

PS5: BREAKTHROUGH IN BUY TO USE FOR AERONAUTICS

KEY SECTOR TRENDS AND CHALLENGES

Air transport is steadily growing at a pace of 5 to 7% per year with direct impacts on the environment

- According to the International Civil Aviation Organization, passenger air traffic has almost tripled to 4 bn passengers in 2017 in just 20 years. Freight air traffic has doubled in the same period.
- In Europe, if air traffic has increased by 60% since 2005, average fuel consumption of commercial flights has been decreased by 24% and average noise is down by 14%. However, full flight emissions have increased by 16% in CO₂ and 25% in NO_x. They are predicted to further increase by 21% and 16% respectively by 2040 (source = European Aviation Environmental Report 2019)
- While traffic increases linked to population and wealth growth, there is increased societal scrutiny from the public and governments, leading to tighter regulations and standards.

Players in the aerospace industry remain challenged to solve the difficult equation of lowering environmental impacts, optimizing performance and safety while ensuring competitive aircrafts.

- Critical performance drivers in the context of the WMF classification (smarter, less and longer) are structural weight & fuel consumption (smarter), buy to fly ratio (less), Cutting tool consumption and maintenance (longer).
- New technologies are being investigated at different levels, including printed electronics, Li-Ion, Additive Layer Manufacturing, E2E material management, hybrid cutting tools, ceramics, alternative fuels, LED and composites.

MATERIALS EFFICIENCY SOLUTIONS AND GOALS

Battery storage, safety and performance altogether are even more critical in the aircraft than they are in a car. Which means improved charge density, lighter weight, more compact, corrosion resistant components, novel battery chemistries and processing, surface chemistry and morphology. For example the number of cycles for the duration of the battery is far more demanding : 3500 charging cycles in a year vs 1500 cycles in 10 years for a car battery.

- Saft is developing a solid state battery for better performance, lower cost and intrinsic safety. New technologies based on lithium foil increase the specific energy and power from 372 mAh/gram for carbon to 3800 mAh/gram.
- Cuberg proposes a lithium metal battery that enables 70% longer flight time while providing better safety.

And Materials fully contribute to meet the challenge:

- In the wider framework of additive manufacturing, the Swinburne university of technology proposes a new testlab for fill multilayer process which reduces carbon fibre waste from 60% to 10%. It also develops graphene enabled smart structural composites for various types of sensing (strain, damage, temperature, thermoelectricity or flow).
- The usage of advance materials from ATI like Nickel Superalloy Powder and Isothermal forging enable 15% improvement in fuel efficiency and CO₂ emissions and a 75% reduction in noise. Digital metals also enable smarter manufacturing with tailored microstructure, reduced part count and cycle time reduction.
- Finally Silicon Carbide is a key enabler while bringing higher conductivity. When ST Microelectronics uses it in PMOSFETs, energy commutation is 10 times faster and energy losses are reduced by 90%. »

SPEAKERS

Jean-Marc Chery - CEO ST Micro (France/Italy) - Chair

Klaus Richter - Chief Procurement Officer Airbus (France/Germany)

Richard Wang - CEO Cuberg - WMF Grand Prix 2018 (USA)

Kevin Kramer - Chief Commercial & Marketing Officer - ATI (USA)

Prof. Bronwyn Fox - Director of the Manufacturing Futures Research Institute - University of Swinburne (Australia)

Ghislain Lescuyer - CEO Saft (France)

Moderator: Olivier Dufour, most recently Director Public Affairs Rio Tinto Europe