

Pilot. Passion. Partnership.

facc

# Extend Your Expectations

Economic Symposium Alpbach 2016

Aviation Industry as a Pioneer for Lightweight Design

facc

By: FACC AG, R. Machtlinger / CEO

- 1 FACC Company Overview
- 2 Changes in Air Travel and Technology
- 3 The Aerospace Global Market
- 4 The Challenges in Front of the Industry
- 5 Executive Summary & Notes

# FACC AG – at a glance

**100%** focus on  
lightweight

**4** plants & **2** engineering  
centers in Austria

**Global** network in  
engineering & production

**TIER 1** partner to the  
leading aerospace OEM's

**3,200** employees  
worldwide



# FACC activities are focused...

...on a defined product portfolio from the product idea to customer tailored solutions



**AEROSTRUCTURES**



**ENGINES & NACELLES**



**INTERIORS**

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# Growing Composite Demand in Aerospace

A rapid growth from a 3% composite content on a 1970's built B737 to a >50% composite content on last technology Airplanes.



1970's



2015 +

# Significant changes in air travel

Real life examples

## 1970's



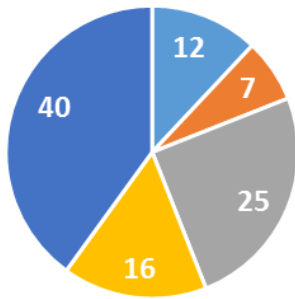
## Today



## Passenger Comfort

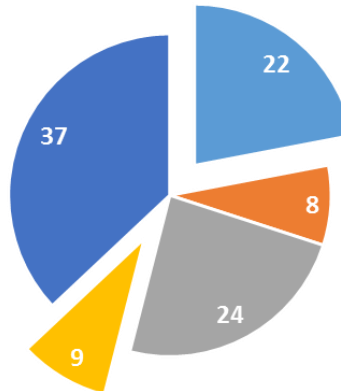
- Increased significantly
- Longer distance flights
- Point to point travel due to extended range capability
- Interior system weight added to fulfill customer expectations

1990



- Fuel
- Flight Crew
- Other direct OPS Cost
- Ticketing & Sales
- Other indirect OPS Cost

2015



Source: ICAO

## Airline Cost Structure

- Significant increase in fuel cost
- Reduction in ticketing and sales cost
- Fuel efficient aircraft is a must have for profitability

# Aerospace is a highly competitive market...

## Market Requirement for Aircraft:

- Lower sales price
- Lower operating cost
- Lower maintenance cost
- Environmental friendly
- Passenger comfort





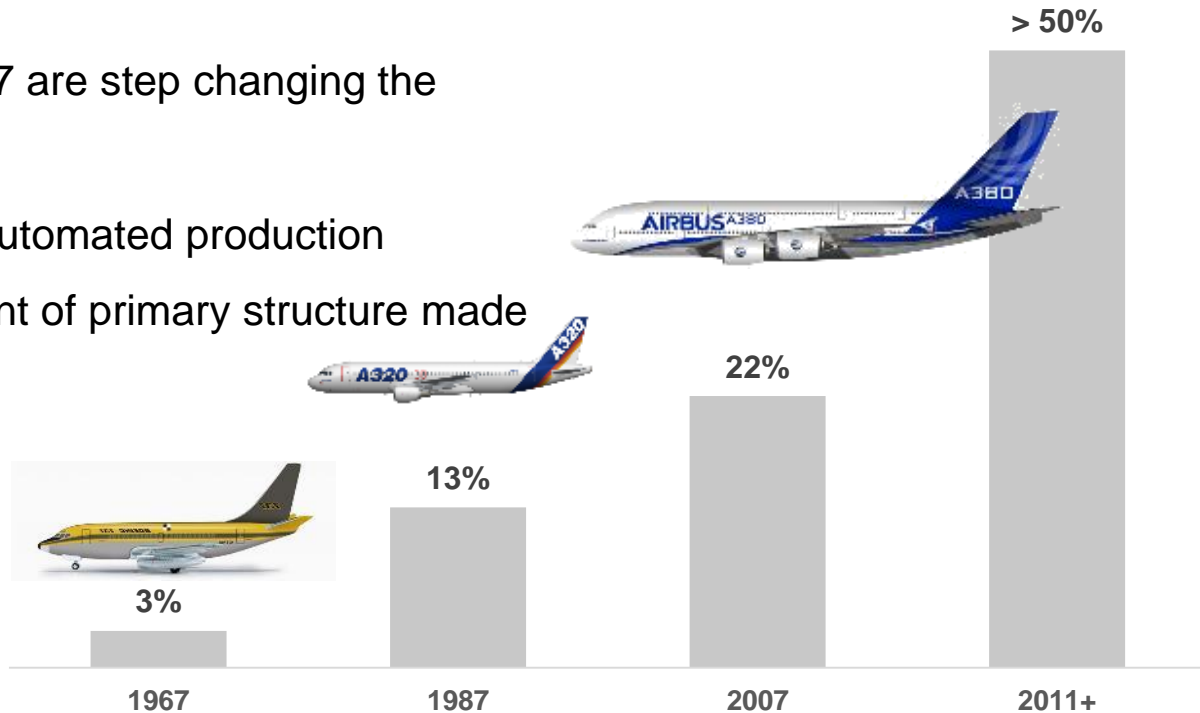
# Growing composite demand in airplanes

Changes in air travel and Airline demands triggers development of more efficient products

- From a 3% composite content on a 1970's built B737 to more than 50% composite content on last technology airplanes like A350 or B787.



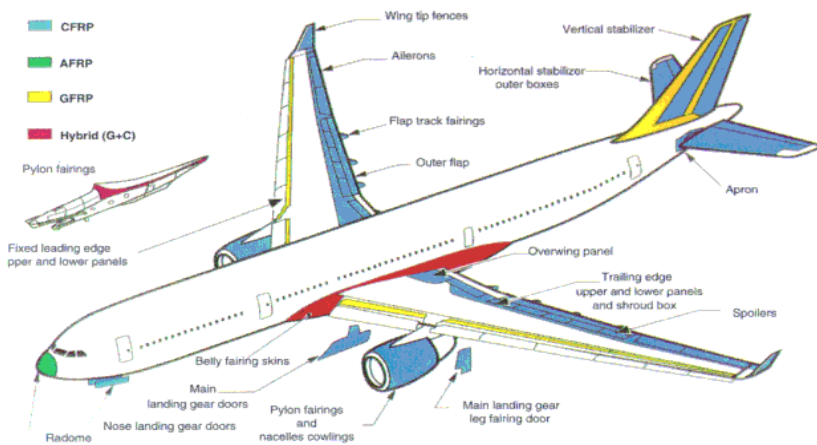
- The A350 & B787 are step changing the Industry
- High degree of automated production
- Significant content of primary structure made out of composite



# Application Road Map of Lightweight Structure

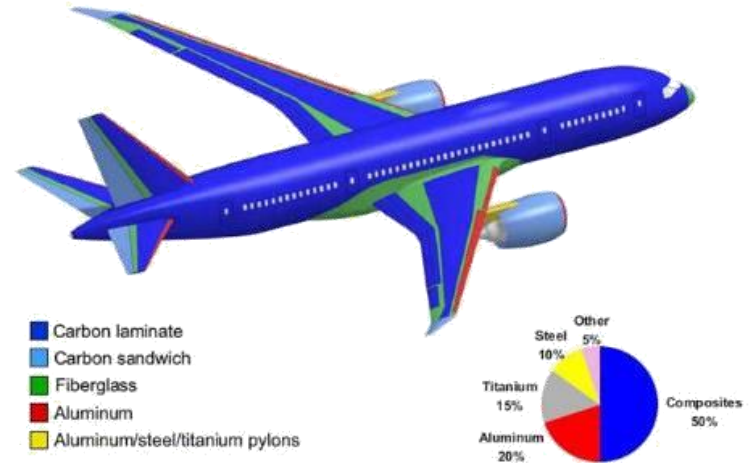
A swift change in composite application helps to improve aircraft efficiency

## Past



- Mainly Secondary Structure
- Fairings, Flight Control Surfaces & Interior
- Limited application on primary structure

## Today



- Primary structure (Wing, Fuselage), made out of composite
- Technology step up mainly driven by automated composite production
- Material & Process not significantly changed

# Manufacturing Road Map

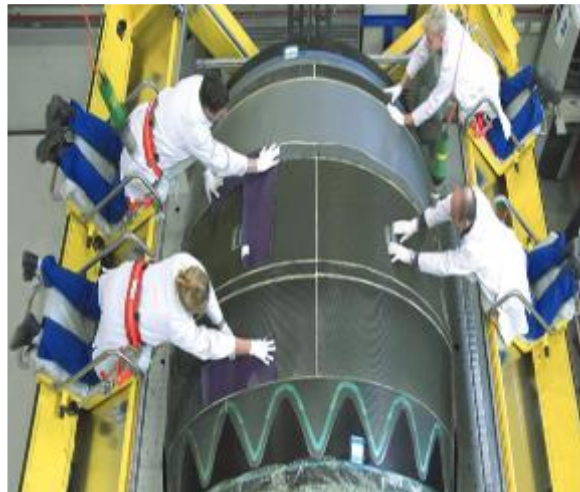
Automated manufacturing and inspection as key enabler to increase composite content in aerospace

Manual layup and assembly



3kg / hour

Assisted manual manufacturing



10kg / hour

Automated fibre placement technologies



150kg / hour

# Airplane characteristics / benchmark

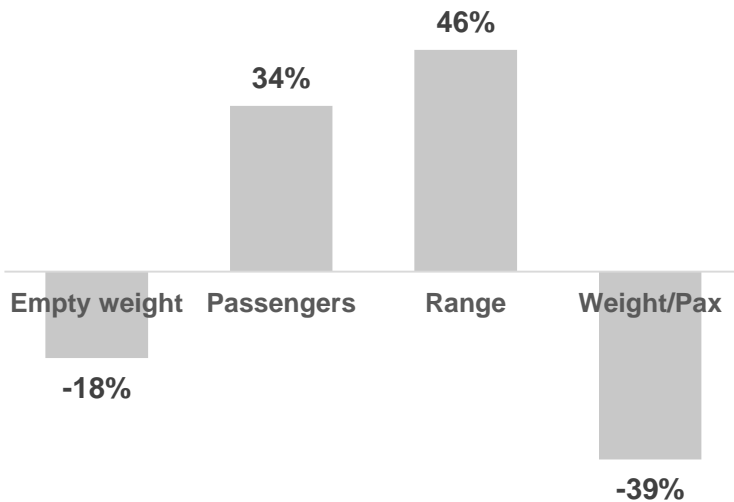
The increasing use of composite structured helps to make new airplanes more efficient in comparison to older generation platforms.

Superior characteristics...	...Leading to tangible advantages	Real life examples
20%+ lower weight	<ul style="list-style-type: none"><li>✓ Fuel savings</li><li>✓ Lower emissions</li></ul>	<ul style="list-style-type: none"><li>▪ 787 Dreamliner:<ul style="list-style-type: none"><li>▪ <b>20% lower fuel consumption</b> vs. old generation WB's</li><li>▪ <b>30% lower emissions</b> then 767</li></ul></li></ul>
Corrosion free	<ul style="list-style-type: none"><li>✓ Lower cost of airframe maintenance</li></ul>	<ul style="list-style-type: none"><li>▪ A350XWB:<ul style="list-style-type: none"><li>▪ <b>Service intervals</b> from 6 to <b>12 years</b></li><li>▪ <b>Lower need for fatigue related inspections/ corrosion related checks</b></li></ul></li></ul>
Better vibration absorption	<ul style="list-style-type: none"><li>✓ Noise reduction</li></ul>	<ul style="list-style-type: none"><li>▪ 787 &amp; A350 <b>noise footprint 60% smaller</b> vs. old generation WB's</li></ul>
Design flexibility	<ul style="list-style-type: none"><li>✓ Absence of scrap materials reducing manufacturing costs</li></ul>	<ul style="list-style-type: none"><li>▪ Significant amount of raw aluminium used to create airplane parts is turned into scrap during manufacturing process. Buy to Fly ratio for composites improved to &lt; 10% scrap.</li></ul>

# Performance Indicators

## New vs. old aircrafts

B 777-200 (1994) vs. B787-8 (2013)



## Technology Accomplishments

- 18% reduction in aircraft empty weight
- 46% increase in payload and range
- 39% reduction of aircraft empty weight / passenger
- Significant increase of passenger comfort
- 25-50 % reduction in product cost / kg achieved in the past 20 years.

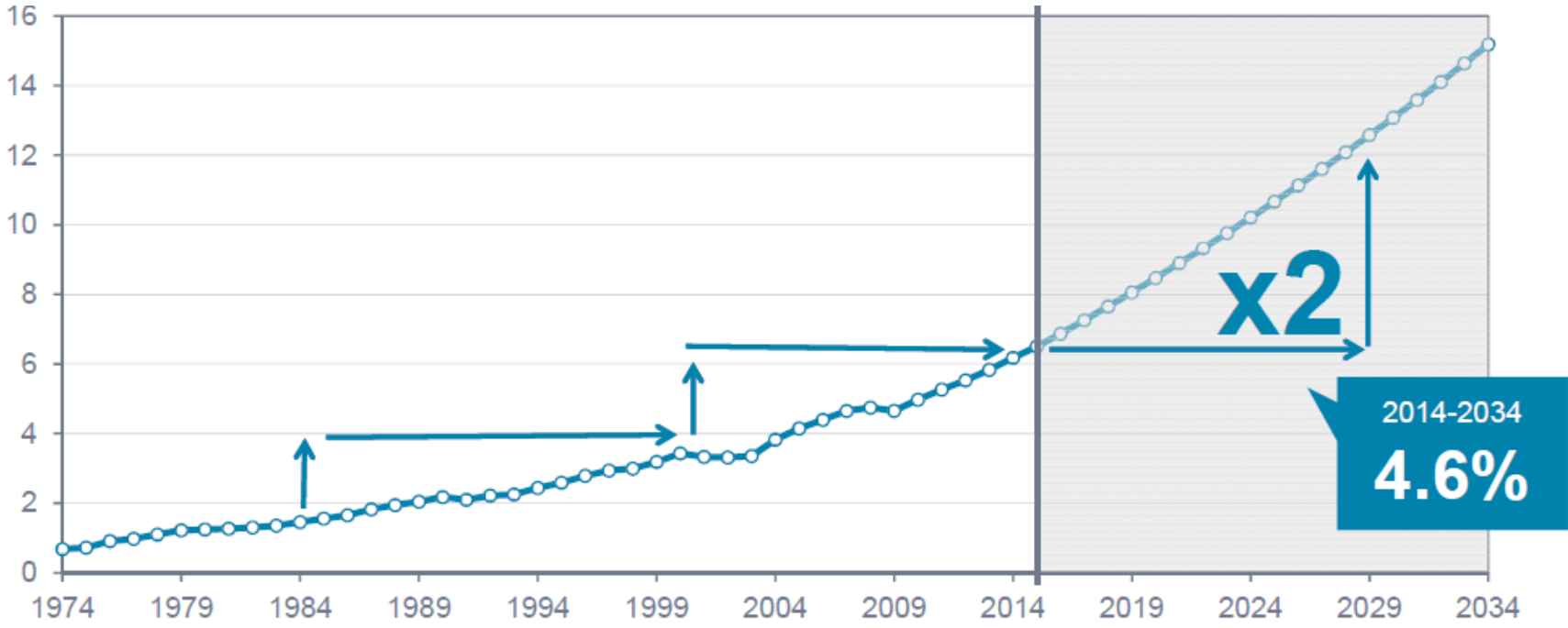


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# Economic Environment

Sustainable positive outlook for the aerospace industry

- Expected increase of the volume of passengers by approx. 100% within the next 15 years

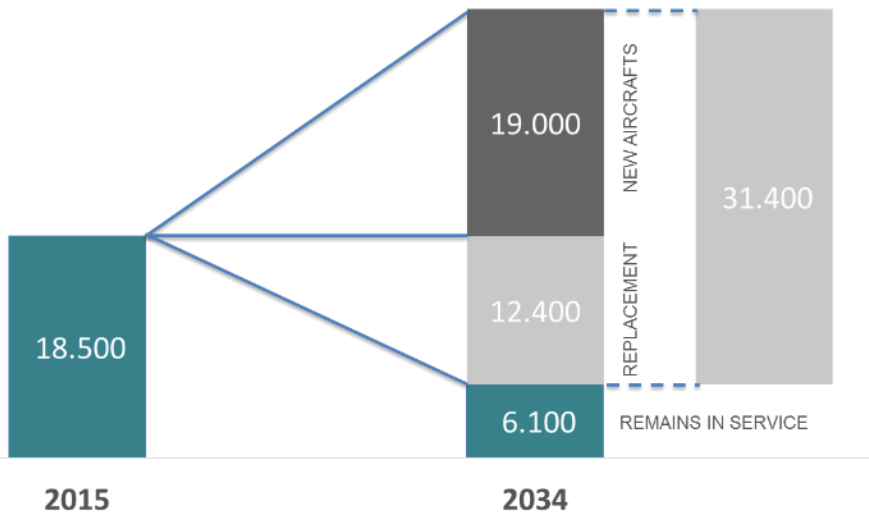


Source: ICAO, Airbus GMF2015

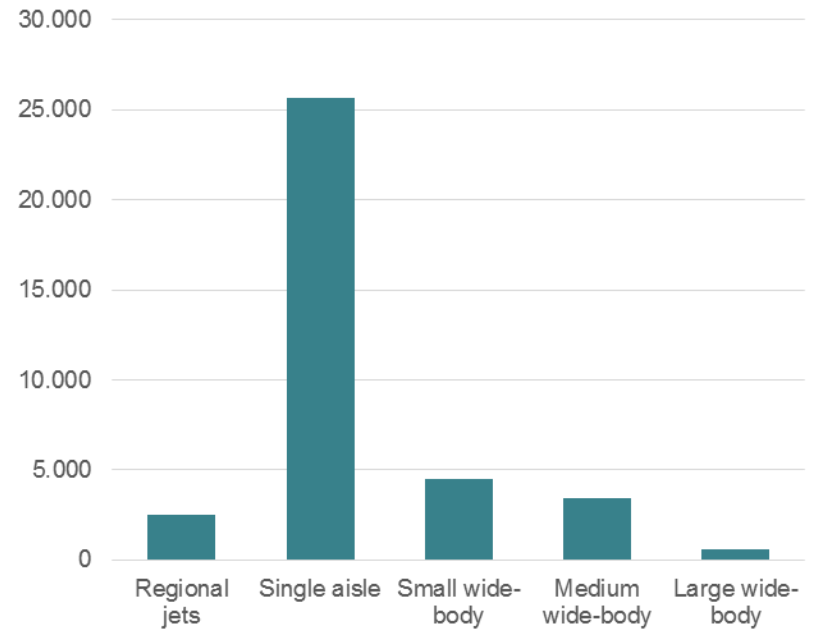
# New airplane demand

BOEING and AIRBUS predict a demand of 31.400 aircrafts until 2034

Overall demand / worldwide



demand per type





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# The challenge in front of the industry

The challenge goes on

- Mass production of Airplane structure made out of composite
- Affordability in cost for OEM's and Airlines
- Human Resources and right talent from R&D to production.

# The challenge in front of the industry

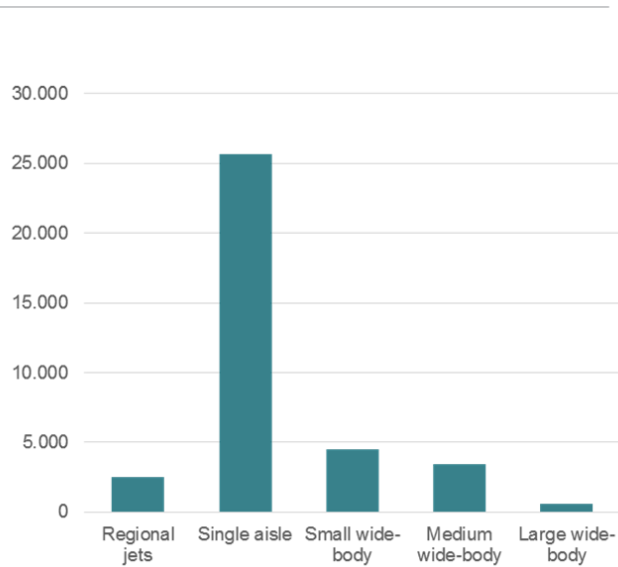
## Mass Production of Composite Structure

- Market growth is driven by single aisle AC (A320 & B737)

Today's production process are supporting production rates of 10-15 AC per month.



demand per type



If a 50 % composite contents on A320 / B737 is applied, different technologies are a must have.



# The challenge in front of the industry

Technology development under current review

- High pressure RTM manufacturing to reduce cycle time and cost.
- Out-of-autoclave technology for large scale applications to reduce CAPX in production.
- Material development for highly advanced resin system that cure faster
- Add new technologies, ie 3D printing
- Use of integrated hybrids to benefit from different material characteristics
- High degree of automation and I 4.0 applications to keep competitiveness, increase maturity and quality

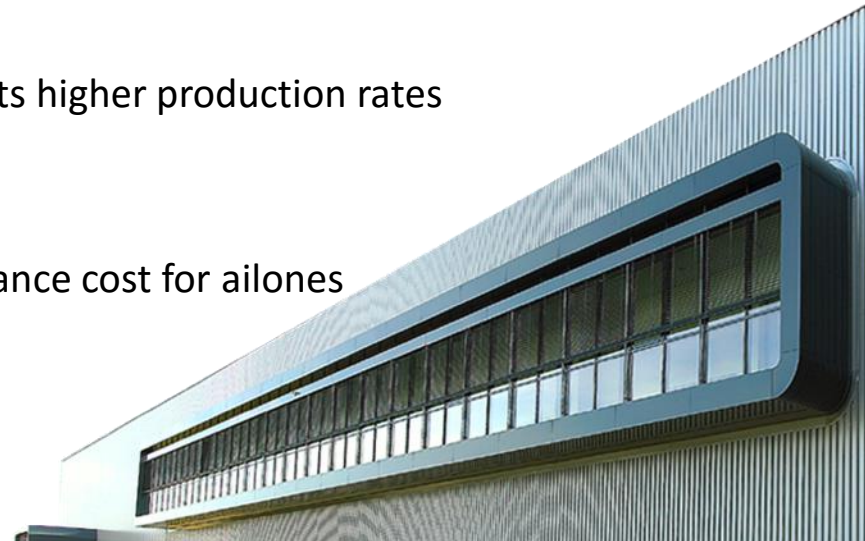


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# Executive Summary

## Top Level Highlight

- Composite demand in Aerospace has grown significantly in the past
- New programs (A350 & B787) are step changes in the industry
- The market is demanding
  - Cost pressure from Airlines
  - Cost per kg / Aero structure must further be reduced
  - Total performance is key to customer – weight only is not the only market entry
- Front loaded material- and process engineering remains key for success
- Key enablers for Aerospace Composites
  - Material & Process development that supports higher production rates
  - Design for automation
  - Increase of process maturity
  - Health monitoring systems to lower maintenance cost for airlines
  - .....



# Extend Your Expectations

Thank you for your attention

- **FACC Aerostructures**
- **FACC Engines & Nacelles**
- **FACC Interiors**