



Investor & Analyst Day 2016 MTU Aero Engines AG

Rzeszów, 14th December 2016



Agenda – MTU Investor and Analyst Day 2016

Time	Agenda	Speaker
9:00 – 9:10	Welcome	Michael Röger, VP Investor Relations
9:10 – 9:30	MTU's Market Environment: The Cycle Continues	Reiner Winkler, Chief Executive Officer
9:30 – 10:40	Technology Leadership Cost Leadership Industry 4.0 @ MTU	Dr. Rainer Martens, Chief Operating Officer
10:40 - 11:00	Coffee Break	
11:00 – 12:20	MTU's Partnership Strategy: Teaming up for Growth	Michael Schreyögg, Chief Program Officer
12:20 - 13:20	Lunch	
13:20 – 14:20	MTU's Financials and Outlook: Reap the Benefits	Reiner Winkler, Chief Executive Officer
14:20 – 16:00	MTU Polska Shop Tour	Krzysztof Zuzak, Managing Director of MTU Polska

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MTU's Market Environment: The Cycle Continues Reiner Winkler, Chief Executive Officer

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Market indicators support our end customers

		2015	2016	
Airline Customers	Oil	\$52	\$43	Continuing low fuel prices
	Traffic growth	+7.4%	+6.2%	stimulates traffic via low fares
	Load factors	80%	81%	Load factors at a historical peak







Market environment supports new engine deliveries as well as engine aftermarket

		2015	2016	
Engine Deliveries	Deliveries	3,130	3,150	Delivery rates are expected to go up
	Backlog	26,030	26,150	Backlog will turn into deliveries
Engine Aftermarket	Fleet growth	+5.0%	+5.2%	Fleet growth has been above average over the last few years
	Park rate	9.0%	7.3%	Low rate benefits mature engines
	Retirements	820	800	Retirements declined since 2014

Source: Ascend, MTU; airliner engines, firm orders only

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MTU's continuous growth is supported by all market segments

OEM market volume (\$bn)

140 CAGR 2016-2026	CAGR	Aircraft segment
120 Total market Mid to high single digit 100	Mid single digit	Widebody (50-120 klb)
60 - 40 -	Mid single digit	Narrowbody (20-50 klb)
20 -	High single digit	Regional jet (13-24 klb)
0	High single digit	Business jet (3-16 klb)
2016 2018 2020 2022 2024 2026		Source: MTU Dec 2016; escalated

MTU projects outperformance of market growth in 3 out of 4 segments

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Over-proportional growth in three out of four segments

Increasing market shares, program shares and new business segments



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Source: MTU internal, Oxford Economics (Oct. 2016)

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Main indicators that influence the resilience of our industry

Demand indicators	Early '0)0s	Mid-la '00s	te	Today	/	Influence on Demand
Backlog	4 yrs	<u></u>	8 yrs		8 yrs		 Higher rates needed to meet orders
Technology status	'90s	٢	'90s	::	'10s	٢	 Step change in efficiency achieved
Cost of debt	high		mid	:	low		 Easier access to financing options for airlines
Oil	30		80	:	50		 Below \$80, continued traffic stimulation

Important key indicators in better shape than at any time in the last 15 years

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Conclusion



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Technology Leadership – Status Development Programs and Production Ramp-up Dr. Rainer Martens, Chief Operating Officer

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First Geared Turbofan engine flights



Bombardier CS100: 16.09.2013



Mitsubishi Regional Jet: 11.11.2015



Irkut MS-21: open



Airbus A320neo: 25.09.2014



Airbus A321neo: 09.03.2016



Embraer E175-E2: open



Bombardier CS300: 27.02.2015



Embraer E190-E2: 23.05.2016

Six maiden flights with Geared Turbofan were accomplished in recent years, with two more on their way

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A very successful new product family





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Deliveries and in-service experience







- Nine airlines are now operating over 30 aircraft powered by Geared Turbofan engines
- The engines have already accomplished more than 17,000 flights
- The dispatch reliability is already very high in early phase
- Early teething issues are fixed motor-to-start time and nuisance messages
- Focus is on
 - o product maturity
 - o delivery performance and stabilizing the supply chain
 - o completion of MRO-readiness.

Over thirty Geared Turbofan aircraft are in-service at nine airlines

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Features and metrics of PW1100G-JM



Specifications and targets have been proven in service

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Update: Development milestones of new engine programs

	PW1500G C Series	PW1100G -JM A320neo	PW1200G MRJ	PW1400G MS-21	PW1900G 2nd Gen E-Jets	PW800 G500 / G600	GE9x B777x	Т408 СН-53К
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First engine to test	~	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
Tested in flying testbed	~	\checkmark	\checkmark	N/A	\checkmark	\checkmark	2017	N/A
Engine certifica- tion	~	\checkmark	2017	\checkmark	2017	\checkmark	2018	2018*
First flight	~	\checkmark	\checkmark	2017	(E190-E2)	(G500)	2018	\checkmark
Entry into service	\checkmark	\checkmark	2018	2019	2018	2017	2020 whole aircraft system after	2019

* T408: Certification of whole aircraft system after flight testing is completed

Steady progress on all platforms achieved

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Update: Production ramp-up Key ramp-up projects



New blisk shop

Progress status

In operation



Optimize rotor and stator production lines Progress status

In operation



Extension of MTU-AE Polska

Progress status

In operation



Engine assembly Progress status

In operation



Logistics building

Progress status

In operation



Shop floor management

Progress status

In operation

Relevant projects have been completed. Infrastructure and equipment are ready for ramp-up

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Update: Production ramp-up Production rates

	 2009	2015	2020
Turbines	800	1150	1850
Compressors	200	320	1580
Turbine center frames	30	380	350
Engine assembly	30	110	290
Total			4070 5%

Volume increases step by step

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Update: Production ramp-up

Geared Turbofan target costs and achievements



- Quality is at a high level: • Production and supplier challenges have been fixed
- Volume is increased step by • step
- Lead times are on track
- Actual costs are within target ۲ costs, further reductions are ongoing

Target costs Efficiency gains p.a. post learner curve

On track to achieve target costs

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Cost Leadership – Production Strategy for Best-Cost Dr. Rainer Martens, Chief Operating Officer

Rzeszów, 14th December 2016



Production strategy for best-cost

Major company sites



Production strategies for OEM and MRO define the most competitive locations worldwide

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Strategic set-up

High-tech



MTU Aero Engines Munich

- Sophisticated parts and production processes
- Automation
- Development of new production technologies
- Know-how to support all MTU sites and suppliers

Mid-low-tech



MTU Aero Engines Polska

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

Raw material, mid-low-tech



Supplier

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

OEM strategic setup ensures a cost-saving allocation of parts in the MTU network

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Highly-automated blisk machining shop in Munich





Target

Key factors

Flexible manufacturing system

- Suitable product portfolio
- Efficient processes and structures
- Stable processes
- High utilization rate
- High flexibility and reaction time



Operating figures (YE 2016)

Labour efficiency [HC] ~1,100 blisks produced 30 employees



Conventional blisk machining Highly-automated blisk shop

High-tech with highest quality standards is produced at a cost-efficient machining shop

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Labour and machining hours trend in Munich





Higher automation makes future production more efficient

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Engineering, operations and services at MTU Aero Engines Polska



Major business areas

Operating figures (YE 2016)

Labour costs per hour



- Engineering and operations
- V2500 IAE upshare: Externals and accessories center
- Services: IT, procurement, production planning, production tooling design
- ~ 110,000 parts produced
- ~ 600 employees thereof 120 R&D



MTU Aero Engines Polska in Rzeszów is a key pillar of the OEM production strategy

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History and company development at MTU Aero Engines Polska



The company was built and continuously expanded in recent years

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Engine MRO at MTU Maintenance Zhuhai Co. Ltd.





Major business areas

- Engine MRO
- On-wing services
- Standard repairs
- **MRO-related services**



Operating figures (YE 2016)

Labour costs per hour

~ 250 engine shop visits

~ 750 employees



MTU Maintenance Zhuhai is an established and well-known independent engine MRO facility in China

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Parts repair at Airfoil Services Sdn. Bhd. (ASSB)



Major business areas



- Repair of high-pressure compressor (HPC) airfoils
- Repair of low-pressure turbine (LPT) airfoils



Operating figures (YE 2016)

Labour costs per hour

~ 440,000 parts repaired

~ 450 employees



ASSB celebrated its 25th anniversary in 2016

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Site selection and benefits

Three-step model for site selection

Step 1: Evaluation of possible countries and regions Step 2: Pre-selection of countries and regions Step 3 "deep dive": Close-pitch selection of 2-3 countries 1-2 regions each



The establishment of companies in Rzeszów, Zhuhai and Kuala Lumpur were based on this model

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Site selection and benefits

OEM benefits and achievements

	2009	2015	2020
Total production rates	1060	1960	4070
Headcount MTU Aero Engines Munich	4430	4410	4470
Headcount MTU Aero Engines Polska	240	560	800

- Total production will grow approx. 15% per year, from 2015 to 2020
- Headcount in Munich will remain stable through increased efficiency and benefits from production strategy
- Headcount at MTU AE Polska will continuously grow. Further service work packages will be transferred

Production strategies foster the ramp-up with growing headcounts only at best-cost sites

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Industry 4.0 @ MTU Dr. Rainer Martens, Chief Operating Officer

Rzeszów, 14th December 2016





Different projects are leveraging all sectors of the supply chain

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Virtual engine – product design 4.0

Technology roadmap key enabler

Virtual Engine	
Goal	 Intensified use and development of highly capable simulation methods for all engineering disciplines as well as manufacturing of engine parts and modules Reduction of cost-intensive testing of materials, parts, modules and ultimately engines
Activities	 ICM²E: Integrated Computational Materials and Manufacturing Engineering DLR TESIG: Testing and Simulation Gas Turbines with a cutting edge facility Digital factory "Fabrik 4.0" including "Logistic 4.0" Additive manufacturing Life cycle engineering Strong enhancement of interdisciplinary working together
	Preparing for the future – balancing design, materials and

manufacturing innovation with cost

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Additive manufacturing – the cornerstone has been laid

Very promising new technology

Commercial & Military Business	Boroscope eye	Sealing carrier	Bearing chamber
Cost reduction		Up to 30%	
Weight reduction		Up to 10%	
Certification	2013 🗸	2019	2020

Additive manufacturing offers distinct functional and cost-reduction potential

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Conclusion

- Geared Turbofan engine generation has entered service and meets all targets
- Development milestones for all new engine programs are secured
- Several new programs are about to enter service or already in-service
- Major ramp-up projects done. Quality, volume and cost on track
- OEM and MRO ramp-up will trigger headcount increase at best-cost sites
- Production and sourcing strategies define future roadmaps
- Industry 4.0 projects will foster technological leadership





MTU's Partnership Strategy: Teaming up for Growth Michael Schreyögg, Chief Program Officer

Rzeszów, 14th December 2016


MTU's strategic objectives in a long term business environment



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MRO

General Electric: Reliability in a long-term partnership

Focusing on widebody segment and US military market access



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MRO

Pratt & Whitney: Exclusive collaboration

Increase our market presence and expand our responsibilities



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Return on investment in the commercial engine business



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MTU Aero Engines partnering with OEMs

Well established in all market segments







- Excellent technology
- Benchmark production costs
- Reliable partner in terms of delivery and quality
- Long-term relationship
- Market leader in widebody segment
- Access to US military business

- Strategic collaboration
- Improving market position in business / regional jet and narrowbody segment

Providing leading technology Ensuring growth & market access in all business segments Balanced portfolio & risk mitigation

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MTU Aero Engines cooperating with the German Armed Forces



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MTU Aero Engines and the German Armed Forces

Saving cost, time and resources



Com.



- Customer since 1956
- Private Public Partnership since 2002
- Employees: 75% MTU; 25% Armed Forces

- Engine, module and parts repair
- Technical and logistical support
- Spare parts provisioning and stock management



Bringing a commercial approach to military engine programs Sharing technical know-how and military operational experience



Com.

MRO

Evolution of our MRO service portfolio

Increasing airline demand for full MRO service packages



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MTU Maintenance and Lufthansa Technik

Best-cost for engine parts repair







Dedicated to parts repair – now and in the future

*company was founded in 1991 by MTU and Malaysian Airlines



Com.

MTU Maintenance Zhuhai Ltd. and China Southern

A success story







#1 MRO shop in China aiming to expand customer base and grow narrowbody portfolio



MTU Maintenance and JetBlue

Low-cost airline supported with t(h)rust



- Contract in place since 2005
- Reliable fleet management on a flight-by-hour basis
- Offering full service package

>500 Shopvisits

11

years

- Market leader for V2500
- More than 300 engines covered
- Joint capacity planning approach

Driving cost-savings for airline and supporting MTU's strategy as independent MRO provider



Engine lease JVs with Sumitomo



MRO

Complementing each other's business model





Rapid recognition in lease business Potential for further growth



MRO

Partnerships are necessary to remain competitive in commercial MRO

OEM cooperation



Airline cooperation



Develop current cooperation
Investigate future cooperation potential

Goal

Provide cost-efficient, industrialized MRO
Leverage OEM network

GE Aviation

Sumitomo Corporation

CHINA SOUTHERN AIRLINES

Lufthansa Technik

AIRFO/L Services Remain #1 provider with focus on customers
Provide integrated life cycle services

Partner





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We continue to develop strong partnerships



MRO

MTU and Lufthansa Technik explore a maintenance joint venture

Background

- MTU and Lufthansa Technik participate in the PW1000G aftermarket network
- Additional capacity for disassembly, assembly and test work in a cost competitive environment
- For MTU, the PW1000G is a major growth program in the commercial engine business
- For Lufthansa, the PW1000G is an integral part of the fleet development

Main contribution to MTU's strategy



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- Shared investments
- Synergies due to combined volume



- Shared buildup effort
- Fast ramp-up

High volumes and high industrialization in a low-cost environment will generate the most efficient MRO shop for PW1000G in the future



Opportunities @ MTU to ensure future growth



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Pillars of MTU Strategy



All of MTU's partnerships with their different characteristics contribute to MTU's growth strategy

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MTU's Financials and Outlook: Reap the Benefits Reiner Winkler, Chief Executive Officer

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Pillars of MTU Strategy



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Head and tailwinds 2017

Organic Revenue Growth

Military:	Down mid single digit	Ţ
Commercial OE:	Up high single digit	行
Commercial Spares:	Up mid single digit	
Commercial MRO:	Up in the low teens	行行
Tailwind from US\$		
Slight headwind from mix		

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Long-term outlook 2014-2025: Status CMD2015

	Investment phase 201	4-2017	Consolidation phase 20	18-2025
Revenues	Military:		Military:	Ś
	Com. OE:	分	Com. OE:	分
	Com. spares:	分	Com. spares:	
	Com. MRO:	谷谷	Com. MRO:	分分
EBIT adjusted	Growth in line with revenue		Growth stronger than re	evenue
Net Income adj.	Growth stronger than E	BIT adj.	Growth in line with EBIT a	adj.
CCR*	Low double digit %		High double digit %	

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

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Investment phase 2014 to 2017 – well on track to deliver

Organic revenue growth	2014 A	2015 A	2016 G	2017 G	CAGR
Military:		++	\Box	\mathbf{Q}	\Rightarrow \checkmark
Commercial OE:		•			☆ 🗸
Commercial Spares:			公	公	☆ ✓
Commercial MRO:		-		公	\$\$ ✓

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Investment phase 2014 to 2017 - well on track to deliver

	2014 A	2015 A	2016 G	2017 G	2014-2017	
EBIT adjusted Margin	~10%	~10%	~11%		Growth in line with revenue	✓
Net Income adj.	€253m	€307m	~€340m		Growth stronger than EBIT	✓
CCR	17%	22%	21%		Low double digit %	✓



Revenue growth in commercial OE



Growth of commercial OE business secured through extensively filled order books and stronger diversification

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Revenue growth in commercial spare parts



New engine programs (GP7000, GEnx, GTF) will join the V2500 to significantly drive future spare parts growth

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Revenue growth in military



Stronger demand in aftermarket/services and T408/GE38 compensates for decline in EJ200 production

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Revenue growth MRO

Today (2015)

Future (2025)



Independent business will remain MTU MRO's revenue driver while OEM & airline cooperation business gains importance

*) MTU Zhuhai is consolidated at equity thus not part of MTU's group reported IFRS revenues.. JV's Net Income part of the group's EBIT line.

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ter income part of the group's Ebit line.

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Long term outlook 2018-2025 update: Improvement of profits and cashflow reconfirmed

	Consolidation phase 2018-2025	
Revenue	Military (ex slightly down 🔅):	
	Com. OE:	$\hat{\mathbf{U}}$
	Com. spares:	分
	Com. MRO:	谷谷
EBIT adjusted	Growth stronger than revenue	
Net Income adj.	Growth in line with EBIT adj.	
CCR	High double digit %	

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MTU's cash deployment strategy

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 v	Growth stronger than net income	
Ш	Share buyback programs	No buyback programs as cash conversion low	Instrument to Iimit deleveraging	
IV	M&A	No suitable targets in aircraft engine market	No new targets	

IFRS 15 – Summary

- IFRS 15 "*Revenue from Contracts with Customers*" has been endorsed by the EU in October 2016, becoming effective in 2018
- It replaces all existing IFRS revenue recognition requirements
- IFRS and US GAAP revenue standards are substantially aligned
- The new framework focuses on contractual performance obligations and on allocating a transaction price to those obligations (5-step model)

Step 1	Step 2	Step 3	Step 4	Step 5
Identify the contracts with the customer	Identify the performance obligations in the contract	Determine the transaction price	Allocate the transaction price	Recognize revenue when a performance obligation is satisfied

- Core principle: Revenue should be recognized as an entity transfers control of goods or services
- No impact on cash flows



IFRS 15 @ MTU

Preliminary assessment of implications on MTU accounts:

Main accounting issues	Current accounting	Potential future accounting
Concessions	 Cost of goods sold 	 Reduction of revenue when underlying engine sales occur
Program entry fee and compensation payments for development costs	 Capitalization as intangible asset Straight-line amortization over the useful life within costs of goods sold 	 Payment to the customer capitalized as "other long-term assets" Reduction of revenues over program term depends on timing of revenue recognition
Flight Hour Agreements	 Recognition of revenue when shop visits occur 	 No change

No material impact on profit and cash recognition expected from IFRS15

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Market in excellent shape

Better position than ever

GTF on spec

Acceleration of EBIT and FCF growth

...looking forward to answering your questions!

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