GF Casting Solutions

Solutions for the future of mobility

Carlos Vasto, President GF Casting Solutions
Capital Market Day 2019
Review Technology Day 2016: Future market opportunities through e-mobility

Lifetime volume of acquired e-mobility orders in million CHF

- 2016: 182
- 2017: 343
- 2018: 426
Key Market Trends
Megatrends driving our business

Climate change / CO₂-reduction

Urbanization

Mobility

Lightweight Design

Automotive

Aerospace

New Production Technologies

Weight reduction and reduced fuel consumption
Automotive Market Trends
Environmental regulations are among the main innovation drivers in the automotive industry.

**Climate change & CO₂-reduction**

- **By 2015**: 130 g CO₂/km
- **By 2021**: 95 g CO₂/km
- **By 2025**: 81 g CO₂/km
- **By 2030**: 59 g CO₂/km
We support the UN Sustainable Development Goals with our solutions

- Industry, Innovation and Infrastructure
- Sustainable Cities and Communities
- Responsible Consumption and Production
- Climate Action
By 2025, >90% of light vehicles are forecasted to be still powered by hybrid / combustion engines

Global LV production outlook in mill. units

Source: LMCA 2019 Q1
GF is prepared – and already a strong partner for complex hybrid / alternative drive solutions …

Powertrain Parts in E-Vehicles

Transmission Housing
VW MEB Platform

E-Engine Housing
Audi E-Tron

Battery Housing
VW Golf GTE

Source: VW
Source: Audi
Source: VW
... and for structural parts based on its lightweight expertise ...

Structural Parts in E-Vehicles

Cross Car Beam
Jaguar I-PACE

Rear Door Frame
Mercedes-Benz EQC

Shock Tower
Audi e-tron

Source: Jaguar Land Rover
Source: Daimler
Source: Audi
... and its global presence in all three major Automotive markets

Parts in e-vehicles – NAFTA and Asia

Upper Door Frame
US OEM

Various Structural Parts
Aiways (China)

Source: Aiways
GF Solutions to the future of mobility

Magnesium components up to 50% lighter than aluminum

Development Know-How

Digital Production Know-How
Aerospace Market Trends
Market trends in Aerospace – geared towards eco-efficiency and alternative powertrain concepts

Eco regulations to reduce Noise, NOx, CO₂

- 10% CO₂ than previous generation
- 45% less NOx
- 8 dB reduction to Stage 5 noise emission standard

Emerging Alternative Drives

- Hydrogen-fueled electric powertrain
- 10-20 seat
- 500 miles

Source: Atkins: Current and emerging trends in the aerospace sector July 2018
Source: ZeroAvia
Source: Safran

Example: GE9X Jet Engine
Image source: GE Aviation

Image source: Safran
Main driver remains the traffic increase …

Traffic has proven to be resilient to external shocks and doubles every 15 years

World annual traffic (trillion RPKs)

- Oil Crisis
- Gulf Crisis
- Asian Crisis
- 9/11 SARS
- Financial Crisis

Airbus GMF 2018: 4.4% growth p.a.

2x

RPK = Revenue Passenger Kilometer
Source: ICAO, Airbus GMF 2018
...driven by backlog and replacement needs

Sources: Fleet Analyzer & Boeing CMO
Our focus is on lightweight and efficient aircraft engines

- Turbine Rear Frame: 400 – 800 mm
  Aerodynamic and mechanical function between the engine and the aircraft structures

- Outlet Guide Vane: 600 – 900 mm
  Each guide vane has an expanding section to slow down the airflow and increase its pressure

- Vane Segment: 200 x 200 x 100 mm
  Directs airflow onto the turbine blades and converts pressure energy into kinetic energy
GF Solutions for the future of air travel

GF Casting Solutions offers fully NADCAP certified value chain

Precision Casting Know-How

Additive Manufacturing Know-How
Showcase GF Casting Solutions

Roger Kupferschmid
Head of Research & Development

Antoine Marty
Head of Sales & Strategy BU Precision Casting + Additive Manufacturing

Automotive:
Lightweight Design & Digital Production

Aerospace:
Growth market & Additive Manufacturing
Thank you!