



## 24<sup>th</sup> ICAS Congress

31st August 2004, Yokohama, Japan

Dieter Schmitt  
Vice President Research & Technology  
Airbus

### Bigger, Faster, Greener, Cheaper?

Developing the Airbus response to the  
European Vision 2020 demands

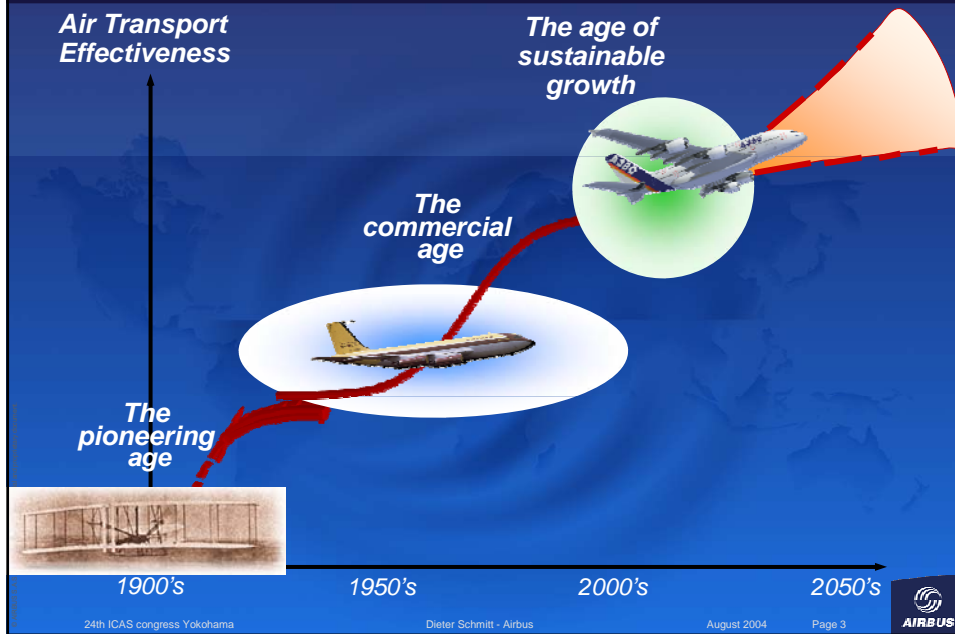


## Content

1. **ACARE Vision 2020**
2. Design drivers for aircraft technology
3. Airbus' future capability development
4. The European aeronautics research network
5. Fascination aeronautics
6. Conclusion



# Evolution or Revolution ?



# European Aeronautics - Vision 2020

Group of Personalities

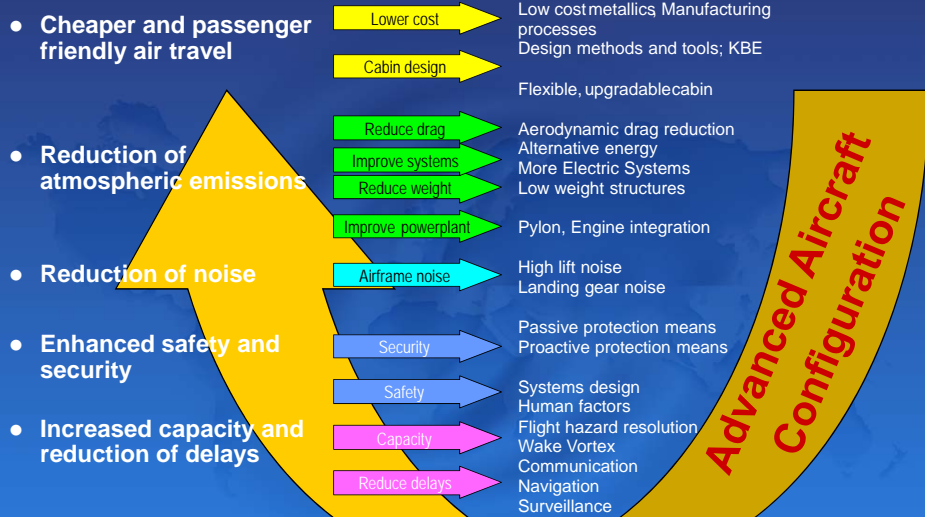
## Challenges and associated goals

- **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%
  - Substantial progress towards 'Green MMD'
- **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**

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## How will Airbus implement the vision?

















## Content

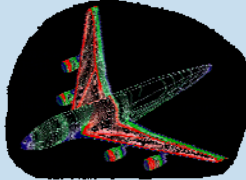
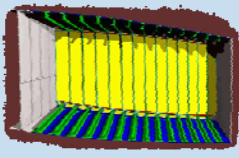

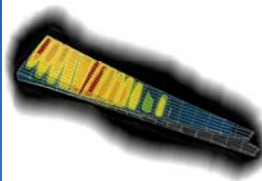


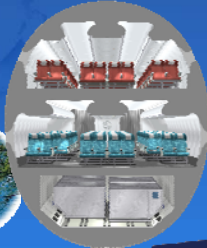
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# Technology as a driver for Airbus

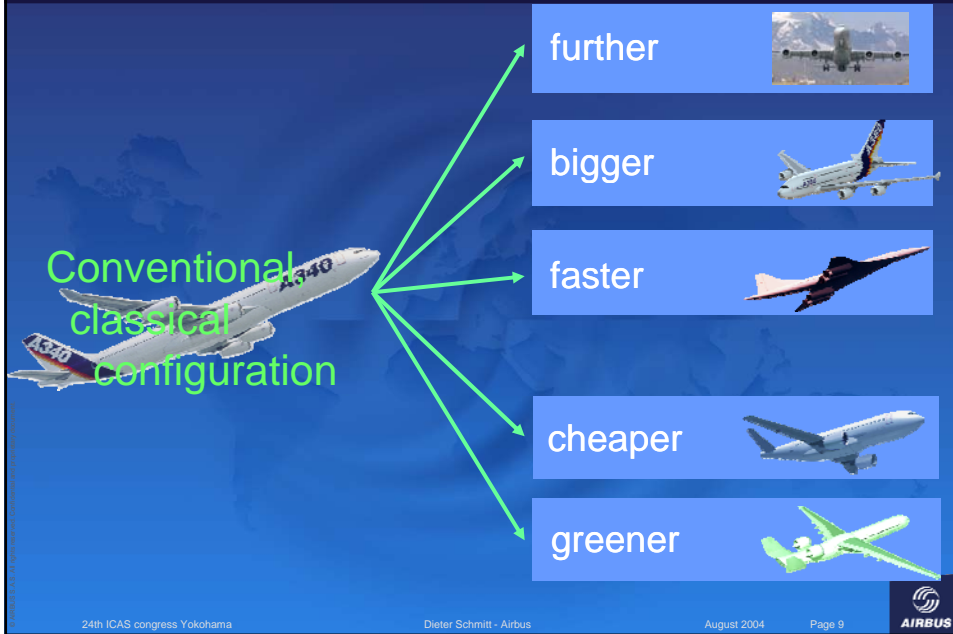
Examples of successful technology implementation

A300	A310	A320	A340-356	A380
				
twin-engine, twin-aisle a/c	2 man-cockpit	Sidestick controller	All new advanced technology wing	CFRP centre wing box
				
	CFRP vertical fin	Second generation digital auto flight system	CFRP bulkhead	Variable Frequency generator
				
1970	1980	1990	1990	2000
A300B2 <small>24th ICAS congress Yokohama</small>	A310-200	A320-200 <small>Dieter Schmitt - Airbus</small>	A330-300 A340-300	A340-600 <small>August 2004</small> A380 <small>Page 7</small>

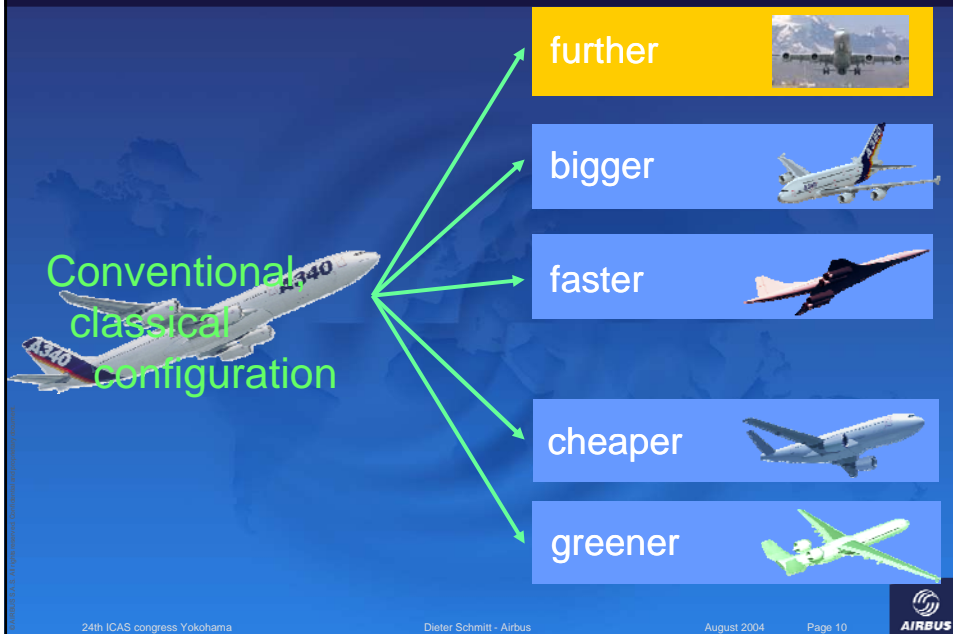
# Means for evolutionary progress

<b>Drag Reduction</b> 	<b>Weight Reduction</b> 	<b>SFC</b> 
Classical Priorities for R&T Activities		
<b>Safety &amp; Security</b> 	<b>Cost Reduction</b> 	<b>Noise</b> 
		<b>Comfort &amp; Convenience</b> 
<small>24th ICAS congress Yokohama</small>		<small>Dieter Schmitt - Airbus</small>
		<small>August 2004</small>
		<small>Page 8</small>

## Drivers for aircraft design

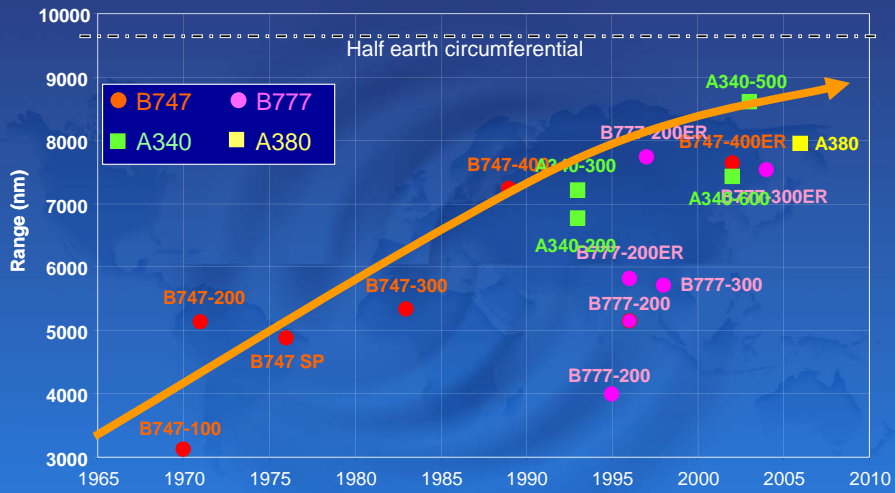


## Drivers for aircraft design



# Design driver "further"

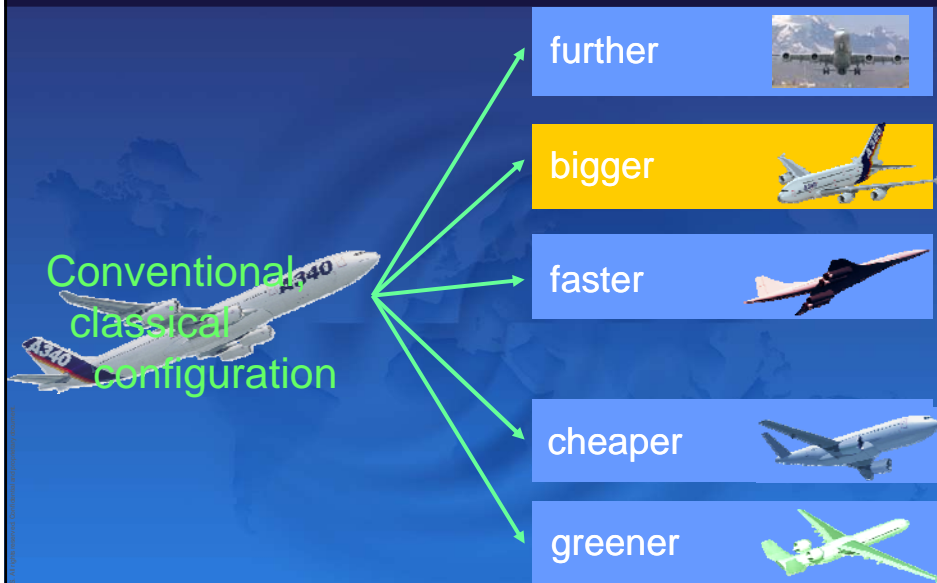
## Long Range Aircraft development vs Time



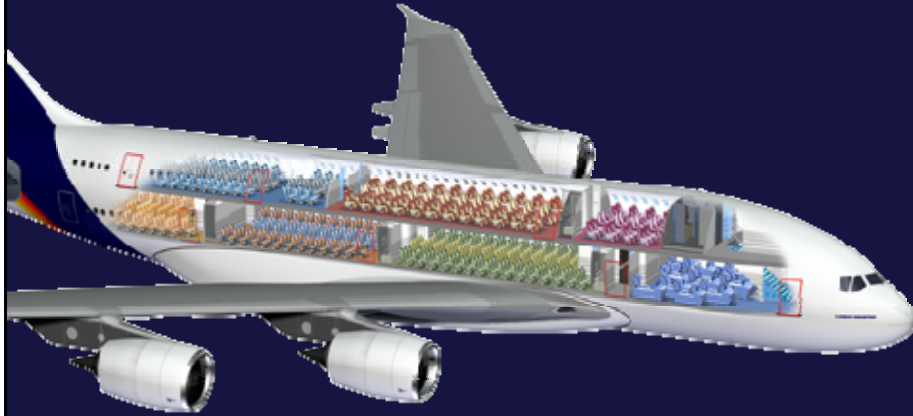
Range as design driver is reaching natural limit



# Drivers for aircraft design

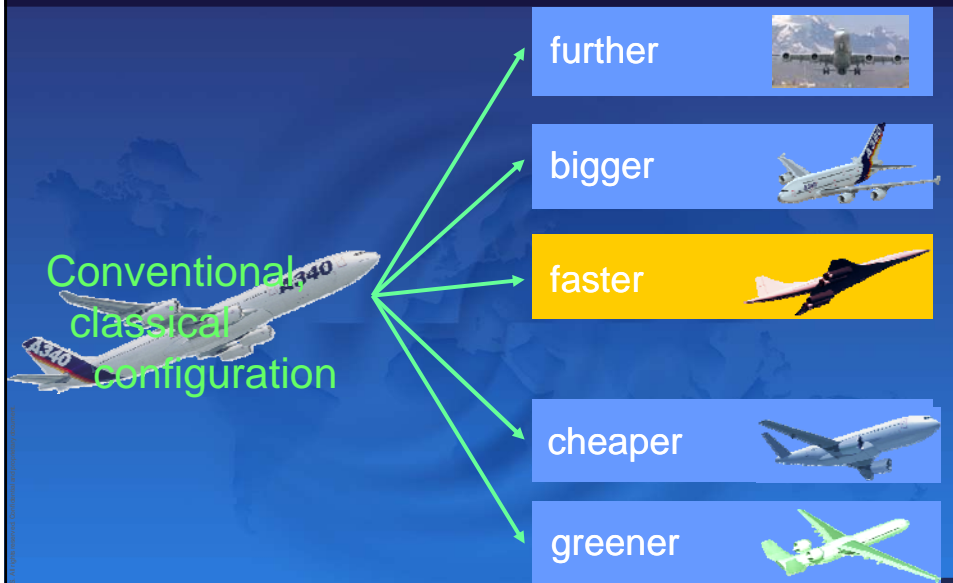


## Design driver "bigger" The A380



Setting the standards for high capacity aircraft for the next decades

## Drivers for aircraft design

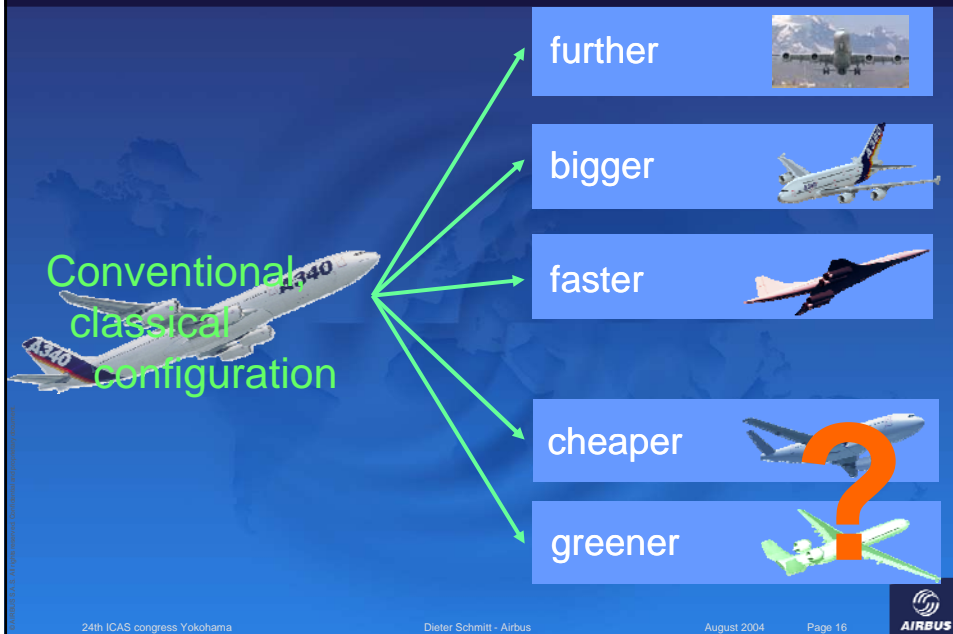




## Design driver "faster"



## Drivers for aircraft design



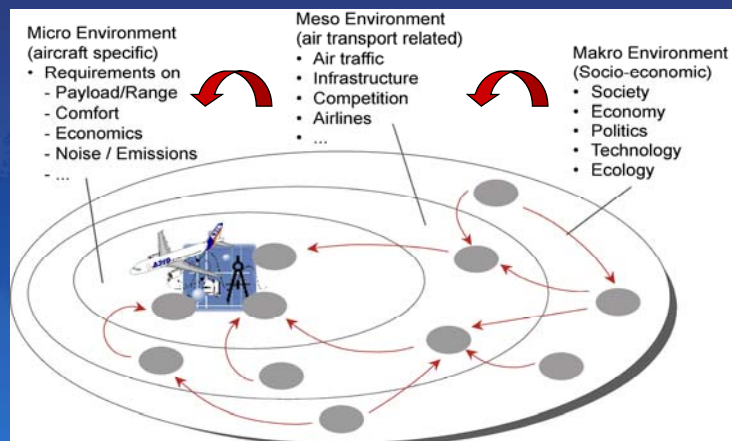


## Understand the challenges of the future

- Which aircraft will answer the multiple challenges of sustainable growth for the 21<sup>st</sup> century ?
- Which aircraft configurations, evolutionary or revolutionary, will offer the opportunities to provide answers to customer expectations ?
- Which selection of concepts and technologies should be explored in order to push further current state of the art ?

**from Vision 2020 to  
Innovative Capability Development**

## 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

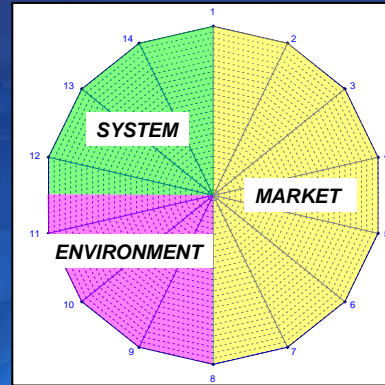
1. High Productivity
2. Low cost of operation
3. Superior reliability/maintainability
4. Comfort / health driven cabin design
5. Low cost of acquisition / high residual value
6. High flexibility/updatability
7. Family Concept design
8. Market specialisation

### ENVIRONMENTAL PRESSURE

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

### INTEGRATION IN THE SYSTEM

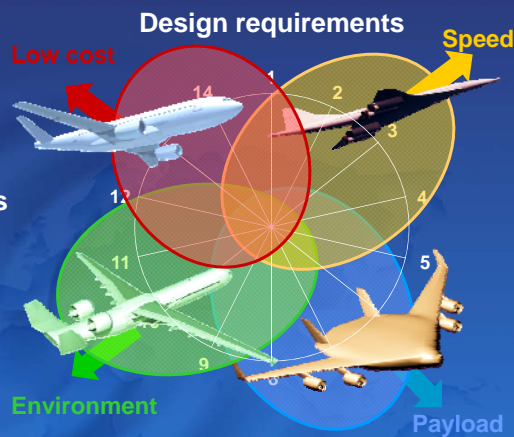
12. Solution to airport congestion
13. Good airport compatibility
14. Exploiting new ATM opportunities



**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**

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## Environmentally friendly

### • What do we mean with „green“ aircraft?



- ▶ Just following a green trend? **No**
- ▶ Constant effort to reduce fuel consumption? **Yes**
- ▶ Further reduction of noise around airports? **Yes**
- ▶ Improve production processes to comply with EN9100? **Yes**
- ▶ Improve image of aeronautics compared to road and rail? **Yes**

**What are the characteristics of a „green“ aircraft?**

## The “proactive” green aircraft – design drivers

Concept to drive R&T

Reduce noise

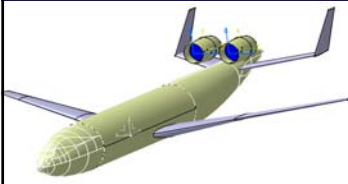
Environmental friendly manufacturing

Reduce fuel burn

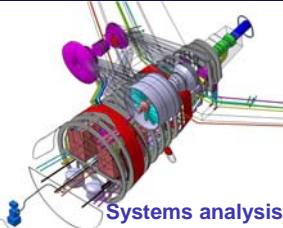
Reduce emissions

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

Engine / airframe integration

New architectures (contra fan, gearbox)

Fuel efficient, quiet, clean engines

High aspect ratio, low swept wing

Concept to drive R&T

## Cheaper, what does it mean?

- ▶ Improvements in economics has always been a challenge for aircraft manufacturers
- ▶ What is new?
- ▶ Growing market and increasing segmentation opens niches
  - Fulfil **passenger** expectations between 2 extremes:
    - Transport between A and B at minimum cost
    - Travel from home to destination with optimum services
  - Meet **Airlines** needs
    - Low cost carriers
    - Regional airlines
    - National airlines
    - World standard setting airlines
    - Business airlines
- ▶ The **Manufacturers** task is to provide a family of aircraft to satisfy the demands of all airlines

**The approach to „Low Cost Design“ of a new aircraft is a complex challenge**

## The “Money Booster” – design drivers

Concept to drive R&T

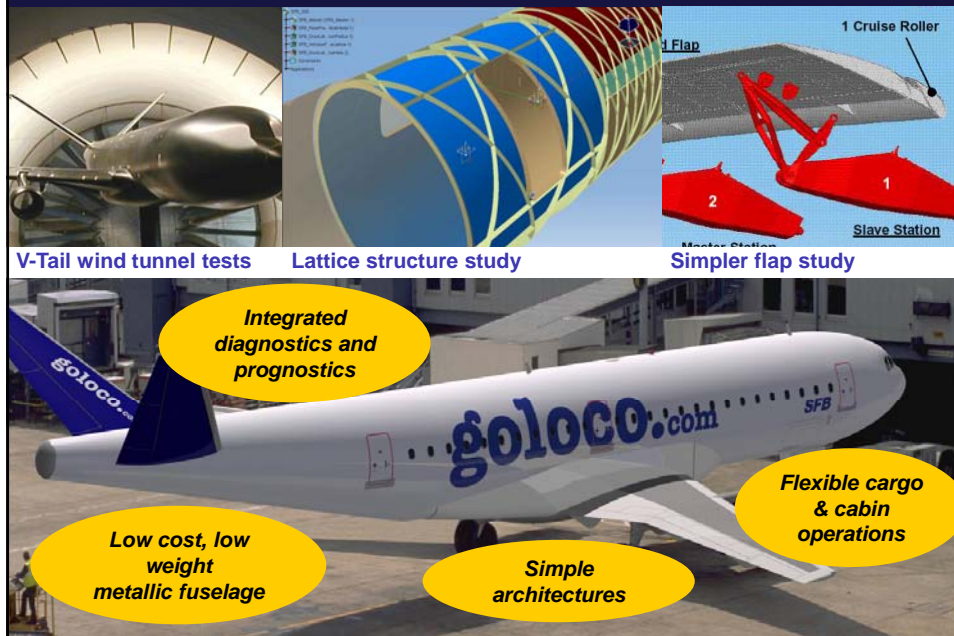


- Low manufacturing cost**
- Versatility in operation**
- Simple and robust design**
- Maintenance free aircraft**
- Minimum number of parts**

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



## The “Money Booster” – solutions and technologies



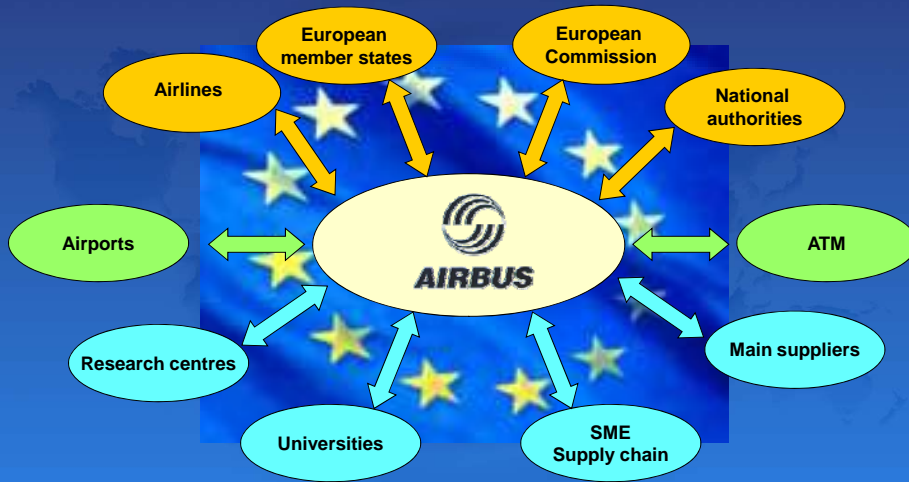
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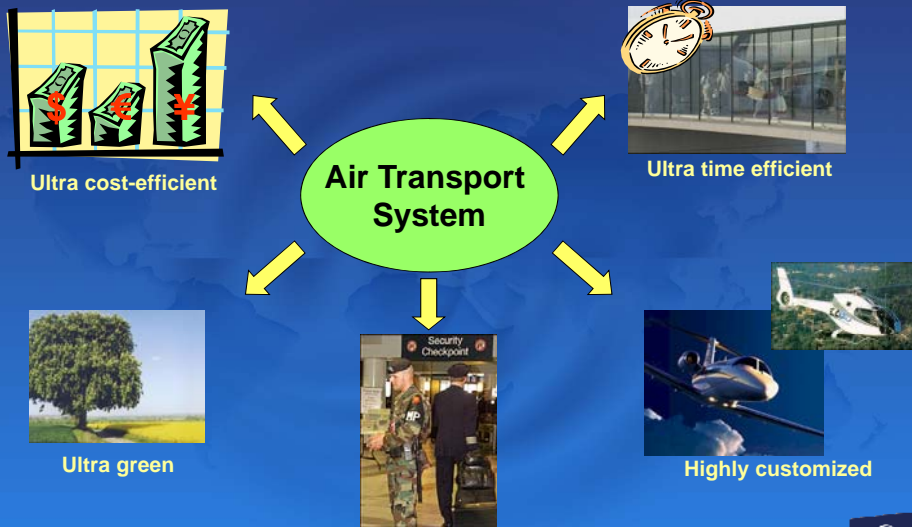
# Leading role of Airbus as R&T architect in Europe

Airbus relevant stakeholders in ACARE

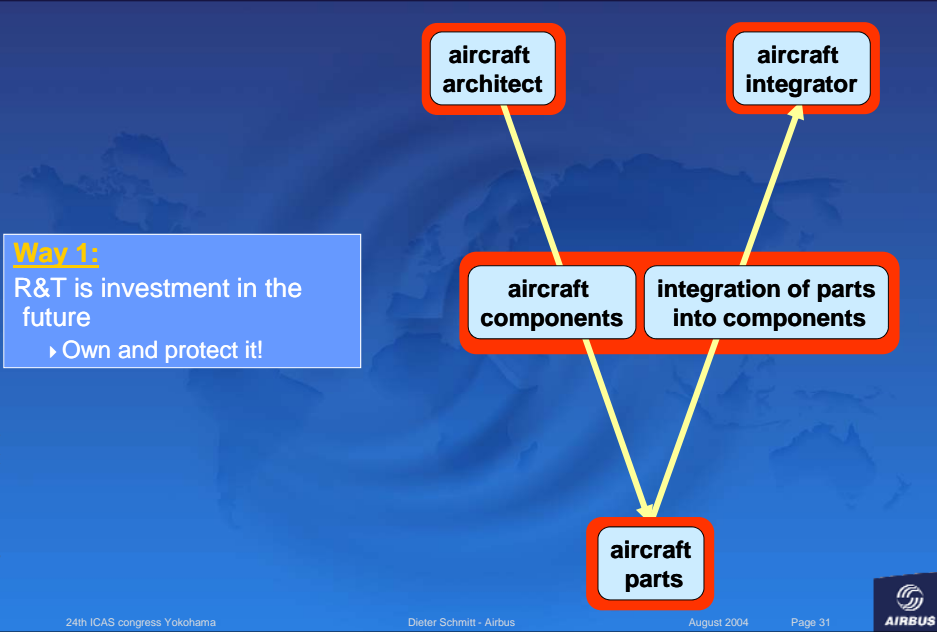


# Strategic Research Agenda SRA2

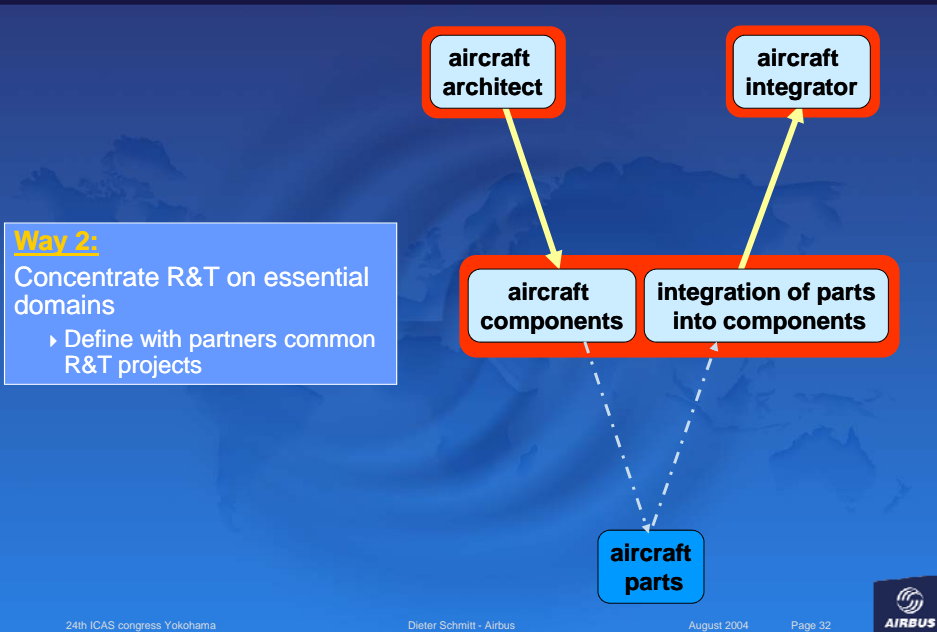
5 High level target concepts for Air Transport Systems:



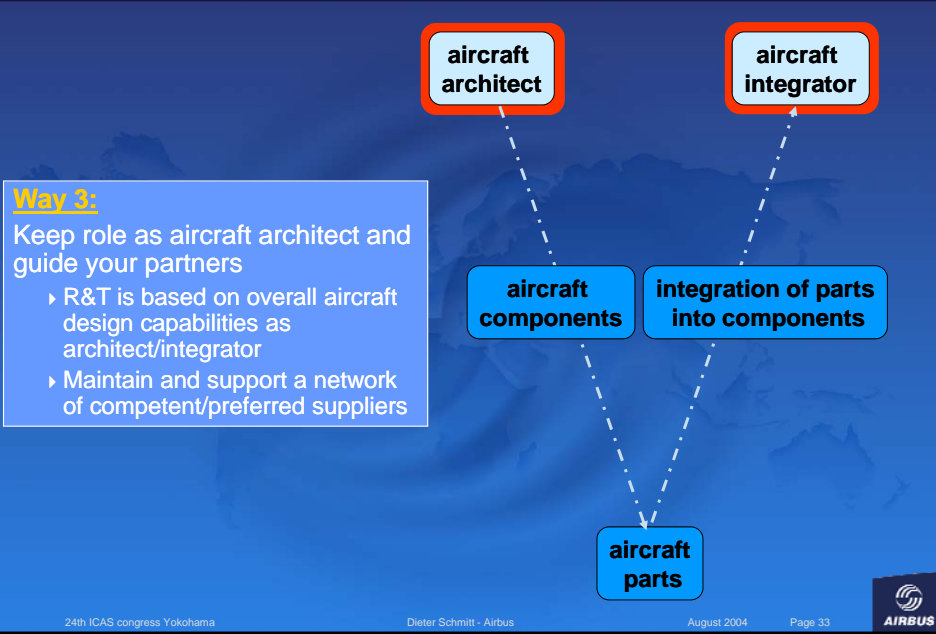
## Ways to manage R&T in the aeronautics industry



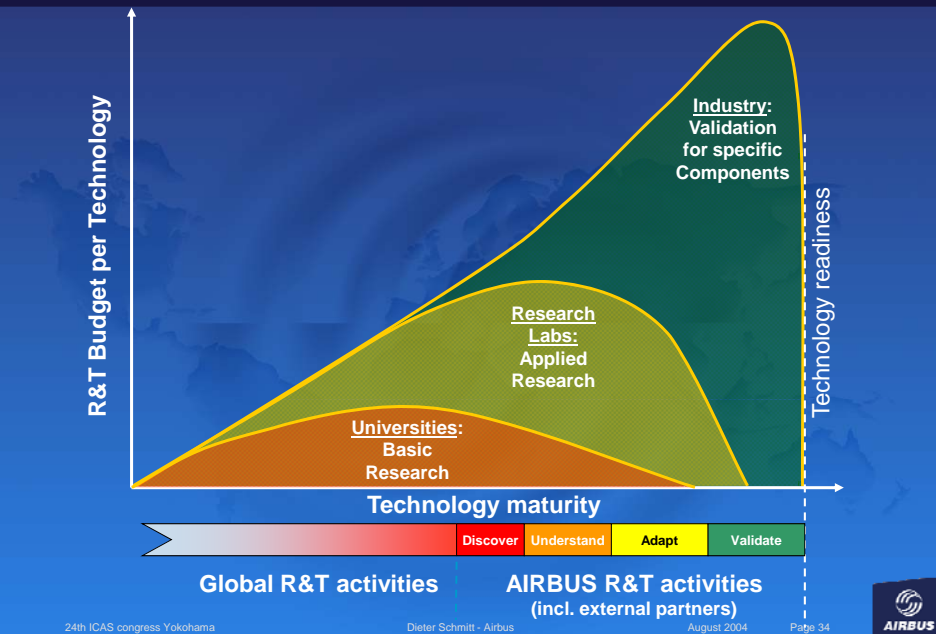
## Ways to manage R&T in the aeronautics industry



# Ways to manage R&T in the aeronautics industry



# Partner involvement in the R&T process



# The TANGO project

- TANGO = Technology Application to the Near-Term Business Goals and Objectives
- Goal: integration of innovative technologies, specific targets for wing and fuselage:
  - 20% weight and 20% cost reduction
- Involves 34 partners in 12 countries



CFRP fuselage

CFRP centre wing box

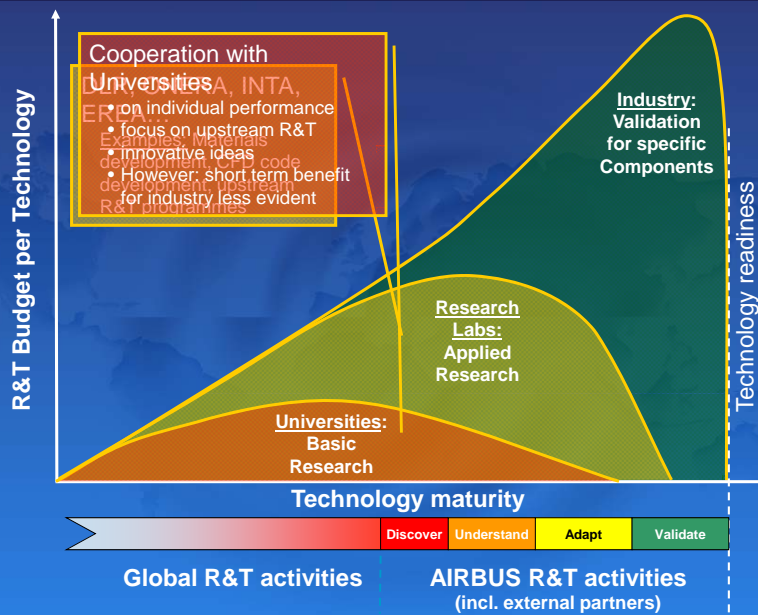


CFRP lateral wingbox (with metallic joint)



Metallic fuselage

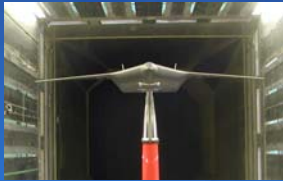
# Partner involvement in the R&T process



## 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

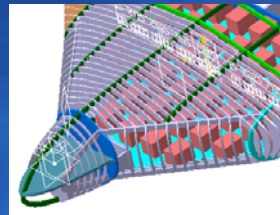
### Aerodynamics



### Configuration



### Structural design



### Stability & Control

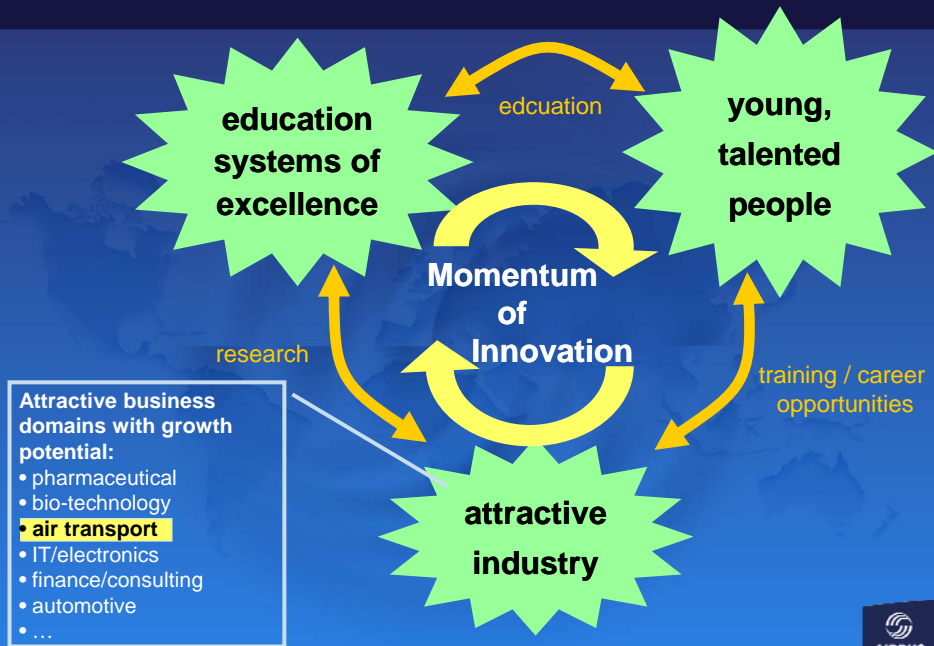
### Cabin design&evacuation



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# Successful Innovation



# Fascination Aeronautics

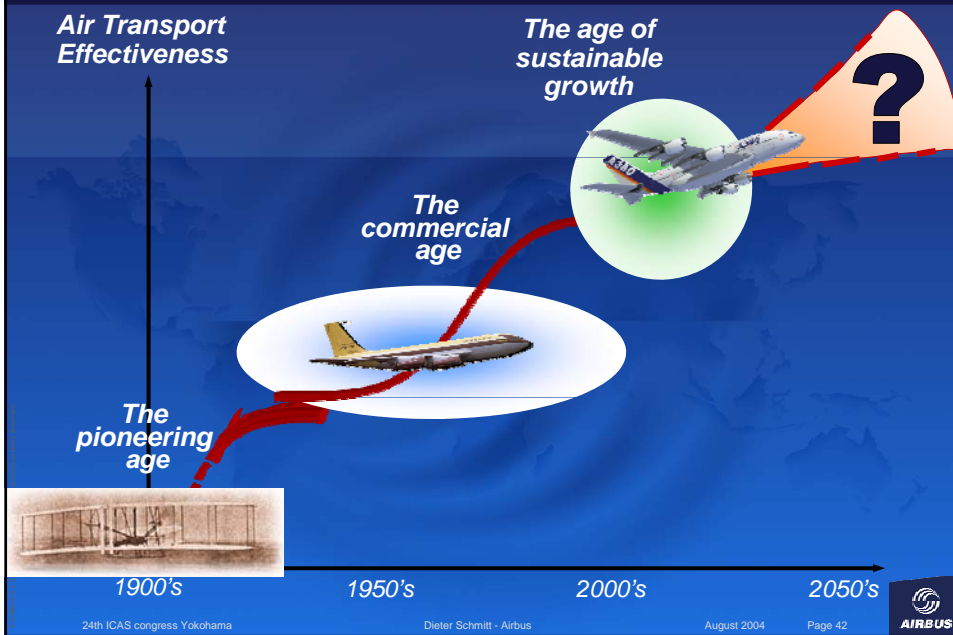




## Fascinating concepts



## Evolution or Revolution ?



## Conclusion

- Evolution or Revolution?
  - New aircraft programs involve high capital expenditure and risk
    - Evolutionary development may look most probable
  - However:
    - Innovation has been and will be mandatory for the future
    - Innovation needs the best brains and young talents
    - Fascination for Aeronautics is key motivator for young and experienced engineers
    - Exploring new ideas, concepts and dreams is and has to be a constant challenge
    - Well trained and motivated young engineers are the base for future success of this industry

**Joint effort from industry, research centers and universities  
to develop innovative concepts and dreams**

Thank you for your attention!



