

A large, dark, curved shape representing a planet or moon, with a bright sun or star rising behind its horizon on the right side, creating a lens flare effect.

# FACC // CAPITAL MARKETS DAY

DAY 1 – November 22, 2018

Presentations

A large, dark planet is shown in the background, partially illuminated by a bright sun on the right side. The sun creates a lens flare effect, with several rays of light extending outwards. The planet's surface is mostly in shadow, with a thin, bright line where the sun's light hits it.

# FACC // CAPITAL MARKETS DAY

Global Markets & Strategy

Robert Machtlinger - CEO

A low-angle, upward-looking photograph of several modern glass skyscrapers against a blue sky with scattered white clouds. A white commercial airplane is flying in the upper center of the frame. The left side of the image is partially obscured by a white, curved graphic element.

# GLOBAL MARKET FORECAST

# GLOBAL MARKET FORECAST

Airbus and Boeing released their Global Market Forecast 2018

- 2017 Aerospace Industry results have been another “Record Year”
- Market consensus re-confirms long term growth to continue
- World annual traffic will double every 15 years
- 2018 – 2037 demand for 37.400 new commercial airplanes
- Market trends continue to develop
  - Growth shifts to Asia Pacific
  - Efficiency, Cost & Performance remain top line requirements
  - Single Aisle market dominating market rates and market value



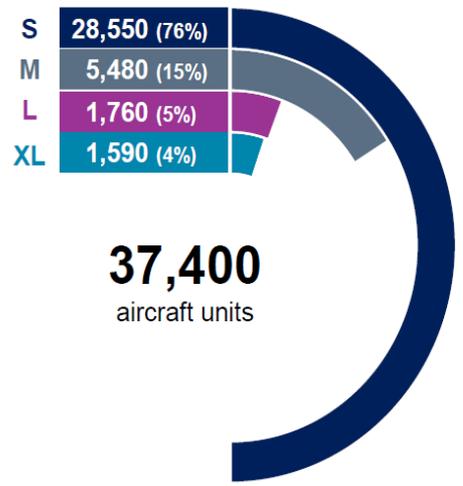
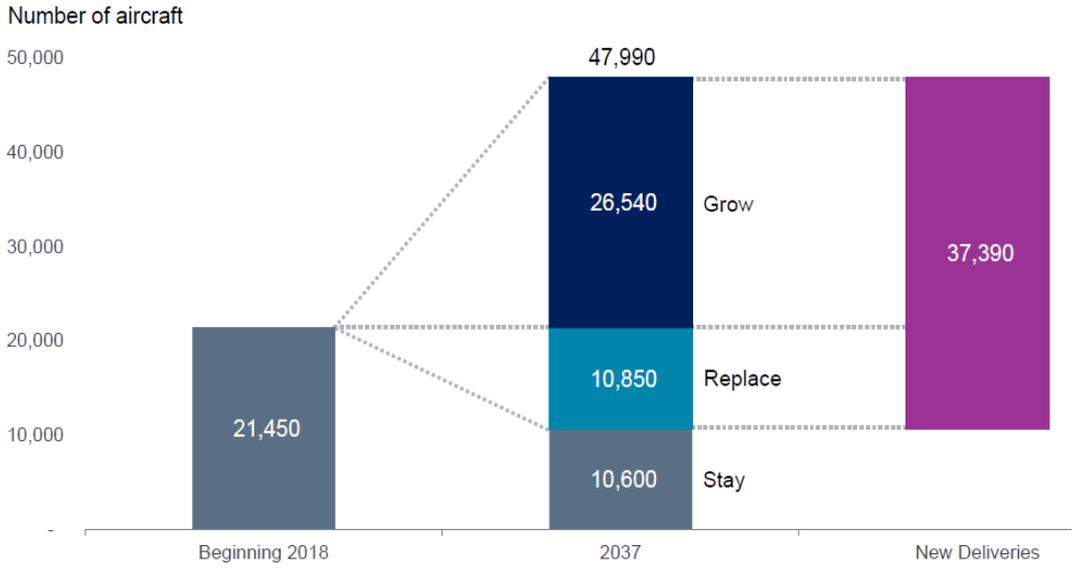
# GLOBAL MARKET FORECAST

2017 vs. 2018 comparison of market development KPI's

	GMF17	GMF18	
<b>GDP</b> 20-year avg. growth	2.8%	2.8%	+US\$ 2.9 trillion <i>at end of period</i>
<b>RPK</b> 20-year avg. growth	4.4%	4.4%	+2.4 trillion RPK <i>at end of period</i>
start <b>FLEET</b>	20,500	21,500	+1,000
end <b>FLEET</b>	42,530	47,990	+5,460
20-year NEW <b>DELIVERIES</b>	34,900	37,400	+2,500

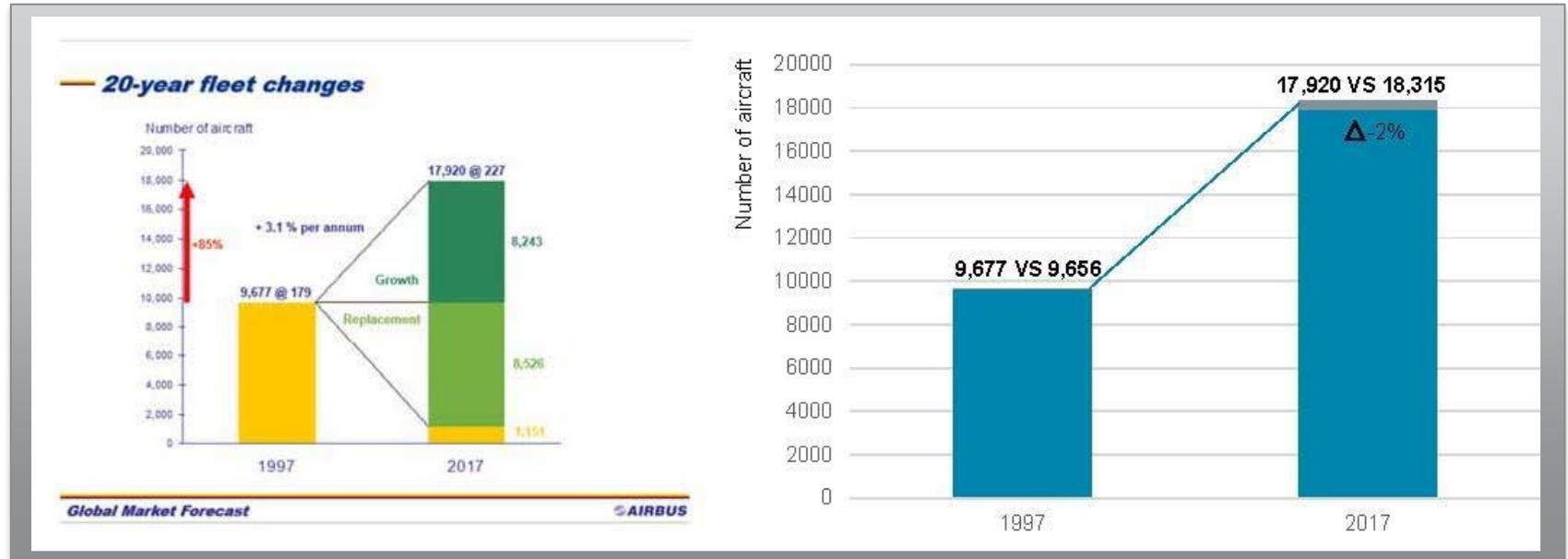
# GLOBAL MARKET FORECAST

Airplane demand increased from 34.900 to 37.400



# GLOBAL MARKET FORECAST

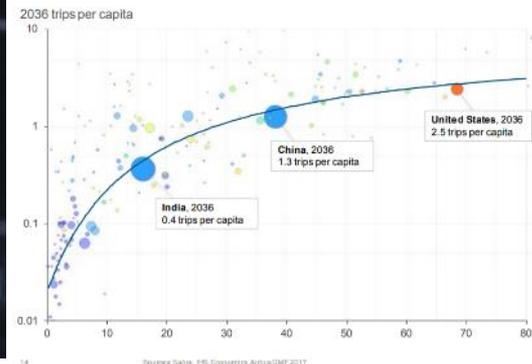
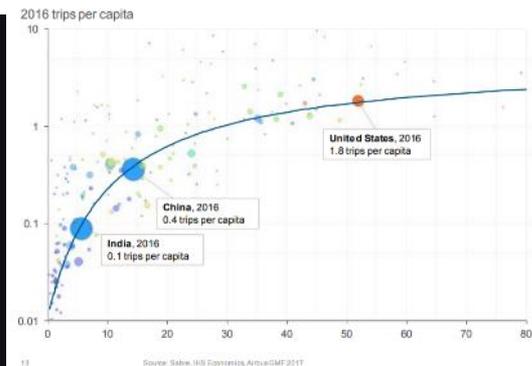
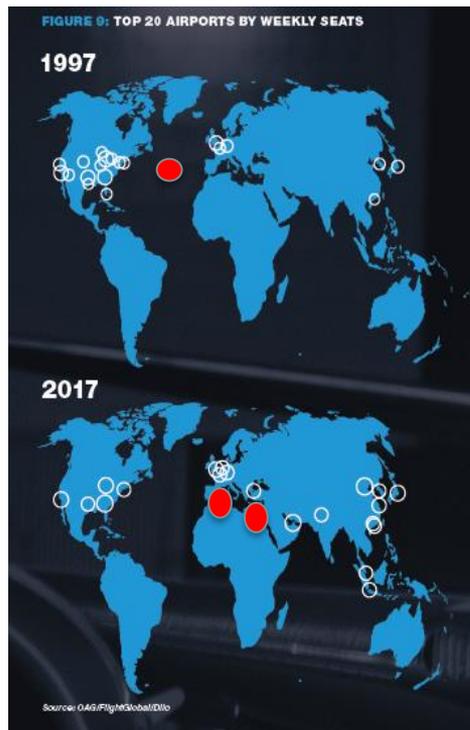
Is a Airplane demand of 37.400 real and how accurate are forecasts



# GLOBAL MARKET FORECAST

The growth market shifts from “West to East”

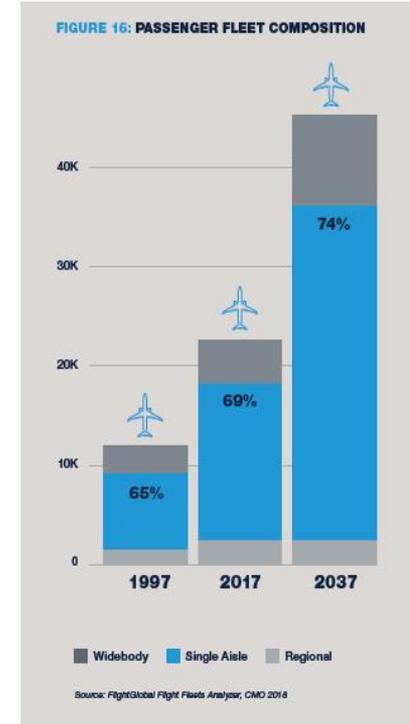
- The center of global GDP and RPM shifts south and east west
- Asia Pacific region will grow the most
- In 2017, 30% of emerging country population took a flight
- In 2037, 85% of emerging country population will take a flight
- US and Europe will grow too, but less intense



# GLOBAL MARKET FORECAST

In the past 20 years, there was a shift in airplane size demand

- The travel desire of people is changing
- Point to Point travel is in favor of using hub systems
- Between 1997 and 2017, the demand in Single Aisle airplane increases by 4%
- This trend is expected to continue in the next 20 years
- Further, single aisle seat capacity is growing



# GLOBAL MARKET FORECAST

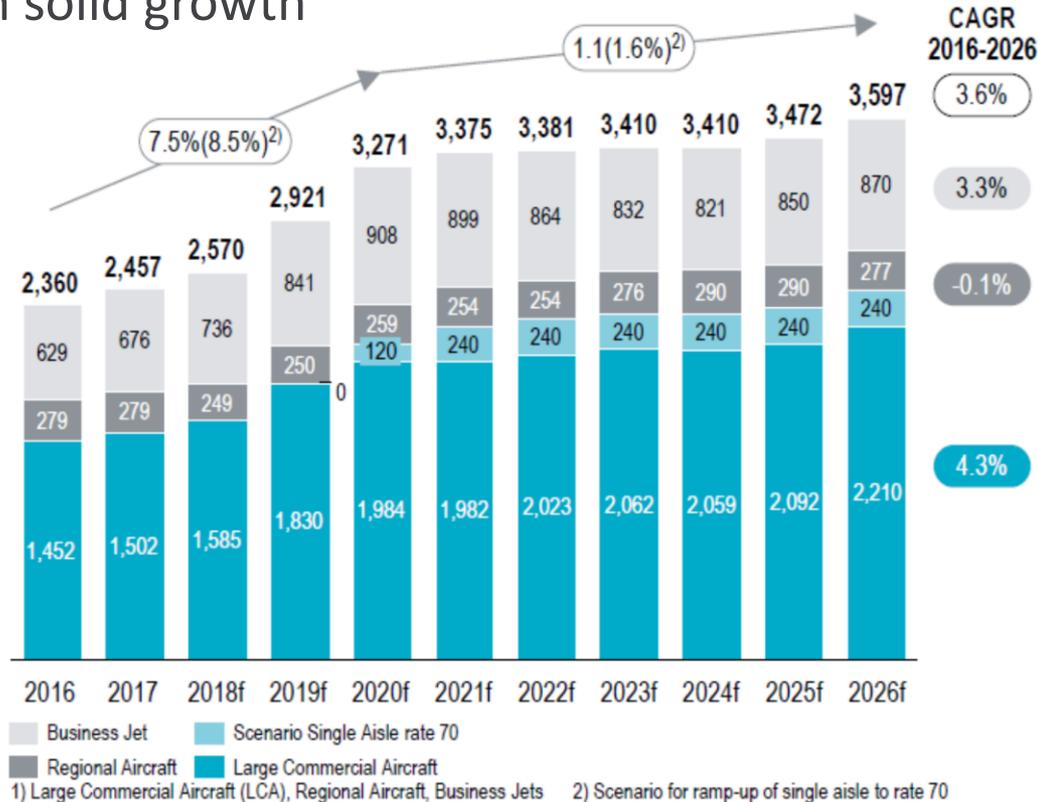
Production & delivery rates with solid growth

- Commercial Aircraft:** Dynamic increase until 2020 (mostly driven by several ramp ups) and a more moderate growth afterwards

→ Overall growth driven from growing GDP particularly in emerging markets.

- Business Jets:** benefiting from increasing GDP until 2020 with stable rates afterwards

- Regional Jets:** Constant over time



# GLOBAL MARKET SUMMARY

- Long Term Forecast confirmed by OEM's
- Air traffic will double every 15 years
- Airplane model ramp ups support higher growth rates up to 2020
- Approx. 40.000 airplanes forecasted between 2018 and 2037
  - Narrow Bodys drive rate and value
- Geopolitical Dynamics to be considered
  - Global Footprint is enabler for growth



# CUSTOMER TRENDS & EXPECTATIONS



# FOUR OEM MEGA TRENDS

The Aerospace Industry will reshape ...

- Changing OEM landscape
- Next Generation Airplane Requirements
- New Supply Chain Model
- Strategic Partnership Approach and Life Cycle Service

# TREND 1: CHANGING OEM LANDSCAPE

The industry will further consolidate

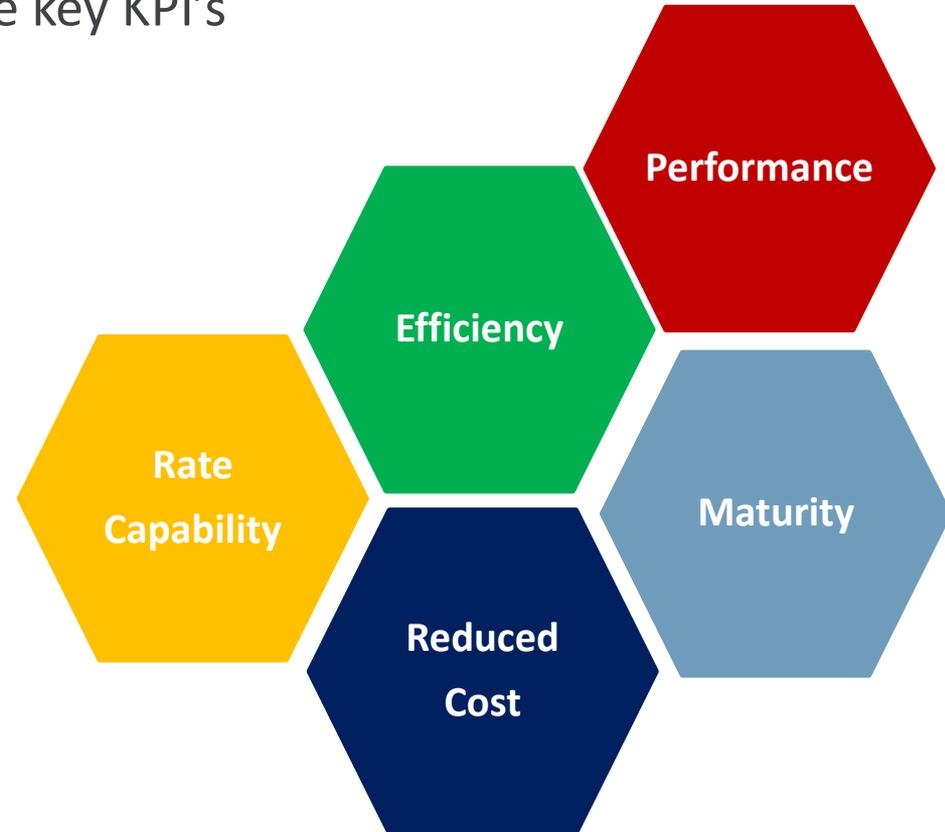
- AIRBUS / Bombardier vs. BOEING / Embraer
  - OEM Customer base further reduced
  - Cross Company alignment will increase pressure on supply chains
  - Market dominance from both will further grow
  
- COMAC market entry with airplane family
  - 3<sup>rd</sup> player in the industry
  - Airplane family concept under set up (ARJ 21, C919, CR929)



# TREND 2: NEXT GENERATION REQUIREMENTS

Cost, performance and efficiency are key KPI's

- Efficiency improvements and electrical systems
  - Laminar Flow, Bionic Surfaces, Electrical Engines
- Rate capability and Automation
  - Design for automation and digitalization
  - Life cycle monitoring
- Cost Reduction through new technologies
  - Material → Thermoplastics, SMC, ...
  - Process → Oven, Presses, 3D printing, ...

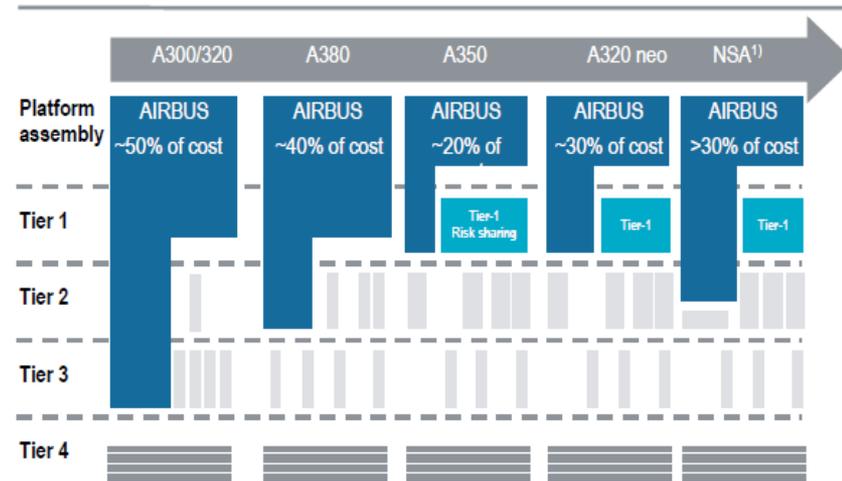


# TREND 3: NEW SUPPLY CHAIN MODEL

Vertical integration, innovation and global sourcing

- Increased size of scope of the work packages triggered consolidation within the Tier 1 industry
- OEMs have experienced
  - negotiation power from consolidated Tier 1 suppliers
  - delivery issues which resulted in resourcing as well as insourcing of work packages
- OEMs counter-reaction
  - Set-up alternative sources
  - Insourcing & Vertical intergration

Supply chain evolution – Airbus as example



# TREND 4: SERVICE & PARTNERSHIP

## Global Footprint, IP Sharing and Life Cycle Support

- Strategic Partnerships
  - Joined R&T and Product Development
  - IP sharing and participation
  - Global sourcing to support growing market demands
  - Strategy alignment for program life time support



# OEM CUSTOMER TRENDS AND EXPECTATIONS

- OEM Customer Base will further consolidate
- Supply Chain model is in a transition phase
- Innovation, Globalization and Cost Competiveness are key to increase market share
  - Provide technology for future airplane applications
  - Global production network to support OEM's in growing markets
  - Partnership and OEM alignment on defined work packages



# FACC VISION 2020 AND BEYOND



# FACC STRATEGY

From 2020 into the next decade ...

- Vision 2020 Execution
- Mission critical factors
- Preparation for the next decade

# OUR MISSION

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WE DESIGN FUTURE MOBILITY  
WITH TOMORROW'S MATERIALS

# VISION 2020 EXECUTION

... we are on track to fulfill our commitment



- **1 Billion Euro Sales** in FY 2020/21
- **Preferred Tier 1 Partner** to all OEMs
- **Technology-, Cost & Quality Leadership**
- **Sustainability** throughout increasing Profitability
- **Increasing Shareholder Value** from a constantly growing market share and innovation

# FACC AT A GLANCE // SPOT LIGHT

100% 

Aerospace composite  
lightweight

2 

Engineering centers  
in Austria

5 

Plants

Global 

Network of engineering- &  
production locations in 13 countries

Tier 1

Partner for all  
aerospace OEMs

20% 

YoY average growth  
EUR 750,7 Mio. Sales in 2017/18

3,500 

Employees worldwide

Nr. 1 

Largest aerospace  
company in Austria

100%

Export

All 

Represented of every  
modern aircraft

# FACC - WELL POSITIONED IN THE INDUSTRY

## The Best for The Best

- FACC provides turn key solutions to all OEM's
- Our value chain covers
  - R&T
  - Engineering & Certification
  - Global production
  - Worldwide MRO Coverage



# UNIQUE IN PRODUCTS & TECHNOLOGY

Every second, FACC technology & innovation takes off with 100% dispatch reliability



**AEROSTRUCTURES**

**ENGINES & NACELLES**

**CABIN INTERIORS**

**AFTERMARKET SERVICES**

# FACC STRATEGY - FACTORS

**... that are supporting our execution of profitability  
and growth**

- 1. Automation and Execution of cost reduction  
initiatives***
- 2. Organic- and non-organic growth to  
increase market share beyond aerospace  
growth***



# FACC STRATEGY / FACTORS

## Automation and further execution of cost reduction initiatives

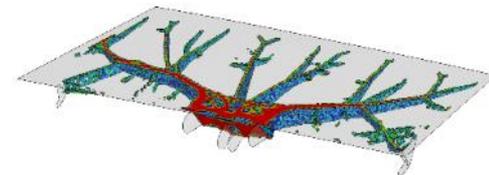
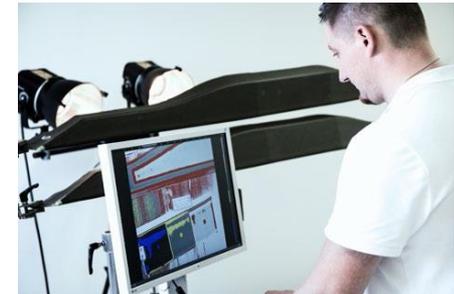
- Internal efficiency targets are set for EBIT step changes
- 8% YoY increase of production efficiency
- 1,5% YoY constant material cost decrease
- Inventory reduction measures to reduce Working Capital
- Continued introduction of automation & digitalization
  - Achievement: 150 million USD sales output increase between 2016 and 2018 with same staff
  - Significant automation projects are in pipeline
- Low cost sourcing to reduce labor cost ratio
- Fixed cost control to benefit from growing volume effects



# FACC STRATEGY FACTORS

... for organic and non-organic growth

- Innovations that provide technology for next generation airplanes
  - R&T Projects with customer in the pipeline
  - Increasing network with partner and universities
- Organic Growth
  - Benefit from 1 billion new contract boarded in 2017 and 2018
  - Increase market share from getting new contracts
- Non-organic Growth
  - Pursue M&A to increase FACC core business
  - Look after bolt on technology or vertical integration
- New market entry
  - Increase FACC MRO business to meet 100 Million target in 2022
  - Front runner in new mobility systems



# FACC ROADMAP 2030

... a more sizeable and global technology & service company providing mobility solutions

- Further system integration capability
  - Aerostructures Primary Structure
  - Cabin System and market leadership in Business Jet Interior
  - Nacelle Systems & Engine Composite Casings
- Grow twice as fast as the overall market
- Increase footprint in all important markets
- Non-organic growth to increase market share and competence

# URBAN AIR MOBILITY

FACC as a front-runner in advanced  
mobility solutions



# URBAN AIR MOBILITY (UAM)

Three key topics



## **A huge opportunity**

UAM business models are poised to take off and disrupt mobility markets and value chains

## **A multidisciplinary challenge**

Setting up UAM operations requires technology and infrastructure development involving a wide range of industries

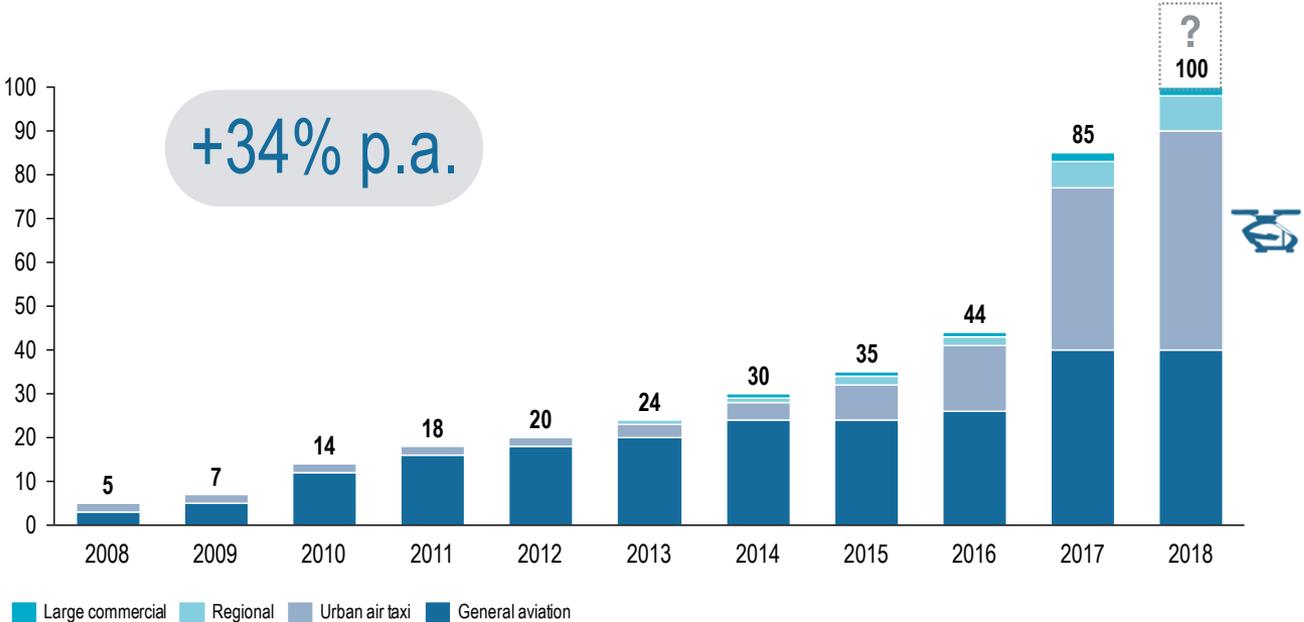
## **Things are getting real**

First movers have already launched projects

# DEVELOPMENT PROGRAMS

...the pace of program development is increasing

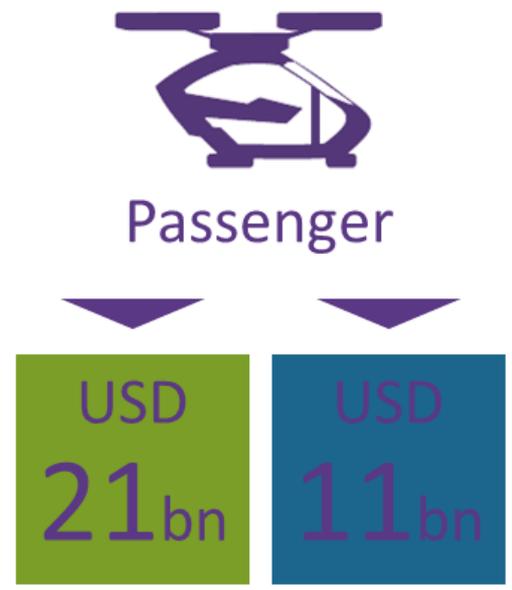
Known developments by date of announcement (cumulative, 2009-May 2018)<sup>1)</sup>



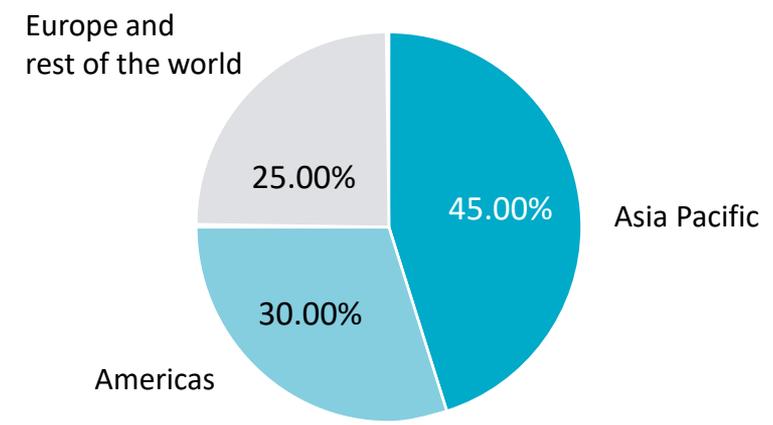
1) Excluding UAVs and purely recreational developments

# UAM IS EXPECTED TO BECOME A SIGNIFICANT MARKET

... consisting of hardware, transportation of PAX and related services



Regional split of intra city market [%]



# URBAN AIR MOBILITY

## FACC's and eHang Strategic Partnership

### Joint Development

FACC engineering, certification and technology leadership in lightweight composite systems supports industrialization of product

### Step by Step penetration of market

Cargo vehicle delivery for oil platform support and other mission considered first. Certification for further use to follow with market readiness in 3-5 years

### Market penetration

Step by step increase of units built from 300 in 2021 up to > 1.000 p.a. before 2025



An aerial view of a city at sunset. The sky is a warm, golden-orange color. In the foreground, a drone is flying towards the right. The city skyline is visible, featuring a prominent tall, spired Gothic cathedral on the left and a large, domed classical building in the center. Other buildings and a construction crane are visible in the background.

INNOVATION IS OUR  
DESTINATION

A dark, curved horizon line of a celestial body, possibly a planet or moon, is shown against a black background. A bright light source is positioned just behind the horizon on the right side, creating a lens flare effect with several rays of light extending outwards.

...BEYOND HORIZON

A large, dark planet is shown in the background, partially illuminated by a bright sun on the right side. The sun creates a lens flare effect, with rays of light radiating outwards. The planet's surface is mostly in shadow, with a thin, bright line where the sun's light hits it.

# FACC // CAPITAL MARKETS DAY

Operational Excellence

Andreas Ockel – COO

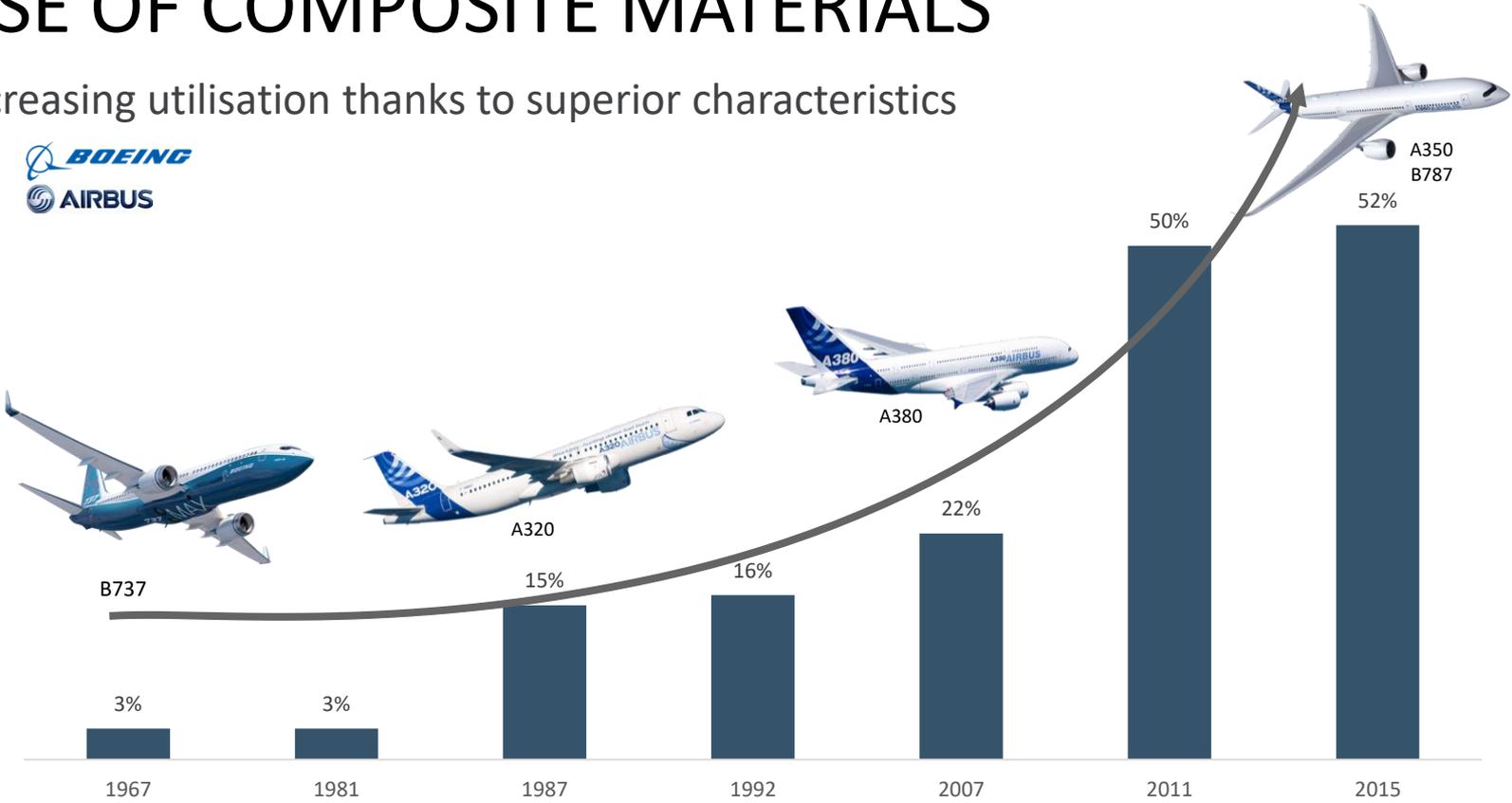
Kurt Pieringer – VP Cabin Systems

# CONTENTS

- > Introduction
- > Composite Materials
- > Production process (video)
- > Global operations footprint
- > Operational excellence
- > Operational challenges
- > Takt production
- > Automation / industry 4.0

# USE OF COMPOSITE MATERIALS

Increasing utilisation thanks to superior characteristics

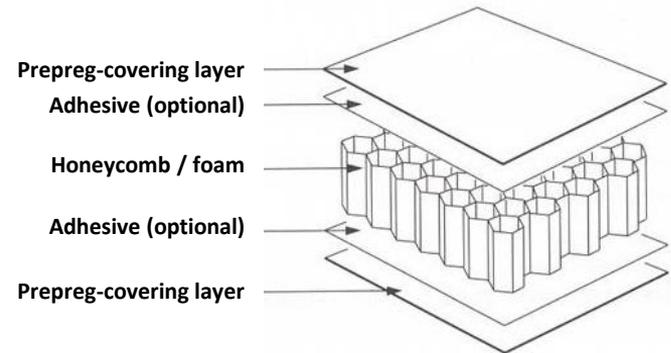
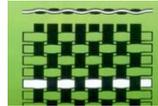


# COMPOSITE OVERVIEW

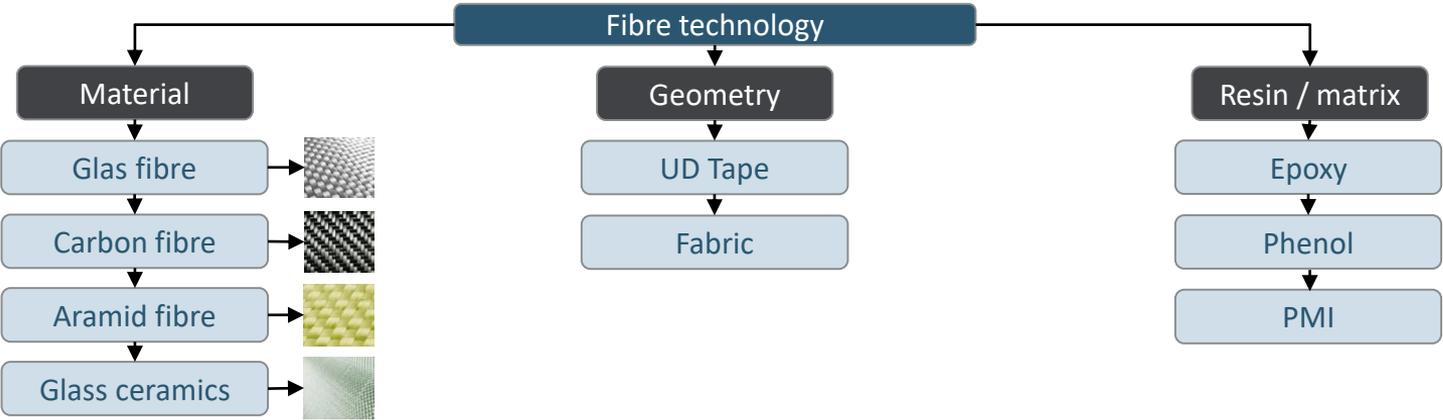
## Superior characteristics

Composites are defined by:

- Material of fibre / roving (glass fibre, aramid fibre, carbon fibre, ceramic fibre)
- Weave (plain / twill / satin)
- Fibre orientation
- Matrix (epoxy / phenol)
- Stack-up
- Usage of cores
- Process parameters



# MATERIALS



# COMPOSITE OVERVIEW

Numerous advantages

- Lighter than comparable metals
- Mechanical characteristics better than those of comparable light metals
- Low / no thermal expansion
- High fatigue strength at dynamic loads
- Structure can be adapted to mechanical requirements (acting forces / direction of forces)
- Complex geometrical shapes to be manufactured with less effort (compared to metal)

# COMPOSITE OVERVIEW



## Superior characteristics ...

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- ✓ 20%+ lower weight
- ✓ No corrosion
- ✓ Better vibration absorption
- ✓ Design flexibility

## ... lead to tangible advantages

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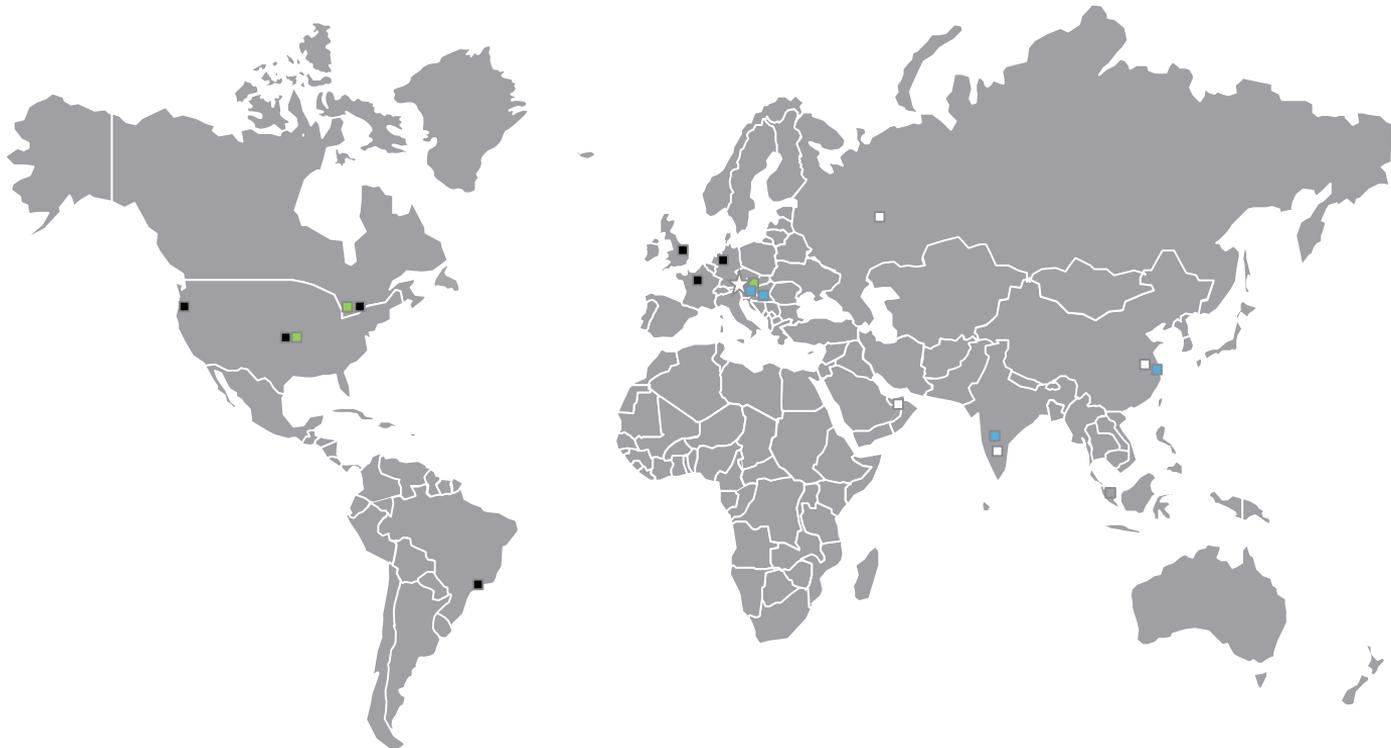
- ✓ Fuel savings
- ✓ Lower emissions
- ✓ Lower cost of airframe maintenance
- ✓ Noise reduction
- ✓ Absence of scrap materials reduces manufacturing costs

## Real-life examples

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- ✓ 787 Dreamliner
  - **20% lower fuel consumption** than old generation
  - **30% lower emissions** than 767
- ✓ A350XWB
  - **Service intervals** from 6 to **12 years**
  - **Lower need for** fatigue-related **inspections** / corrosion-related **checks**
- ✓ 787 Dreamliner noise footprint 60% smaller than old generation
- ✓ 90% of raw aluminium used to create airplane parts is turned into scrap during manufacturing process

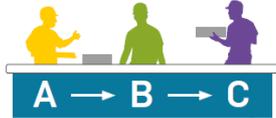
# GLOBAL OPERATIONS FOOTPRINT



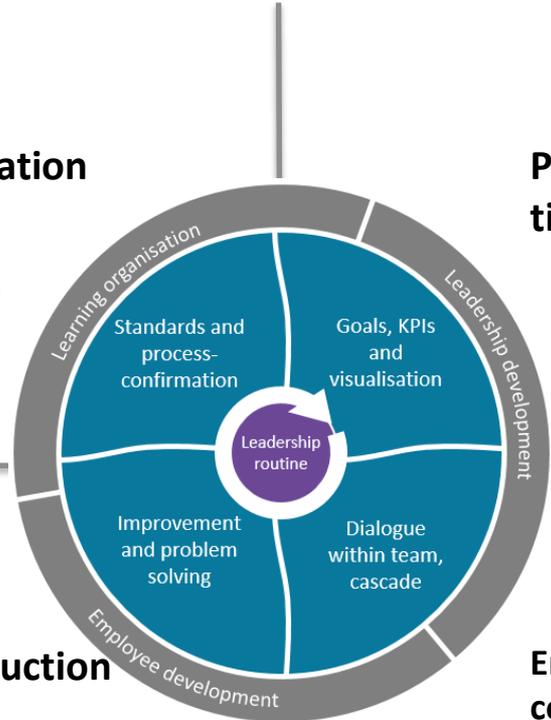
- ☆ Headquarters
- On-site offices
- Production plants and partnerships
- Engineering center
- MRO

# OPERATIONAL EXCELLENCE

**Ensuring efficiency and application of standards**



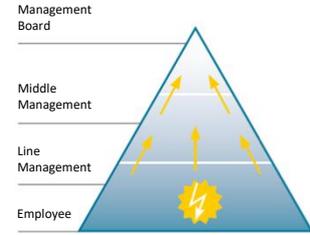
**Providing relevant information on time**



**Steady increase of production efficiency**



**Ensuring bottom-up communication within operations covering all operational aspects**



# OPERATIONAL EXCELLENCE

Ensuring efficiency and application of standards

- **5S methods**
  - Implementing and improving standards
- **One-piece flow**
  - Decreasing production lead times / inventory
- **Total productive maintenance**
  - Actions to prevent breakdown of machinery
- **Kanban**
  - Reduction of inventory by applying pull principles



# OPERATIONAL EXCELLENCE

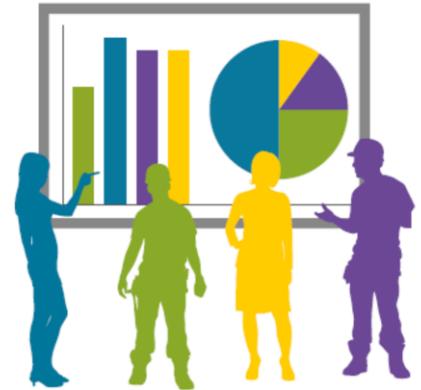
Providing relevant information on time

- **Visual management**

- Providing information
- Communication of standards and procedures
- Visualisation of target-performance comparison

- **Key performance indicators (KPI)**

- KPIs to be used as basis for
  - evaluation
  - analyses
  - tracking of production processes



# OPERATIONAL EXCELLENCE

Steady increase of production efficiency

- **Kaizen / continuous improvement**
  - Steady working on perfection of production
- **Value stream mapping / design**
  - Visualisation of value stream
  - Identification of improvement potentials
- **SMED**
  - Reduce non-productive time of machinery and equipment
- **CAQ (Computer-Aided Quality assurance)**
  - Reduction of costs for quality check
  - Automated reporting and analyses

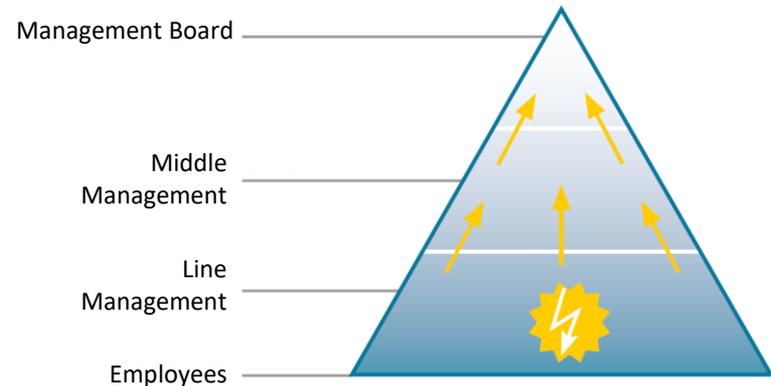


# OPERATIONAL EXCELLENCE

Ensuring bottom-up communication within operations covering all operational aspects

## SQCDP

**S** ... Safety  
**Q** ... Quality  
**C** ... Cost  
**D** ... Delivery  
**P** ... People



# OPERATIONAL EXCELLENCE

Applied on the Airbus A350 Winglet

- **Work without mistakes**
  - Increased efficiency by using a semiautomated drilling unit
- **Work in Progress**
  - Reduction of “Work in Progress” by 20%
- **Pay attention to the right amount**
  - Less tools necessary by adjusting the assembly strategy
- **Stick to standards**
  - Continuous CM improvements

# OPERATIONAL CHALLENGES

## Current challenges and solutions

### ▪ Increasing rates

- High customer demand (net increase in order book)
- Ramp-up of major programmes (Airbus & Boeing)
- Involvement in new business programmes (Comac)

### ▪ Actions

- Facility expansion
- Takt production lines (efficiency gains)
- Automation / I4.0



# TAKTED PRODUCTION

Continuous improvements (Airbus A321 outboard flap)

- Assembly shop floor reduction by 55%
- Enabled rate capability increase by 50%+
- Production cycle time reduction from 21 to 9 days
- Ergonomic assembly using trunnions, robotic drilling & CSK



# TAKTED PRODUCTION

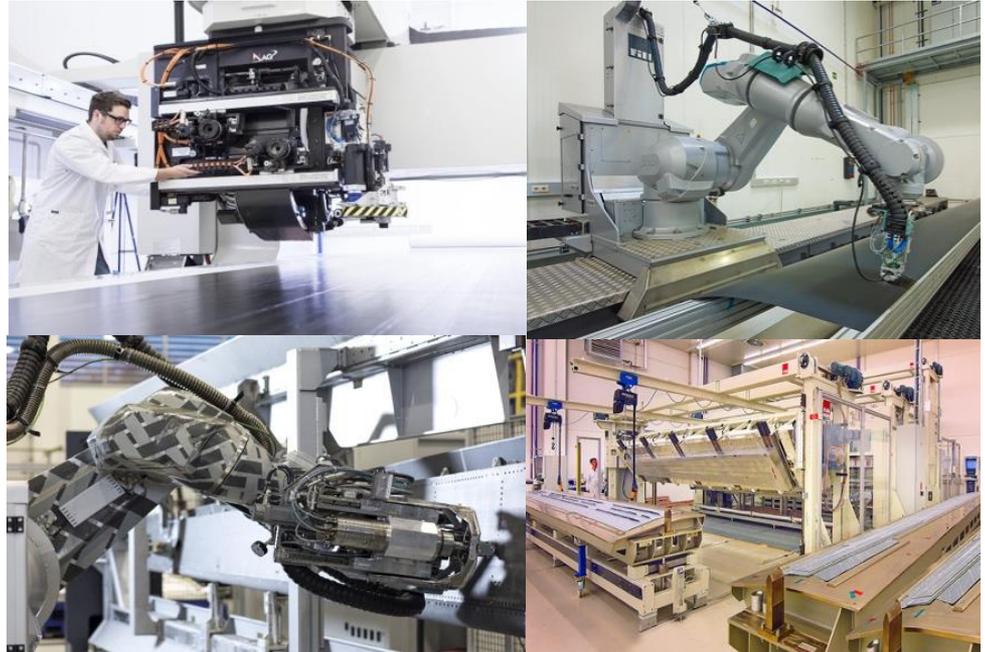
Continuous improvements (Boeing 787 blocker doors)

- Shift reduction from 3 to 2 shift model, capacity savings by 33%
- Shop floor reduction by 27%
- Enabled rate capability increase from 530 to 600+ blocker doors / month
- Four separate product configurations in one mixed model line



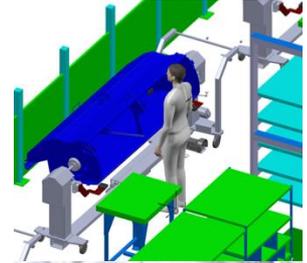
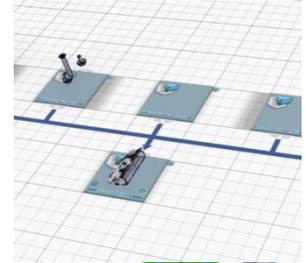
# AUTOMATION / I4.0

- Implemented automated processes
  - Automated tape laying
  - Advanced high-speed NDI
  - Robot drilling
  - Hot drape forming
  - Phonometry
- Results
  - Lower amount of manual labour
  - Decreased production lead times



# AUTOMATION / I4.0

- Ongoing / future automation campaigns
  - Automated transport systems
  - Automated drilling, riveting, grinding and painting applications
  - Seamless link of data in entire value stream
- Results
  - Lower amount of manual labour
  - Increased efficiency in labour-intensive work steps by semi-automation
  - Real-time monitoring of production steps
  - Paced decision making



# AUTOMATION / I4.0

- Industry 4.0 campaigns
  - Real-time visualization
  - Proof of concept MES
- Way forward
  - I4.0 – main streams defined and team established to drive initiatives
  - Strong focus on E2E (end to end) process introduction
  - Road map for new technology introduction established and I4.0 goals defined
  - Further cycle time reduction
  - Utilization and flexibility
  - Fixed cost reduction
  - Partnerships established



A dark, curved horizon of a celestial body, possibly a planet or moon, is shown against a black background. A bright light source is positioned just behind the horizon on the right side, creating a lens flare effect with several rays of light extending outwards.

# BEYOND HORIZONS