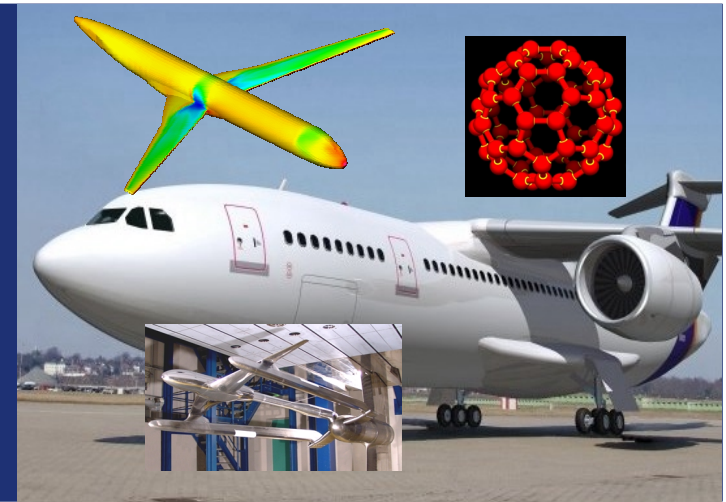


Presented by

Dieter SCHMITT

Airbus SAS

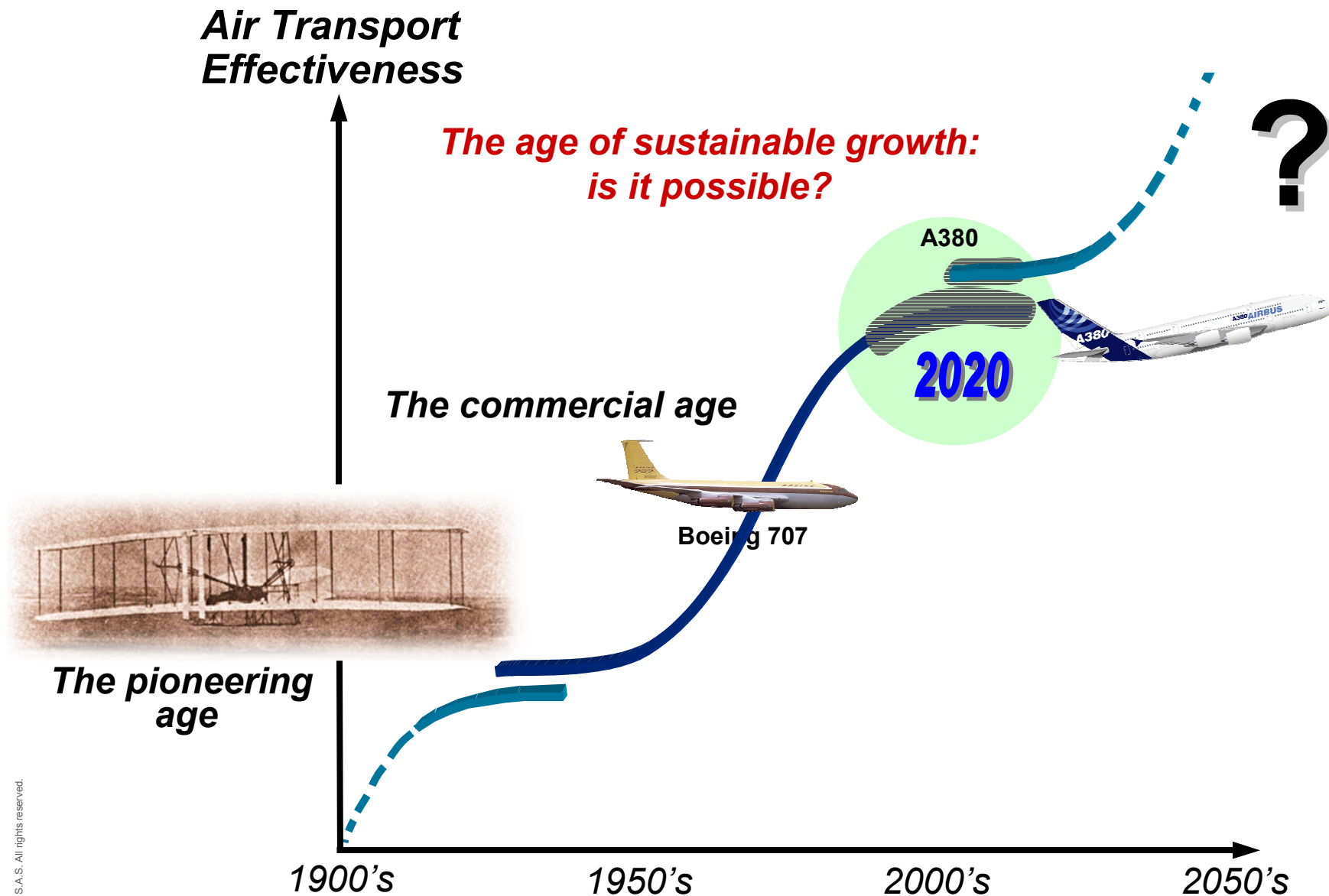
Vice-President Research & Technology



Education in Aeronautics

An Airbus perspective

Evolution vs Revolution



European Aeronautics Vision 2020

Challenges

■ Quality and Affordability

- *Reduced passenger charges*
- *Increased passenger choice*
- *Transformed freight operations*
- *Reduced time to market by 50%*

■ The environment

- *Reduction of CO2 by 50%*
- *Reduction of NOx by 80%*
- *Reduce perceived external noise by 50%*
-

■ Safety

- *Reduction of accidents rate by 80%*
- *Drastic reduction in human error and its consequences*

■ The Efficiency of the Air Transport System

- *3X capacity increase*
- *99% of flights within 15' of schedule*
- *Less than 15' in airport before short flights*

■ Security

- *Airborne - zero hazard from hostile action*
- *Airport - zero access by unauthorised persons or products*
- *Air navigation - No misuse. Safe control of hijacked aircraft*

...addresses the full scope of customer expectations



Group of Personalities

Pedro Argüelles
Pedro Argüelles

John Lumsden
John Lumsden

Manfred Biedhoff
Manfred Biedhoff

Denis Rancque
Denis Rancque

Philippe Busquin
Philippe Busquin

Søren Rasmussen
Søren Rasmussen

B.A.C. Drotte
B.A.C. Drotte

Paul Reutlinger
Paul Reutlinger

Sir Richard Evans
Sir Richard Evans

Sir Ralph Robins
Sir Ralph Robins

Walter Kroll
Walter Kroll

Helena Terho
Helena Terho

Jean-Luc Lagardère
Jean-Luc Lagardère

Arne Witbock
Arne Witbock

Alberto Lima
Alberto Lima

January 2001

How will Airbus implement the vision?

Challenges of Vision 2020

- **Quality and Affordability**
- **The Environment**
- **Safety and Security**
- **The Efficiency of the Air Transport System**

Challenges for AIRBUS

Lower cost

Low cost manufacturing and assembly
Design methods and tools; KBE

Cabin design

Flexible, up-gradable cabin

Reduce drag

Aerodynamic drag reduction

Improve systems

Alternative energy
More Electric Systems

Reduce weight

Low weight structures

Improve powerplant

Pylon, engine integration

Airframe noise

High lift noise
Landing gear noise

Security

Passive protection means
Proactive protection means

Safety

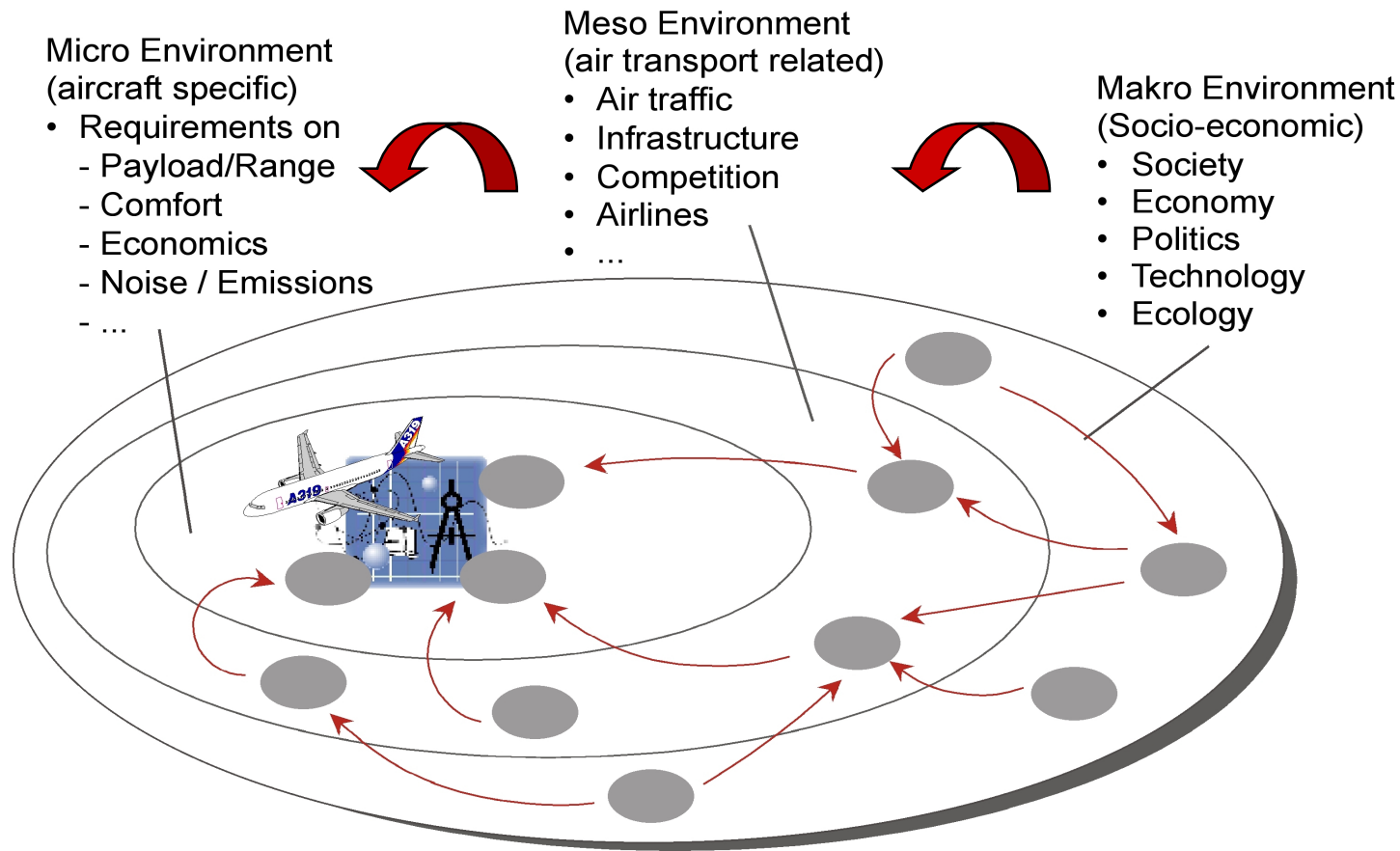
Systems design
Human factors
Flight hazard resolution
Wake Vortex
Communication
Navigation
Surveillance

Capacity

Reduce delays

Advanced Aircraft Configuration

Rationalise future challenges



Modelling of the world context will provide insight and rationale to prioritise the different concepts for the benefit of the end customer as well as for the aircraft manufacturer

Understand the challenges

SAFETY and SECURITY

MARKET REQUIREMENTS

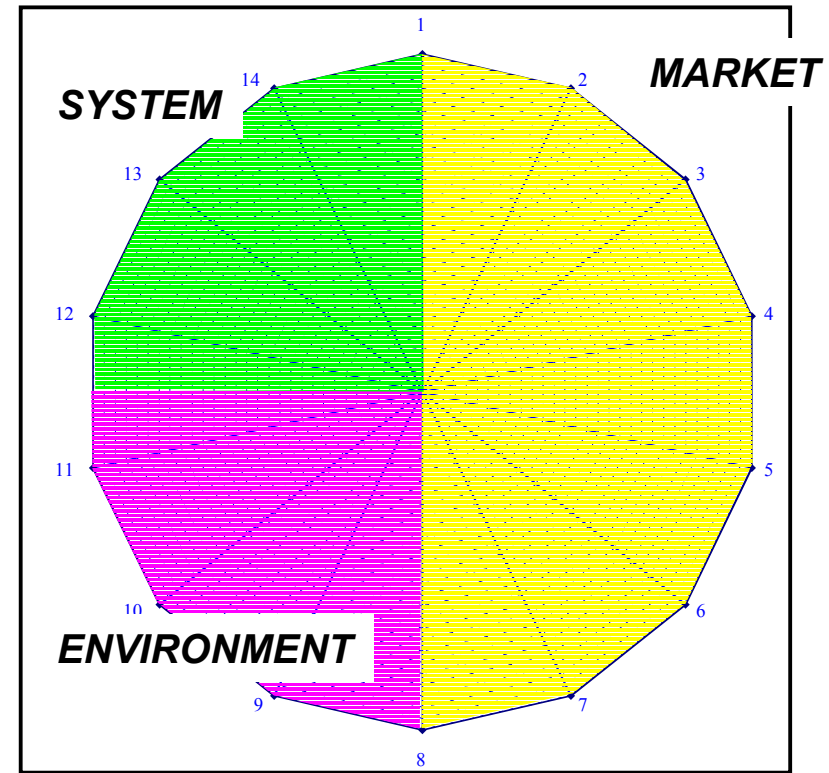
1. ***High Productivity***
2. ***Low cost of operation***
3. ***Superior reliability/maintainability***
4. ***Comfort / health driven cabin design***
5. ***Low cost of acquisition / high residual value***
6. ***High flexibility/updatability***
7. ***Family Concept design***
8. ***Market specialisation***

ENVIRONMENTAL PRESSURE

9. ***Low noise***
10. ***Reduced emissions***
11. ***Low manufacturing and life cycle impact***

INTEGRATION IN THE SYSTEM

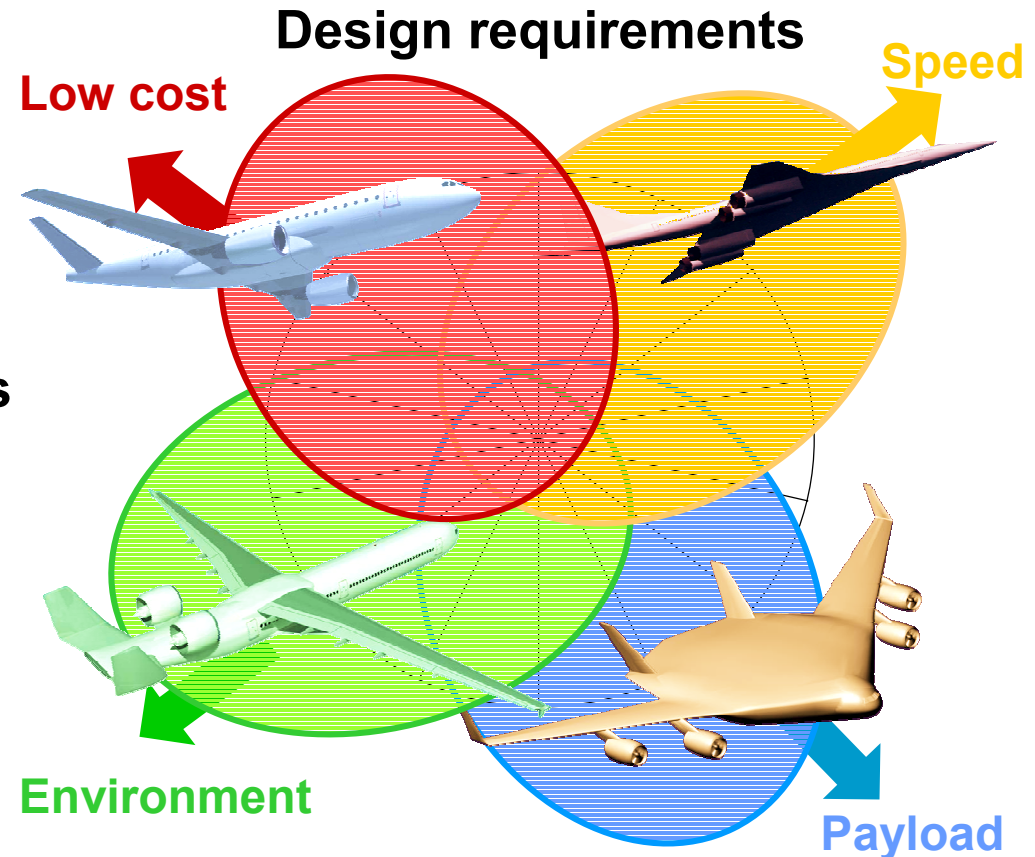
12. ***Solution to airport congestion***
13. ***Good airport compatibility***
14. ***Exploiting new ATM opportunities***



Key driving requirements for the future air transport system have been captured and analysed

Think out of the box

Future capabilities : driven by a family of concepts tailored to fit specific sets of requirements



The idea is to select concepts to explore the most relevant capabilities and meet the widest range of challenges
Important: these are not intended to be future Airbus products but extreme configurations to develop our capabilities

The “proactive” green aircraft – design drivers

Concept to drive R&T

**Reduce
noise**

**Environmental
friendly
manufacturing**

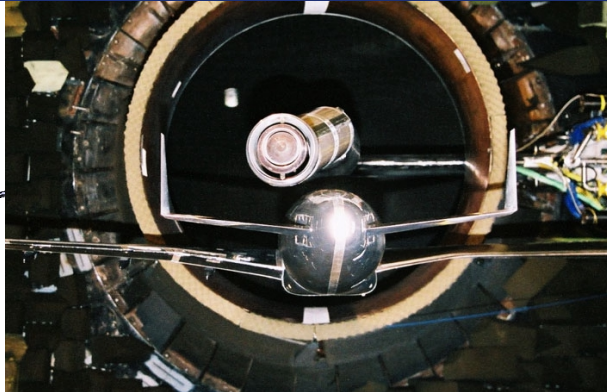
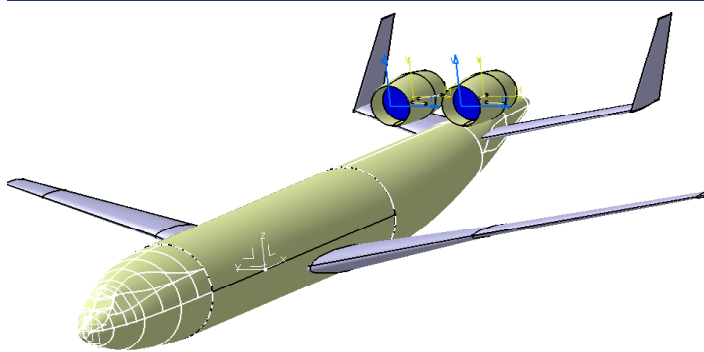
**Reduce
fuel burn**

**Reduce
emissions**

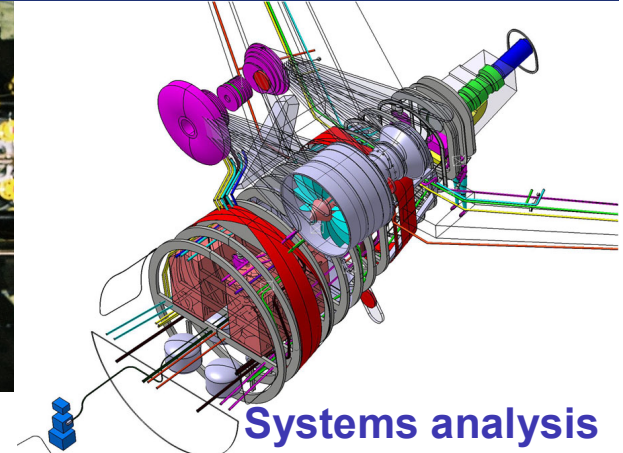
**Giving minimum affordable impact of aviation operations
and manufacturing on the environment**



The “proactive” green aircraft – solutions and technologies



Jet noise shielding studies and test in acoustic wind tunnel



Systems analysis

Concept to drive R&T

**Engine /
airframe
integration**

**New architectures
(contra fan, gearbox)**

**Fuel efficient,
quiet, clean
engines**

**High aspect
ratio, low
swept wing**



The “Money Booster” – design drivers

Concept to drive R&T

**Low manufacturing
cost**

**Versatility
in
operation**

**Simple and
robust design**

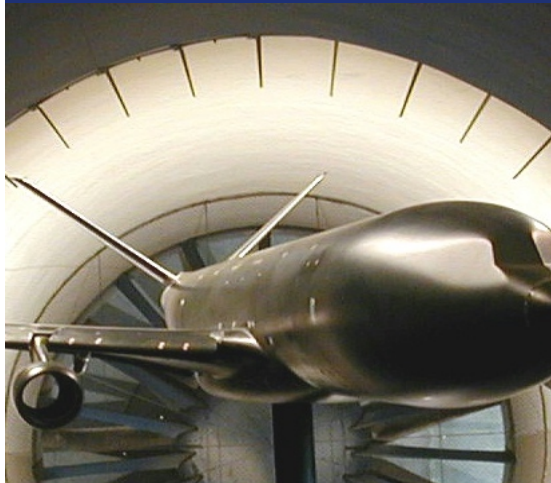


**Maintenance
free aircraft**

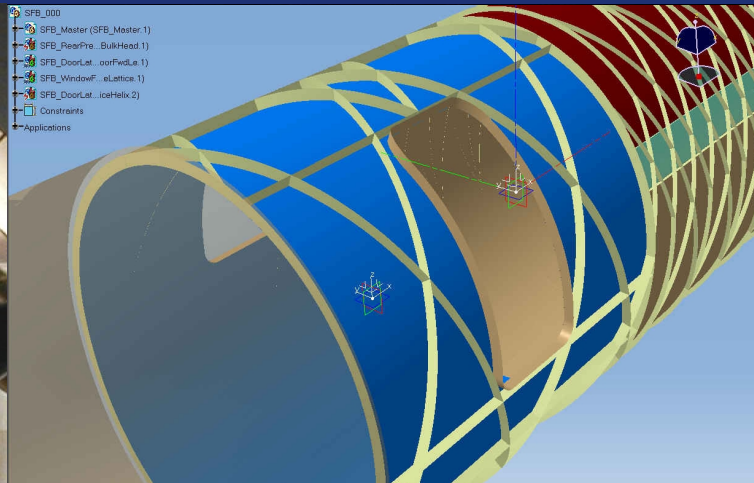
**Minimum
number of
parts**

**Putting maximum emphasis on return of investment over
life cycle of the aircraft**

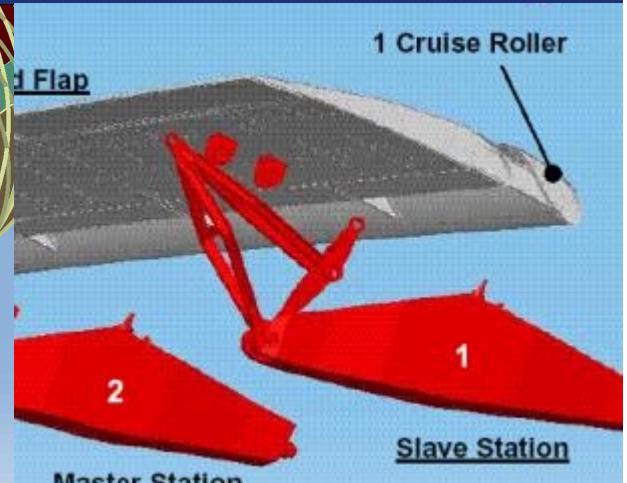
The “Money Booster” – solutions and technologies



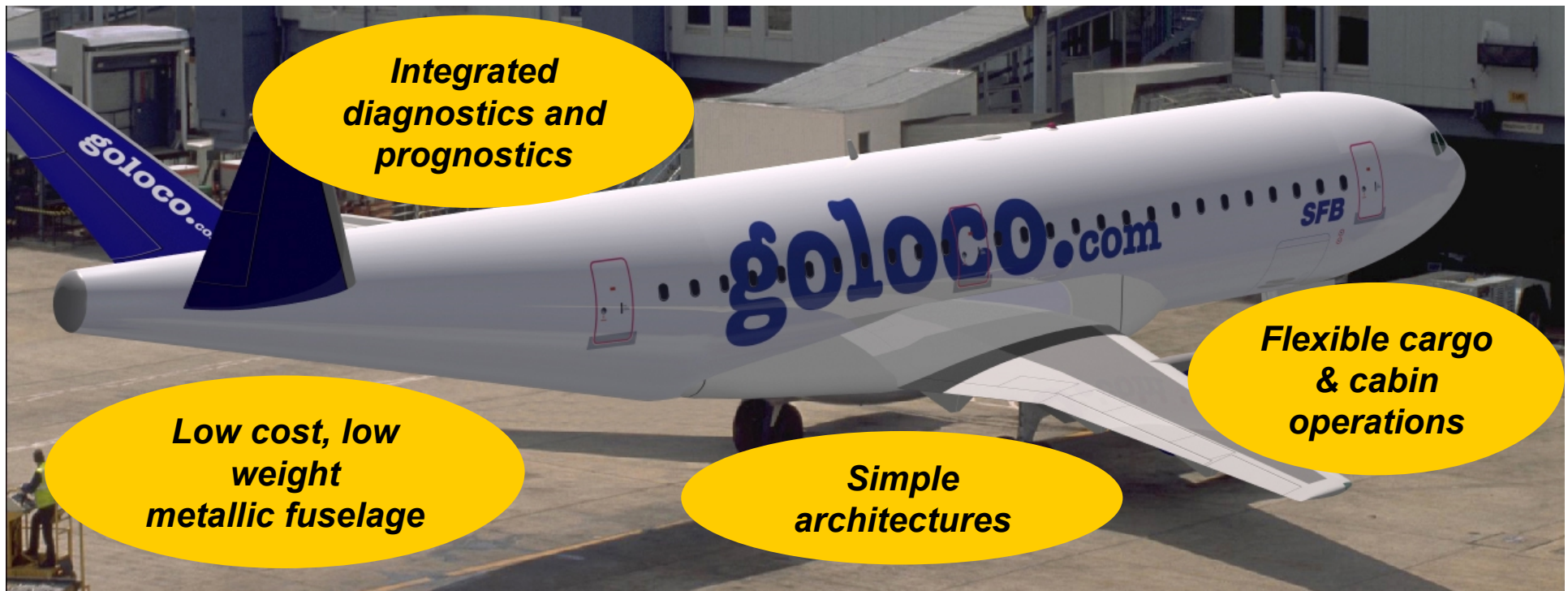
V-Tail wind tunnel tests



Lattice structure study

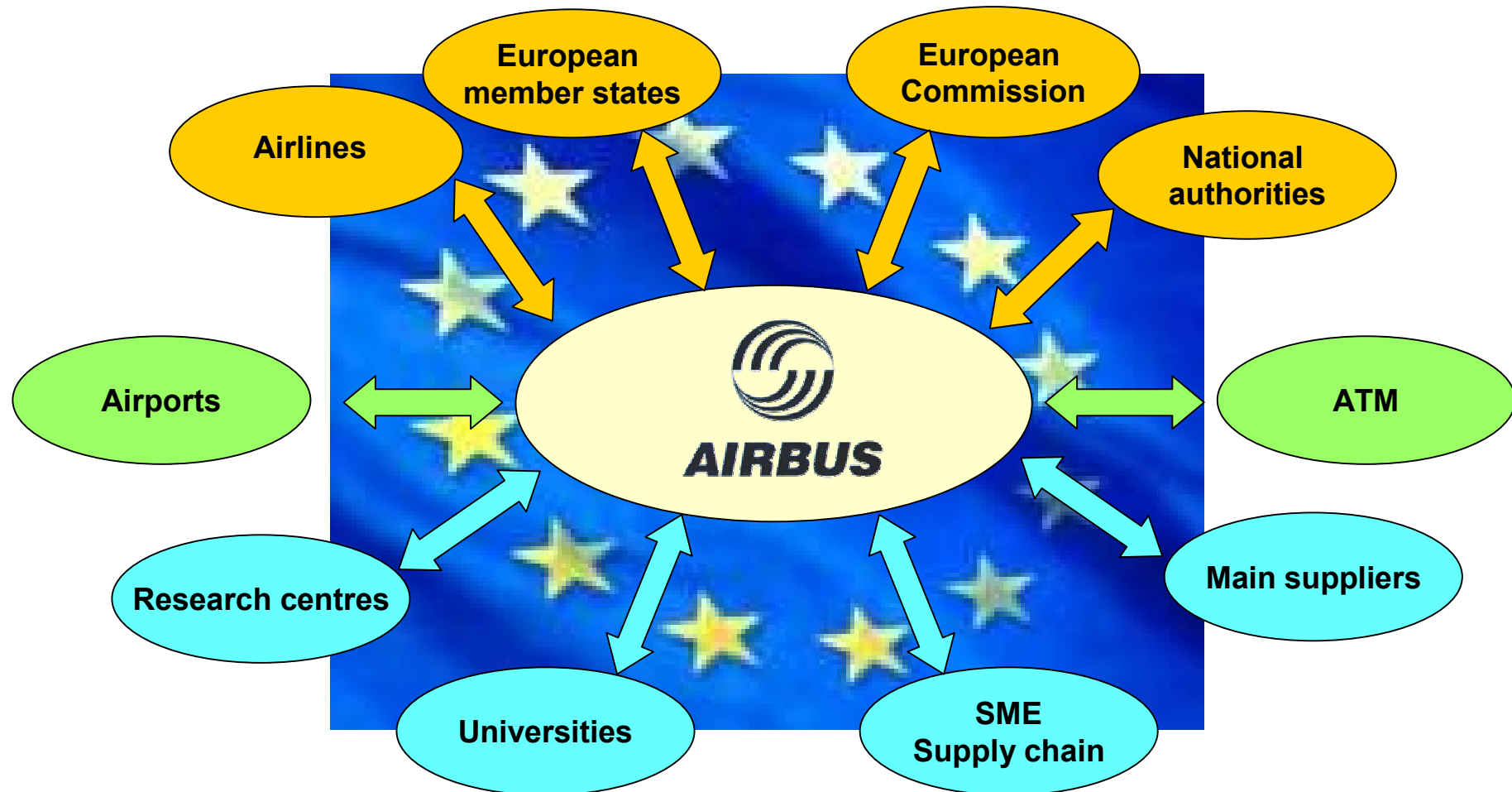


Simpler flap study



Leading role of Airbus as R&T architect in Europe

Airbus relevant stakeholders in ACARE



Strategic Research Agenda SRA2

5 High level target concepts for Air Transport Systems:



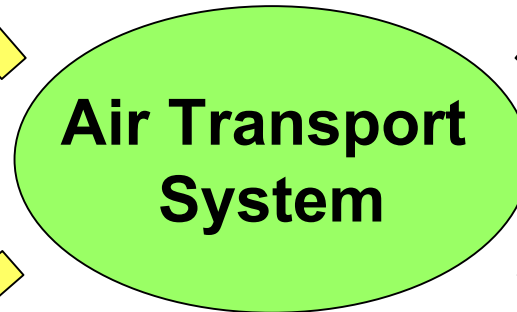
Ultra cost-efficient



Ultra time efficient



Ultra green



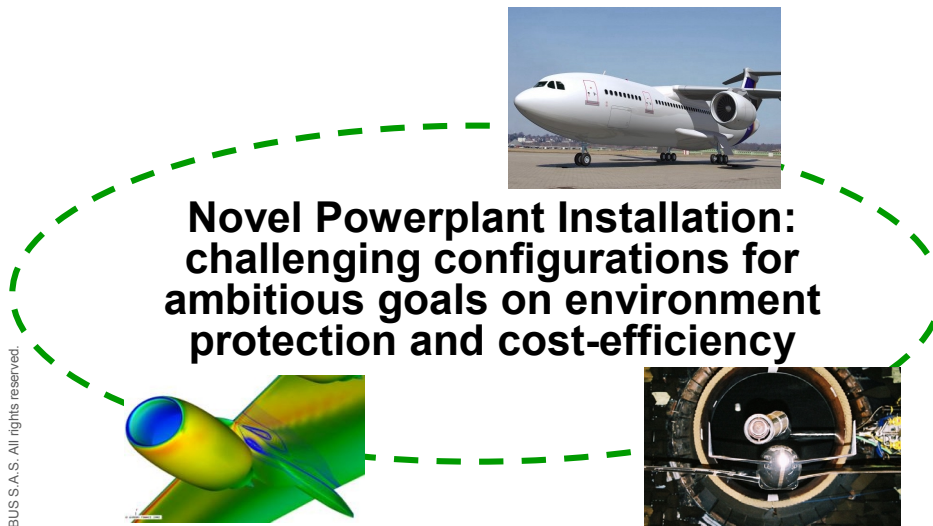
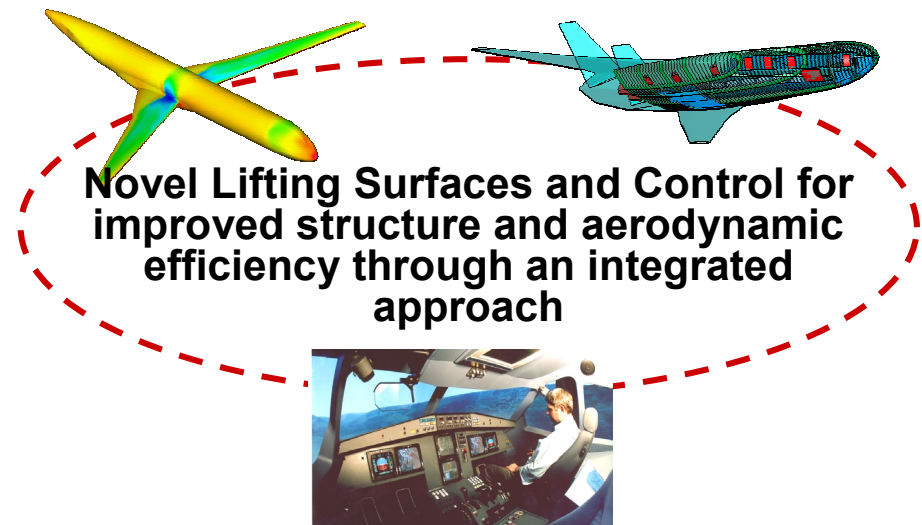
Ultrasecure



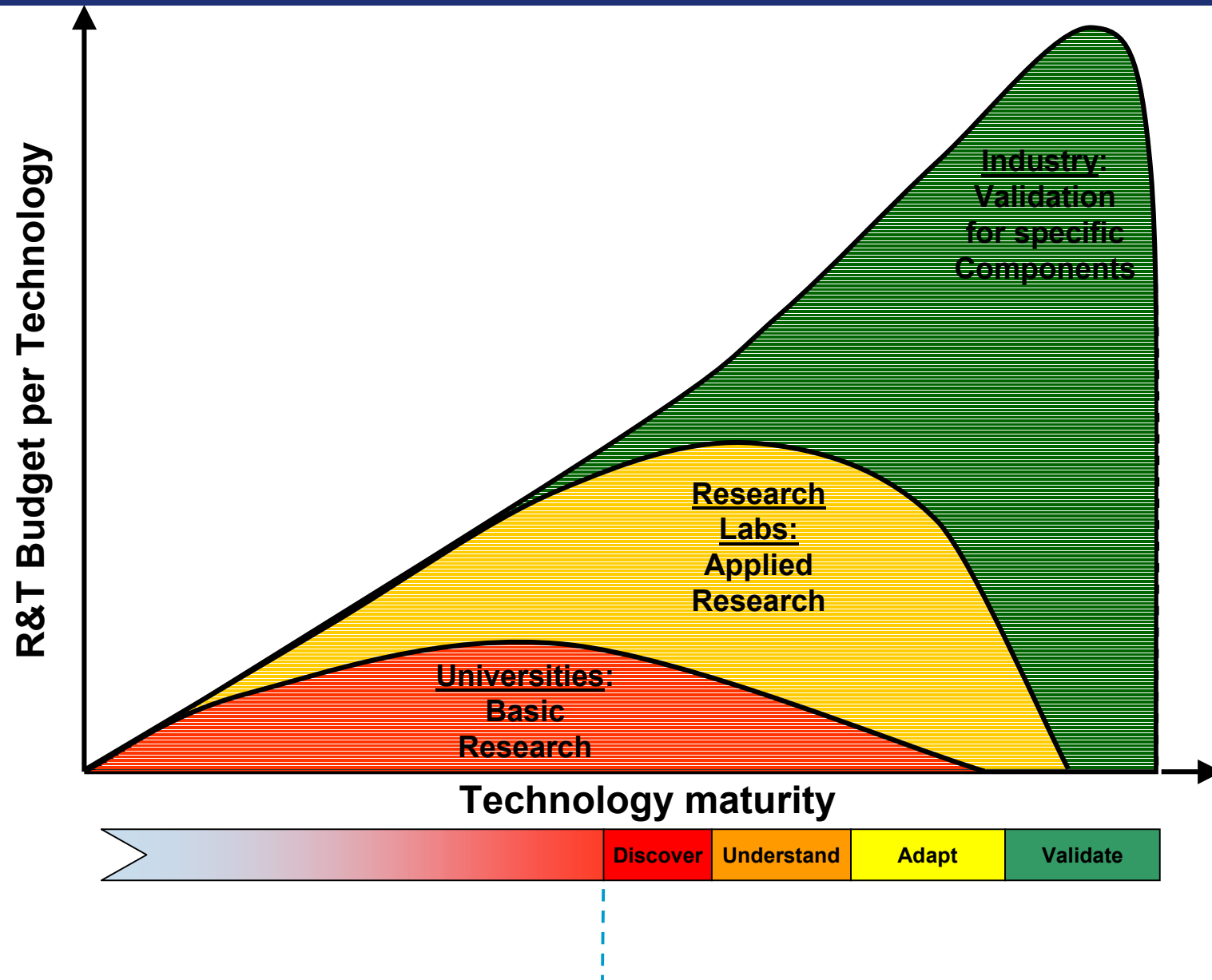
Highly customized

Preparing the future: NACRE

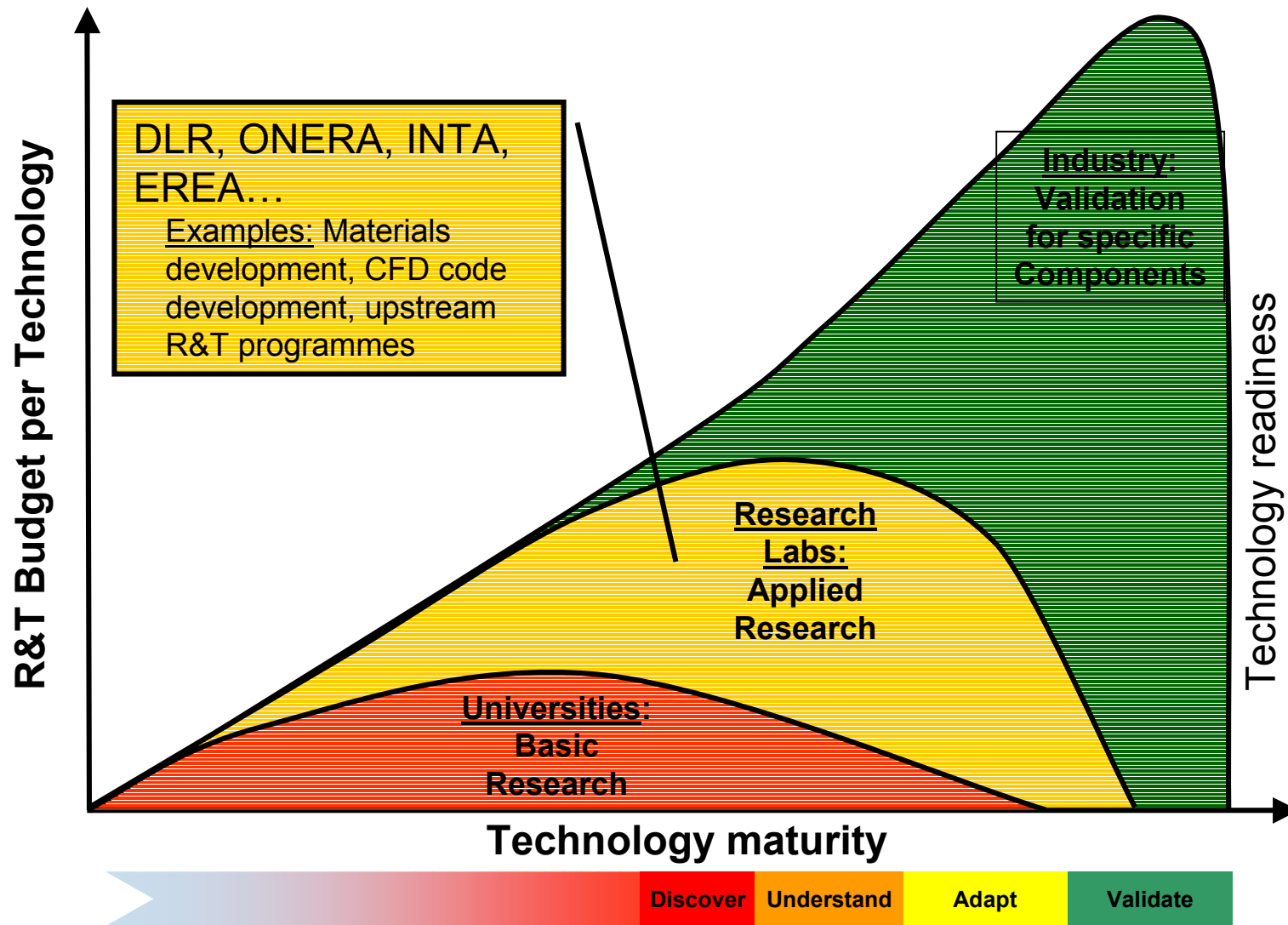
1st of April 2005 saw the launch of the 4 year EU FP6 funded research programme NACRE
(**N**ew **A**ircraft **C**oncepts **R**esearch) under Airbus lead together with 35 European partners.



Partner involvement in the R&T process



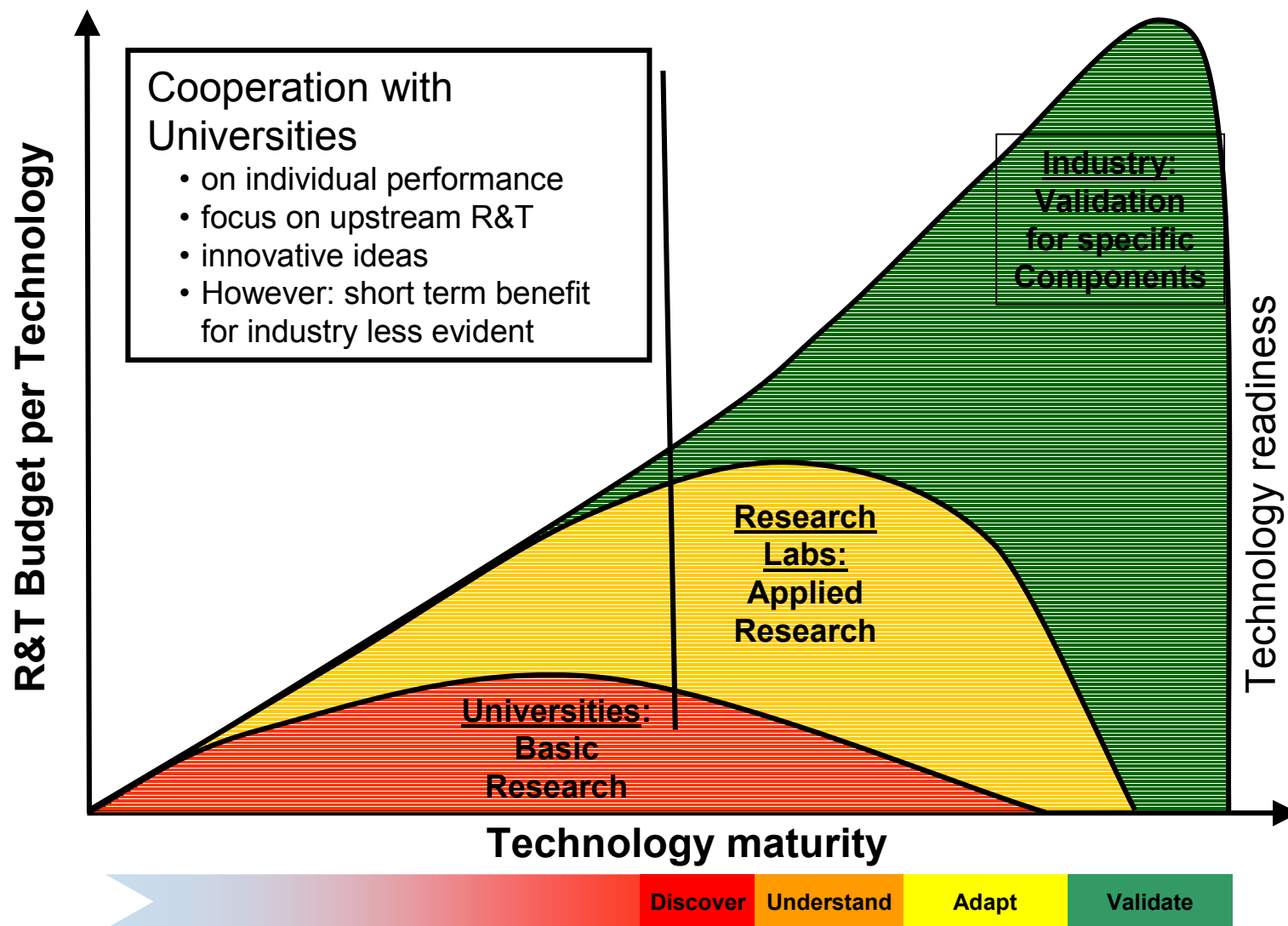
Partner involvement in the R&T process



Global R&T activities

AIRBUS R&T activities
(incl. external partners)

Partner involvement in the R&T process



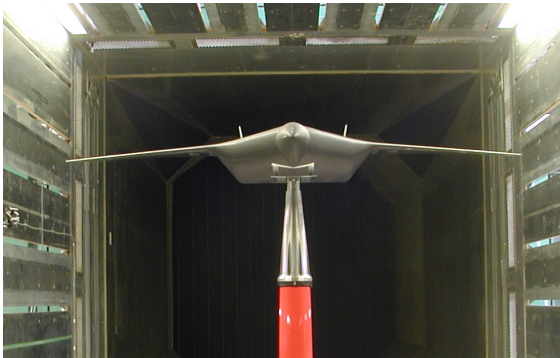
Global R&T activities

AIRBUS R&T activities
(incl. external partners)

The VELA project

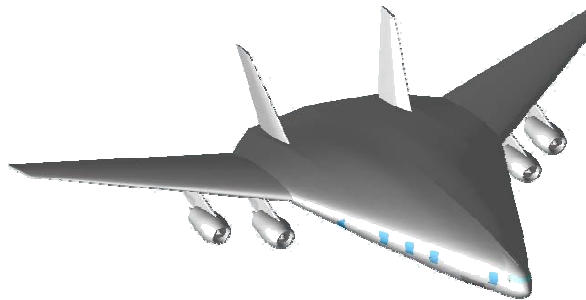
- VELA = Very Large and Efficient Aircraft
- Goal: Acquiring appropriate knowledge of flying wing design across the main disciplines
- Involves 16 partners from industry and research centres of 8 nations

Aerodynamics

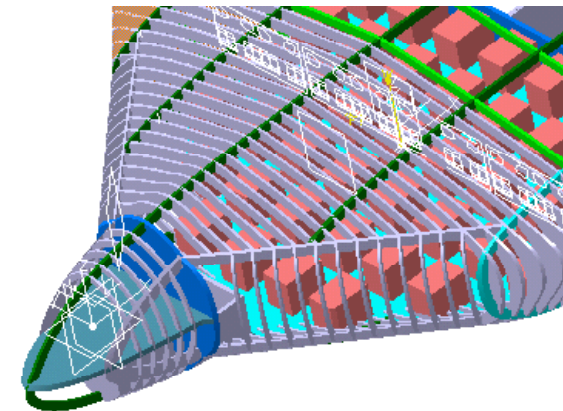


Stability & Control

Configuration



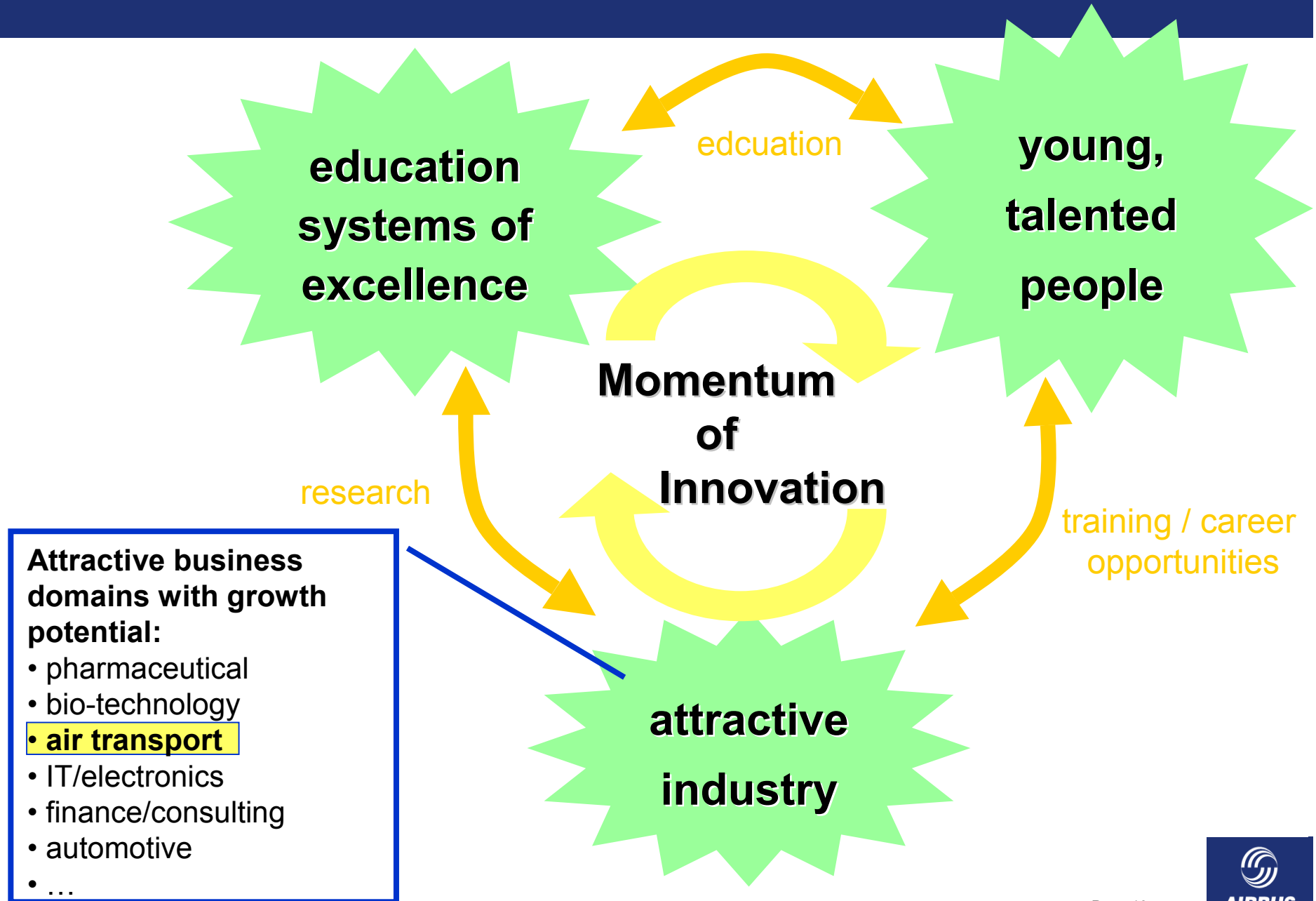
Structural design



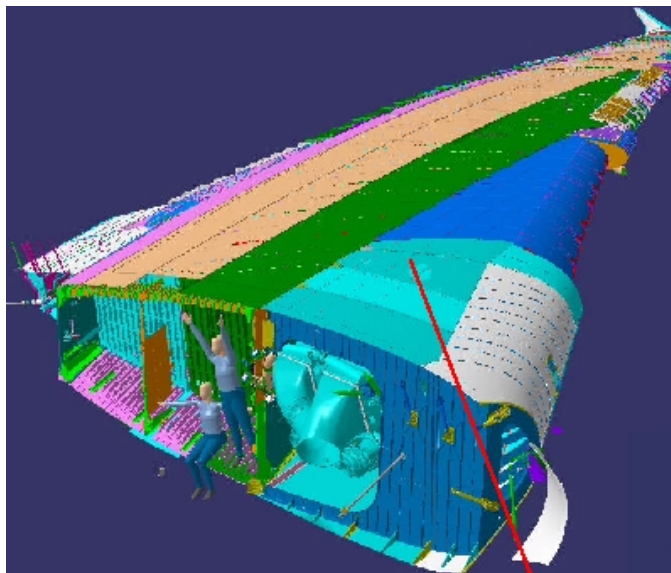
Cabin design&evacuation



Successful Innovation



Fascination Aeronautics



Fascination Aeronautics



Fascinating concepts



Aeronautical Education

- Need for excellent trained engineers:
 - Basics are needed:
 - Flight mechanics
 - Aerodynamics
 - Structures
 - Propulsion
 - New features required:
 - Aircraft design
 - Air transportation system
 - Systems
 - Cabin
 - Development processes
 - Basic knowledge of cost
 - Basic knowledge of project management
 - Team work

Jobs in industry

- Airbus employs ~15 000 engineers (55 000)
 - Constant renewal 500 engineers / year
 - 1000 open positions today
- Top level profiles:
 - Architect&Integrators (FPO)
 - Chief engineers
 - Programme Managers
- Interesting jobs with overall aircraft knowledge
 - Marketing/Sales/Product support
 - Procurement / Costing
 - Engineering Specialists (Aerod., Struct., Loads, Aeroelast., ..

Future trends in aeronautics technology

Flight Performance



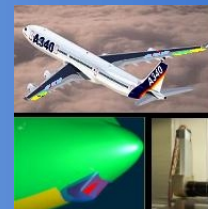
A320 laminar fin



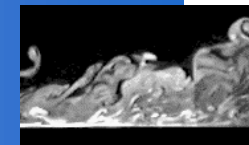
Zero splice liner



Landing gear fairing



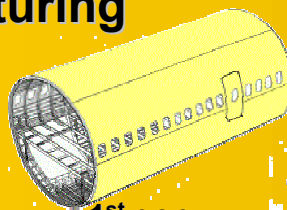
Gust load sensing & alleviation



Flow control

Structures & Manufacturing

Advanced metallic technologies



1st gen composite fuselage



Structural health monitoring



2nd gen composite fuselage

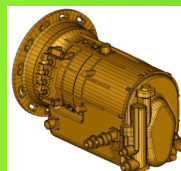


1st nanotech applications

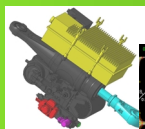
Systems



LCDs



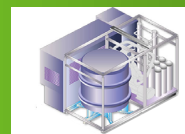
Variable frequency generators



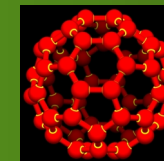
EHA



Advanced cockpit features



1st fuel cell applications



1st nanotech applications

1995

2005

~2015

Conclusions



**Enthusiastic and continuous search
for new ideas, mixing lessons from
the past and bold step changes**



**Rationale approach to develop
enlarged capabilities and to
focus widest contributions**



**Adapted solutions for
sustainable growth,
enjoyed by all citizens of
the planet**

