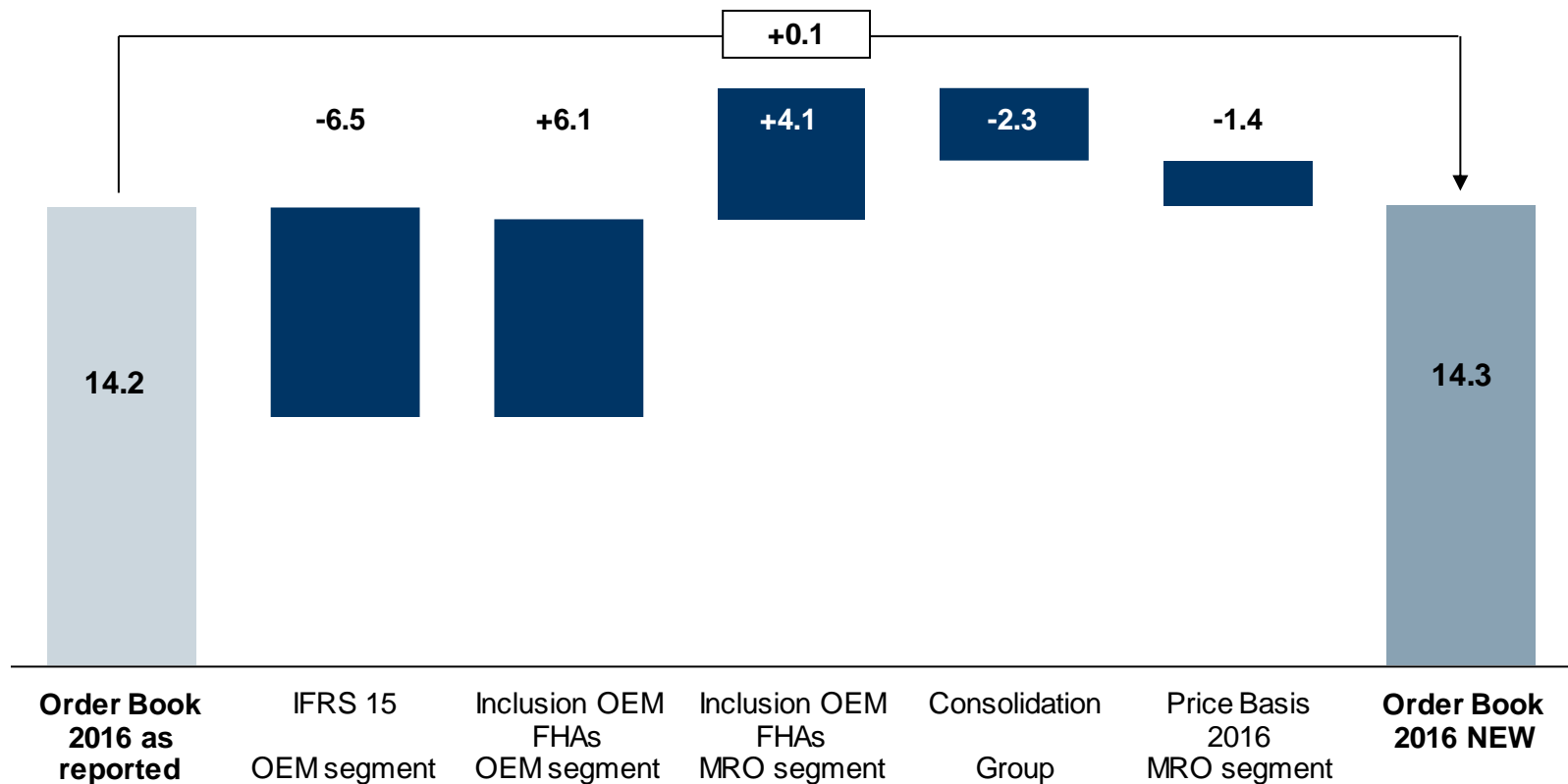
Main changes	Old definition	New definition
IFRS15		<ul style="list-style-type: none"> Order book definition corresponds to IFRS 15 revenue recognition scheme (i.e. net-revenue basis)
IAE/GE long-term service agreements (FHAs)	<ul style="list-style-type: none"> Considered only in MRO for max. 10 years 	<ul style="list-style-type: none"> Consideration in both segments with consolidation on group level Basis: business case
Price basis	<ul style="list-style-type: none"> Consideration of total business case revenues incl. escalation in MRO segment 	<ul style="list-style-type: none"> Price basis is the current year in all businesses

General assumptions:

- Only firm and exclusive contracts considered
- Order book included until expiry of contract

Updated order book definition

Reconciliation based on order book Dec. 31st 2016 (in € bn):



Flashback CMD 2015: Long-term outlook 2014-2025 - our initial commitments

	Investment phase 2014-2017	Consolidation phase 2018-2025
Revenues	Military:  Com. OE:  Com. spares:  Com. MRO: 	Military:  Com. OE:  Com. spares:  Com. MRO: 
EBIT adjusted	Growth in line with revenue	Growth stronger than revenue
Net Income adj.	Growth stronger than EBIT adj.	Growth in line with EBIT adj.
CCR*	Low double digit %	High double digit %

* Cash Conversion Rate = Free Cash Flow/Net Income adj.

...our status today: Stronger aftermarket and delay in new programs

Organic revenue growth	2014A	2015A	2016A	2017G	2014-17	CMD2015
Military:	↑	↓ ↓	↑	↓ ↓ ↓	↓	⊖
Commercial OE:	↑ ↑	→	↓	↑	↗	⊖
Commercial Spares:	↑ ↑	↑	↑	↑ ↑	↑ ↑	⊖
Commercial MRO:	↑	↗	↑ ↑ ↑	↑ ↑ ↑	↑ ↑ ↑	⊖ ⊖

Compared to our initial planning we faced a stronger than expected demand in aftermarket (Spares & MRO) and a slight delay in Military and Com. OE

The bottom line: Change in business mix lead to an overperformance in investment phase

	2014 A	2015 A	2016 A	2017 G	2014 - 2017
EBIT adjusted Margin	~10%	~10%	~11%	~12%	Growth stronger than revenue
Net Income adj.	€ 253 m	€ 307 m	€ 345 m	~€ 420 m	Growth stronger than EBIT
CCR*	17%	22%	24%	~33%	Low double digit %

The better underlying business mix lead to an improvement of EBIT adj. margin in the investment phase already

* Cash Conversion Rate = Free Cash Flow/Net Income adj.


The year 2018: Transition into consolidation phase

Tailwinds will overcompensate headwinds from GTF growth

- **Doubling of GTF volumes drives up OE losses**
- + **Improved margin from OE business due to lower cost per unit**
- + **Ongoing strong growth of aftermarket (Com. Spares & MRO)**
- ± **Retrofit shopvisits for GTF drive MRO revenue but not profits**
- ? **Will tailwind from mature engine types in aftermarket persist**
- + **Slight tailwind from FX**
- + **Less headwind from working capital**

The year 2018: Transition into consolidation phase

2018 Main drivers

Military:	Stable	
Commercial OE:	Up ~30%	
Commercial Spares:	Up mid single digit	
Commercial MRO:	Up in the high teens	
EBIT adj.	Moderate progression	
Free Cashflow	Growth stronger than Net Income adj. (CCR* up)	

* Cash Conversion Rate = Free Cash Flow/Net Income adj.

2019 onwards...further consolidation of EBIT and Free Cashflow

Long-term trends at MTU 2019 - 2025

- + **Further improvement of OE margins due to pricing**
- + **OE growth will stabilize from 2019 onwards**
- + **Ongoing strong growth of spares and MRO business**
- + **Spares sales growth will outperform OE growth**
- **MRO margin will remain under pressure**
- ? **FX might turn into a headwind**
- ? **2020ff shows opportunities to re-grow military business**

Long term outlook 2019-2025 update: Improved Free Cashflow conversion reconfirmed

	Consolidation phase 2019-2025	
Net income adj.	Steady growth	
Working capital	Growing less than revenues <ul style="list-style-type: none"> + No consumption of prepayments + Inventory turns will improve + More FHAs with preferential Cashflow profile 	
CF from investing	Will go into decline <ul style="list-style-type: none"> + Less payments for intangibles + Less spendings for capacity build-up (PPE) + R&D capitalization declines as programs enter into service 	
CCR*	High double digit %	

* Cash Conversion Rate = Free Cash Flow/Net Income adj.

Cash deployment 2019 - 25

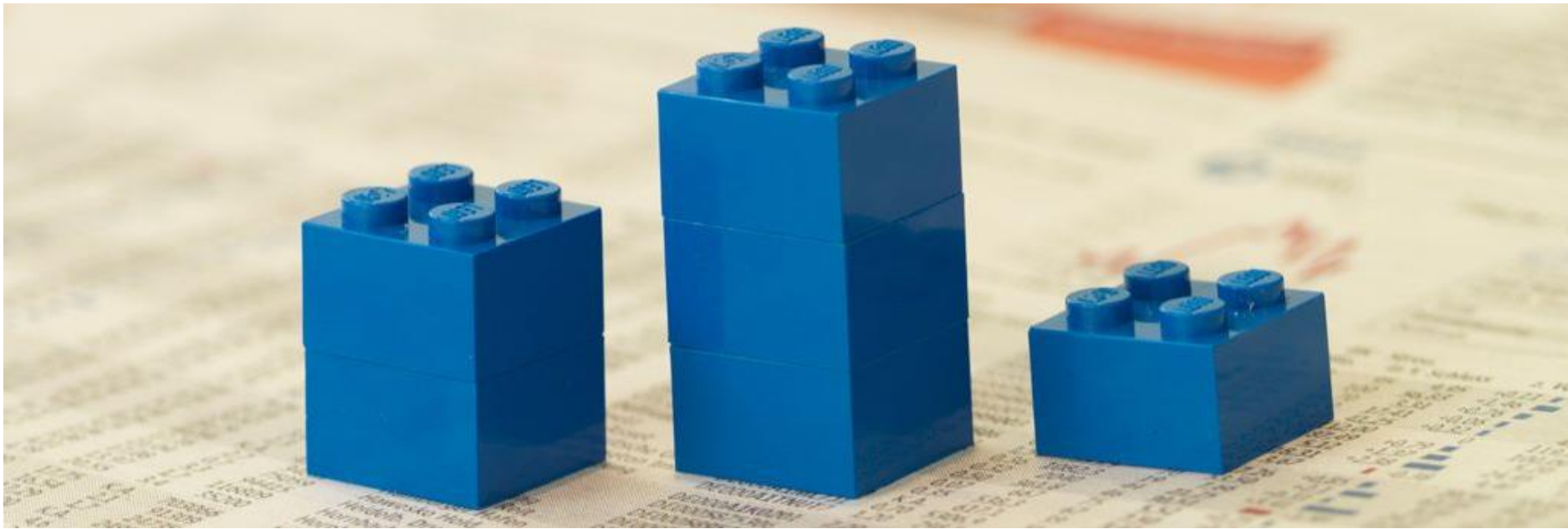
Main targets in Consolidation Phase

- **Keep investment grade rating**
- **Limit de-leveraging**
- **Increased participation of shareholders in returns**
- **Remain prepared for next investment phase after 2025**

**MTU's target is a balanced leverage ratio
in the range of 1 x net Debt / EBITDA**

Cash deployment 2019 - 25: The instruments

Prio	Instrument	Investment phase 2014-17	Consolidation phase 2018 - 25
I	Investment in organic growth	Strong investment in new programs ✓	Limited opportunities ↘
II	Dividend deployment	Growth in line with net income ✓	Growth stronger than net income ↗
III	Share buyback programs	No buyback programs as cash conversion low	Instrument to limit deleveraging ↗
IV	M&A	No suitable targets in aircraft engine market	No new targets expected ↗



...looking forward to answering your questions!



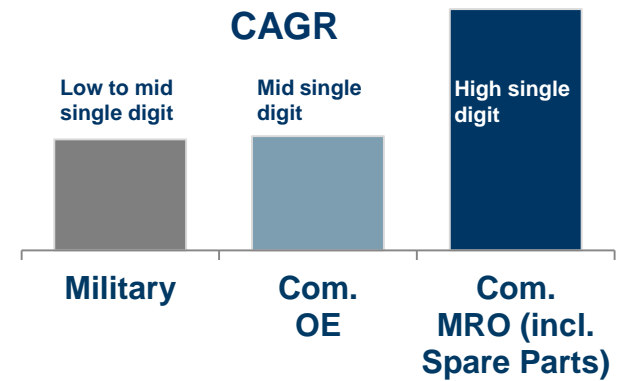
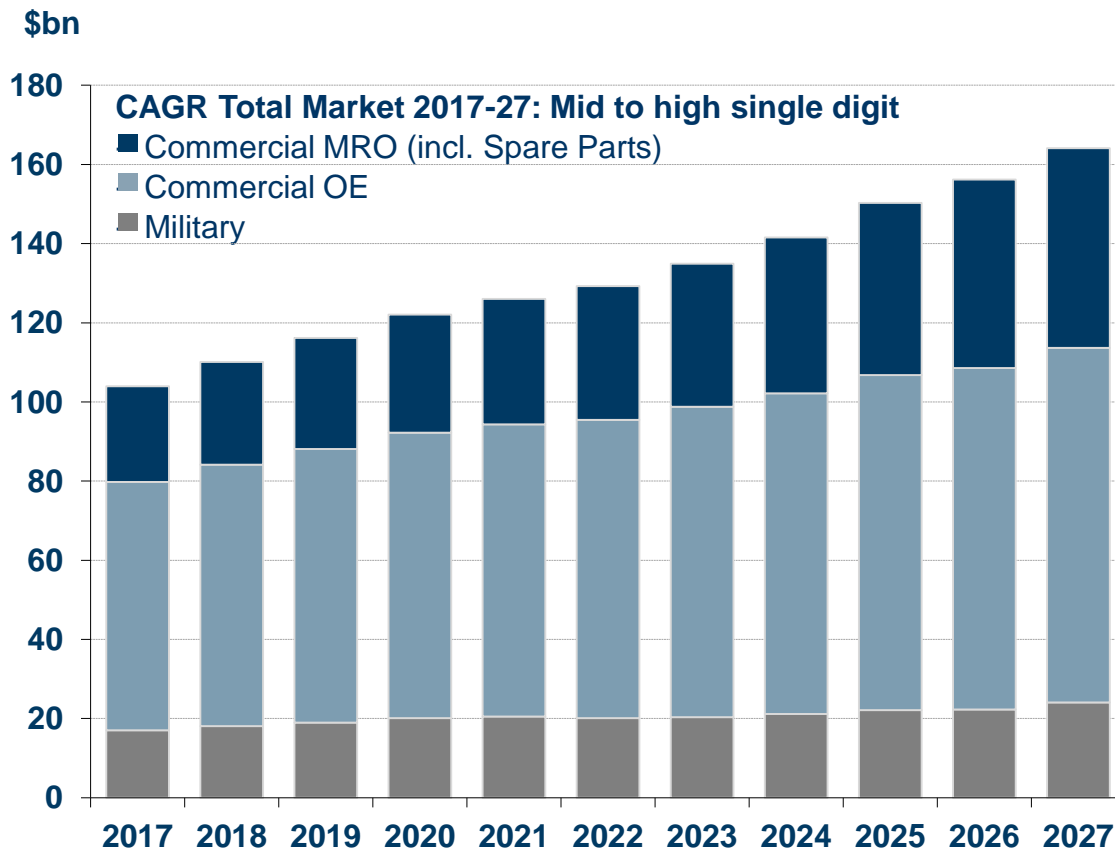
MTU's route 2030

Reiner Winkler, Chief Executive Officer

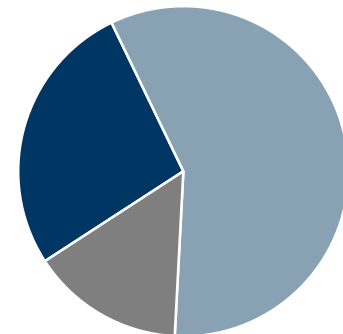
Munich, 12th December 2017

Global aircraft engine market is expected to continue its growth path in the next 10 years

Global aircraft engine market volume (excl. Turboprops)



Breakdown by segment (Next 10 years)

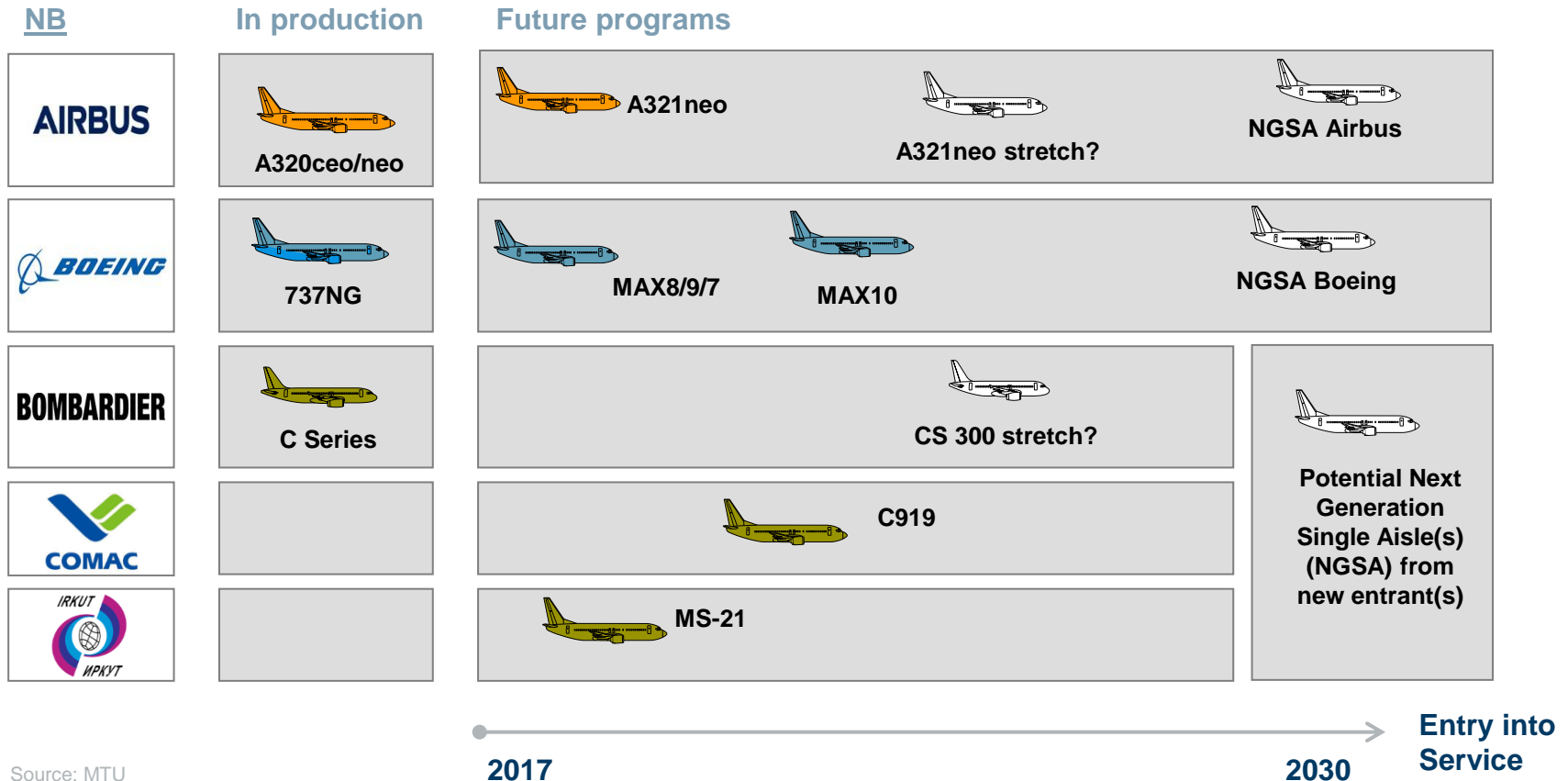


Source: MTU/ASM Mai 2017

Corporate Strategy



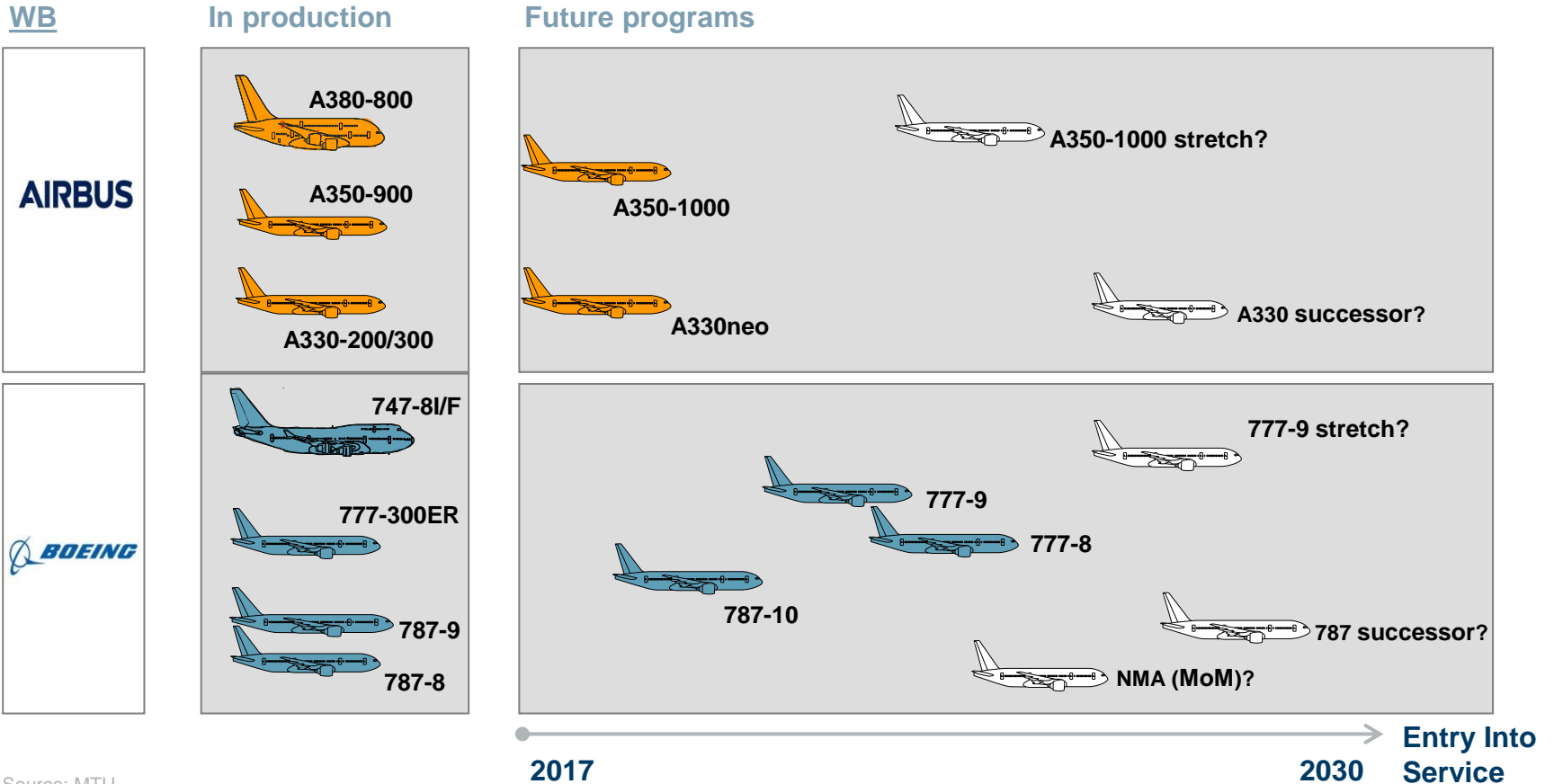
Possible new program opportunities in the narrowbody market



Source: MTU

Window of opportunity for further market share gains opens up in the '30s

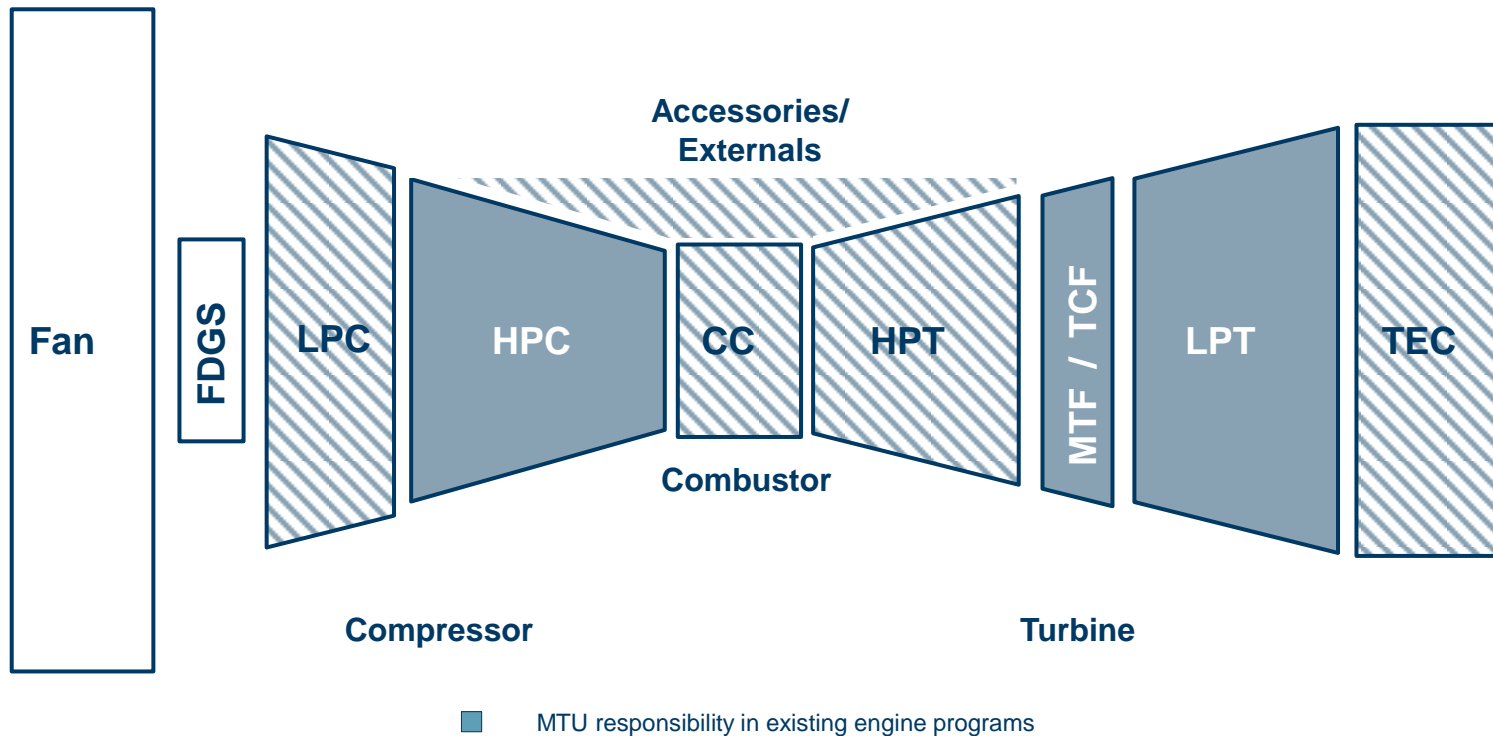
Widebody – landscape seems to be set mid term



Source: MTU

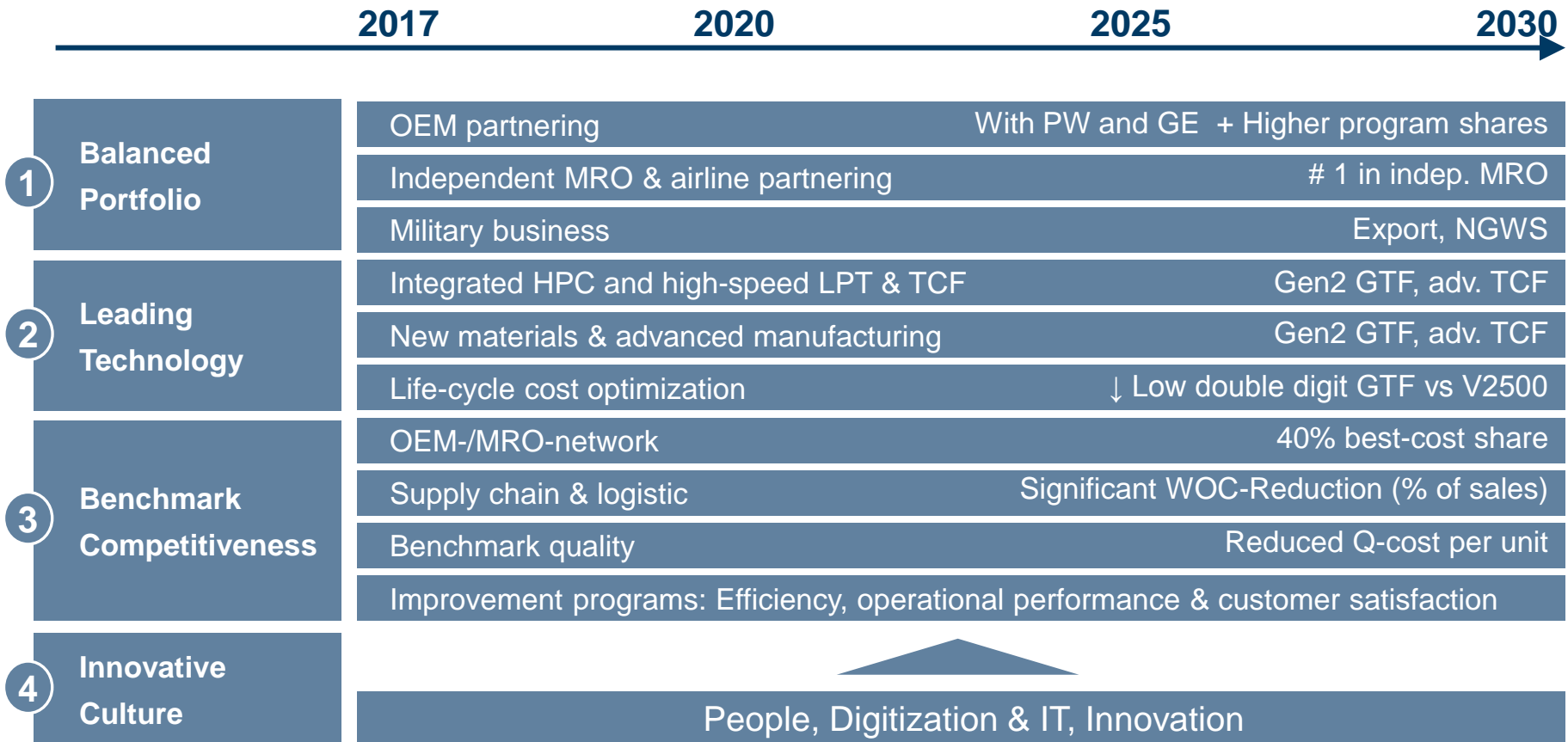
If new midsize aircraft will be launched it might trigger reaction by Airbus

MTU is targeting growth by extending RSP share in future programs



MTU has excellent expertise in various components and is well positioned to increase its footprint in next generation of engines

MTU Strategic roadmap 2030



MRO-/Repair Licenses **GE3000** **GE9X**
GP7000 **TP400** GEnx Succ. **NGWS** PW800 Airline JV **EJ200**
GE90 MRO **GTF** **NMA** Upgr.

Integrated HPC & LPT, TCF Digital
 Adv. LPT, HPC & **Twin** **Coatings** **high-speed**
 LPC Repair Development **JTP-PW**
 Test- & **JTP-GE**
 Simulationszentrum
 Turbo-Electric Engine

PW300 / 500
 0007M
 F404 FJ200
 F414 J200
 F110 J79
 T64-GE
 Gen2GTF
V2500
Genx

Balanced Portfolio

Leading Technology

High temp. light-weight materials CMC
Virtual design & production APD
 Additive Manuf. Bionic Adv. design Inspection VCE

DCIP Blisk
 Production
RAT
 Repair Bidding Repair & Introduction Fukos

Benchmark Competitiveness

Innovative Culture

Startups Digital Augmented office worker
 Lean & agile
top AI
 Employer

EME Efficiency Lean Admin Automation
 Improvements **Logistic 4.0** CF680
Aero TA- Testcell in Munich **OTD** Smart Factory
 Roadmap SFM **Smart Factory**
Benchmark Quality Extension TP+TZ **MRO-** Smart Factory projects

Fail fast learn fast
Innovation Entrepreneurship
 International experienced talents
Digital Transformation
 Always learning eLearning
Diversity and improving
Change Management



...looking forward to answering your questions!

Cautionary Note Regarding Forward-Looking Statements

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