Die Zukunft der Luftfahrt
Die europäische Vision 2020

Joachim Szodruch
Deutsches Zentrum für Luft- und Raumfahrt
About 88% of economic growth is created by innovation

Nobel price winner Robert Solow 1956
Air Traffic and Economy

Europe today: 3,1 M Jobs
130 Airlines
450 Airports
1 Bn Passengers
2,6% EU GDP (+6% Tourism/Air)

Year 2010:
Germany: ca. 1.4 mio jobs (direct, indirect)
Global: ca. 30 mio. employees (direct, indirect)
ca. 1.740 billion US$ profit before tax

Airport Frankfurt:
FAG: 1 slot = 750 jobs at the airport
= 1.650 jobs in the region
1.000 t freight = 8 airport-jobs
= 16 jobs in the region

The Aeronautic Industry is an essential contributor to the worldwide social, economic and industrial development

World Air Travel Forecast

Revenue Passenger Kilometers (billions)

RPKs (Trillions)

Historical

Gulf War Crisis

Present Crisis

Future

Long-Term Growth

2004-2023

GDP 3.0%

Passenger 5.2%

Cargo 6.2%

Quelle: Boeing Market Outlook 2005
Air Travel Forecast by Region

- **2003 traffic**
- **Added traffic 2004-2023**
- **Annual growth %**

### Regions
- North America
- Asia-Pacific (excl. intra-China)
- Europe
- North Atlantic
- Europe - Asia-Pacific
- Transpacific
- Intra-China
- North America - Latin America
- Europe - Latin America
- Latin America
- Africa - Europe

**World Average Growth: 5.2%**

- **2003**
- **2004 - 2023**

**RPKs, billions**

- **Africa - Europe**: 5.1
- **Europe**: 4.9
- **Europe - Asia-Pacific**: 6.0
- **Europe - Asia-Pacific (excl. intra-China)**: 5.5
- **Europe - Latin America**: 5.4
- **Europe - Asia-Pacific (excl. intra-China)**: 8.1
- **North America**: 5.2
- **North America - Latin America**: 5.2
- **Transpacific**: 6.1
- **Intra-China**: 7.6
- **North Atlantic**: 4.1
- **World Average Growth: 5.2%**

Quelle: Boeing Market Outlook 2005
Design Drivers in the next 50 Years

- New Noise Standard 4
- New Noise Standard 5
- No. of Aircraft doubled
- Fossil Fuel Limitation
- Airline Regrouping (Standardisation)
- New Travel Standard (speed, comfort, system approach)
- Air Traffic Management “Free Flight”
- Airport Load
- Regional Transport Optimisation / Restriction
- One Flight/Year per PRC Inhabitant
- “September 11”
- Global Emission Agreement
- 9 bill. World Population

Economy
Growth
Congestion
Ecology
Safety/Security
Oil Reserves

Oil Production Forecast by Region:

- World Production
- World w/o Gulf Region
- Gulf Region
- USA & Canada
- Former USSR
- UK & Norway
Growth - on ground ...

- About 13,000 airliners are in operation today to cover the demand.
- 5% growth per annum for the next 15 years

→ more than 20,000 A/C in 2015
→ Changes in air traffic organisation, starting in the core areas in 2005, are required to prevent a major foreseeable disruption.
Number of Airports with Noise Curfews (May 2000)

- Total: 596
- APU Res.: 69
- Curfews: 311
- E. Run up: 311
- NAP's: 218
- Budgets: 168
- Programs: 168
- Level Lim: 112
- Monit.: 42
- Surcharg.: 42
- Op. quota: 42
- Pref. RWY: 105
- St.2 Phas.: 35
- St.2 Restr.: 35
- St.3 Restr.: 35

Quelle: Boeing
Airlines’ Priority Analysis for Security

**FOUR MAJOR ITEMS**

- Short-term cockpit door reinforcement
- Transponder emergency code
- New cockpit door design
- Stand alone video camera
- Emergency cabin to cockpit communication
- Security training for the crew
- Emergency cockpit to cabin communication

**Priority**

- High
  - Transmission of cockpit conversation to the ground
  - Enhanced air/ground audio/video communication
  - Aircraft manoeuvring
  - Use of sleeping agents
  - Aircraft control from ATC
- Low
  - Missile detector & flare
  - Manual metal detector immediately before boarding
  - Reduce fuel quantity on board
  - Harmful gas indicator

**Interest**

- High
  - Armoured pilot and co-pilot seats
  - Active control
  - Identification of crew on duty
  - Passenger restraint kit
  - Prevent intrusion of metal object into cabin
- Low
  - Manual metal detector immediately before boarding
  - Reduce fuel quantity on board
  - Harmful gas indicator

**Source:** Airbus
Economy of Airlines

Yield (constant 1990 US-cents) / RPK

Source: ICAO Civil Aviation Statistics of the World
Return on Capital

Source: European Economics Forum
Oil Price Development

Oil Price in US $ / Barrel:

Quelle: DLH 2005
Development Trends

Air Transport Effectiveness

- 1900: Engineering & military driven
- 2000: Commercially driven
- 2020?: Sustainability driven

Year
The Future in the Air or on the Ground?
Imagination is more important than knowledge, since knowledge is limited.
The European Union must pursue three goals:

- **Realise a ‘European research area’** to overcome the present fragmentation and duplication of research efforts in Europe.
- **Help raise the European effort on research to 3% of Union GDP by 2010** (1% from public sources and 2% from private sector).
- **Support and strengthen research throughout Europe by providing direct financial support at European level to complement national programmes.**
Aeronautics: A pilot case for a European Research Area

European Organisations of Stakeholders:

- GARTEUR (Member States)
- ASD (Industry)
- EREA (Research Establishments, DLR, ONERA, NLR)
- Eurocontrol (ATM)
- JAA / EASA (Certification)
- EASN / Pegasus (Universities)
- AirTN (Ministries / Agencies)
- Airlines and Airports

Vision 2020
ACARE

(ACARE - Advisory Council for Aeronautic Research in Europe)
European Aeronautics: A Vision for 2020

- Initiated and chaired by Commissioner Philippe Busquin
- Prepared by a group of 14 high-level personalities (GOP)
- Focused on Research / Technology / Development
- Takes a pan-European perspective with a 2020 horizon

Two Top Level Objectives

- Responding to Society’s needs
- Securing global Leadership to Europe
## European Aeronautics: A Vision for 2020

### Challenges and associated goals

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- Reduced passenger charges
- Transformed freight operations
- Reduced time to market by 50%
- Increased passenger choice
Quality and Affordability

Vision 2020
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- Reduction of CO$_2$ by 50%
- Progress towards green MMD
- Reduction of NO$_x$ by 80%
- Reduced perceived ext. noise level by 50%
Environment

Vision 2020

K2020

Folie 25 > Joachim Szodruch
30.05.2006
## European Aeronautics: A Vision for 2020

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Efficiency

3X Capacity increase

99% of flights within 15’ of schedule

Less than 15’ in airport before short flights
Efficiency
## European Aeronautics: A Vision for 2020

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Airborne – zero hazard from hostile action

Airports – zero access by unauthor. persons / products

Air navigation – no misuse, save control of hijacked a/c
Security

Vision 2020
Towards the Future

Emerging technology issues:

- Propulsion systems
- Lift control
- Vectored thrust
- MEMS technologies
- Aerodynamic reshaping
- Nano structures
- Self-healing systems
- Guidance and control
- Habitability
- Zero maintenance
- Aircraft protection
Advisory Council for Aeronautics Research in Europe (ACARE)

Mission:
To establish and carry forward a Strategic Research Agenda (SRA) that will influence all European stakeholders in the planning of research programmes in line with the Vision 2020

Activities:
• Set up SRA (update every 2 years)
• Recommendations for implementation of SRA
• Evaluation of overall results and benefits
• Optimisation of research infrastructures
• Improvement of educational policies for scientists and engineers
• Development of communications strategy
ACARE Members

- ACARE includes member states, the Commission and stakeholders
- Members are individual personalities with decision-making capability to influence the stakeholders in planning research programmes
- ACARE is composed of about 36 members

- Member States
- European Commission
- Manufacturing Industry
- Research Establishments
- Airlines
- Airports
- Regulators
- Eurocontrol

ACARE Members
Key findings of SRA-2

• European research needs more money
  re-analysis has shown that about 50% more research and technology funding is now required over the 20 year forward view than is presently being invested

• European research needs more people
  The industry may face a shortage of skilled young people in the future

• Research needs to be efficient
  The research funds across Europe must be better co-ordinated and this could start with areas of common societal interest (safety, security, environment, ATM)
EU Framework Programme 6

final funding (11285 m€) thematic priorities FP6 [m€]

- 1.1.1 Life sciences, genomics and biotechnology
- 1.1.2 Information society technologies
- 1.1.3 Nanotechnologies and nanosciences, new production processes/devices
- 1.1.4 Aeronautics and space
- 1.1.5 Food quality and safety
- 1.1.6 Sustainable development, global change and ecosystems
- 1.1.7 Citizens and governance
EU Aeronautical Programmes

EU aero R&T funding [m€]

- 1991-92: 35 m€
- 1992-94: 71 m€
- 1995-98: 245 m€
- 1999-2002: 705 m€
- 2003-2006: 750 m€
R&T Budgets Today and Required in 2020

- **1999 - 2002**
  - Total: ~3 bn€ / year

- **Vision 2020**
  - Total required: ~7 bn€

- **Aeronautics Key Action in FP5:**
  - 700 m€ (6%)

- **National Programmes:**
  - ~1.500 m€ (12%)

- **Companies/Institutions:**
  - ~9.800 m€ (~2.400 m€ per year)

- **EU Programmes:**
  - 38%

- **National Programmes:**
  - 12%

- **Companies/Institutions:**
  - 50%
Key findings of SRA-2

- European research needs more money
  Re-analysis has shown that about 50% more research and technology funding is now required over the 20 year forward view than is presently being invested.

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  The industry may face a shortage of skilled young people in the future.

- Research needs to be efficient
  The research funds across Europe must be better co-ordinated and this could start with areas of common societal interest (safety, security, environment, ATM).
R&D Employees Development Requirements

**Proposed R&D Budget**

- **Research Establishment Employees**: 4,000
- **Industrial R&D Employees**: 73,000
- **Industrial Employees**: 420,000

**2000**

- **3,0 Mrd €**

**2020**

- **6,500**
- **650,000**
- **125,000**
- **+50,000 Engineers**
- **+1,500 Researchers**
- **7,0 Mrd €**
ACARE – Importance for Industry

• Total air transport system approach

• All Branches (manufacturing industry, operators, airports, ATM) or single industries / suppliers only part of the entire system

• Industry in regions, member states must be competitive and contribute to European approach

• Industrial focused approach
ACARE – Importance for Research Community

- European Research Area as political and competitive goal
- Common technical goals with Industry
- Industrial commitment guides the research community
- Healthy research infrastructure / cooperation across regional and member states borders
- Foster innovation culture in Europe
Education

• Vision for new generation of students
• Motivation, stimulation
• Research and Education for efficient preparation for future job
• Secure quantity and quality of engineers and scientists
EUROPEAN AERONAUTICS: A VISION FOR 2020