Future Partnerships for Airbus and Universities
What did people think in 1970?

Many thought in 2000 we would see:

• Size will go beyond 1000 seats
• Propulsion to be either Hydrogen or Nuclear
• VTOL aircraft will dominate Short and Medium Range
• Supersonic & Hypersonic For Long Range
The commercial age

The pioneering age

Air Transport Effectiveness

The age of sustainable growth: is it possible?

1900’s 1950’s 2000’s 2050’s

Boeing 707

A380

Evolution vs Revolution
Future challenges of air transport

Further population growth & availability of resources

Projected total conventional oil production, 19

New transportation & communication methods
Challenges

and associated goals

- 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
ACARE and its stakeholders

- Airlines
- European member states
- European Commission
- National authorities
- Airports
- ACARE
- ATM
- Aircraft Industry
- Research centres
- Universities
- SME Supply chain
ACARE and the European Framework Programmes

Goals to be met by 2020:
- 50% CO2 reduction
- 80% NOx reduction
- Reduce perceived noise by half
- Reduced time to market by 50%
- Reduction of accidents rate by 80%
5 High level target concepts for Air Transport Systems:

- Ultra cost-efficient
- Ultra time efficient
- Ultra green
- Ultrasecure
- Highly customized
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
- Cabin design
- Flexible, up-gradable cabin
- Reduce drag
- Improve systems
- Reduce weight
- Improve powerplant
- Airframe noise
- High lift noise
- Landing gear noise
- Security
- Safety
- Capacity
- Reduce delays
- Low cost manufacturing and assembly
- Design methods and tools; KBE
- Aerodynamic drag reduction
- Alternative energy
- More Electric Systems
- Low weight structures
- Pylon, engine integration
- Passive protection means
- Proactive protection means
- Systems design
- Human factors
- Flight hazard resolution
- Wake Vortex
- Communication
- Navigation
- Surveillance

Advanced Aircraft Configuration
Aeronautics has a long term cycle
Airframe manufacturers network in R&T

- Civil transport aircraft
- Helicopters, Business jets etc

- Flight Physics
- Structures
- Systems
- Etc.

Education
Competence & skills to support business

Airframe integrator
### SRA-2 Technology list

<table>
<thead>
<tr>
<th>Taxonomy area</th>
<th>Technology</th>
</tr>
</thead>
</table>
| **Flight Physics**  | • Flow control  
                      • Adaptive winglets  
                      • Noise shielding through aircraft configuration  
                      • etc.. |
| **Aerostructures**  | • New materials  
                      • Highly automated manufacturing & assembly  
                      • etc.. |
| **Propulsion**      | • Contra-rotating fan engine  
                      • etc.. |
| **Human factors**   | • Autonomous flight operations  
                      • etc.. |
| **Innovative concepts** | • Environmental friendly rotorcraft  
                                      • High aspect ratio / low sweep configuration  
                                      • etc.. |
| **Integrated design** | • System simulation  
                           • Fault tolerant systems  
                           • etc.. |

#### Costs
- **Maintenance**
- **Acquisition costs**
- **Fuel**
- **Fees**
- **Crew**

#### Environment

#### Society needs
Partnerships: The Concept

Approach:
- Operating on a global scale:
  - European Union, Russia, USA, Australia, India, China ….
- Aligned with Airbus Technology needs
- Integrated managed partnerships
- Wide Research Networks

Delivering:
- Access to technology and expertise
- Improved focus and effectiveness
- Access and leverage of resources
- Direction and focus for our partners
Conversion of Plans into Action - the steps

- Airbus “needs” and Partner “capabilities” matching
- Partner selection for specific technical topics
- Definition of Work-packages
- Identification of funding routes
- Preparation and submission of Proposals
- Contract negotiations
- Project Launch
**Technology Maturity**

- **Discover**
  - ~ 10% R&T Portfolio

- **Understand**
  - ~ 40% R&T Portfolio

- **Adapt**
  - ~ 50% R&T Portfolio

- **Validate**
  - Programmes

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**Universities**
- Basic research, generally far from application

**Research Institutes**
- Applied research, adapting basic research to industrial needs

**Industrial Companies**
- Validating technologies for specific component applications
Partner Matching

Airbus
- Needs
- Requirements
- Challenges

Technical Workshops

Research Community
- Ideas
- Capability
- Inspiration

Research Community
- Industry, Institutes, Unvvs
- Involved earlier in planning

Formation of Partnerships for specific Topics
Technology as driver for success

- **A300**: twin-engine, twin-aisle a/c
- **A310**: 2 man-cockpit
- **A320**: Sidestick controller
- **A330/A340**: All new advanced technology wing
- **A380**: CFRP centre wing box

- **1970**: A300B2
- **1980**: A310-200
- **1990**: A320-200
- **2000**: A340-600

All new advanced technology wing box

Variable Frequency generator

CFRP bulkhead

Second generation digital auto flight system

CFRP vertical fin

SAMARA 2007
1st of April 2005 saw the launch of the 4 year EU FP6 funded research programme NACRE (New Aircraft Concepts Research) under Airbus lead together with 35 European partners.

- **New Aircraft Concepts** to foster technological innovation
- **Novel Lifting Surfaces and Control** for improved structure and aerodynamic efficiency through an integrated approach
- **Novel Powerplant Installation**: challenging configurations for ambitious goals on environment protection and cost-efficiency
- **Novel Fuselage and Cabin** to develop passenger-centered concepts and cost-efficient technologies
• Partnerships – The concept
• Partner Involvement in the R&T process
• From Plans to Action
• Partner Matching Process
• Funding Instruments
• Contractual Principles: IPR, Publicity
• Proposal Bidding Process
• Next Steps
• Airbus Direct Contracts, 100% or Co-funded
  ‣ 100% Airbus funded, following a bidding process.
  ‣ Co-funded with together with Research Partner(s) and Risk Sharing Industrial Partners

• European Union Funding
  ‣ Classical instruments such as Framework programmes
  ‣ New Instruments (FP 7, JTI)

• National and Regional Funding
  ‣ Via local Networks
  ‣ According to local rules and opportunities
Proposals will be requested from selected Partners.

• Partners will be involved based on the following criteria:
  ▸ Technical Excellence
  ▸ Confidence in Partner Capabilities
  ▸ Project Management ability
  ▸ Facilities, capacity, flexibility
  ▸ Funding and Cost Base
  ▸ Previous Experience

Please Note: Confidence between Parties takes time to grow, however, the process will be open to new Partners.
<table>
<thead>
<tr>
<th><strong>Project 100% Funded by Airbus</strong></th>
<th><strong>Project is Co-Funded by Airbus</strong></th>
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</thead>
<tbody>
<tr>
<td>• Airbus owns Foreground IP.</td>
<td>• Foreground IP ownership to be defined by the Parties within the Research Project contract.</td>
</tr>
<tr>
<td>• Airbus granted rights to Background IP needed to exploit Foreground IP.</td>
<td>• Rights to Foreground IP and Background IP granted by the Parties for commercial exploitation taking into account parties’ contributions and business interests.</td>
</tr>
<tr>
<td>• Airbus will endeavour to provide Foreground IP user rights to its Partners for their own Research purposes.</td>
<td>• <strong>Patents</strong></td>
</tr>
<tr>
<td>• <strong>Patents</strong></td>
<td></td>
</tr>
<tr>
<td>▶ All patenting costs borne by Airbus subject to agreement.</td>
<td>▶ Any Foreground IP suitable for protection will be drawn to the attention of the Parties and necessary action will be taken.</td>
</tr>
<tr>
<td>▶ Airbus is giving an incentive for each patent filed</td>
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Confidentiality

• **When Co-funded:** The Parties must not release any information relating to the R&T activity without the prior written consent of the Parties in accordance with the co-funding contractual rules.

• **When 100% funded by Airbus:** The Partners must not release any information relating to the R&T activity without the prior written consent of Airbus.

Publicity

In general, Airbus, wishes to attract good publicity for its innovative activities and standard procedures exist for rapidly checking and approving publicity material that R&T Partners may wish to issue. Of course, there are cases where good ideas must remain confidential.
Make or Buy Policy

- Based on R&T criticality defined through
  - Time horizon for delivering results
  - Importance of R&T (technical advantage, as seen by Airbus today)

- Co-located teams may be mandatory depending on criticality

<table>
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<tr>
<th>R&amp;T importance</th>
<th>Time</th>
<th>Buy</th>
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<tr>
<td>low</td>
<td>short</td>
<td></td>
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<tr>
<td></td>
<td>mid</td>
<td></td>
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<tr>
<td>high</td>
<td>long</td>
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