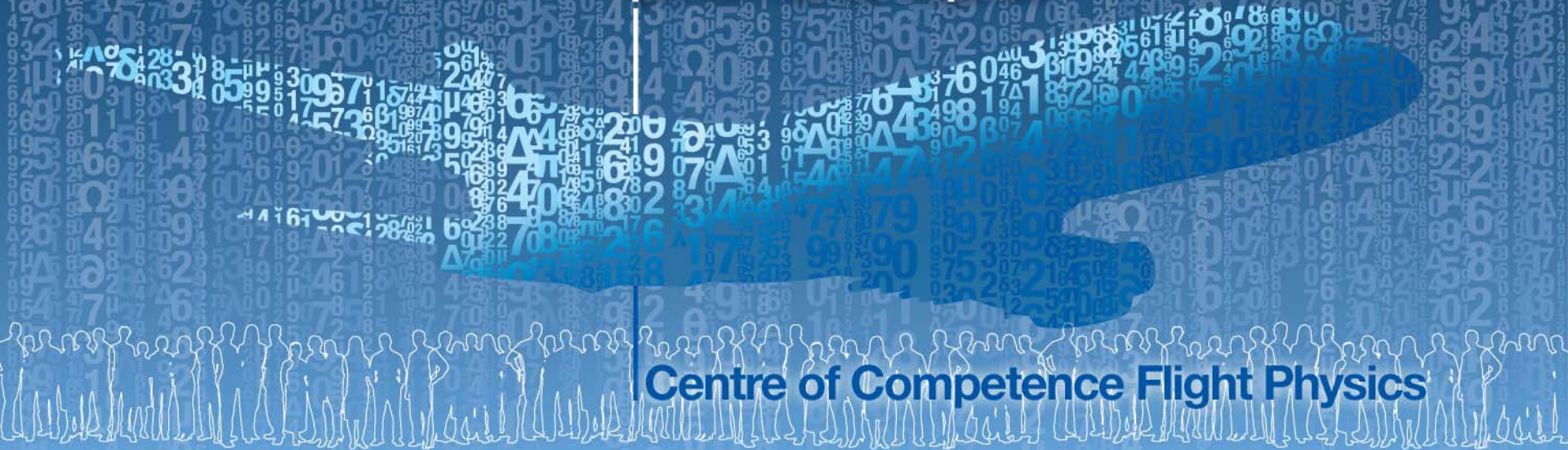


Airbus Engineering unlimited performance inspired



Centre of Competence Flight Physics

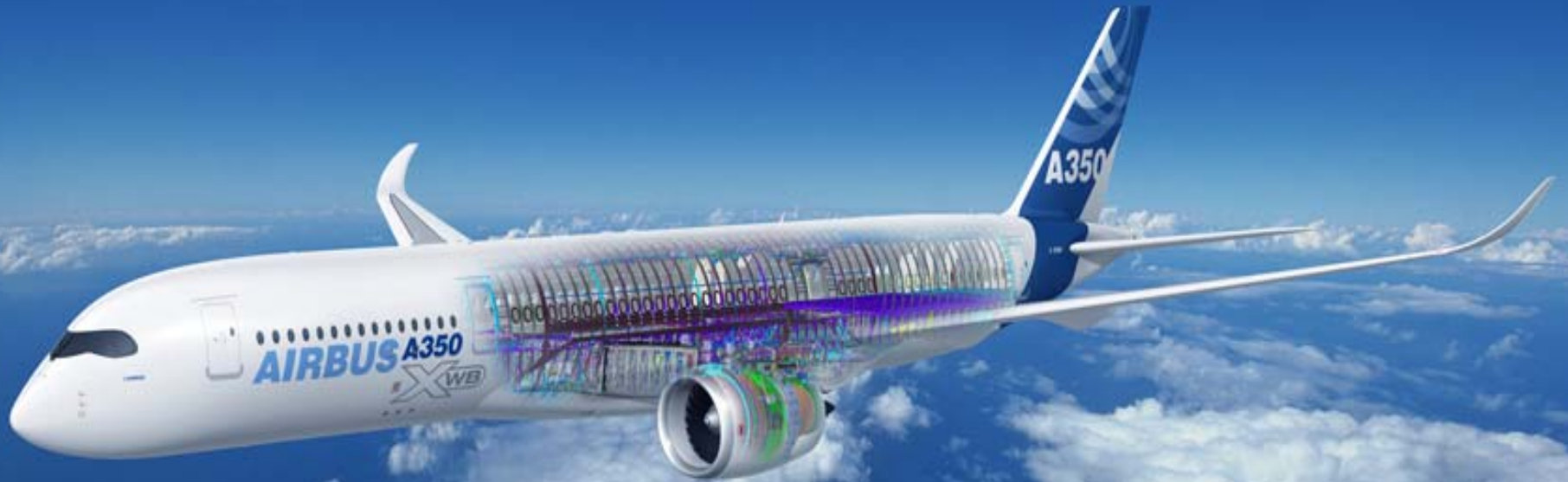
Event / Department (optional)

Industry's Needs of Aviation Infrastructures

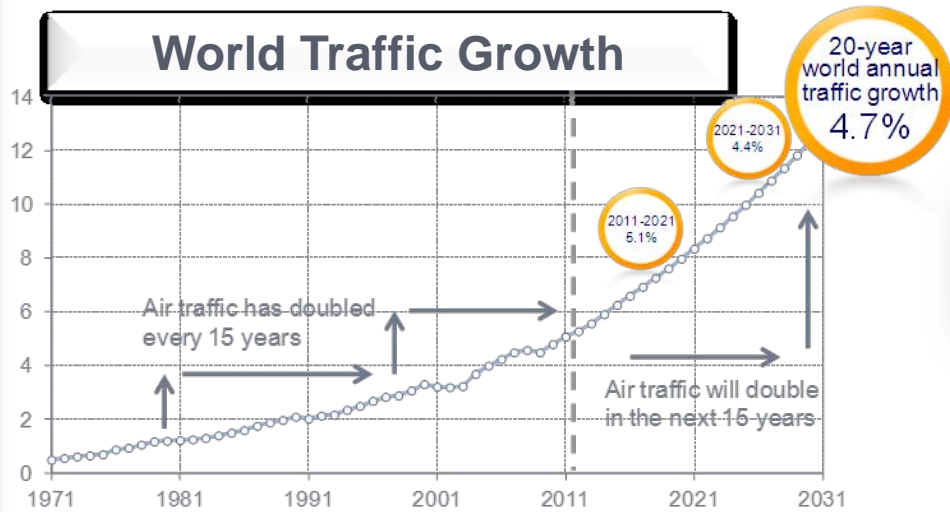
ACARE AirTN Meeting, 26th February 2013

Presented by
Axel Flaig, SVP Airbus Flight Physics

Aviation Challenges



Socio-economics & environment



European Aviation Vision 2050



-Emissions:

-75% less CO₂, 90% less NO_x and 65% less noise

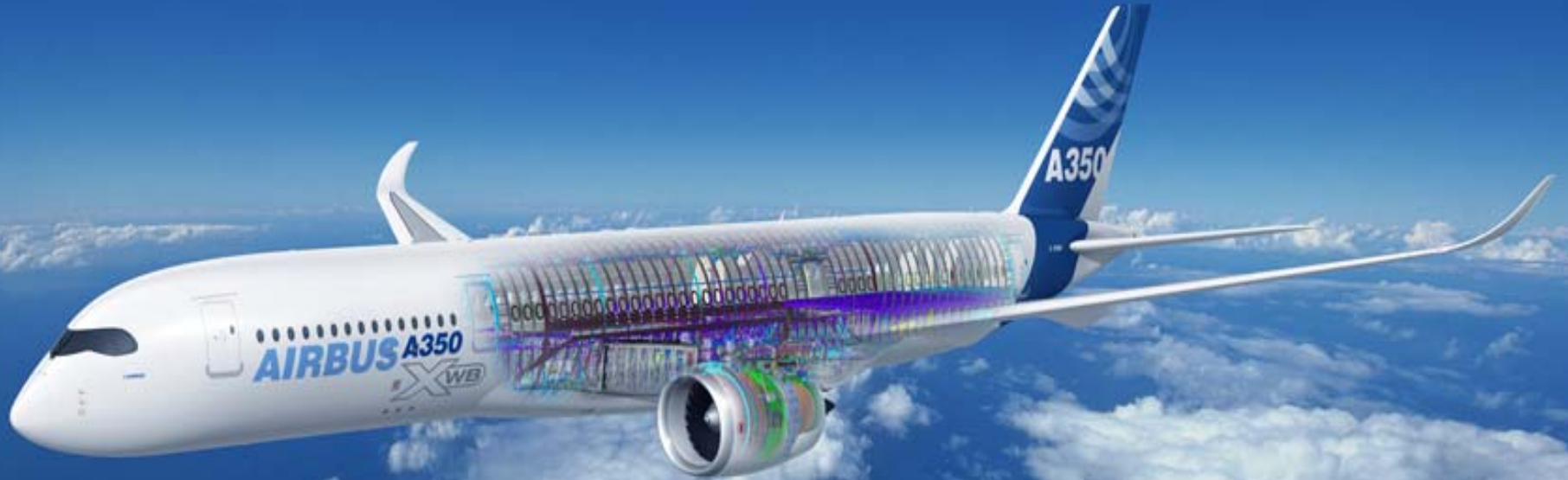
-Seamless air transport system including air traffic management

• Industry Challenges

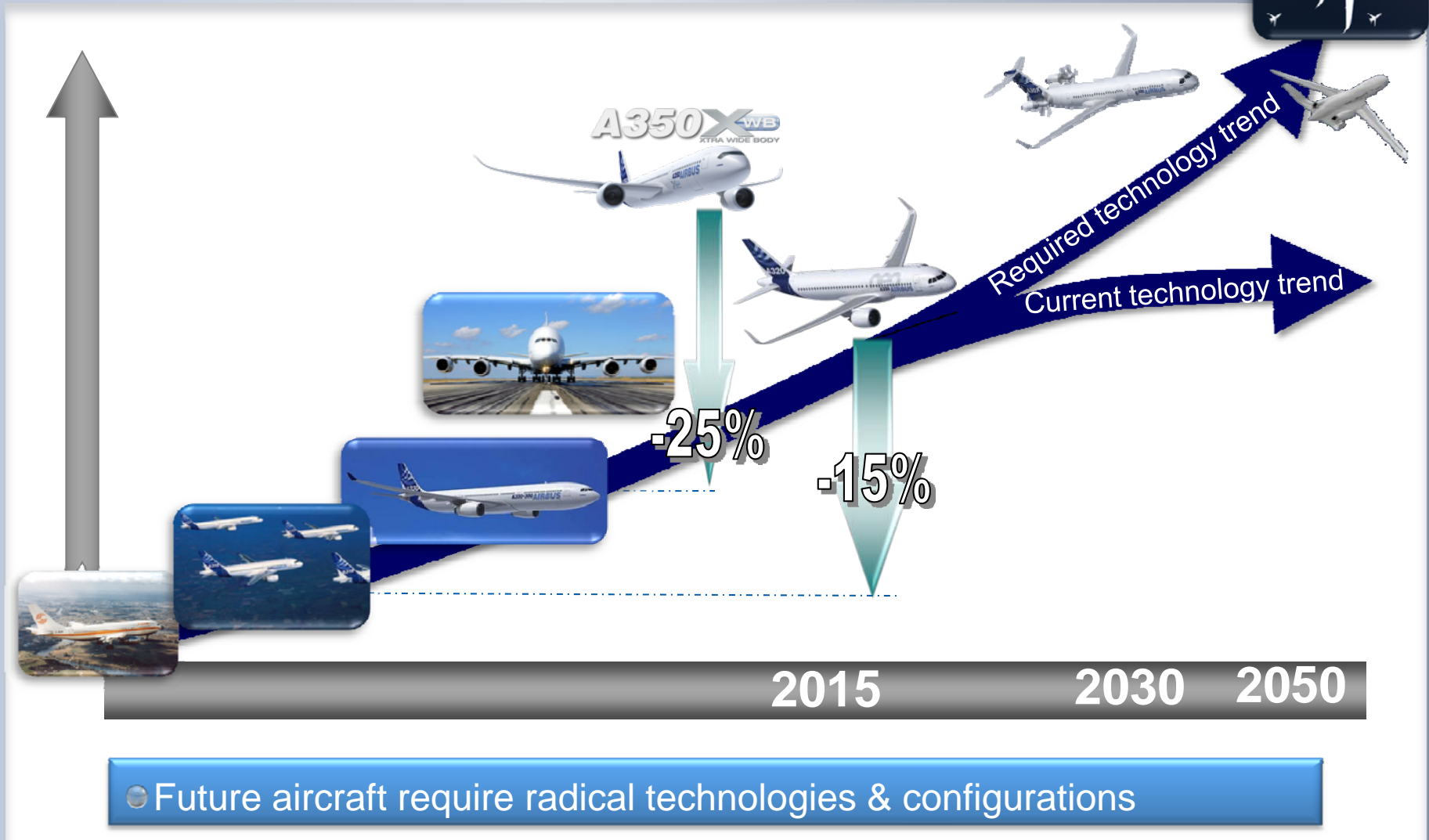
- Europe has set ambitious targets in terms of environmental impact reduction, increased innovation and competitiveness



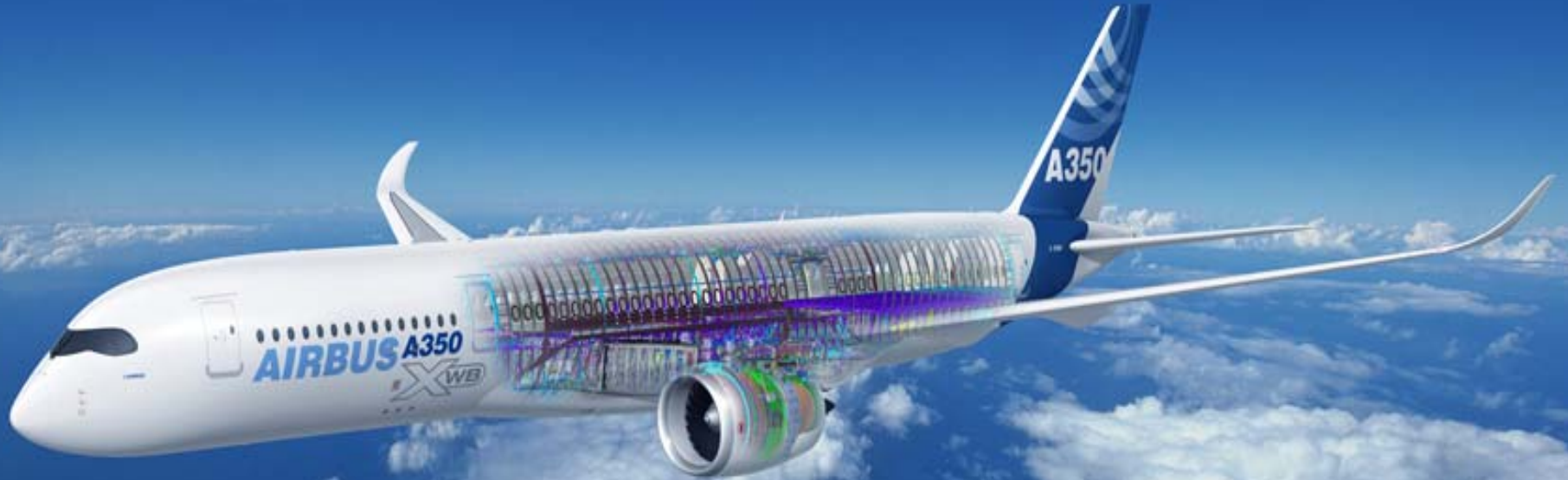
Product Asymptote & Future Technologies



Product evolution: Step Change Needed



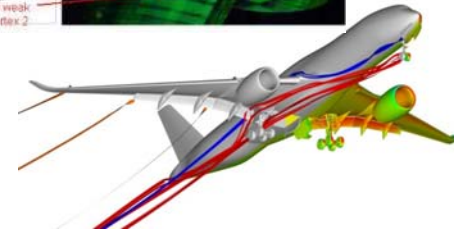
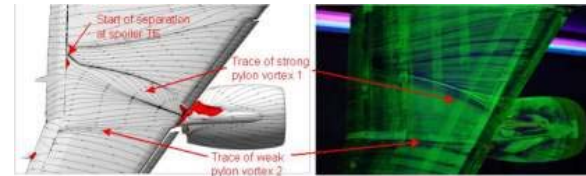
Infrastructure in the Aviation Context



Key Enablers



Flight Tests for design validation



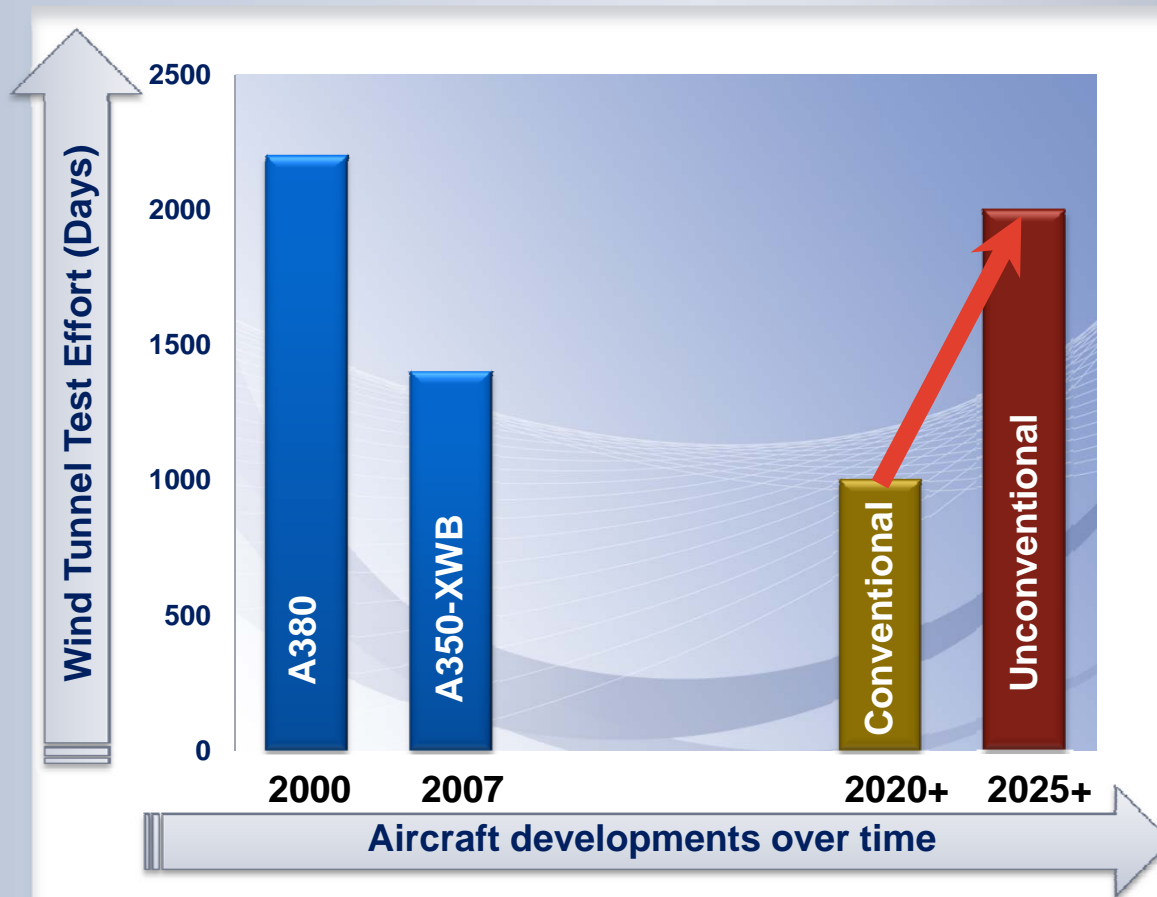
Wind Tunnel Testing for configuration and design verification, technology validation in non-linear flight regimes



Numerical Simulation for specific studies, detailed flow physics and data production in linear flight regimes

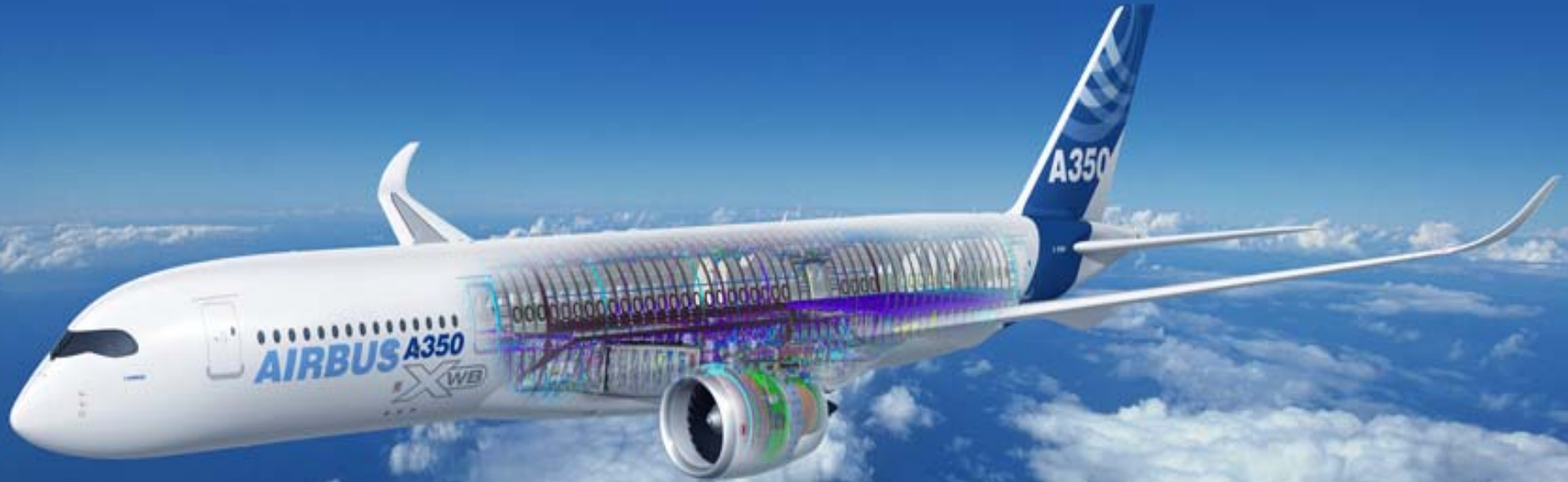
Complementary means: Wind tunnel testing, numerical simulation & Flight Tests

Wind Tunnel Testing: Projected Testing Effort



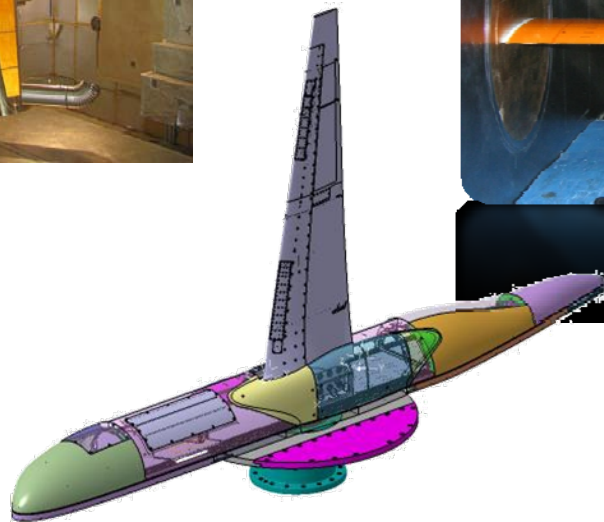
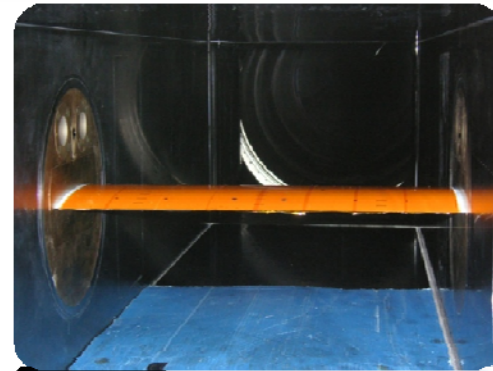
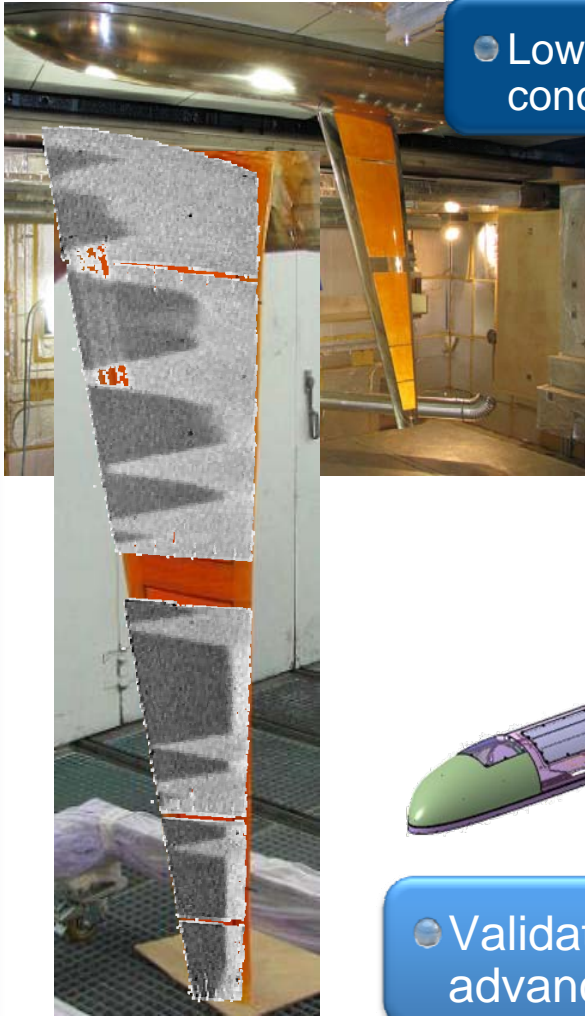
- Unconventional configurations with novel technologies will require significant wind tunnel test effort in concept validation

Requirements on Wind Tunnel Facilities



Aerodynamics technology barrier

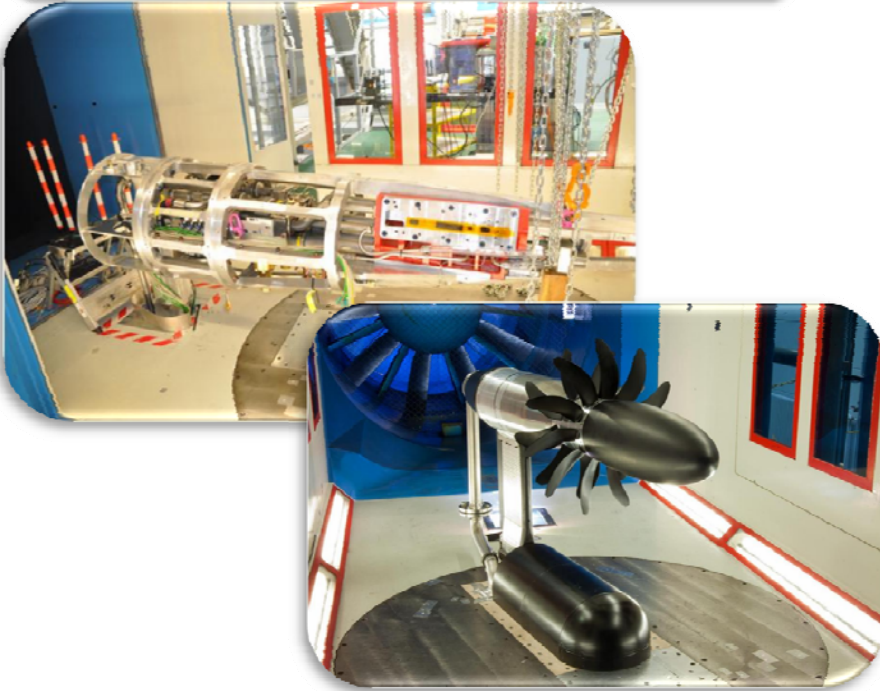
- Low Drag Aircraft through Natural Laminar Flow concept and Flow Control



- Validation of advanced aerodynamics technologies require advanced testing at high Reynolds numbers

Engine simulation & Configuration

- Counter Rotating Open Rotors (CROR): Engine Simulation

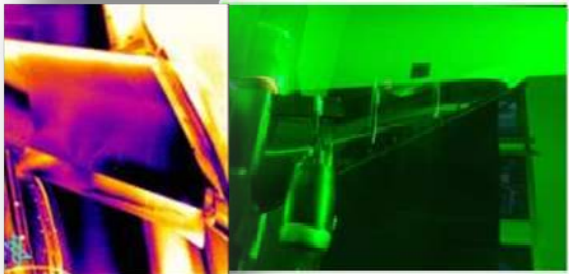
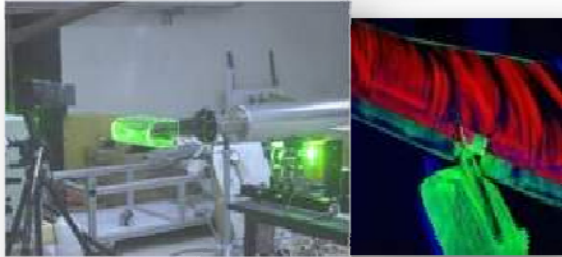
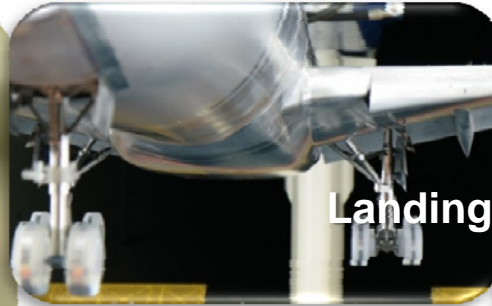


- Configuration testing



- The development of these concept simulators is only been possible through significant wind tunnel testing efforts

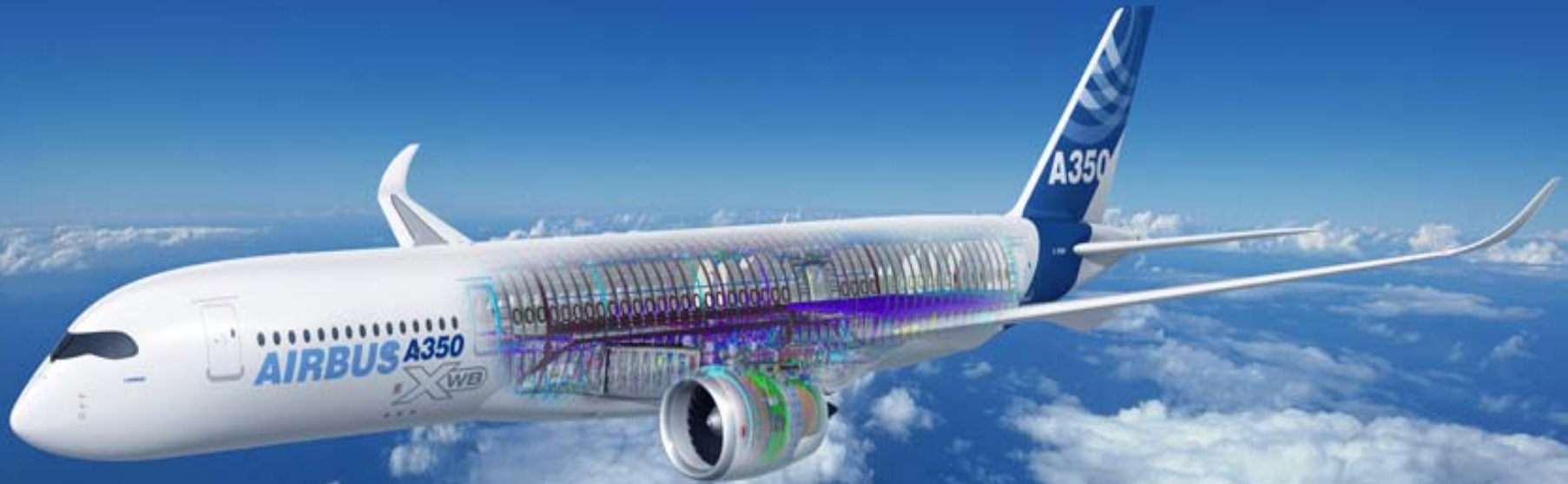
Advanced Measurements: Beyond the conventional



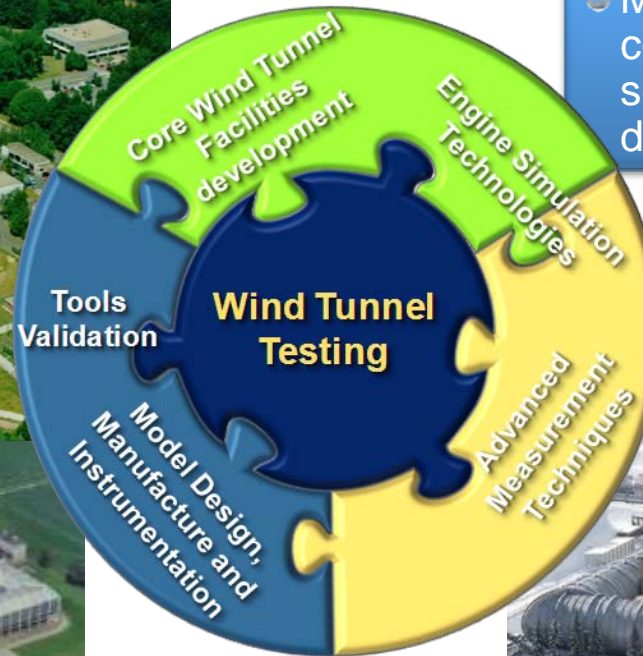
- Non-intrusive advanced measurements and visualisation

- Significant effort needed to *ensure that capabilities are available for industrial exploitation, ready for the next generation of aircraft developments*

Outlook on Future Infrastructure Developments



Maintenance and upgrade needs

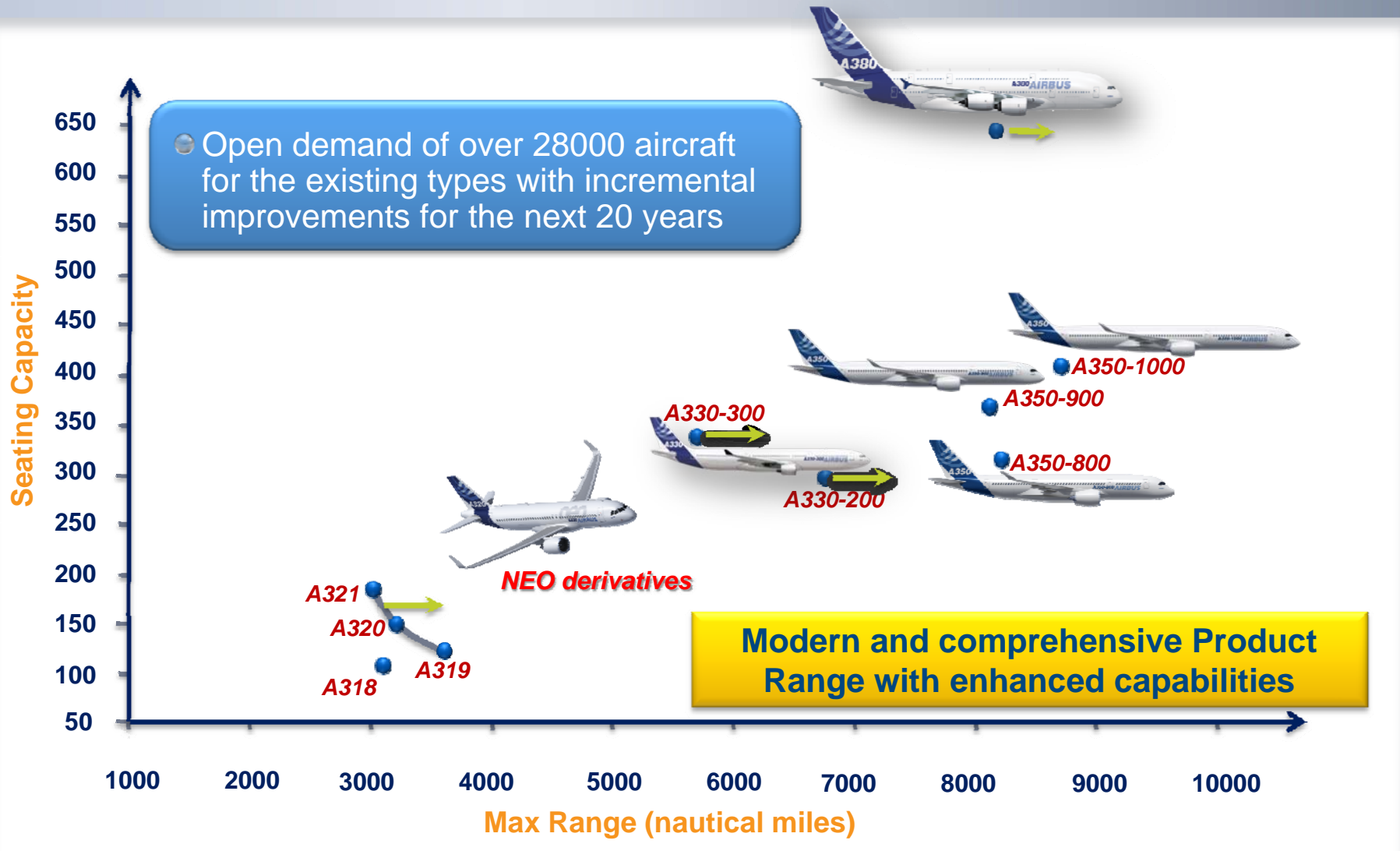


- Maintaining & Developing core facilities is key for securing aircraft developments



- Due to the demanding drive for technology and configuration validation, there is huge pressure on facility owners to upgrade their capabilities

The current aircraft product panorama

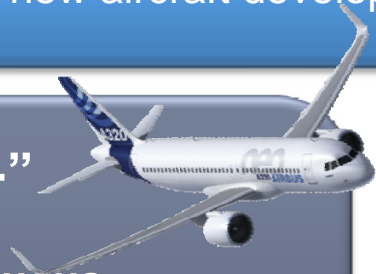


Risks

- No foreseen new aircraft developments in the near future = decreasing workload to key facilities

“2015+”

« Continuous improvements within constrained architecture and schedule »



“2020+”

« Technology validation and de-risking »



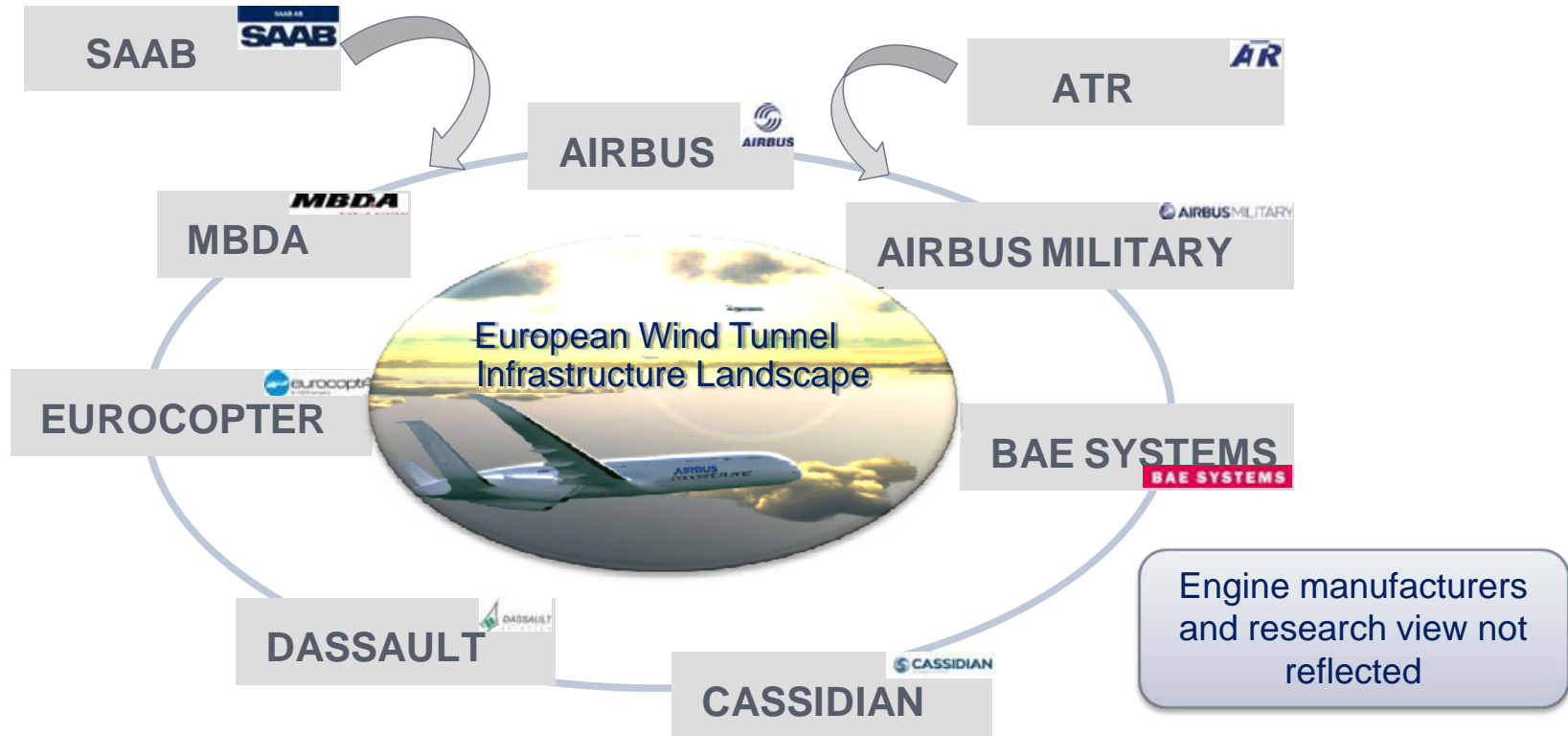
“2030+”

« Game Changing aircraft concept »



- Next major development not foreseen until 2030: Potential financial risks on key facilities due to lack of revenues from testing volume

Airframers' view of the European Landscape



- In 2011, Airbus took the initiative to set up a working group of the major European airframers to review and provide a recommendation on the future wind tunnel infrastructure needs

The current strategic infrastructures



ETW

● **Need for many facilities each with specific capabilities**

Airframers' perspective



CEPRA-19



ONERA-F1



CIRA



DNW-LLF



DNW-KRG

Used for major developments and R&T Programmes



ONERA-S1



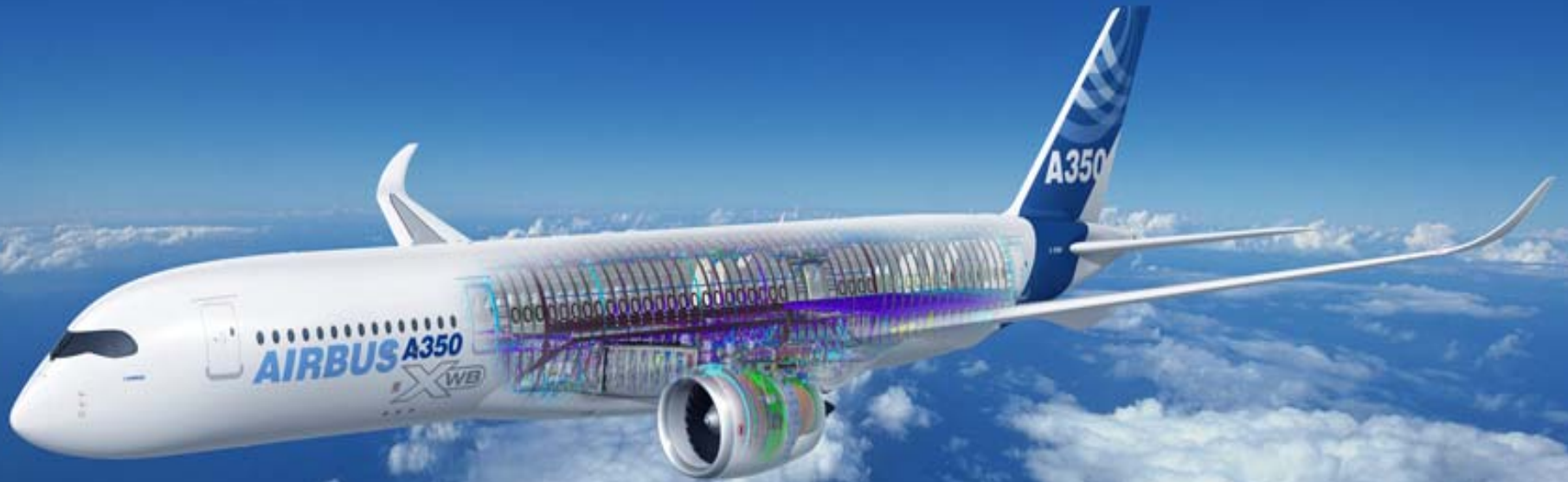
ONERA-B02

Specialist facilities



ARA-TWT

Conclusions



Conclusions

- Industrial Wind Tunnels are vital to support the European Aeronautics industry in future aircraft developments; they fulfil societal needs as expressed in the ACARE Vision 2020 and Flightpath 2050 ambitions
- No major developments are planned over the next decade; this creates a survival risk for the existing infrastructures due to reduced income from industry
- A joint European effort is required to set up a funding mechanism through research programmes to ensure the long term availability of such facilities with state-of-the-art capabilities



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