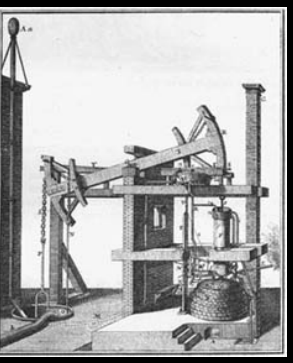
Die Zukunft der Luftfahrt
Die europäische Vision 2020

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:

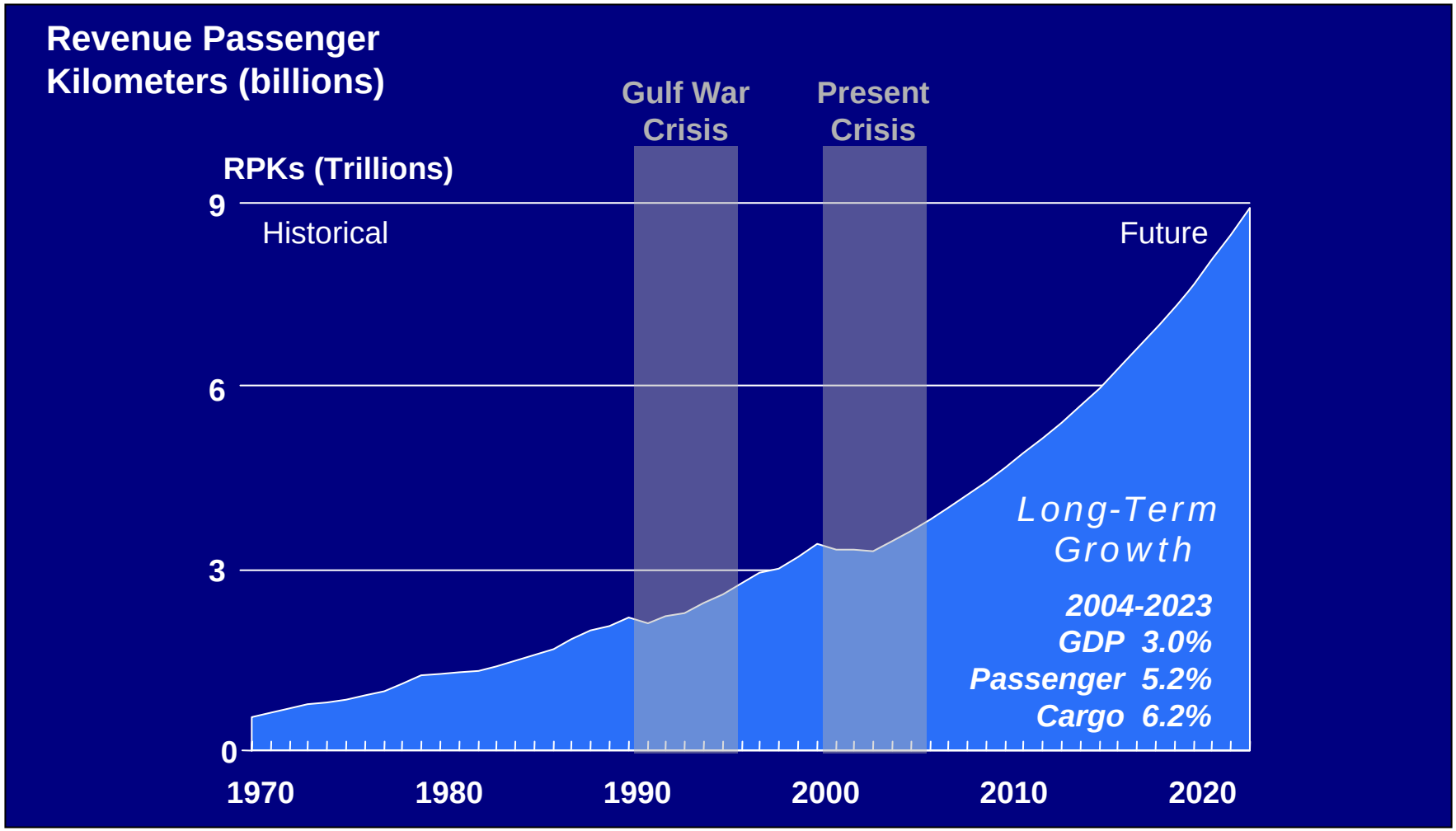
FAG: 1 slot = 750 jobs at the airport
= 1.650 jobs in the region

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

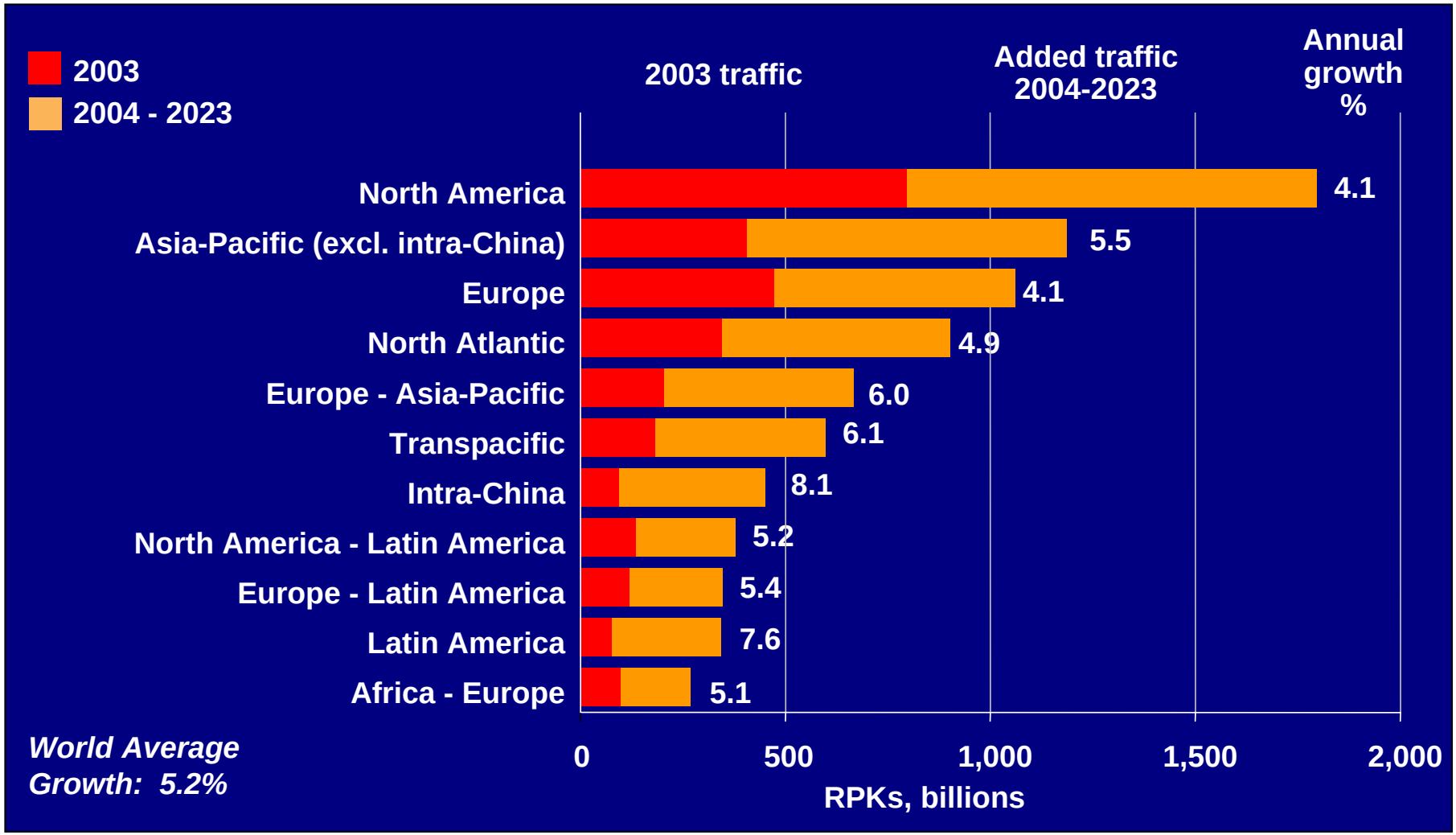
Source: Air Transport Action Group. 1996, Air Transport World, 1997, IATA, 1996, FAG, 1996

World Air Travel Forecast



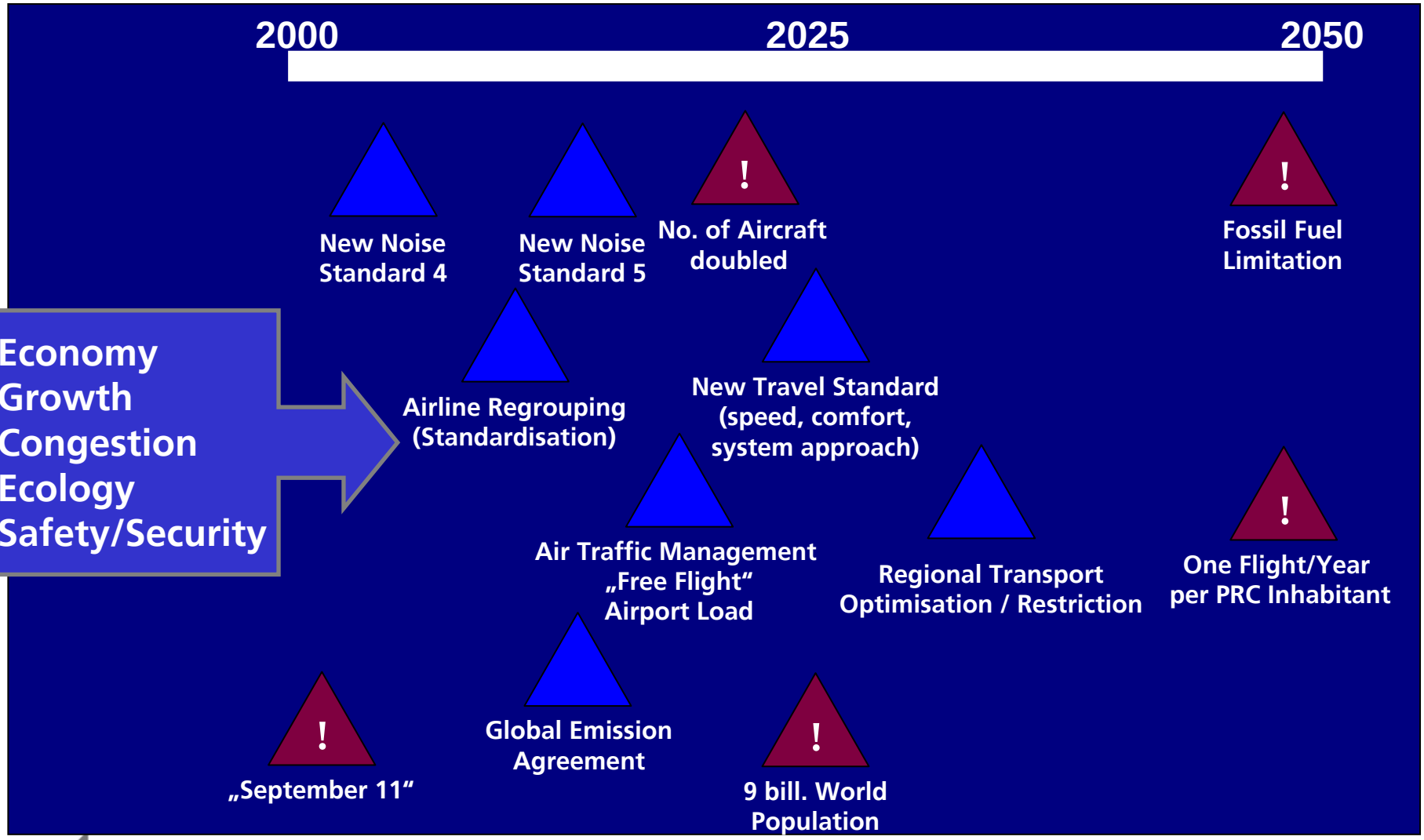
Quelle: Boeing Market Qutlook 2005

Air Travel Forecast by Region



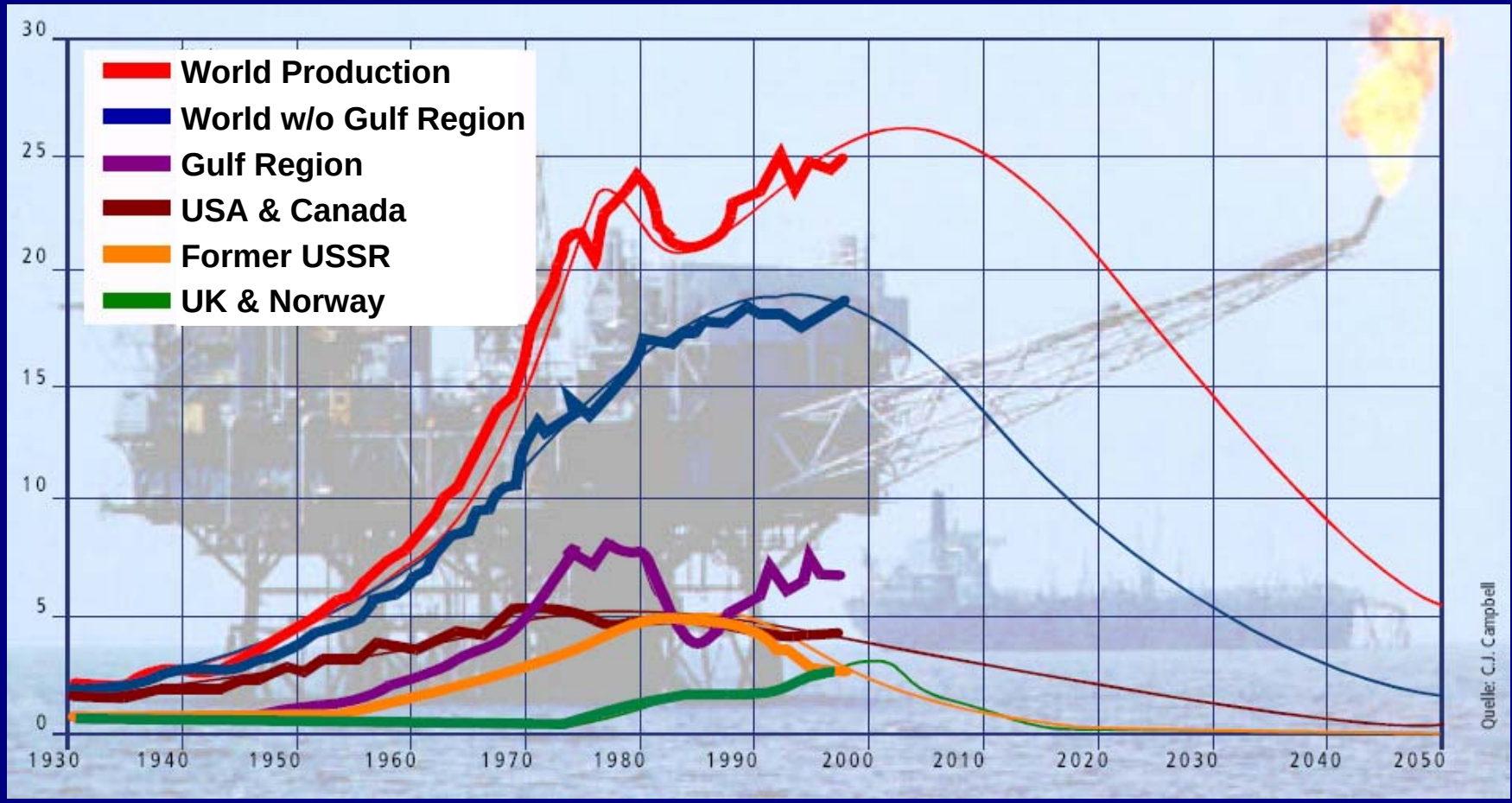
Quelle: Boeing Market Qutlook 2005

Design Drivers in the next 50 Years



Oil Reserves

Oil Production Forecast by Region:



Growth - on ground ...

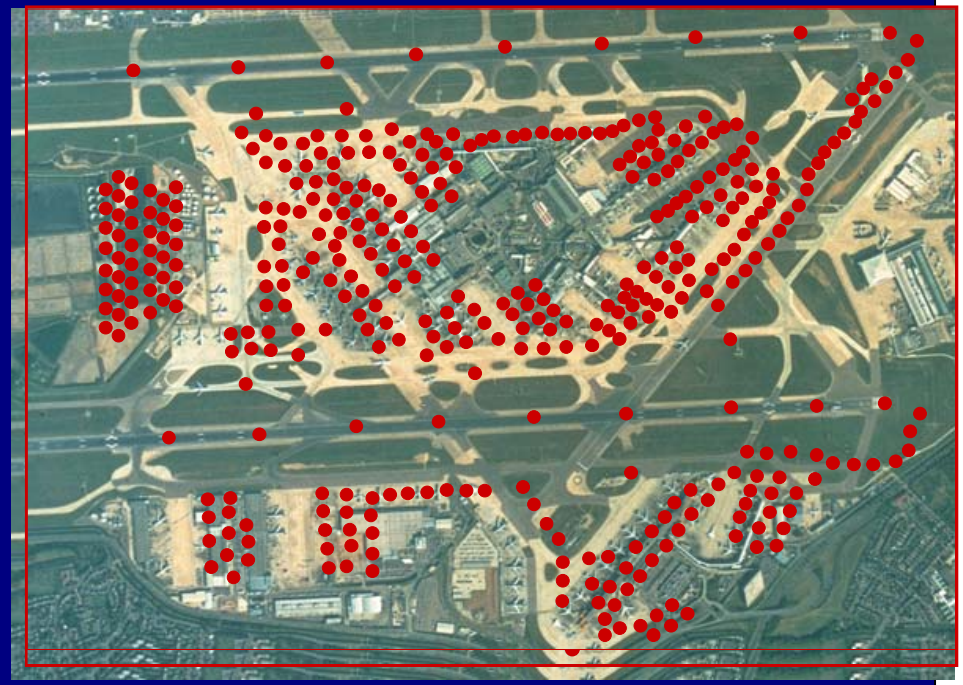
- About 13,000 airliners are in operation today to cover the demand.
- 5% growth per annum for the next 15 years

➔ more than 20,000 A/C in 2015

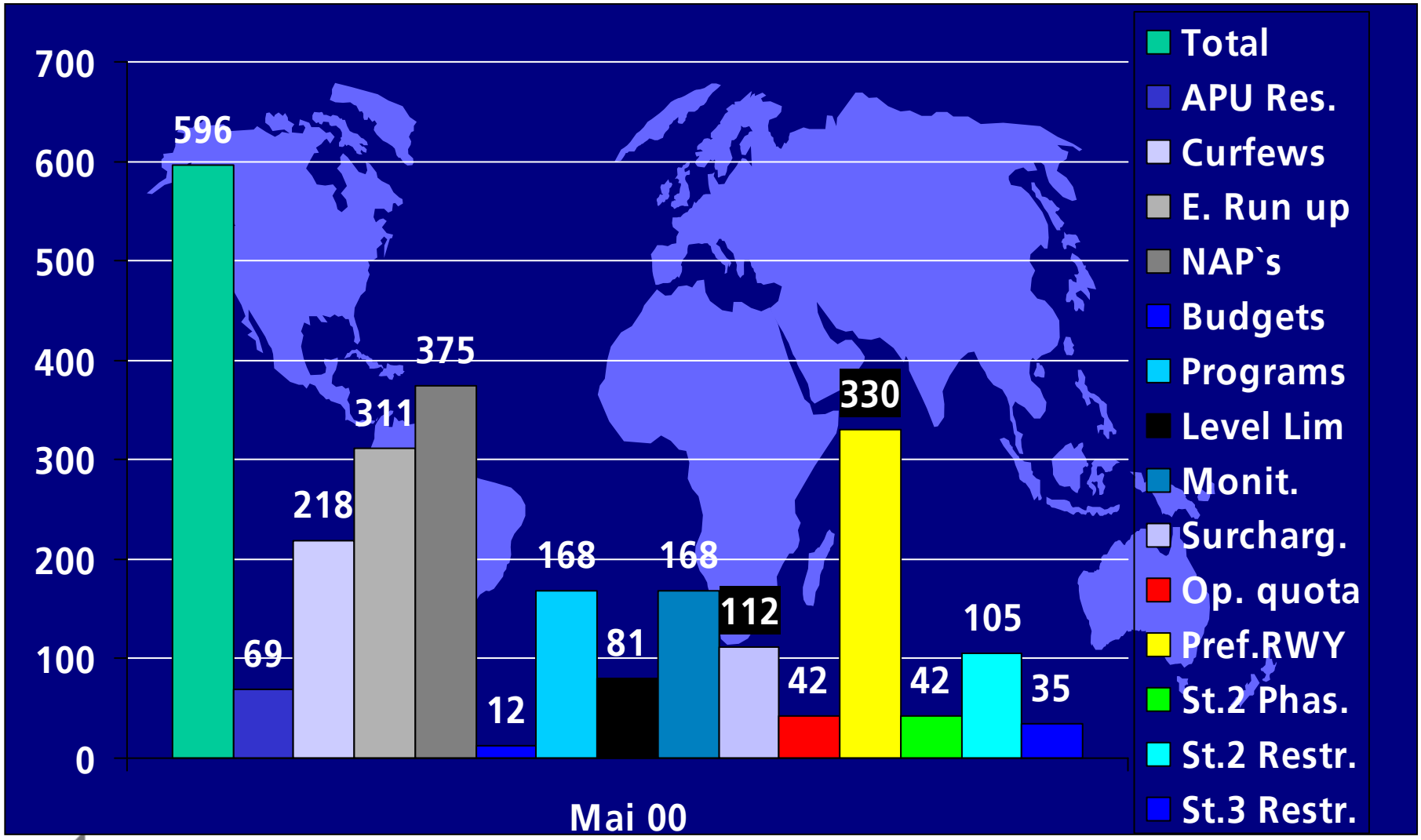
➔ Changes in air traffic organisation, starting in the core areas in 2005, are required to prevent a major foreseeable disruption.

Heathrow ... as an example

Reproduction courtesy of British Airports Authority

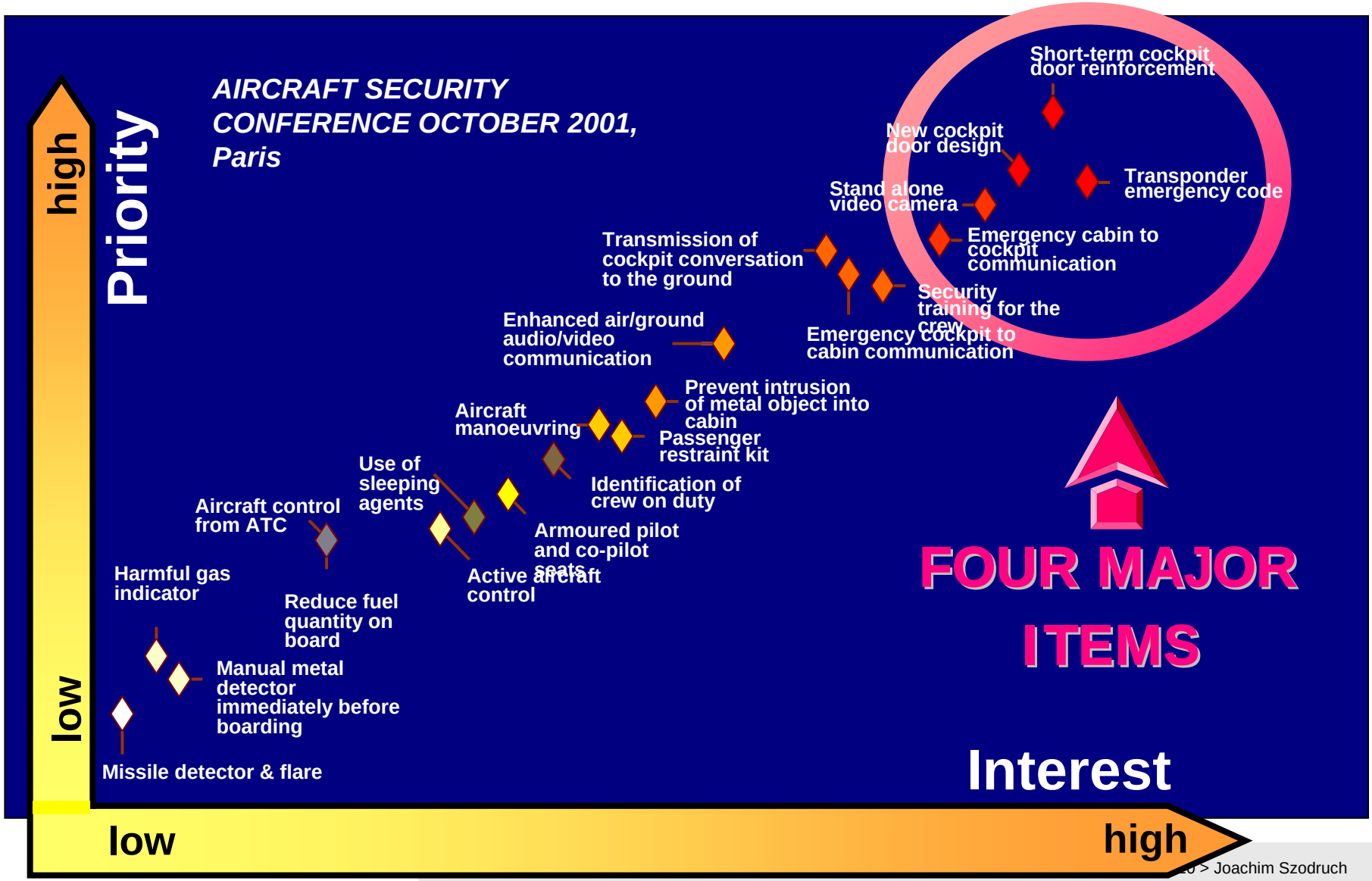


Number of Airports with Noise Curfews (May 2000)



Quelle: Boeing

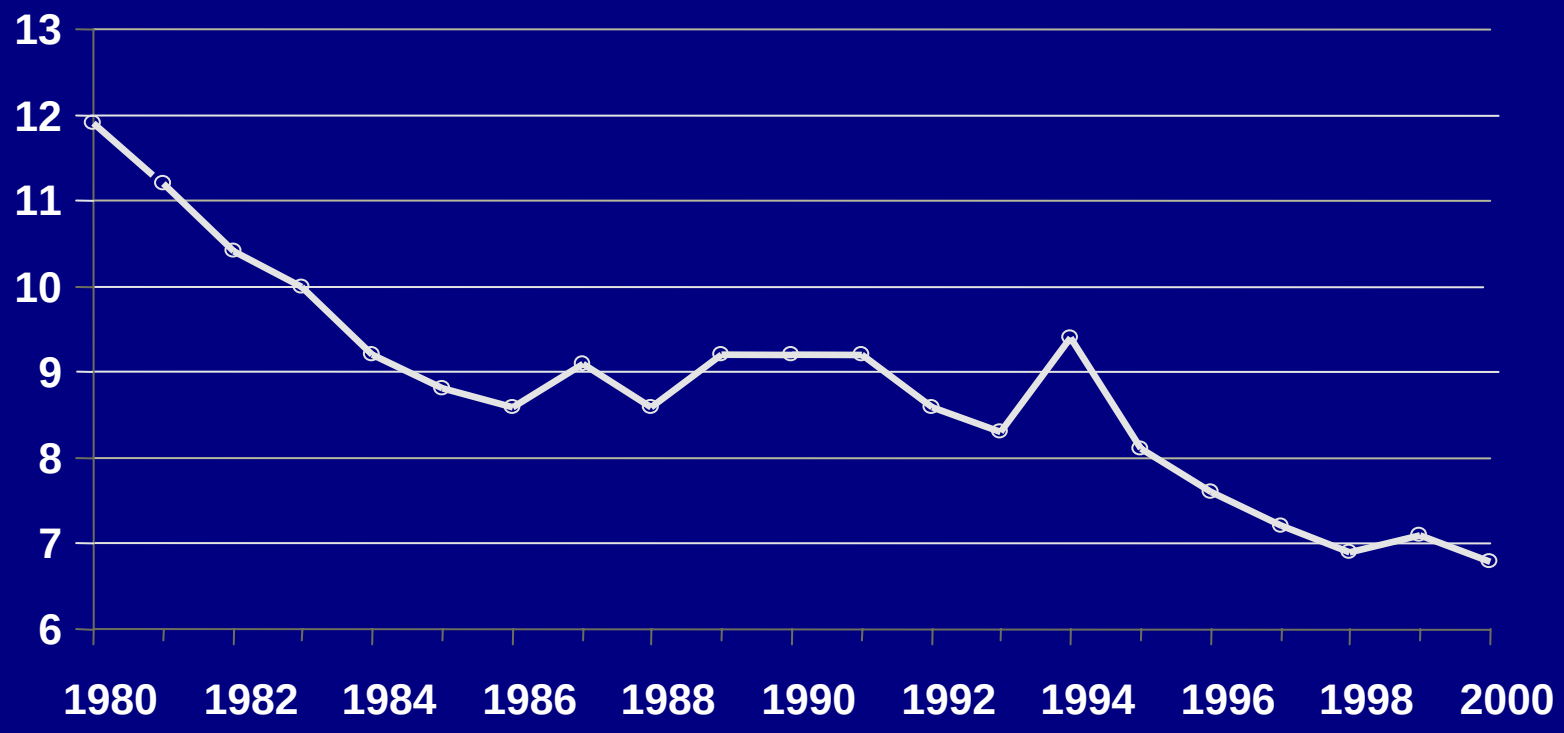
Airlines' Priority Analysis for Security



Source: Airbus

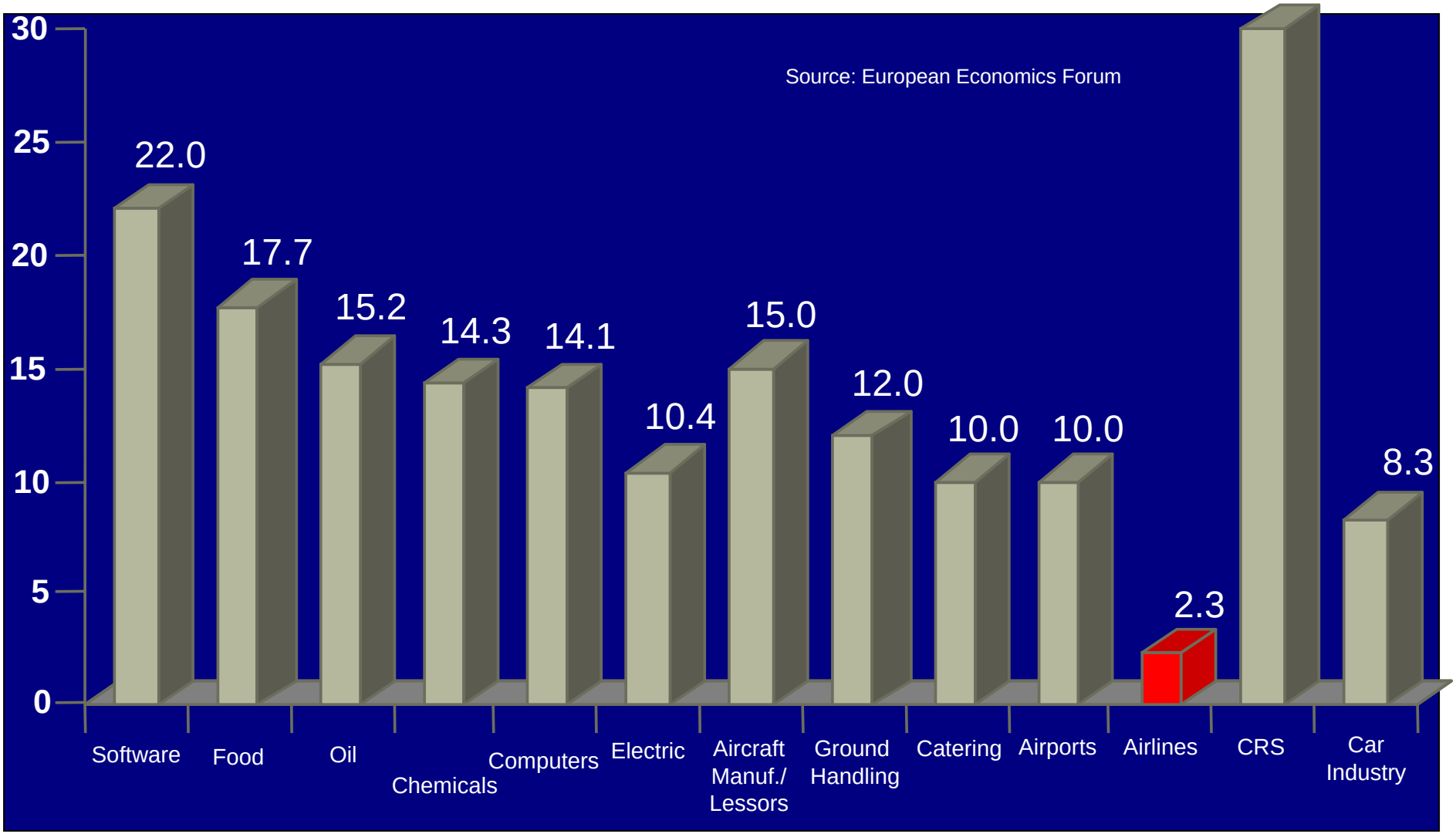
Economy of Airlines

Yield (constant 1990 US-cents) **/ RPK**



Source: ICAO Civil Aviation Statistics of the World

Return on Capital

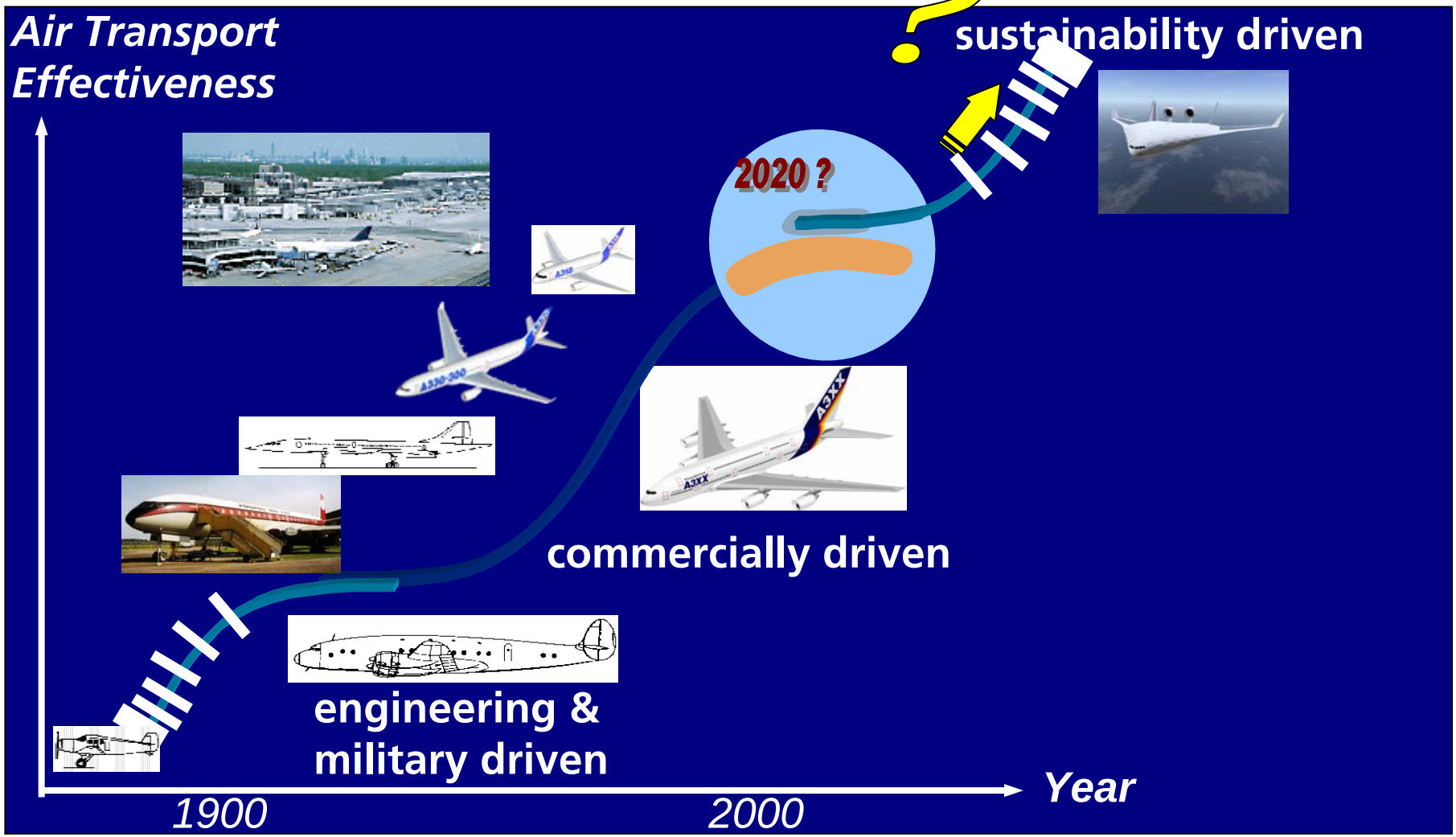


Oil Price Development

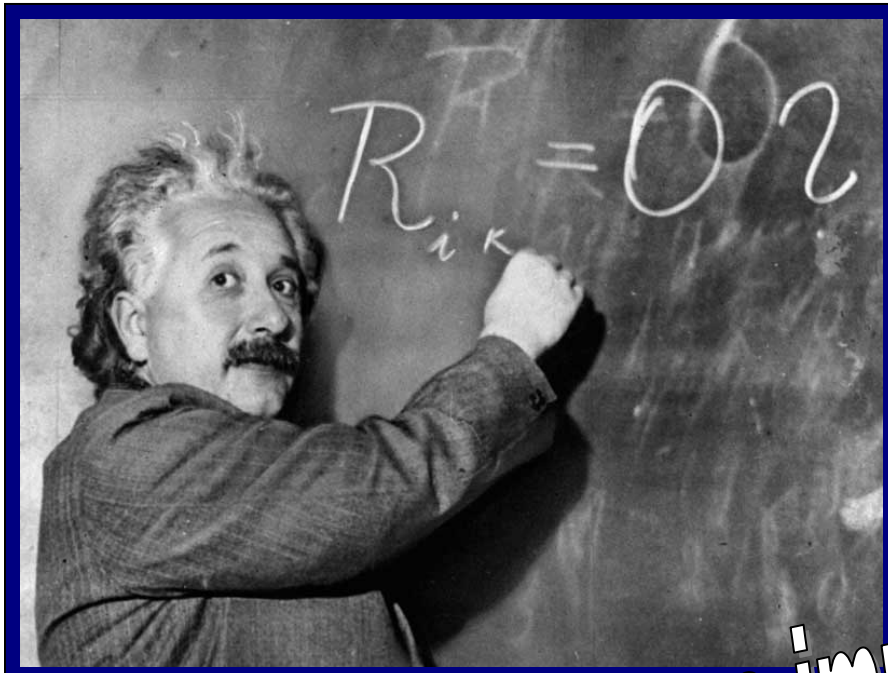
Oil Price in US $ / Barrel:

Quelle: DLH 2005

Development Trends



The Future in the Air or on the Ground?



Imagination is more important than knowledge, since knowledge is limited.

Communication from the Commission "Building our Common Future"

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**

EUROPEAN RESEARCH AREA

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**

EUROPEAN RESEARCH AREA

(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**

Respon-ding to Society's needs

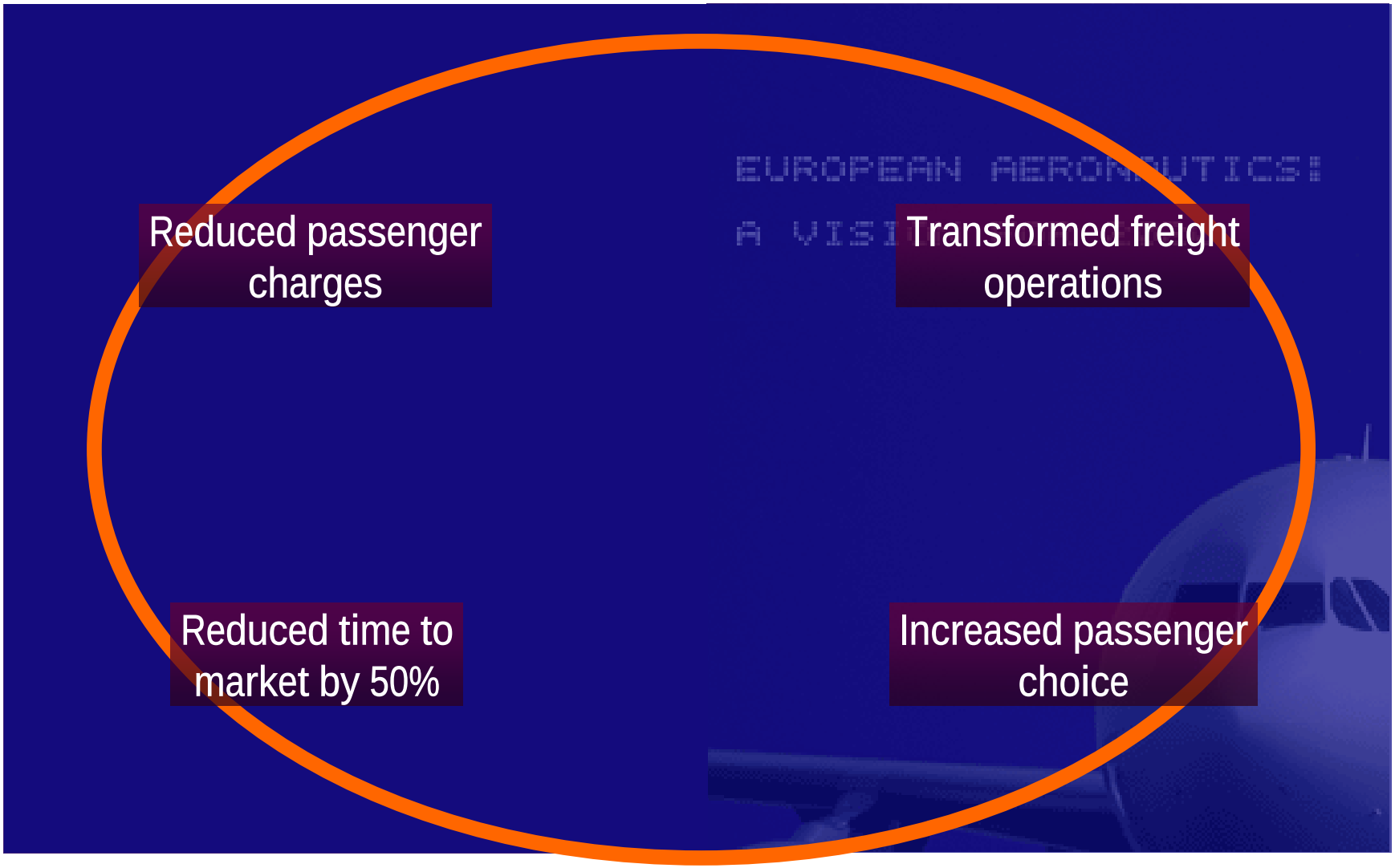
Two Top Level Objectives

Securing global Leader-ship to Europe

European Aeronautics: A Vision for 2020

Challenges	and associated goals
Quality and Affordability	Reduced passenger charges Increased passenger choice Transformed freight operations Reduced time to market by 50%
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
Efficiency	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

Quality and Affordability



Quality and Affordability

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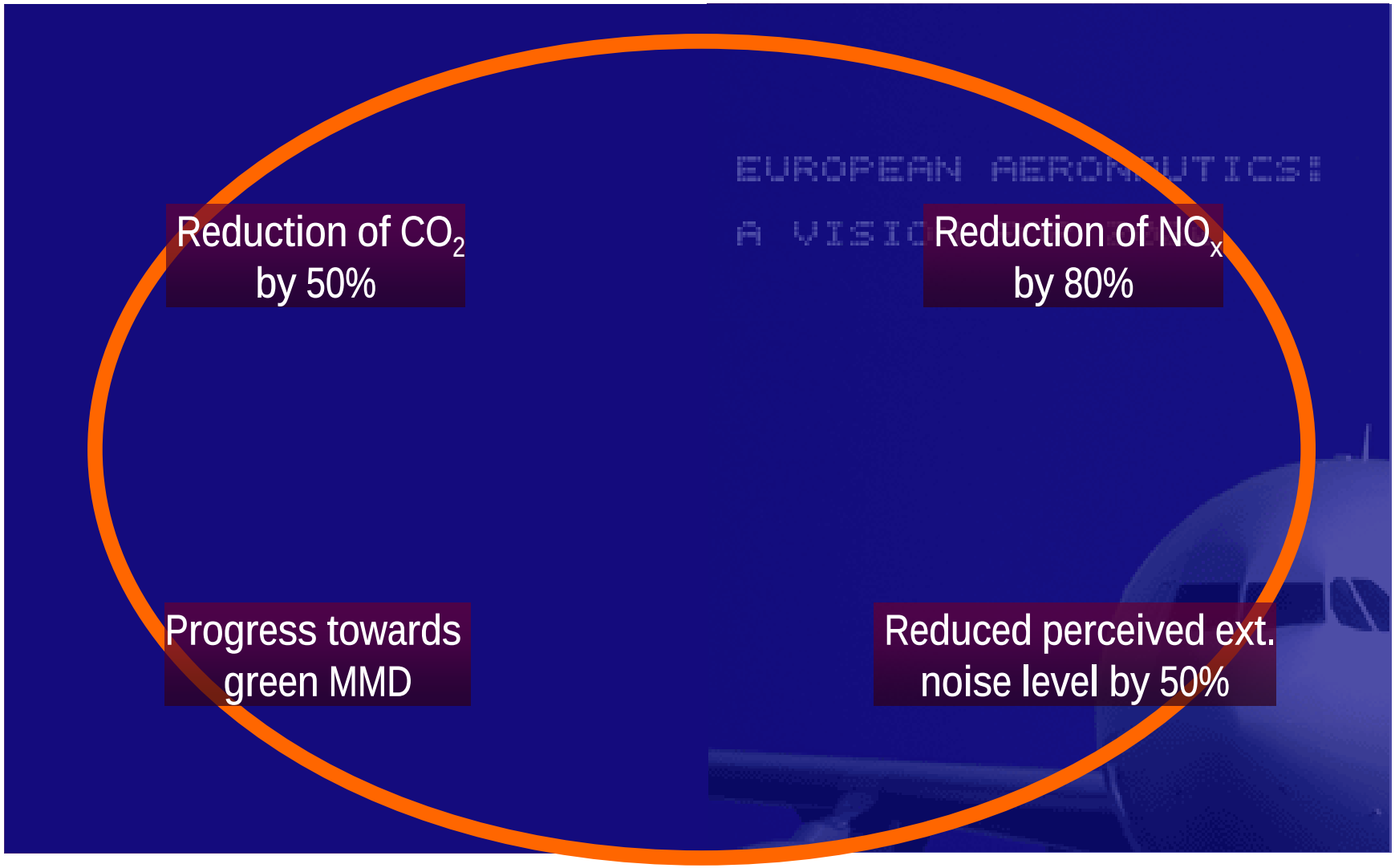

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Safety


EUROPEAN AERONAUTICS:
A VISION FOR 2020
Reduction of accident rate by 80%
Reduction in human errors and its consequences

Safety

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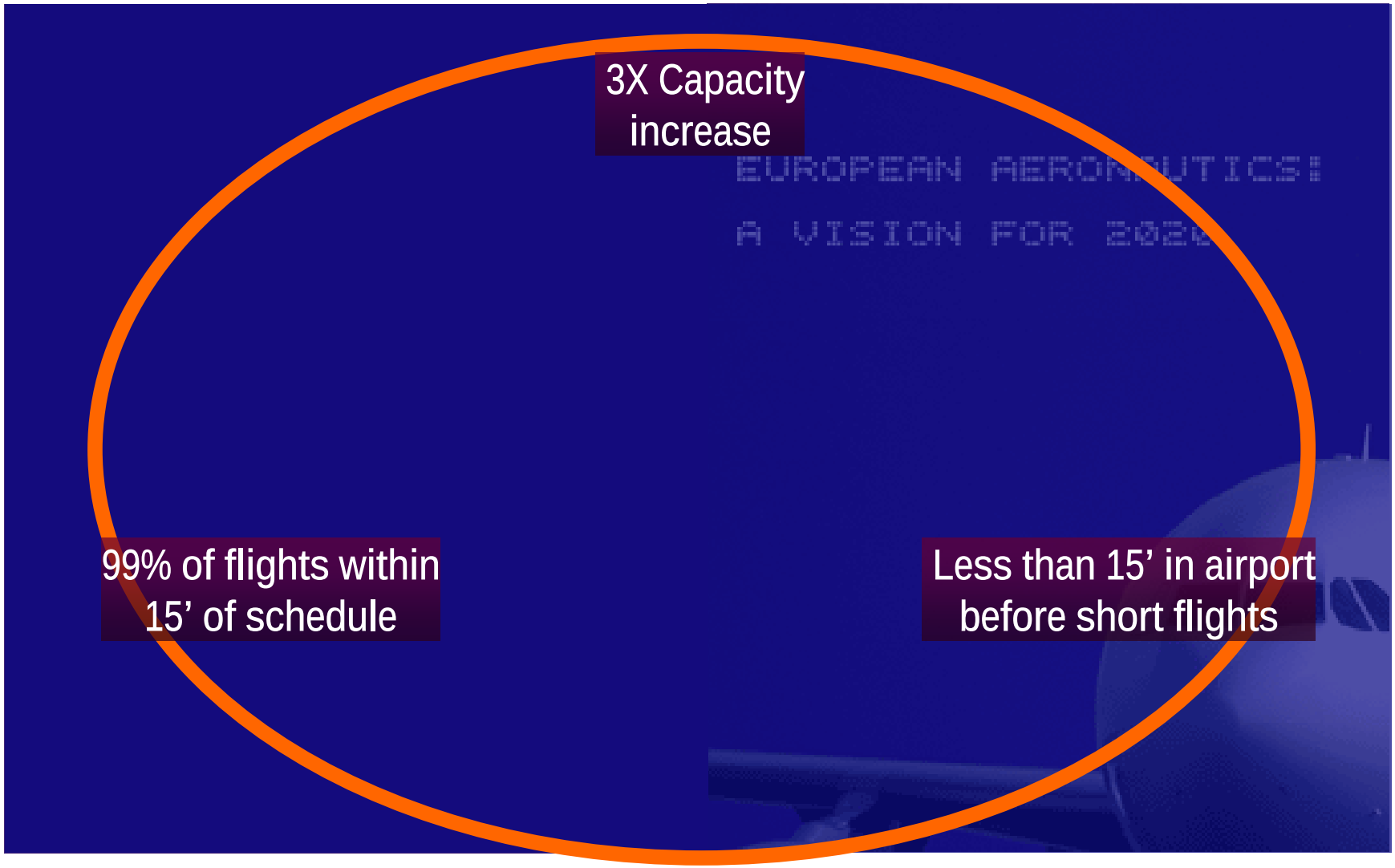
Efficiency


3X Capacity increase
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Efficiency

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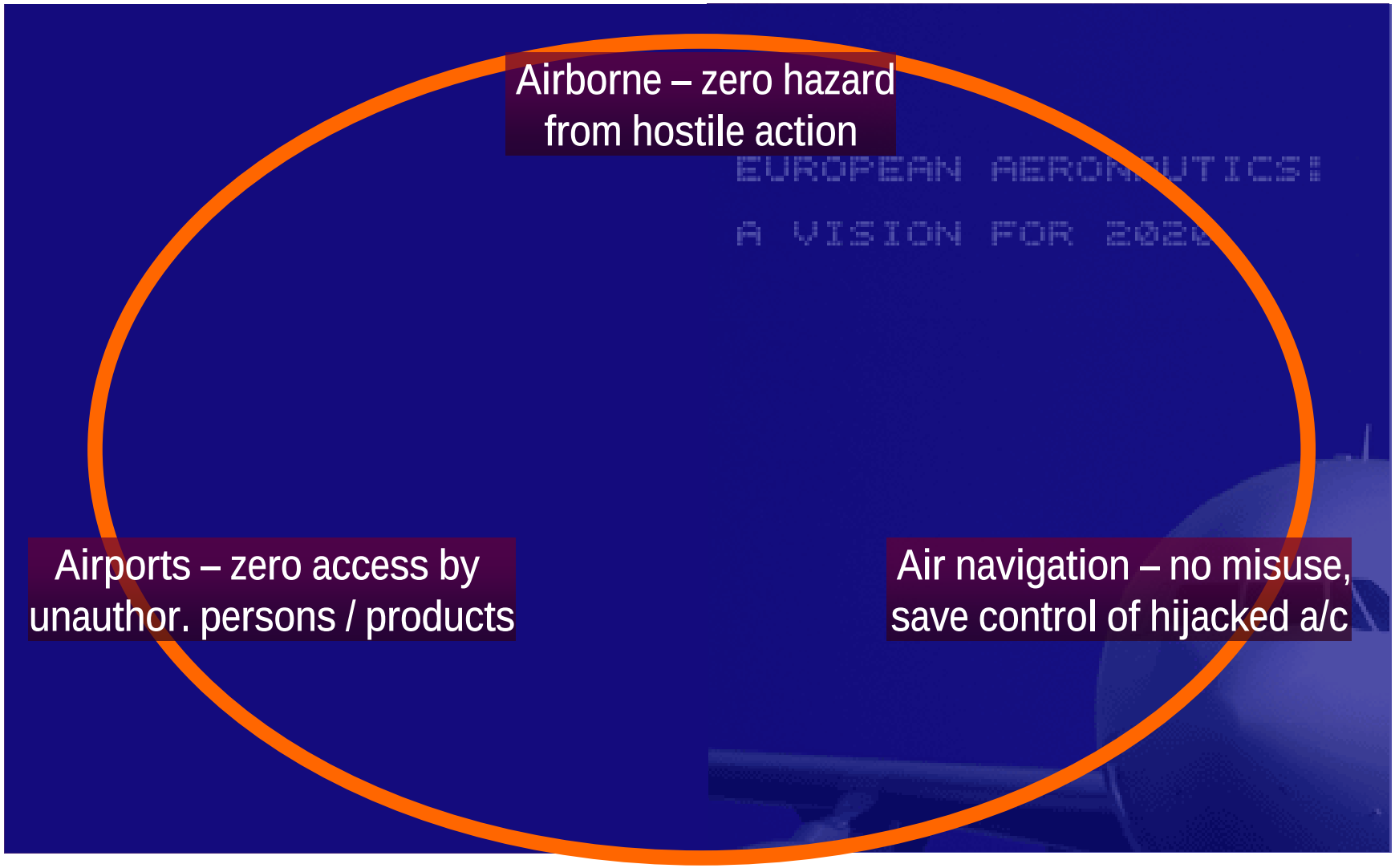

Airborne – zero hazard from hostile action
Airports – zero access by unauthor. persons / products
Air navigation – no misuse, save control of hijacked a/c

Security


Security Checkpoint
SECURITY AREA
UNAUTHORIZED ACCESS
WILL RESULT IN
LOCAL AND FEDERAL
PROSECUTION
MAC SECURITY ORDINANCE
FEDERAL AVIATION REGULATIONS
CAMERA2
CAMERA3
Exit
EntryScan
SAFE
SAFE
DB

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 implementtaion 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 Advisory Council for Aeronautical Research in Europe

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

EREA Association of European Research Establishments in Aeronautics

European Commission

ASD AeroSpace and Defence Industries Association of Europe

European Aviation Safety Agency

AEA Association of European Airlines

ACI EUROPE AIRPORTS COUNCIL INTERNATIONAL

EUROCONTROL

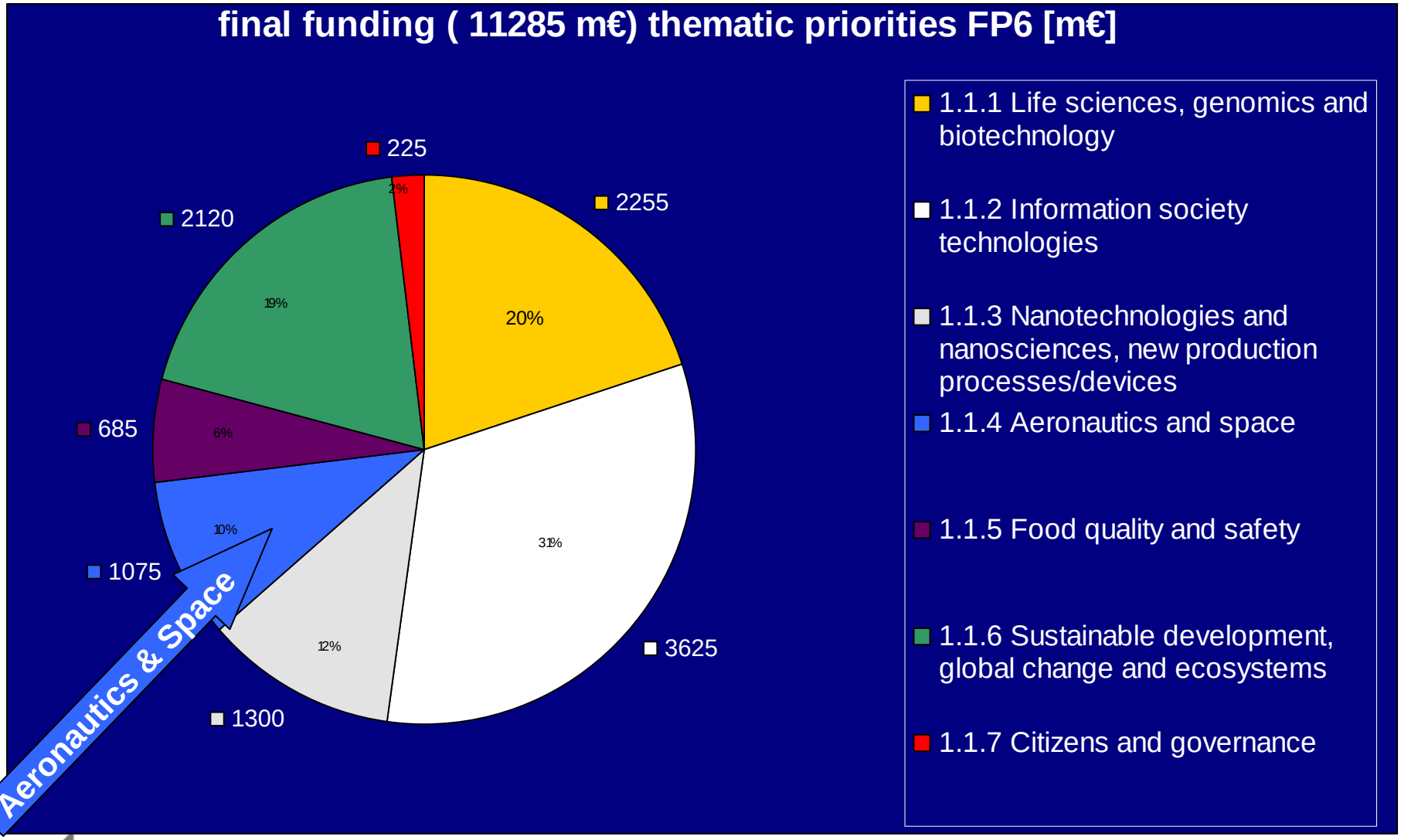
Key findings of SRA-2

- **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

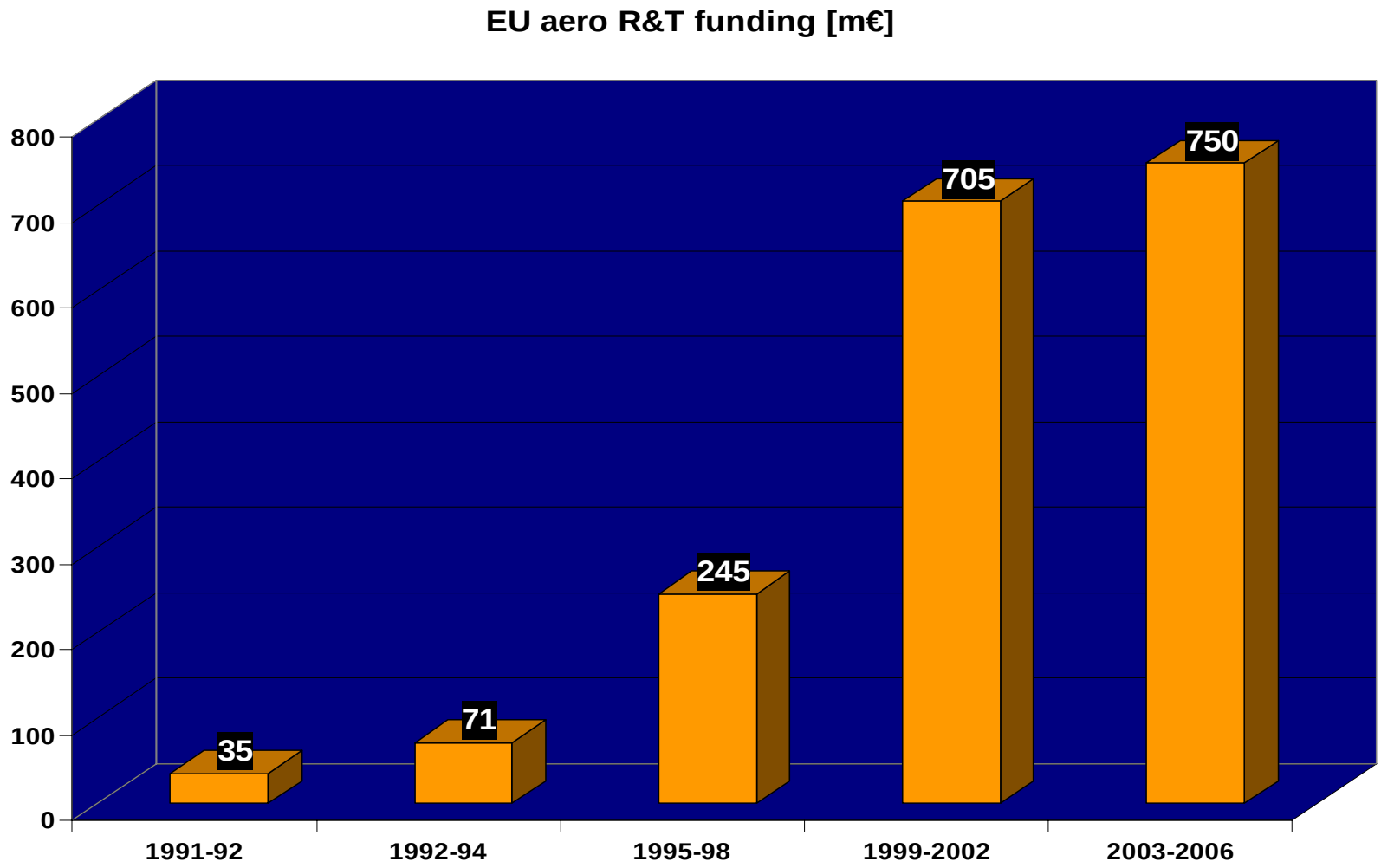
- **European research needs more people**
  The industry may face a shortage of skilled young people in the future

- **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



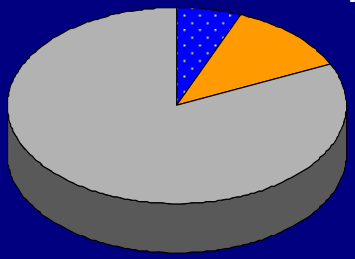
EU Aeronautical Programmes



R&T Budgets Today and Required in 2020

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

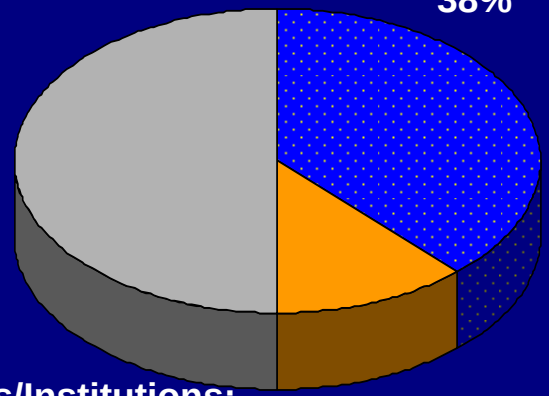
National Programmes:
~1.500 m€ (12%)



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

Vision 2020

EU Programmes:
38%



Companies/Institutions:
50%

National Programmes:
12%

1999 - 2002
total: ~3 bn€ / year

2020
total required: ~7 bn€

Key findings of SRA-2

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  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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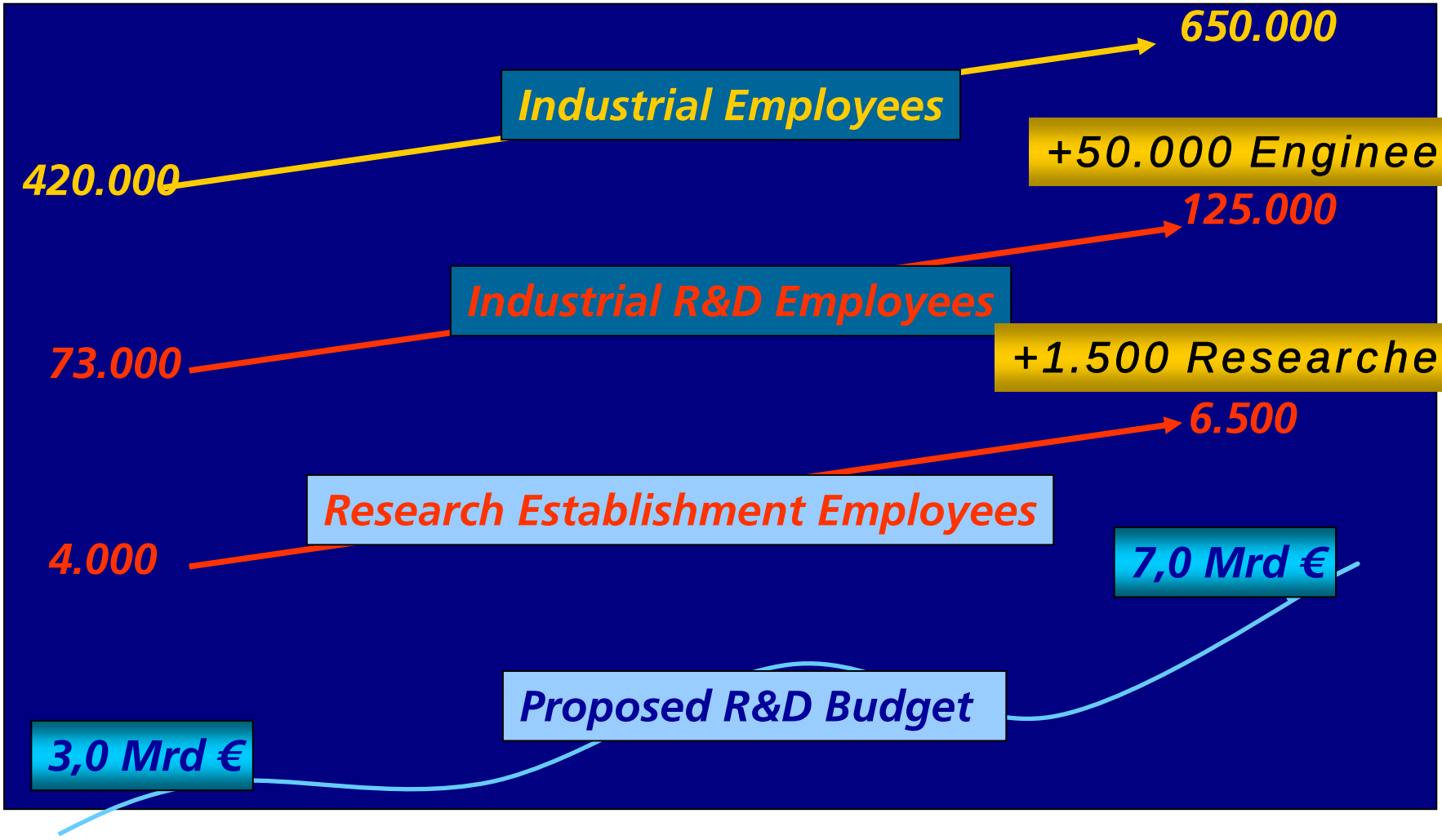
R&D Employees Development Requirements

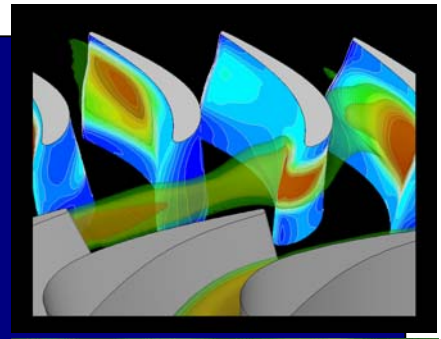


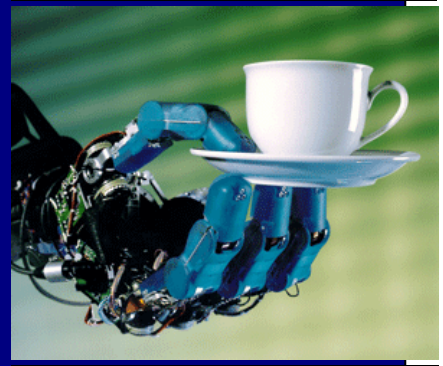
ACARE – Importance for Industry

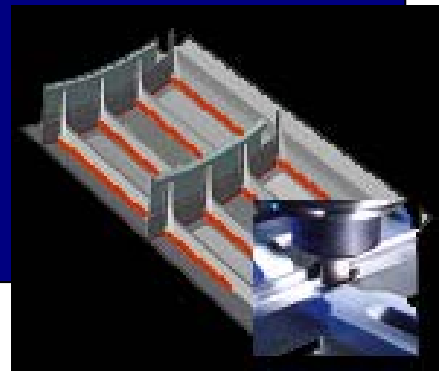
- **Total air transport system approach**
- **All Branches (manufacturing industry, operators, airports, ATM) or single industries / suppliers only part of the entire system**
- **Industry in regions, member states must be competitive and contribute to European approach**
- **Industrial focused approach**

ACARE – Importance for Research Community

- **European Research Area as political and competitive goal**
- **Common technical goals with Industry**
- **Industrial committment 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