

A futuristic white Airbus Concept Plane is shown in flight against a blue sky with white clouds. The aircraft has a sleek, elongated fuselage with a large cockpit window, a high-wing configuration, and a T-tail. The words "AIRBUS" and "concept plane" are visible on the side of the fuselage.

# Aviation, a journey to 2050

Aerospace Technology Congress  
Stockholm, 8-9 October 2019

**Mathias BERTRAND**  
Future Projects Office - Architecture & Integration

**AIRBUS**

An aerial view from an airplane window looking out over a city and harbor. The wing of the airplane is visible in the foreground, with the text 'A350' on the underside. The city below features a large bridge, a harbor filled with ships, and a dense urban area with many buildings. The sky is blue with some clouds.

# Aviation drives our global economy

## Air transport is a vital sector

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**4.4** billion  
Passengers

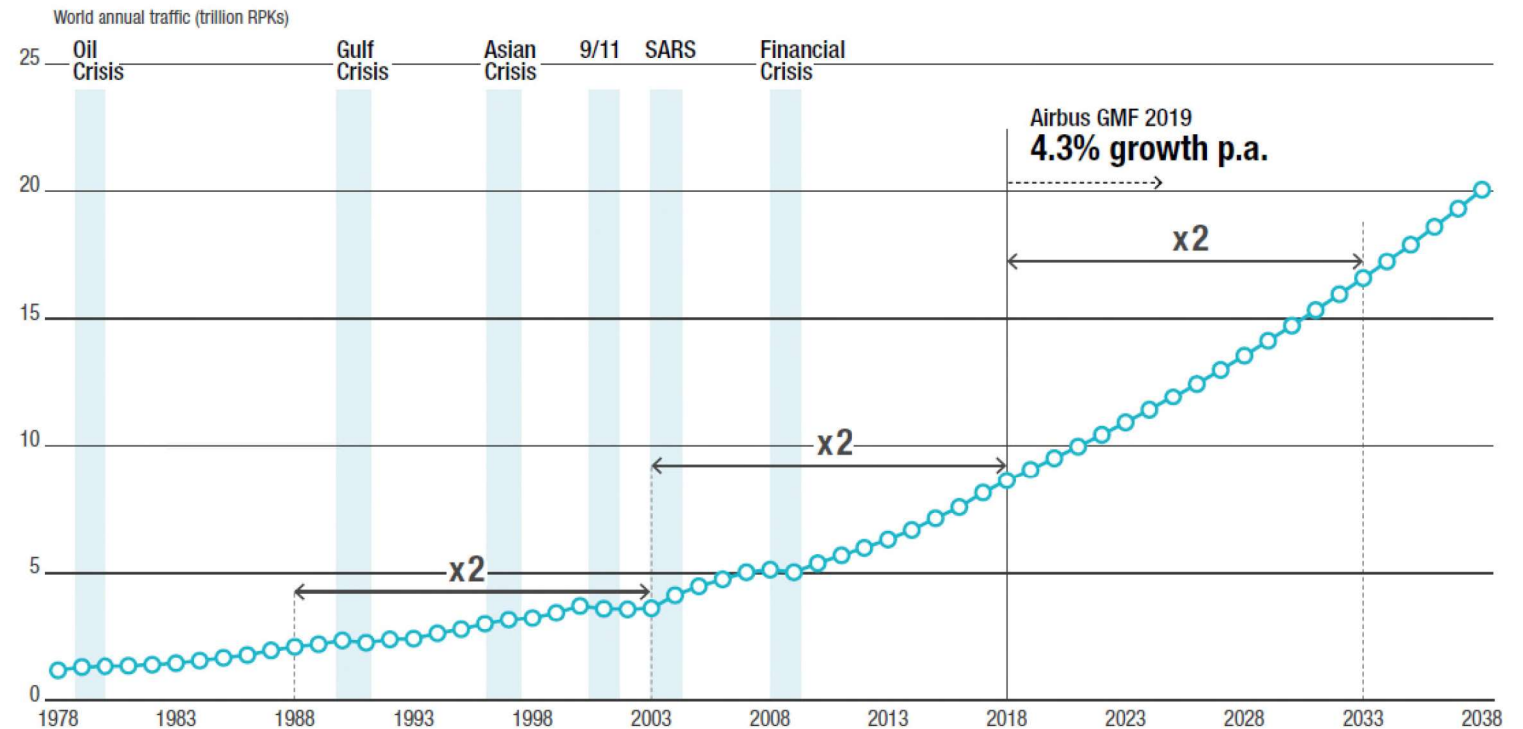
**65.5** million  
Jobs supported

**56** million  
Tonnes of freight

**\$2.7** trillion  
Global GDP annually

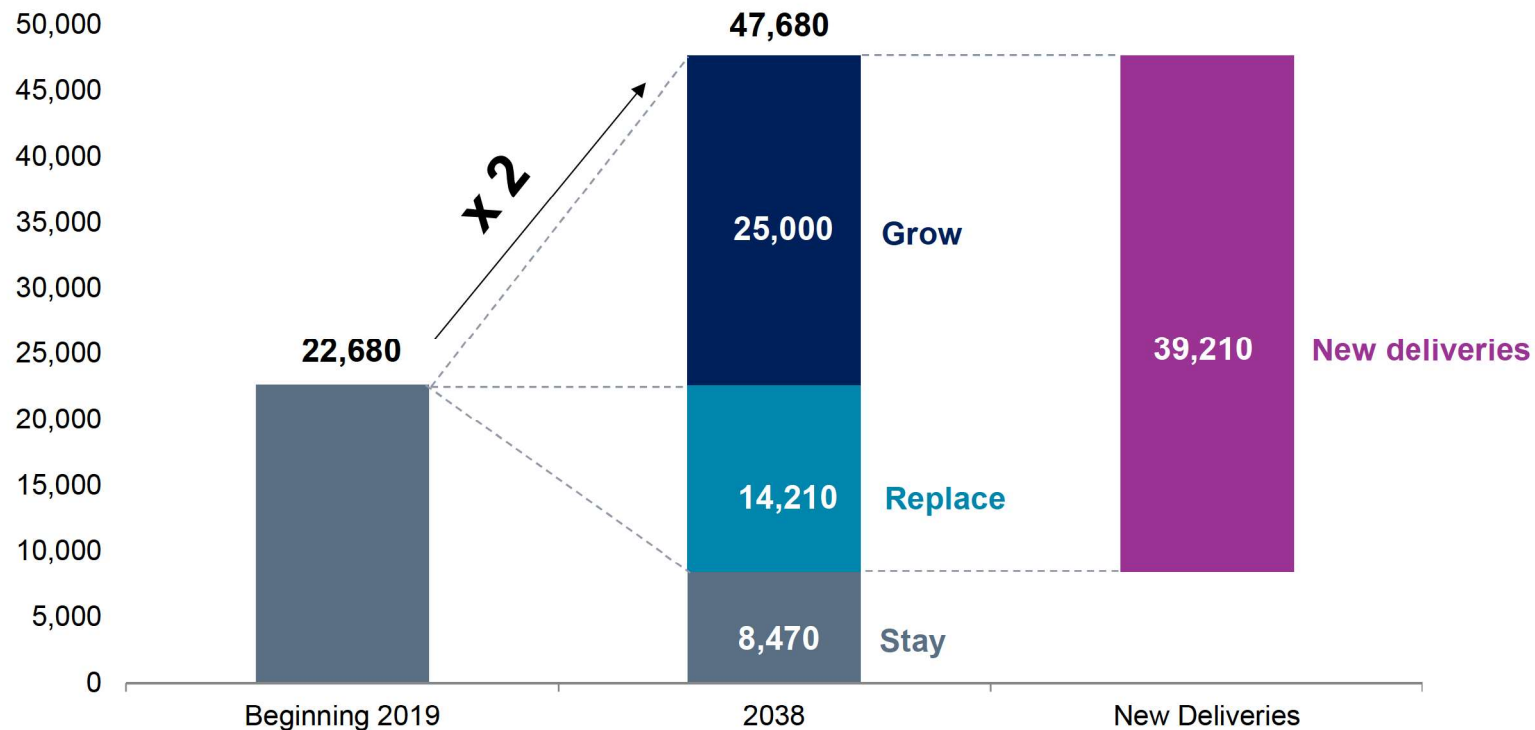
**AIRBUS**

# Air Traffic evolution



**Air Transport is a Growth Market**  
**60%** over the last 10 years  
**More than double** since 2003

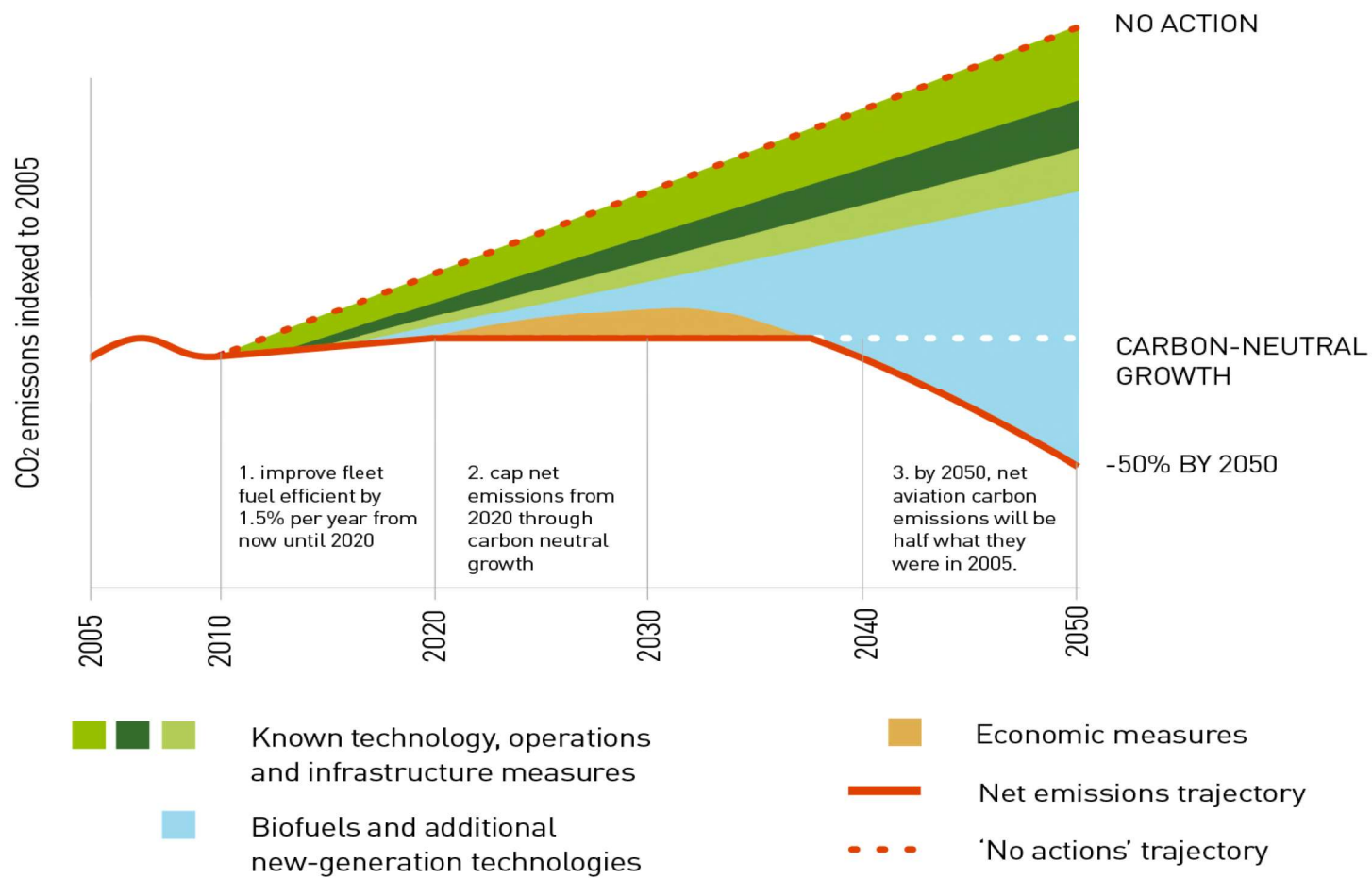
## The world fleet will more than double over the next 20 years



**More than 39000 new aircraft needed**  
to address growth and replacement by 2038

- Notes: Passenger aircraft ( $\geq 100$  seats), Freighters ( $> 10t$ ) | Rounded figures to nearest 10
- Source: Airbus GMF 2019

# The Challenge for Aviation: Sustainable Growth



Source ATAG



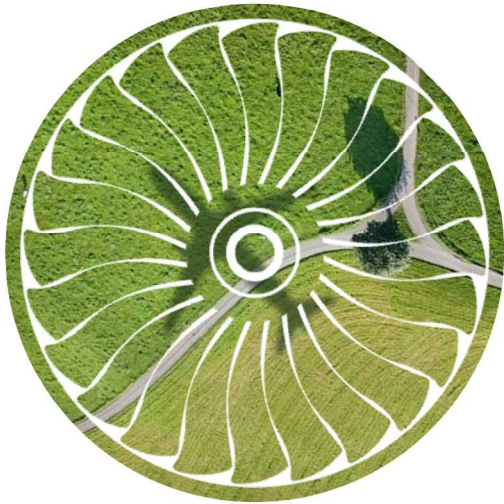
# Our challenges

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Industry **growth** vs  
**environmental**  
commitments

**AIRBUS**

## Sustainable future of air travel



**Market based  
measures**



**Sustainable  
aviation fuel**



**Operations &  
Infrastructure**



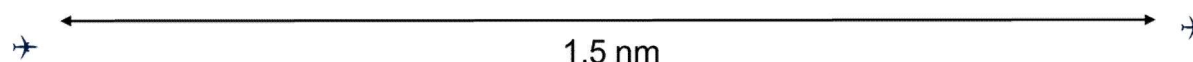
**New  
technologies**

# Wake energy retrieval



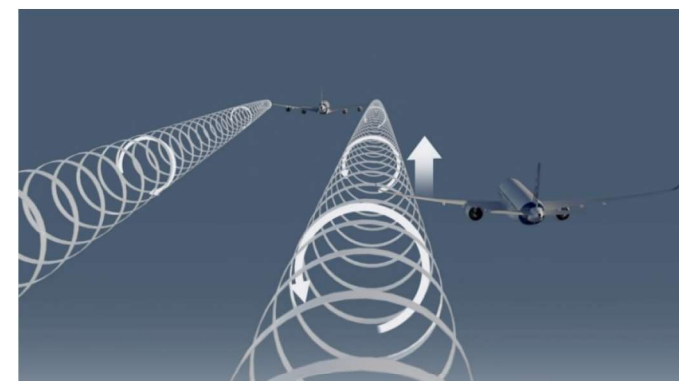
**Reduce CO2 emission and fuel burn up to 10%**

Separation in formation drawn to scale



## Principle

- *The leader aircraft creates two wake vortices. These generate an upwash of free lift outboard of each wake vortex*
- *The follower aircraft can 'surf' this upwash, reduce engine setting and save fuel whilst flying at the same speed*
- *Integrated technical solution to optimize and maintain the position close to the vortex*





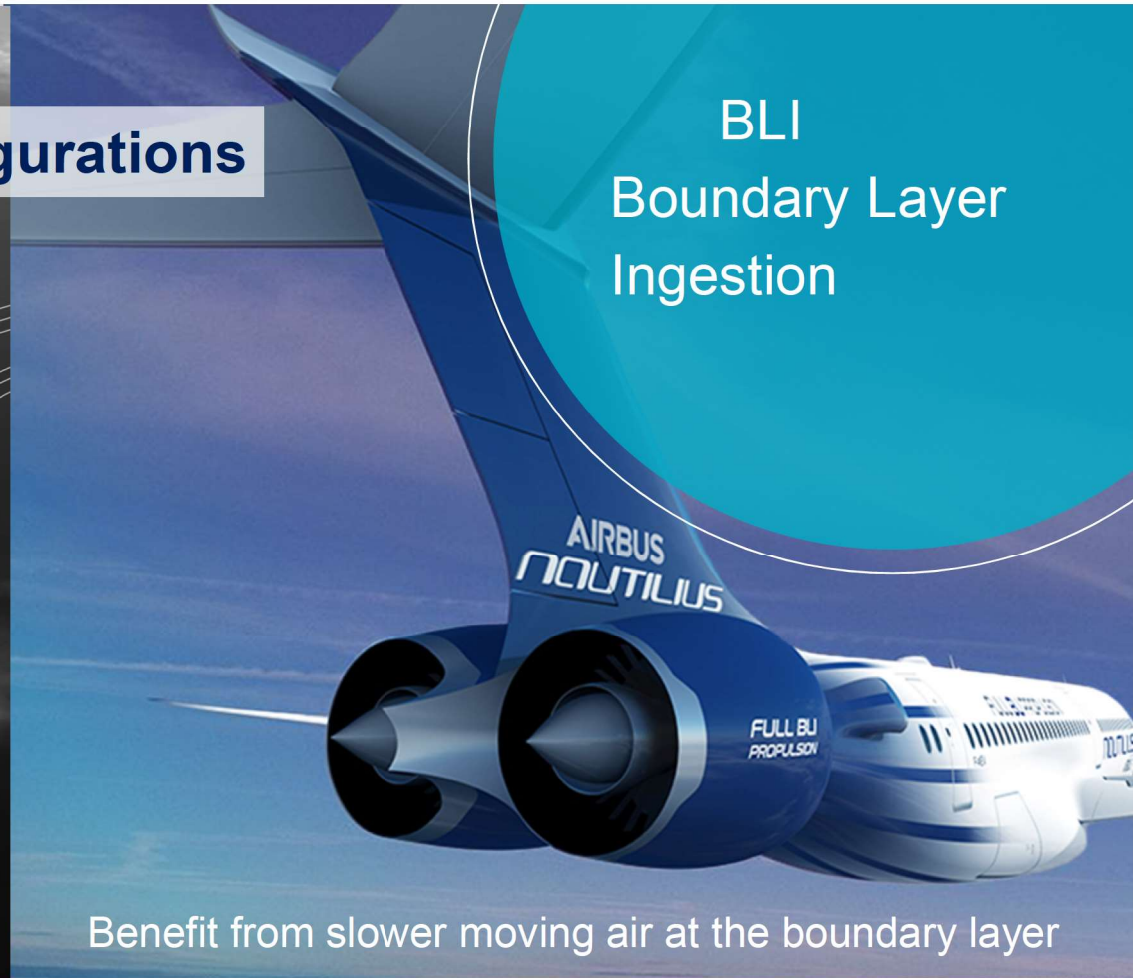
## Towards new aircraft configurations



Minimises  
propulsor  
**effort**  
&  
Reduce total  
**drag**

~10% fuel burn  
reduction

BLI  
Boundary Layer  
Ingestion



Benefit from slower moving air at the boundary layer



## Open Rotor

Push  
propulsive  
efficiency to  
the limit

$\sim 10\%$

Fuel burn saving vs. next generation turbofan

Lower cruise speed (M  $\sim 0.75$ )

Engine integration challenge

Safety and comfort

Noise challenge





## Hybrid Electric Propulsion



Develop technology bricks to investigate higher levels of hybridation & distributed propulsion

Develop integration technologies and operational solutions

Define certification basis with authorities

### E-Fan X

2 MW electrical motor  
2 MW battery power  
2 MW Power Generation System

# Electric Aircraft Propulsion Test Facility to enter into service in 2019

# Airbus & SAS Airlines partner on electric aircraft operations and infrastructure requirements



## Airbus Battery Lab In Shenzhen

### AIRBUS

#### Press Release

**Airbus and SAS Scandinavian Airlines sign hybrid and electric aircraft research agreement**  
[@SAS #Hybrid #ElectricAircraft #Decarbonisation #zeroemissiontech](#)

**Toulouse, 22 May 2019** – Airbus has signed a Memorandum of Understanding (MoU) with SAS Scandinavian Airlines for hybrid and electric aircraft eco-system and infrastructure requirements research.

The MoU was signed by Grazia Vittadini, Chief Technology Officer, Airbus and Göran Jansson, Deputy President EVP Strategy & Ventures, Scandinavian Airlines. Collaboration will start in June 2019 and will continue until the end of 2020.

Under the MoU, Airbus and SAS Scandinavian Airlines will cooperate on a joint research project to enhance understanding of the operational and infrastructure opportunities and challenges involved with the large-scale introduction of hybrid and full electric aircraft to airlines modus operandi. The project scope includes five work packages, which focus on analysing the impact of ground infrastructure and charging on range, resources, time and availability at airports.

The collaboration also includes a plan to involve a renewable energy supplier to ensure genuine zero CO2 emissions operations are assessed. This multidisciplinary approach—from energy to infrastructure—aims to address the entire aircraft operations ecosystem in order to better support the aviation industry's transition to sustainable energy.

Aircraft are roughly 80% more fuel efficient per passenger kilometer than they were 50 years ago. However, with air traffic growth estimated to more than double over the next 20 years, reducing aviation's impact on the environment remains the aim of the industry.

To overcome this challenge, the Global Aviation Industry (ATAG) including Airbus and SAS Scandinavian Airlines have committed to achieving carbon-neutral growth for the aviation industry as a whole from 2020 onwards, cutting aviation net emissions by 50% by 2050 (compared to 2005).

This agreement further strengthens Airbus' position in a field where it is already investing in and focusing its research efforts on developing hybrid-electric and electric propulsion technologies that promise significant environmental benefits. Airbus has already started to build a portfolio of technology demonstrators and is currently testing innovative hybrid propulsion systems, subsystems and components in order to address long-term efficiency goals for building and operating electric aircraft.

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**About Airbus**  
Airbus is a global leader in aeronautics, space and related services. In 2018 it generated revenues of € 64 billion and employed a workforce of around 134,000. Airbus offers the most comprehensive range of passenger airliners. Airbus is also a European leader providing tanker, combat, transport and mission aircraft, as well as one of the world's leading space companies. In helicopters, Airbus provides the most efficient civil and military rotorcraft solutions worldwide.

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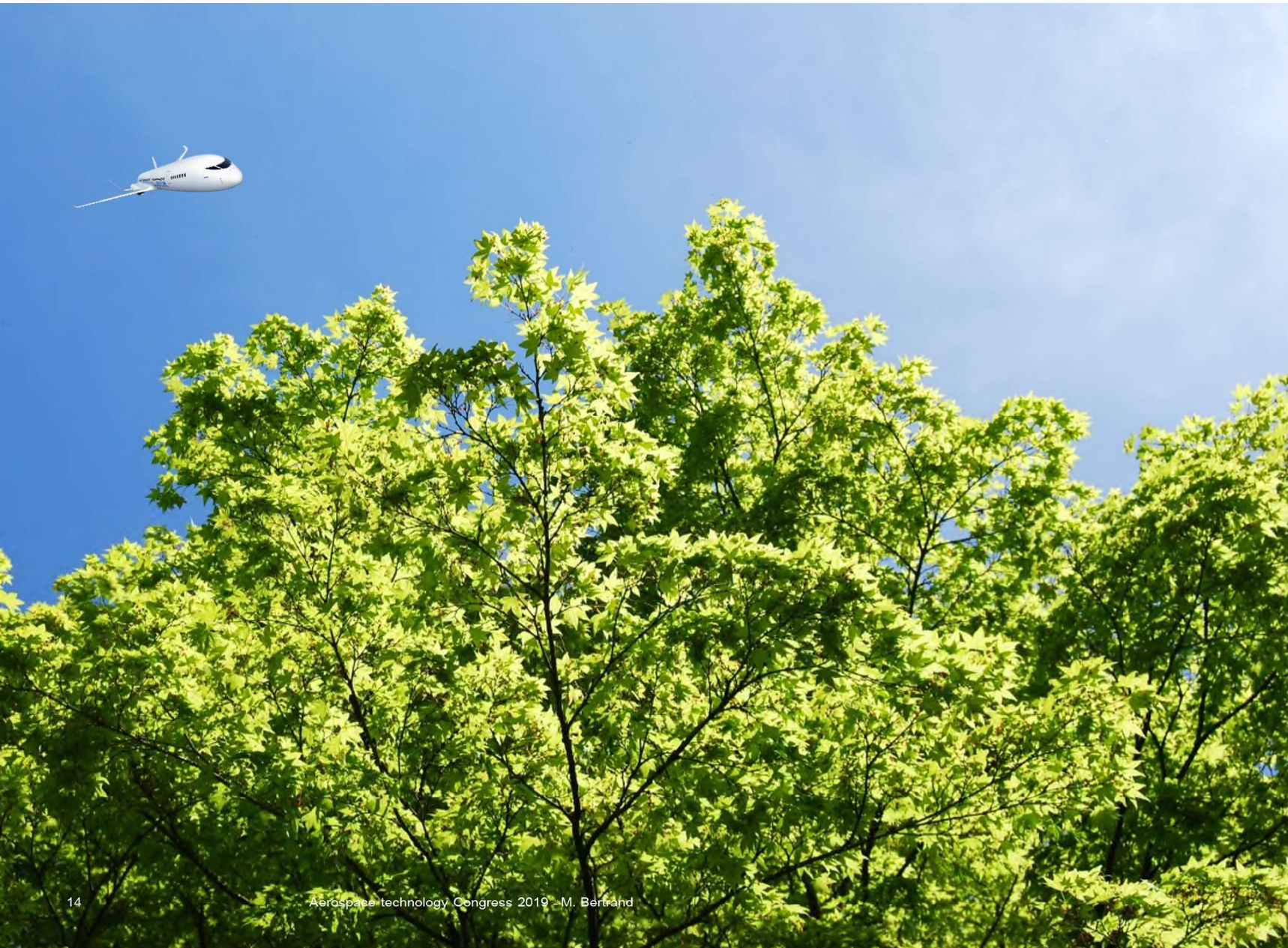
# Our Journey to 2050

## One of our key Challenge

- Industry Growth vs Environmental objectives

## Our Drivers

- New Technologies (advanced Materials, aerodynamics, systems, new energies, AI, etc.)
- More electricity
- More Integration
  - Within aircraft
  - With engines
  - Within overall Air Traffic Management
- **Safety & Security**



# Our Journey to 2050

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Whatever the  
aircraft of tomorrow  
looks like, it will be  
sustainable



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# Thank You