



ICAO

ENVIRONMENT



ICAO Environmental
Symposium 2019

DESTINATION GREEN: THE NEXT CHAPTER

Electrified Propulsion

Rüdiger THOMAS

Propulsion Senior Expert

Airbus Engineering





ICAO

ENVIRONMENT



ICAO Environmental Symposium 2019

DESTINATION GREEN: THE NEXT CHAPTER

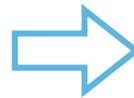
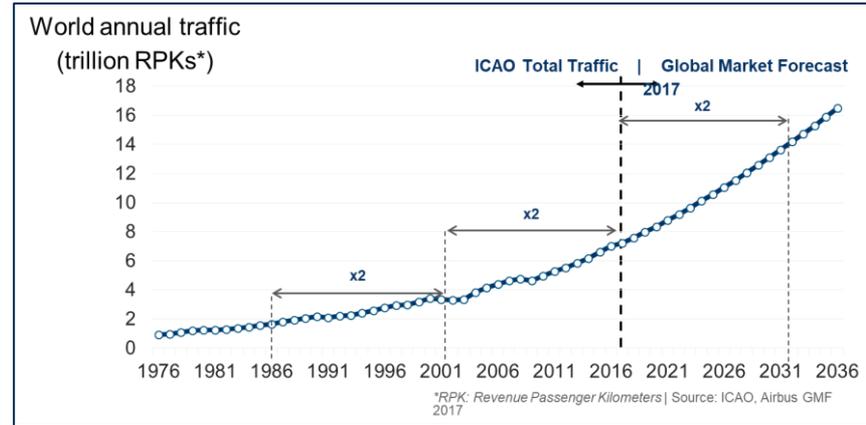
Air traffic will double in the next 15 years

One of our airplanes takes-off or lands every 2 seconds...



Air transport is a growth market

Air traffic will double in the next 15 years



Our industry has to set high environmental standards

AIRBUS



ICAO

ENVIRONMENT



ICAO Environmental Symposium 2019

DESTINATION GREEN: THE NEXT CHAPTER

CO2 technologies

Actively pushing all levers to reduce carbon footprint...



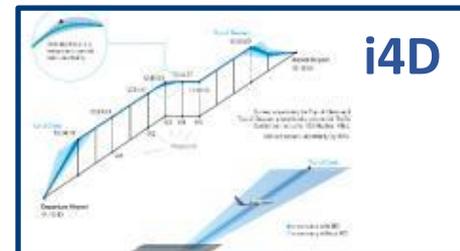
Structure weight reduction



Propulsion Technologies



Aerodynamic Efficiency



ATM Technologies

AIRBUS



ICAO

ENVIRONMENT



ICAO Environmental Symposium 2019

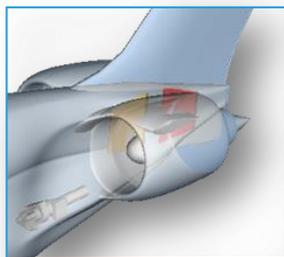
DESTINATION GREEN: THE NEXT CHAPTER

CO2 technologies

... including energy options and disruptive propulsion concepts.



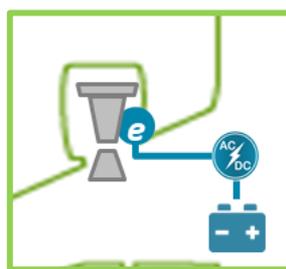
Turbofan development



Boundary Layer Ingestion



Unducted Rotor



Electrified Propulsion



Distributed propulsion



Sustainable Aviation Fuel

AIRBUS



ICAO

ENVIRONMENT



ICAO Environmental
Symposium 2019

DESTINATION GREEN: THE NEXT CHAPTER



Electrification

Significant activities launched

AIRBUS



Electrified Propulsion Perspectives

Opens new perspectives for propulsion energy

...and radical vehicle configurations



Airbus E-Fan 1.0

(2008 – 2012)

Endurance:

1hr + reserves

Battery:

120 Wh/kg



Airbus Zephyr HAPS

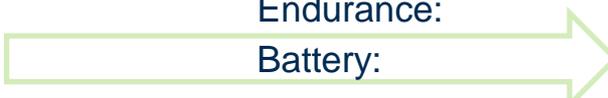
(2018)

Endurance:

25 days

Battery:

440Wh/kg





ICAO

ENVIRONMENT



ICAO Environmental
Symposium 2019

DESTINATION GREEN: THE NEXT CHAPTER



Hybrid electric propulsion – Prototyping and technology bricks

Airbus “E-Aircraft Systems House” :
We develop electric and hybrid propulsion technologies

New test facility capable of testing
power systems up to 20 MW



Installation of CityAirbus complete configuration (8 motors)



To enter into service in 2019

AIRBUS



ICAO

ENVIRONMENT

ICAO Environmental Symposium 2019

DESTINATION GREEN: THE NEXT CHAPTER

Hybrid Electric Flight Demonstrators





ICAO

ENVIRONMENT



ICAO Environmental
Symposium 2019

DESTINATION GREEN: THE NEXT CHAPTER



First flight in Jan 2018

Over 50 test flights – over 1000 subscale model test flights

AIRBUS



ICAO

ENVIRONMENT



ICAO Environmental
Symposium 2019

DESTINATION GREEN: THE NEXT CHAPTER



City Airbus first take-off – 3 May 2019

Flight envelope expansion will start now

AIRBUS



ICAO

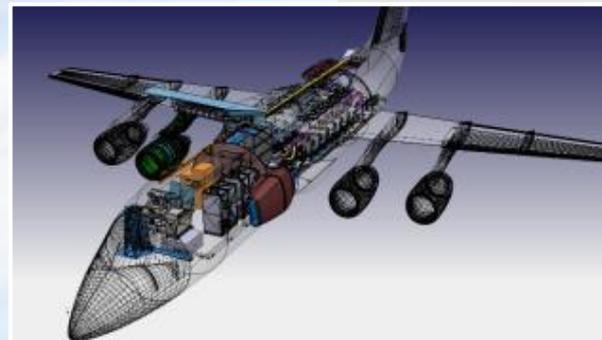
ENVIRONMENT



ICAO Environmental Symposium 2019

DESTINATION GREEN: THE NEXT CHAPTER

E-FAN X – 2MW hybrid electric propulsion flight demonstrator



Strong acceleration of learning and experience acquisition
Pushing limits further: 2 MW power class, UHV distribution, altitude operation

AIRBUS



ICAO

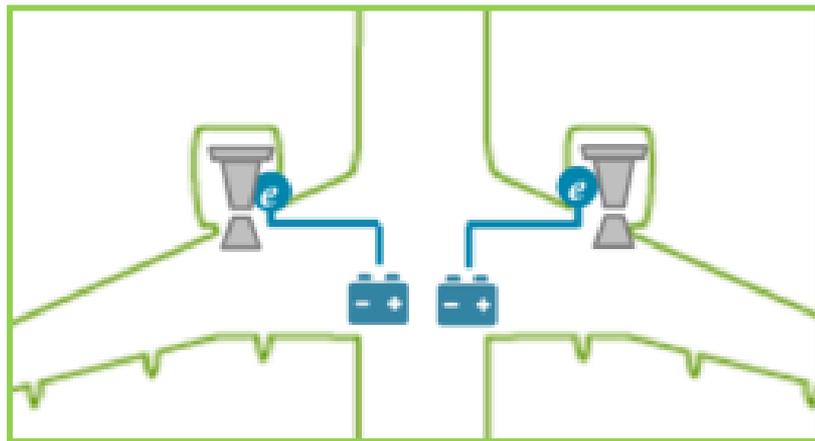
ENVIRONMENT



ICAO Environmental Symposium 2019

DESTINATION GREEN: THE NEXT CHAPTER

Hybrid electric propulsion for large commercial aircraft



From **Low power hybridization**

to

Fully distributed propulsion

... all hybridization options are studied, from several 100kW to 20MW

AIRBUS



ICAO

ENVIRONMENT



ICAO Environmental
Symposium 2019

DESTINATION GREEN: THE NEXT CHAPTER



Electrification will play a major role to achieve our long term environmental targets.





ICAO

ENVIRONMENT



ICAO Environmental
Symposium 2019

DESTINATION GREEN: THE NEXT CHAPTER

SAE E-40 Electrified Propulsion Committee

Standardization group to address considerations for performance, airworthiness, safety, aircraft integration, components and interfaces within and between propulsion system and other aircraft equipment for future

Electrified Propulsion Aircraft

- Initial scope, rational and roadmap set by the industry in Sept 18 (Toulouse)
- **E-40 Created by SAE organization in Nov 18**
- First meeting 26-28 Feb 19
- Next meetings : 10-12 Sept 2019 in Barcelona, 10-12 March 2020 in Tokyo



AIRBUS



ICAO

ENVIRONMENT



ICAO Environmental Symposium 2019

DESTINATION GREEN: THE NEXT CHAPTER



ICAO

North American
Central American
and Caribbean
[NACC] Office
Mexico City

South American
[SAM] Office
Lima

ICAO
Headquarters
Montréal

Western and
Central African
[WACAF] Office
Dakar

European and
North Atlantic
[EUR/NAT] Office
Paris

Middle East
[MID] Office
Cairo

Eastern and
Southern African
[ESAF] Office
Nairobi

Asia and Pacific
[APAC] Sub-office
Beijing

Asia and Pacific
[APAC] Office
Bangkok



THANK YOU