SESAR
Single European Sky ATM Research

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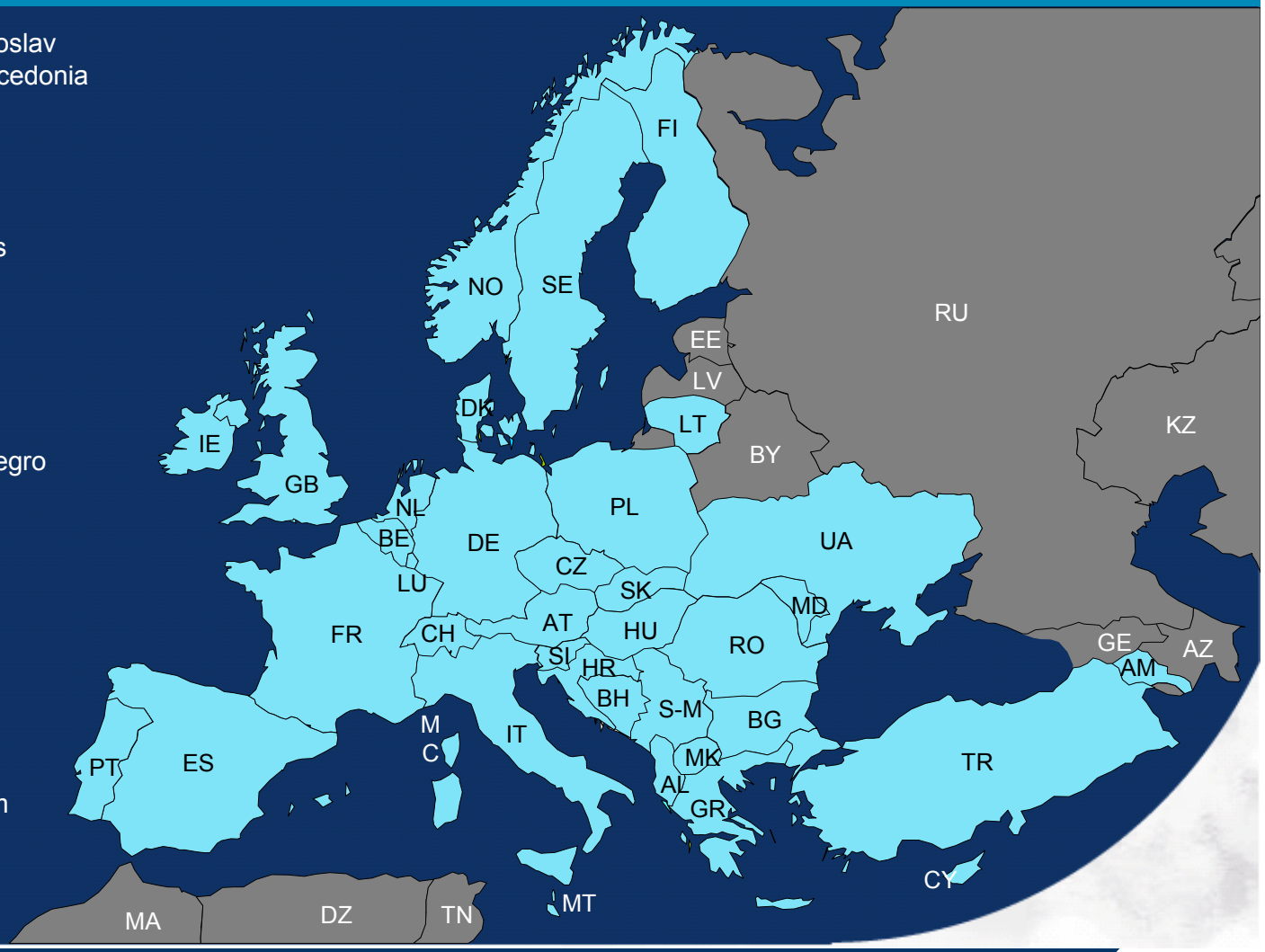
Albania
Armenia
Austria
Belgium
Bosnia and Herzegovina
Bulgaria
Croatia
Cyprus
the Czech Republic
Denmark
Finland
France
Germany
Greece
Hungary
Ireland
Italy
Lithuania
Luxembourg
the former Yugoslav Republic of Macedonia
Malta
Moldova
Monaco
the Netherlands
Norway
Poland
Portugal
Romania
Serbia-Montenegro
Slovakia
Slovenia
Spain
Sweden
Switzerland
Turkey
Ukraine
United Kingdom



37 Member States

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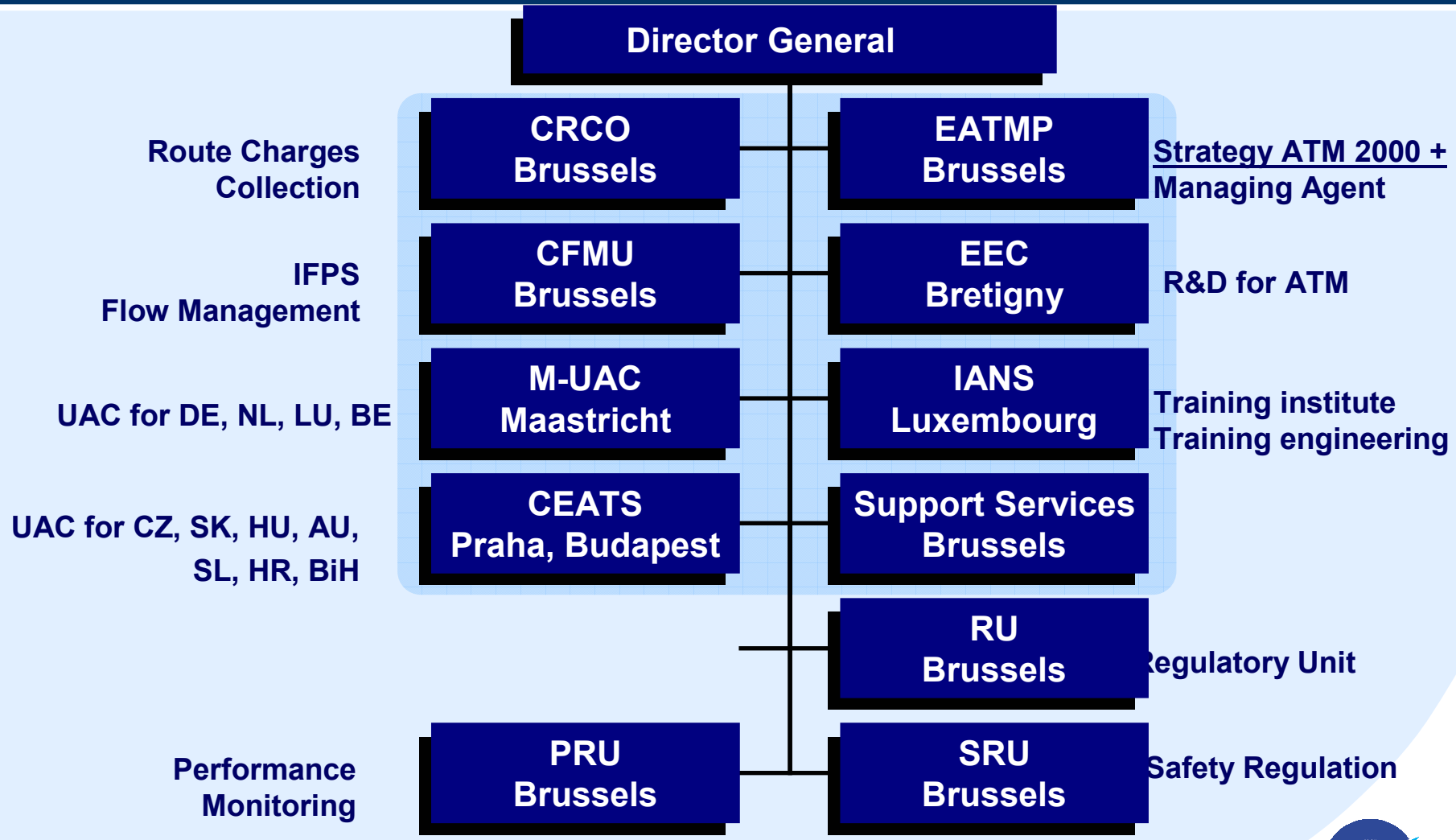

Objective of Europe's Air Traffic Management System

Overarching Objective:

To harmonise and integrate Air Navigation Services in Europe, aiming at the creation of a *uniform* Air Traffic Management System for *civil and military* users, in order to achieve the *safe, orderly, expeditious and economic* flow of traffic throughout Europe. ***(Article 1 of EUROCONTROL's Revised Convention)***

EUROCONTROL's membership includes 37 States and the European Community

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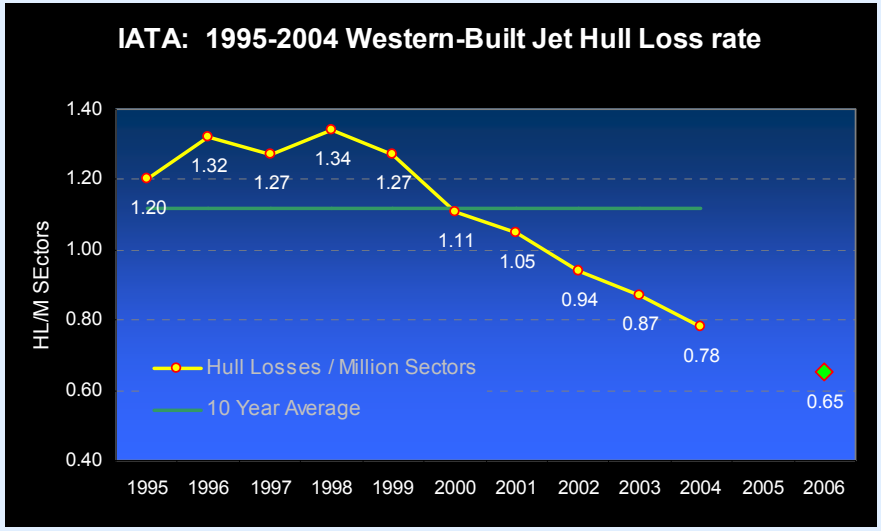
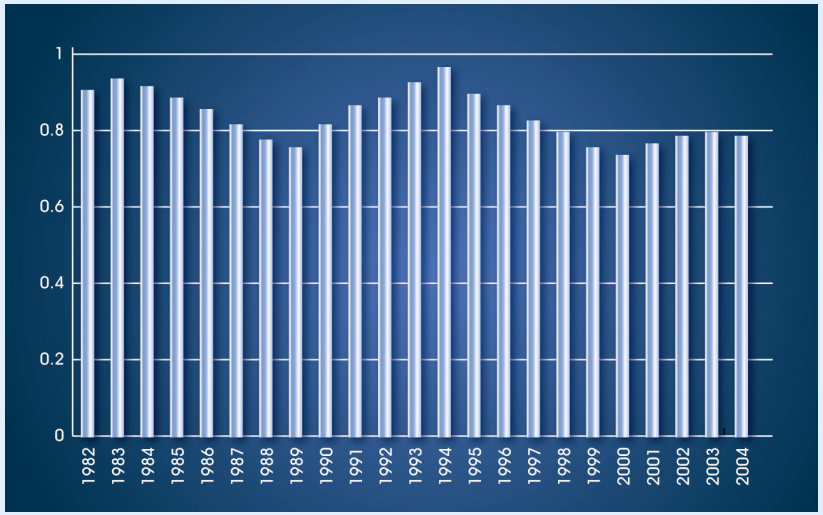
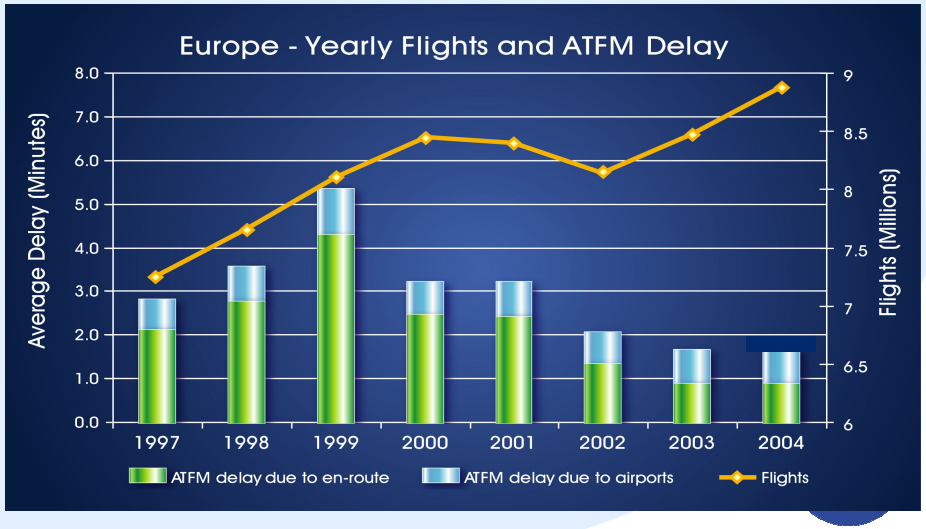
Current Performance of Air Traffic Management in Europe

Excellent performance, in a context of traffic growth:

- **Safety** ensured
- **Delays** eliminated
- **Costs** reined in







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An Evolving European Aviation Landscape

Airspace Users

- High cost pressure (+fuel)
- 9/11 and economic downturn
- Low cost airlines
- VLJs, UAVs

Airports

- Aviation: just a business

Society

- Noise & Climate change
- Safety
- Security
- Sustainable growth
- Mobility

ANSPs

- Corporatisation/privatisation
- Under pressure of users

Supply Industry

- Concentration
- Global

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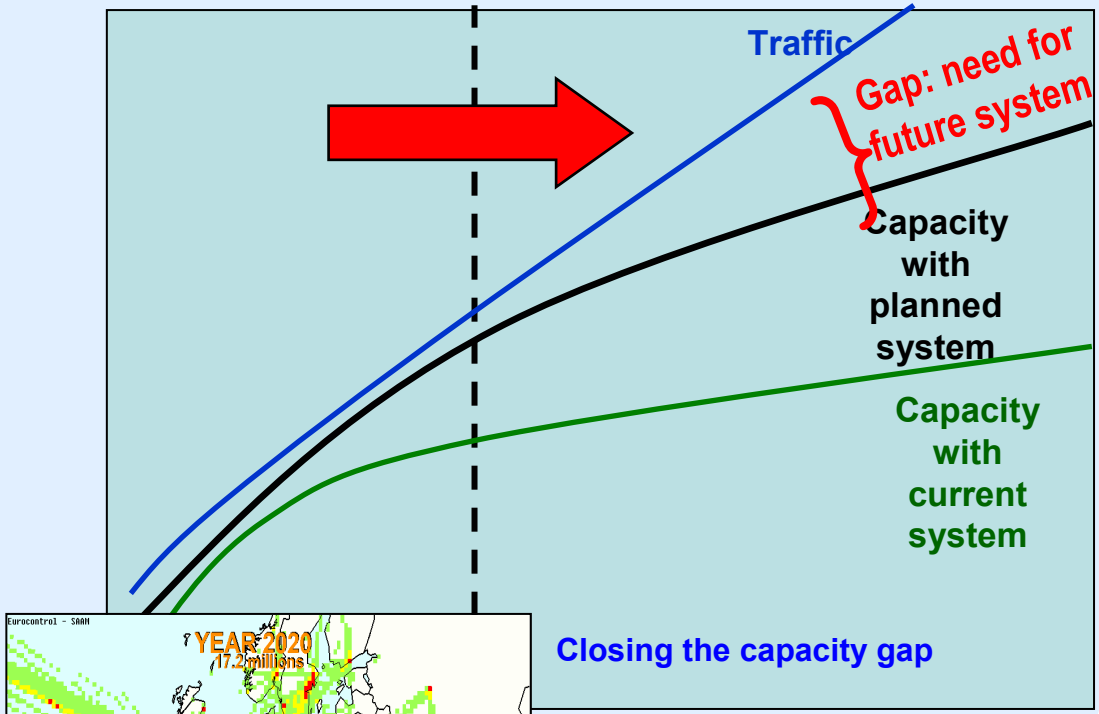
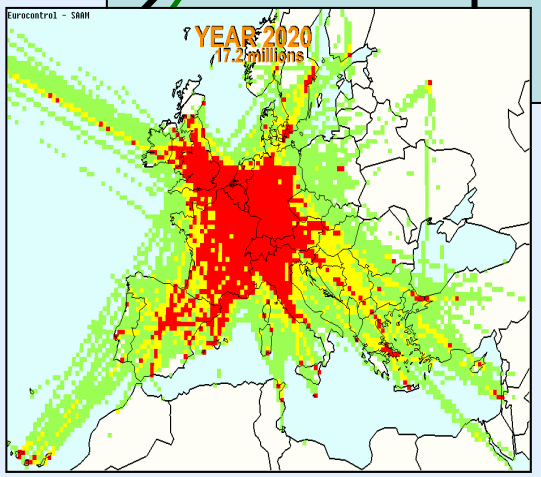
Need for a Future Air Traffic Management System

To address the European Challenges for predicted Air Transport Growth

- Enable a 3-fold increase in capacity which will also reduce delays, both on the ground and in the air,
- Improve the safety performance by a factor of 10,
- Enable a 10% reduction in the effects flights have on the environment and
- Provide ATM services at a cost to the airspace users which is at least 50% less.

A shift towards a new paradigm is required





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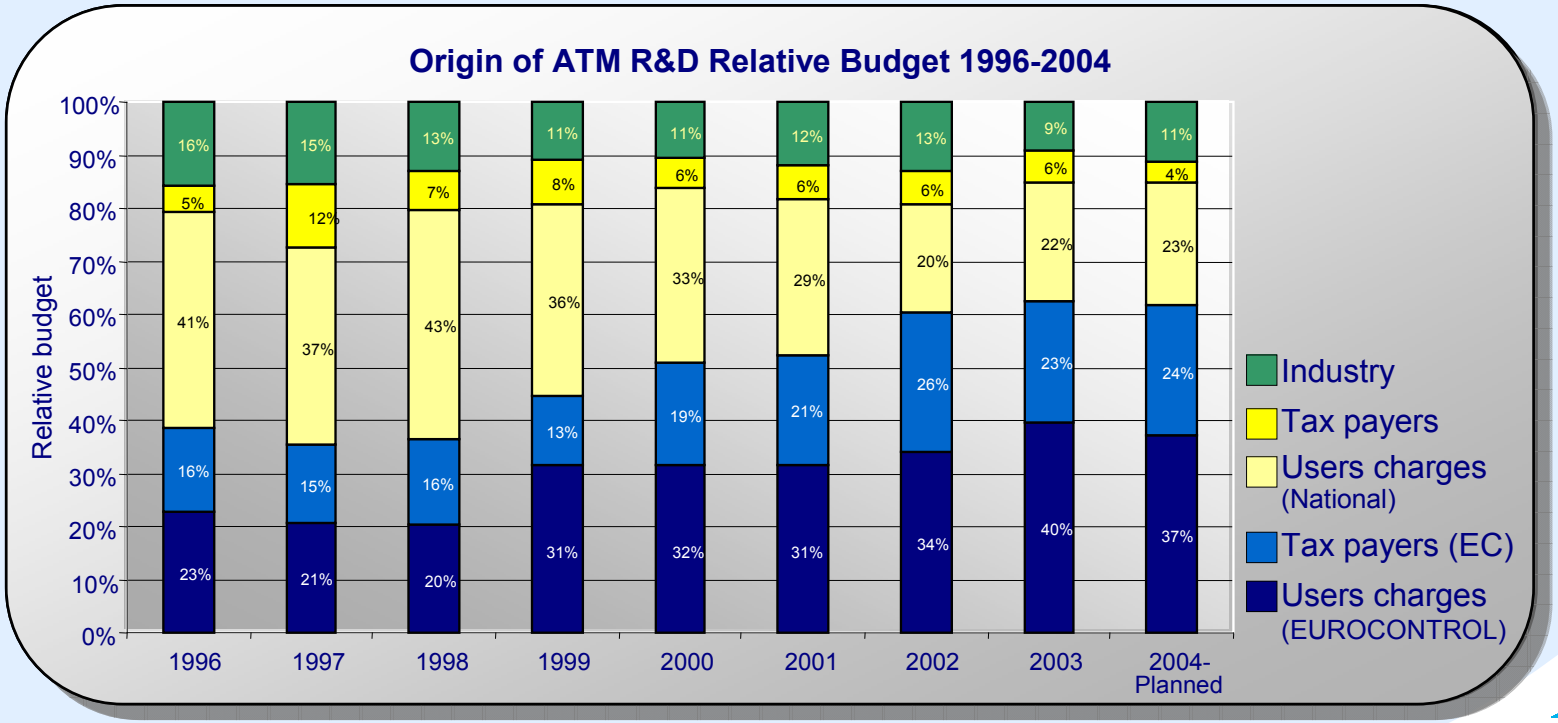
Funding of European ATC Research

Because of the corporatisation of ANSPs and pressure on ATC costs the trend has been reduction of national R&D budgets paid by users' charges totally offset by CEC /FP budget increase

Currently, European R&D in ATM = 200 M€/year:

- **70 % European Commission + EUROCONTROL + Industry**
- **30 % Others (national ATS providers and R&D Centres)**



Source draft ARDEP 2005

A black mark for European R&D

We (research community) are criticised as there seems to be a missing link between successes and implementation**

- **R&D perceived as being conducted in a fragmented manner**
- **Not addressing identified needs**
- **Lacking robust user requirements**
- **Insufficient Business planning analysis and/or Safety case work**

**SESAR D1 Conclusions

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Europe at Work

A European ATM Master Plan To Unlock Air Transport

- Converging Industry, EC & EUROCONTROL
- Needs:
  - **Turn off** fragmented approach
  - **Accelerate** ATM evolution in response to challenges
  - **Synchronise** & integrate plans from research to operations
  - **Synchronise** airborne and ground deployments

Address European needs and global interoperability

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SESAR Definition Phase

€ 60 Million
2 years
300 man-years

50 partners and associates from the Air Transport Industry
Representing different operational & business needs

BUT

Committed to a partnership for the best possible Future System

Under Project management responsibility of EUROCONTROL
Co-funded by EC through TEN-T
Industry wide consortium
with substantial EUROCONTROL effort contribution
This structure ceases to exist at the end of the Definition Phase.

Definition Phase Study : what it will deliver

- Propose detailed specifications of the future system ..... set initial indicative targets for Key Performance Areas
- Impose ONE technical solution..... propose one single functional architecture
- Get commitment from all major players ... build a partnership involving all stakeholders
- End with a fully validated concept element ..... define a detailed plan for validation and test

But above all : a roadmap that is acceptable and supported as THE European way forward for ATM modernisation by all stakeholders of the Air Transport Industry

Basis for subsequent commitment, financing and implementation

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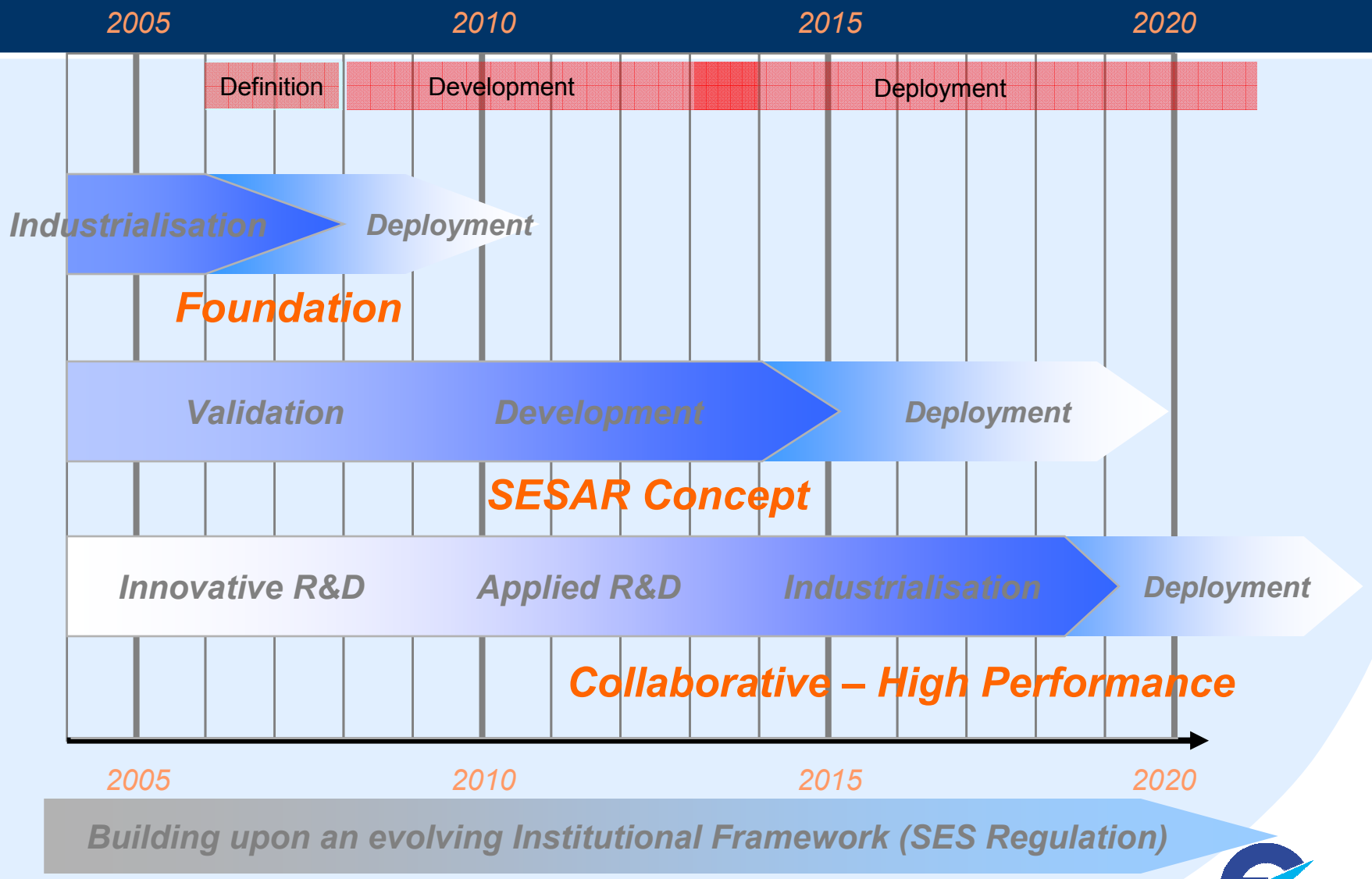
European ATM Roadmap



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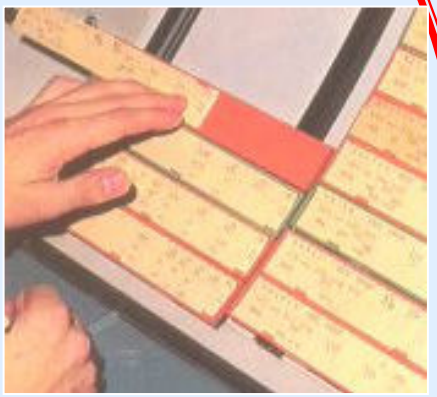
A Paradigm Shift

Past



Procedural

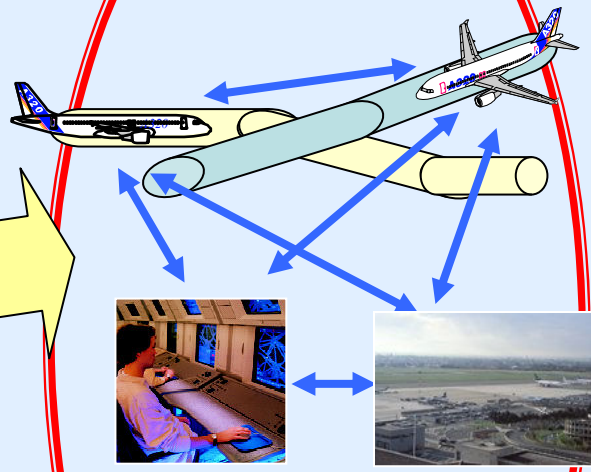
Estimate the current and planned a/c positions

Today

Radar

Know the current and estimate planned a/c positions

Future



Trajectory

Know & share the current and planned a/c positions

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The Future System Features

- ✓ Airspace configured according to operations
- ✓ Automated control functions
- ✓ 4-D Trajectories
- ✓ Air-Ground datalink
- ✓ System Wide Information Management (SWIM)
- ✓ Advanced airport tools
- ✓ Satellite navigation
- ✓ Autonomous airborne separation

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SESAR Definition Phase
Main Milestones and Deliverables

We are here

July 06 | Dec 06 | June 07 | Oct 07 | Jan 08 | March 08

Air Transport Framework: The Current Situation

ATM Performance Targets

ATM Target Concept

ATM Deployment Sequence

ATM Master Plan

Work Programme for 2008-2013

D1 D2 D3 D4 D5 D6

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SESAR Development Phase

Execute the plan - Channel and integrate European Research

- **Governance: key to success**
  - **Oversight by States (through EC and EUROCONTROL)**
  - **Clear Funding Mechanisms**
  - **Efficient Decision Making / Professional Management**
  - **Simple Cost-effective Structure**
  - **Transparency, Involvement & Buy-In**
- **EC to set up a "JU" (Art 171 of Treaty)**
  - **private funding or 3rd Countries**
  - **EC – EUROCONTROL founding members**
  - **EUROCONTROL Agency providing Expertise and Facilities**
- **Set up to be reconsidered for the Deployment Phase (2014+)**

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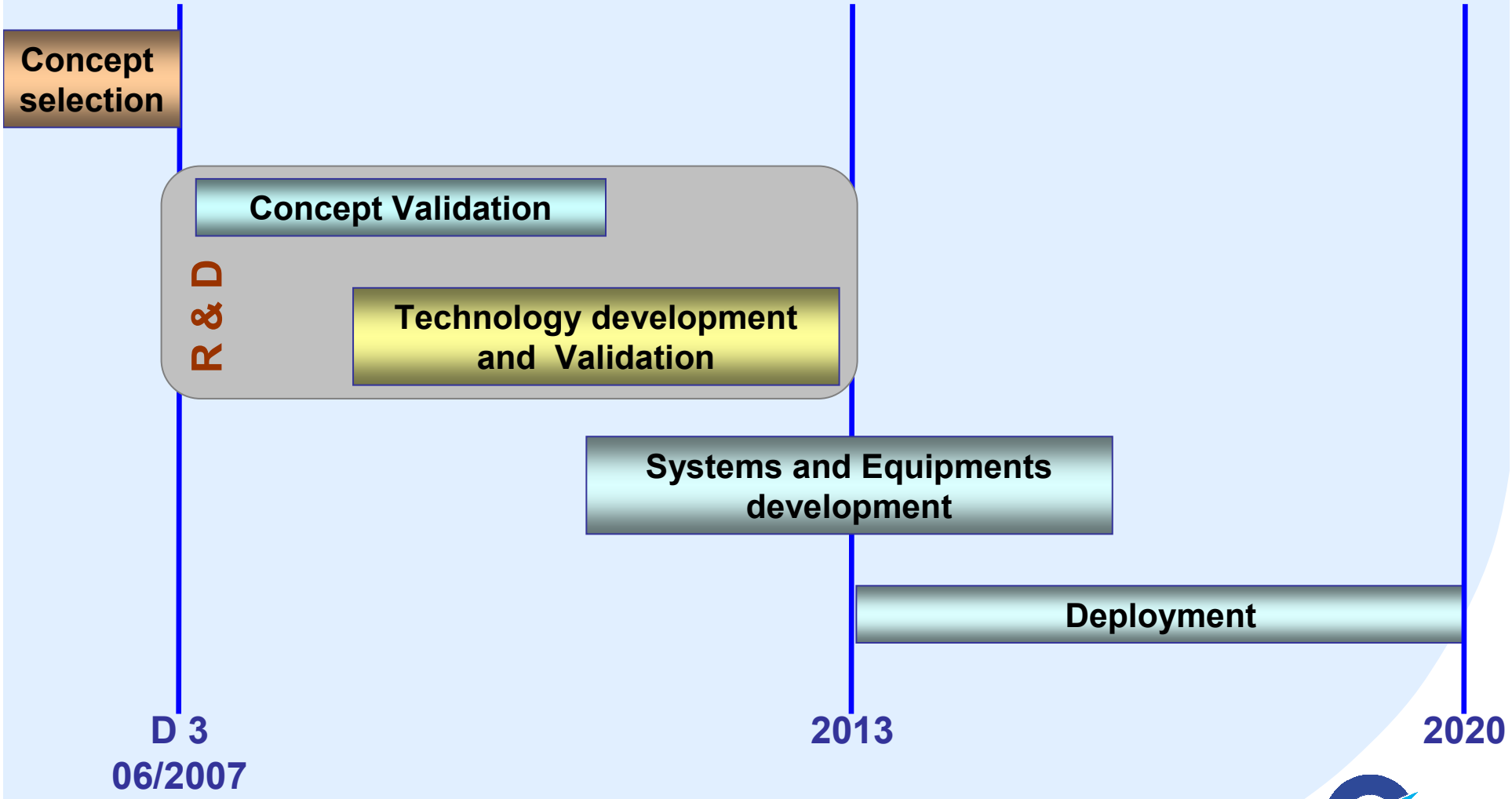
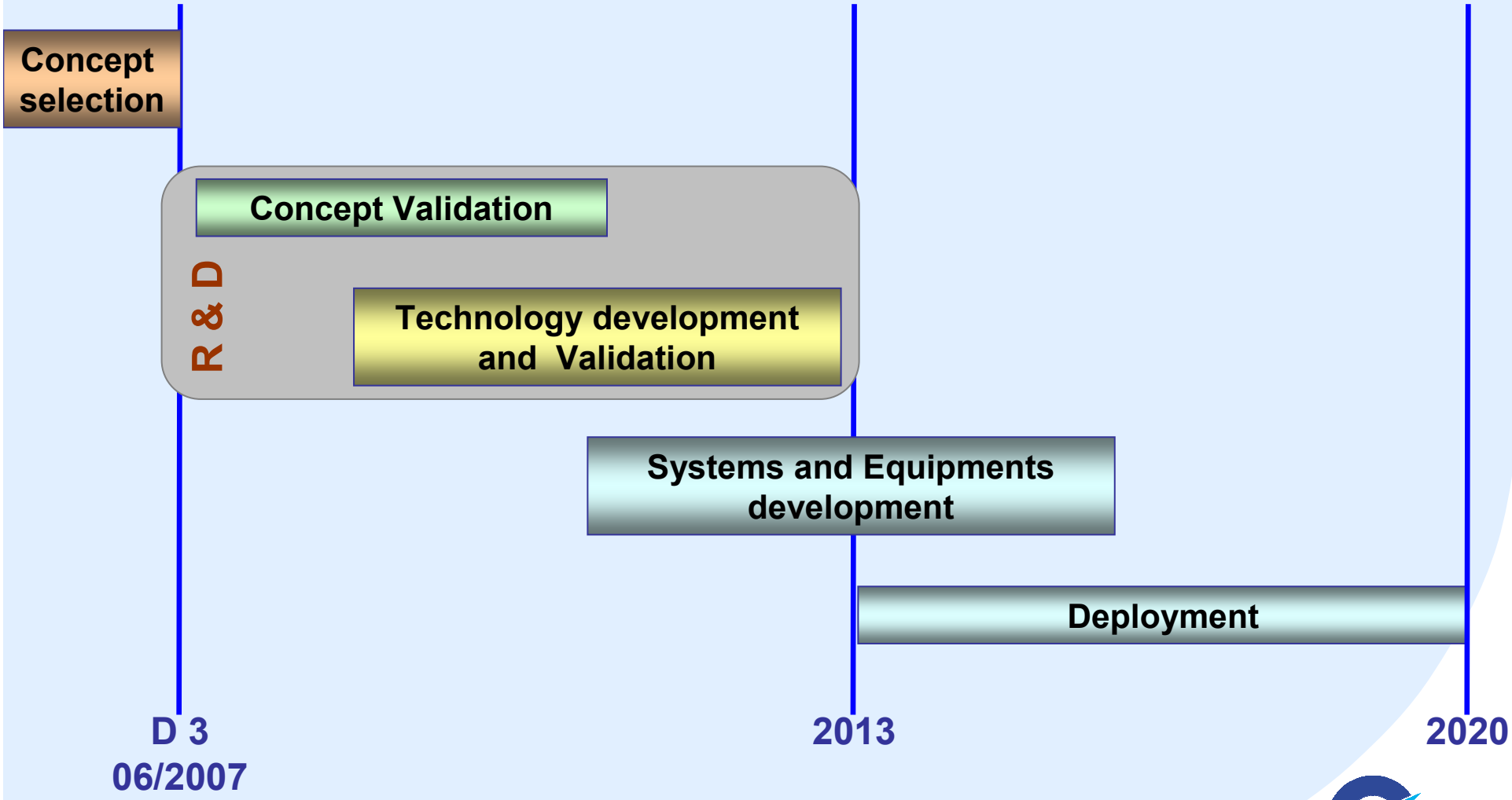
One view of the potential Research for SESAR

- What do we mean by Research for SESAR ?
- Some ideas on the main potential Research activities.
- A paradigm shift in the organisation of Research in Europe.

From a vision to implementation: Research - a mandatory step



Potential Research Activities



Potential Research Activities

Concept Validation

The main objective of Concept Validation is to provide evidence, or otherwise, that the SESAR 2020 Concept of Operation:

- **is “safe in principle”**
- **can attain the “proposed level of performance”**
- **is environmentally efficient**
- **and is “operationally viable”**

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Potential Research Activities

Concept Validation

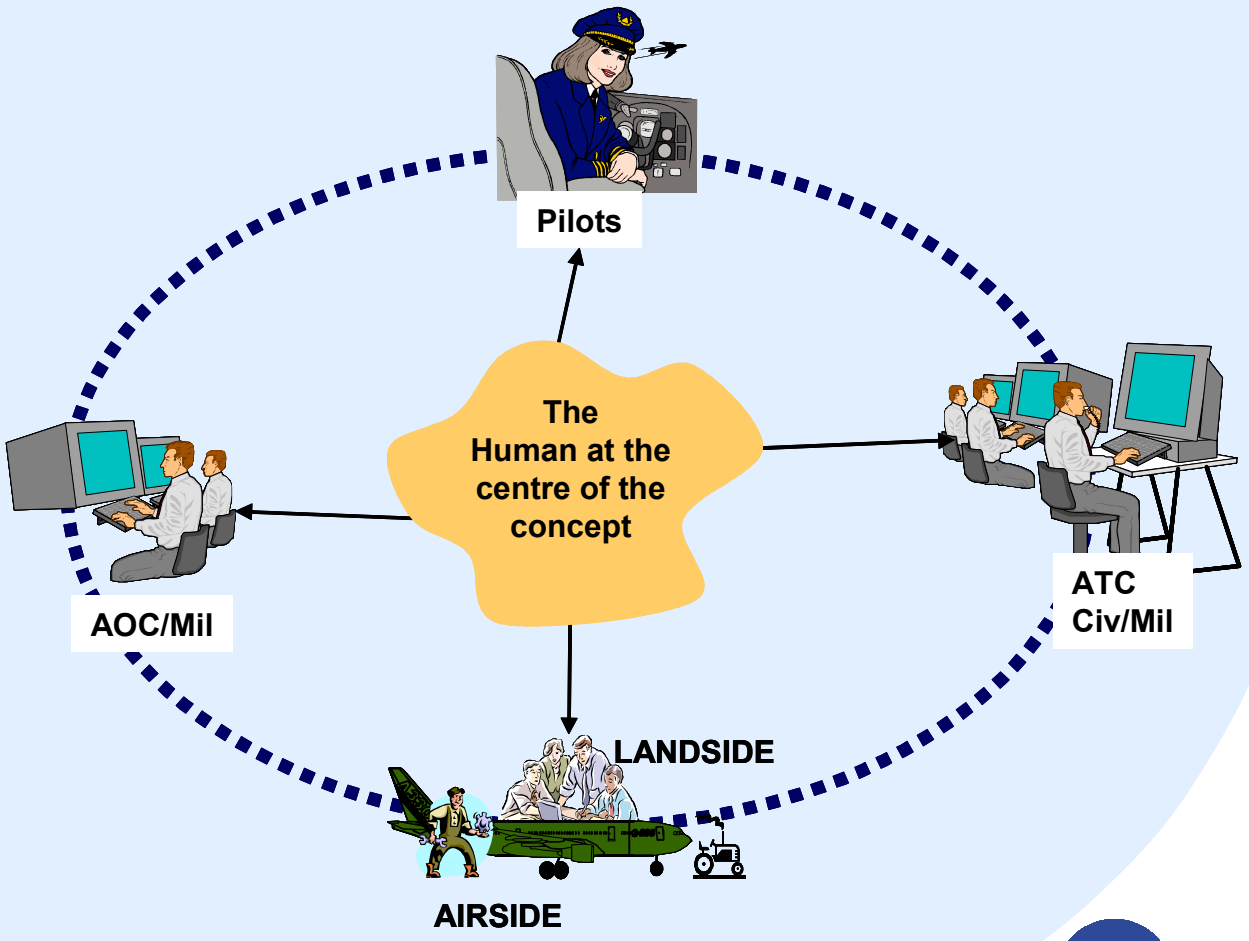
Operational viability assessment

- **New concept will impact operators & organisation**:
  - CDM for 4D trajectory management from strategic planning to pre-tactical de-confliction
  - New repartition of roles for Separation Management,
  - …

=>

- **Validation of working procedures:**
  - HIL simulations
  - Prototyping
  - HF experimentations
- **Validation of collaborative processes**:
  - Modelisation of actors behaviours
  - Trials with real data
- **Validation of optimisation algorithms**:
  - Optimisation of trajectories
  - Controllers Tools

Operational viability assessment



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Potential Research Activities

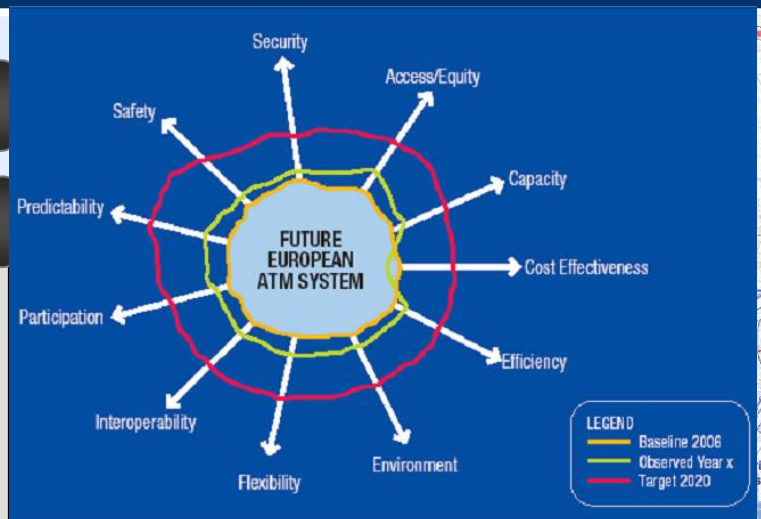
Concept Validation

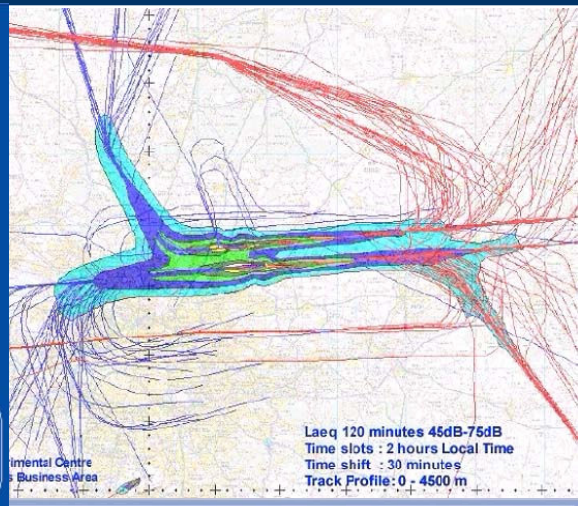
Operational viability assessment

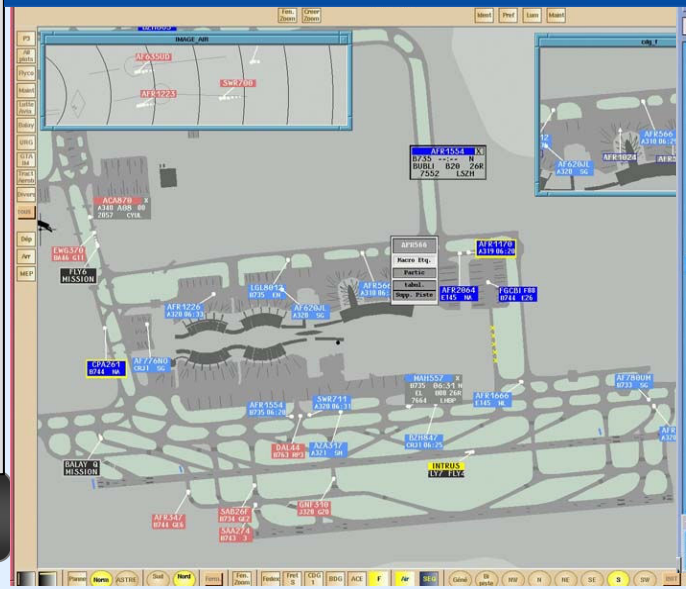
Performance and Environment impact assessment

- **Provide the evidence that the system can attain the required level of performances:**
  - Capacity X3
  - Environmental impact -10%
  - Predictability -1mn/+3mn
- **Using 2020 traffic forecast:**
  - Analytical modelling,
  - F/T simulation,
  - Noise and emission modelling,
  - ATFM modelling
  - …

Performance and Environment impact Assessment







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Potential Research Activities

Concept Validation

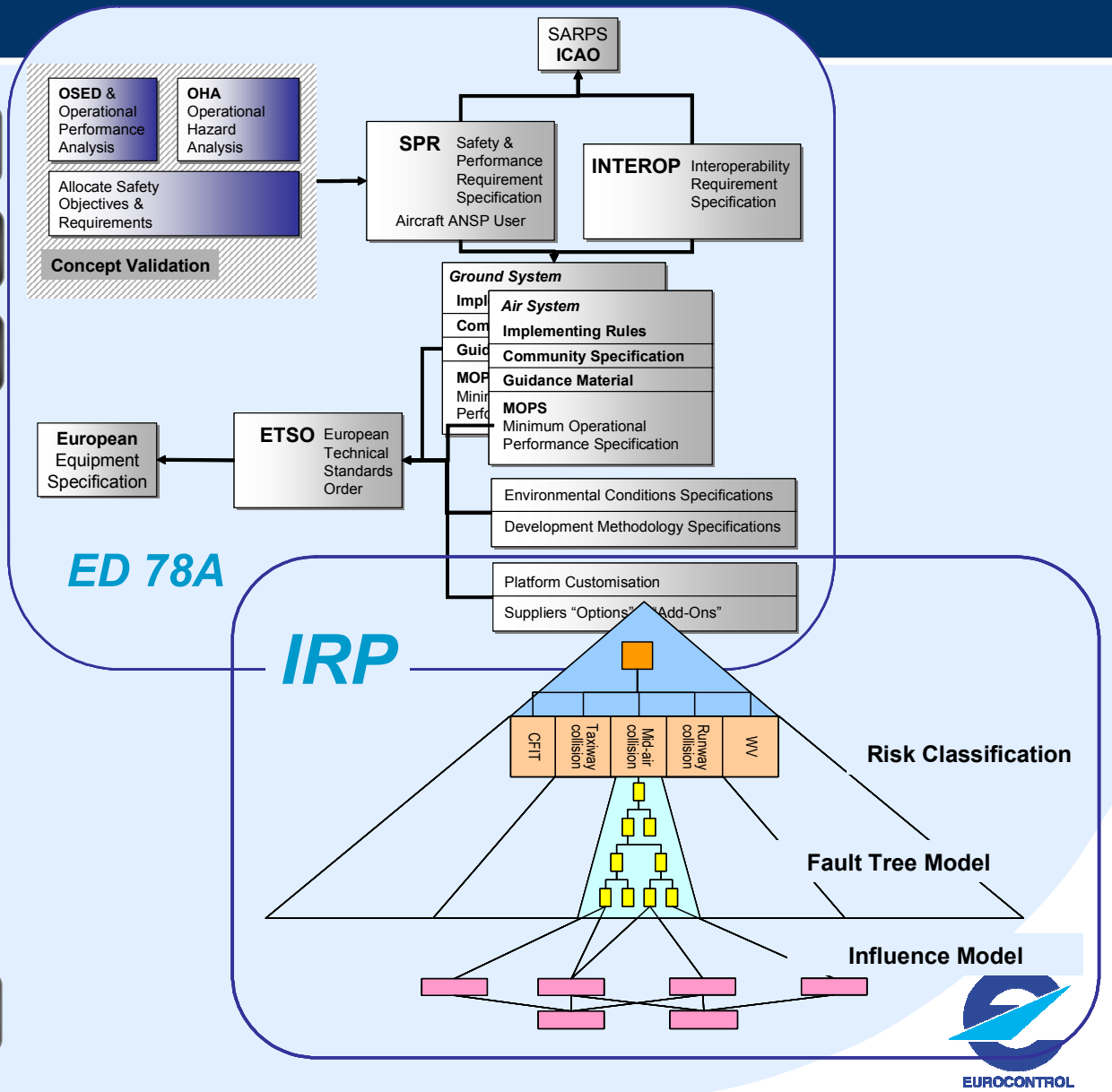
Operational viability assessment

Performance and Environment impact assessment

Safety assessment

- **Provide evidence that the system can maintain today's level of safety with tomorrows traffic:**
  - Safety level X10
- **Apportioning TLS:**
  - Using a holistic top-down modelling (Integrated Risk Picture-**IRP**)
- **As a first cycle of certification process**:
  - Following EUROCAE / RTCA process

Safety Assessment



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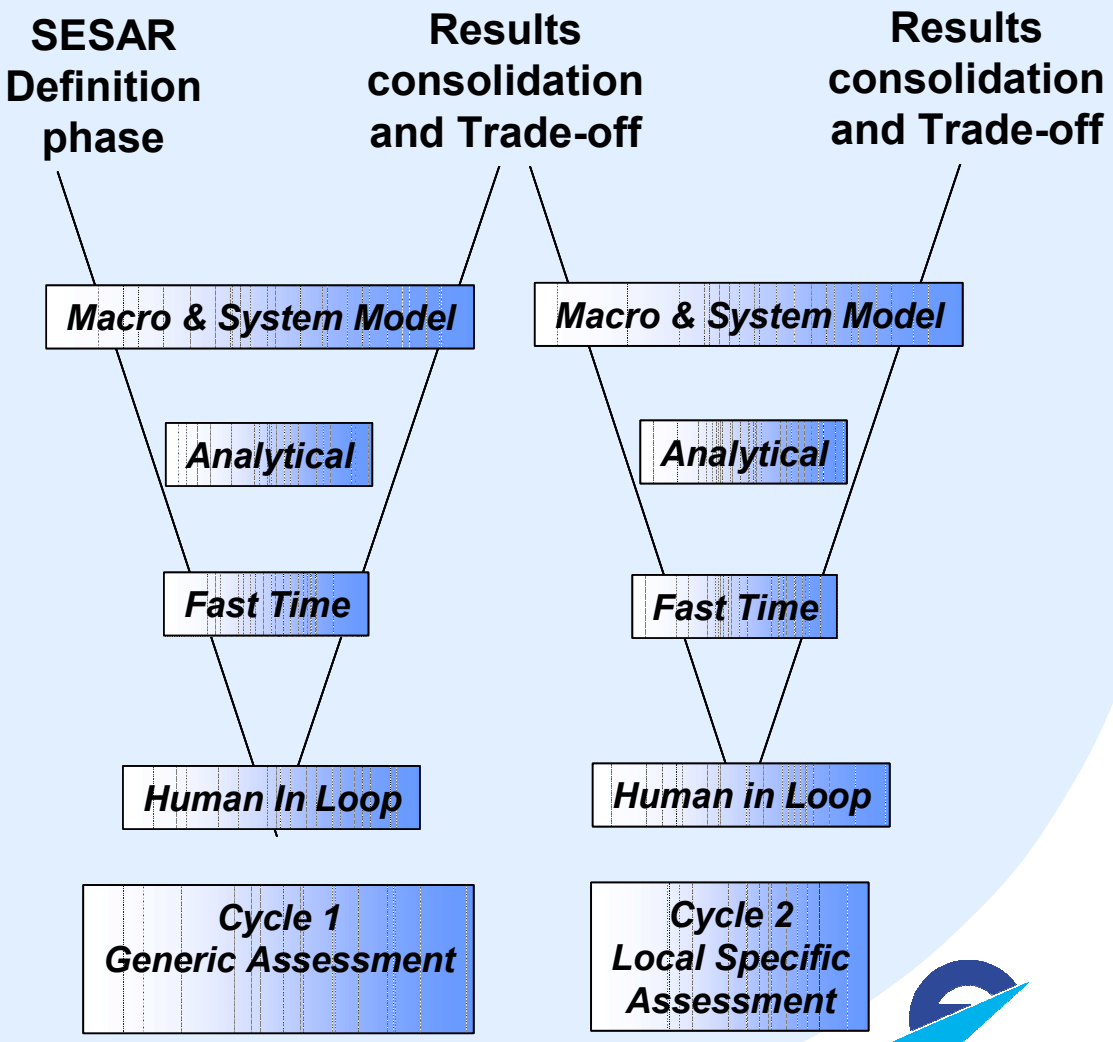
Concept Validation Approach

- **Two or three Cycles**:
  - Cycle 1: Generic Validation;
  - Cycle 2: Refinement (Local Specific).
  - Potentially a 3rd cycle for final refinement
- **EUROCAE / RTCA formalism**



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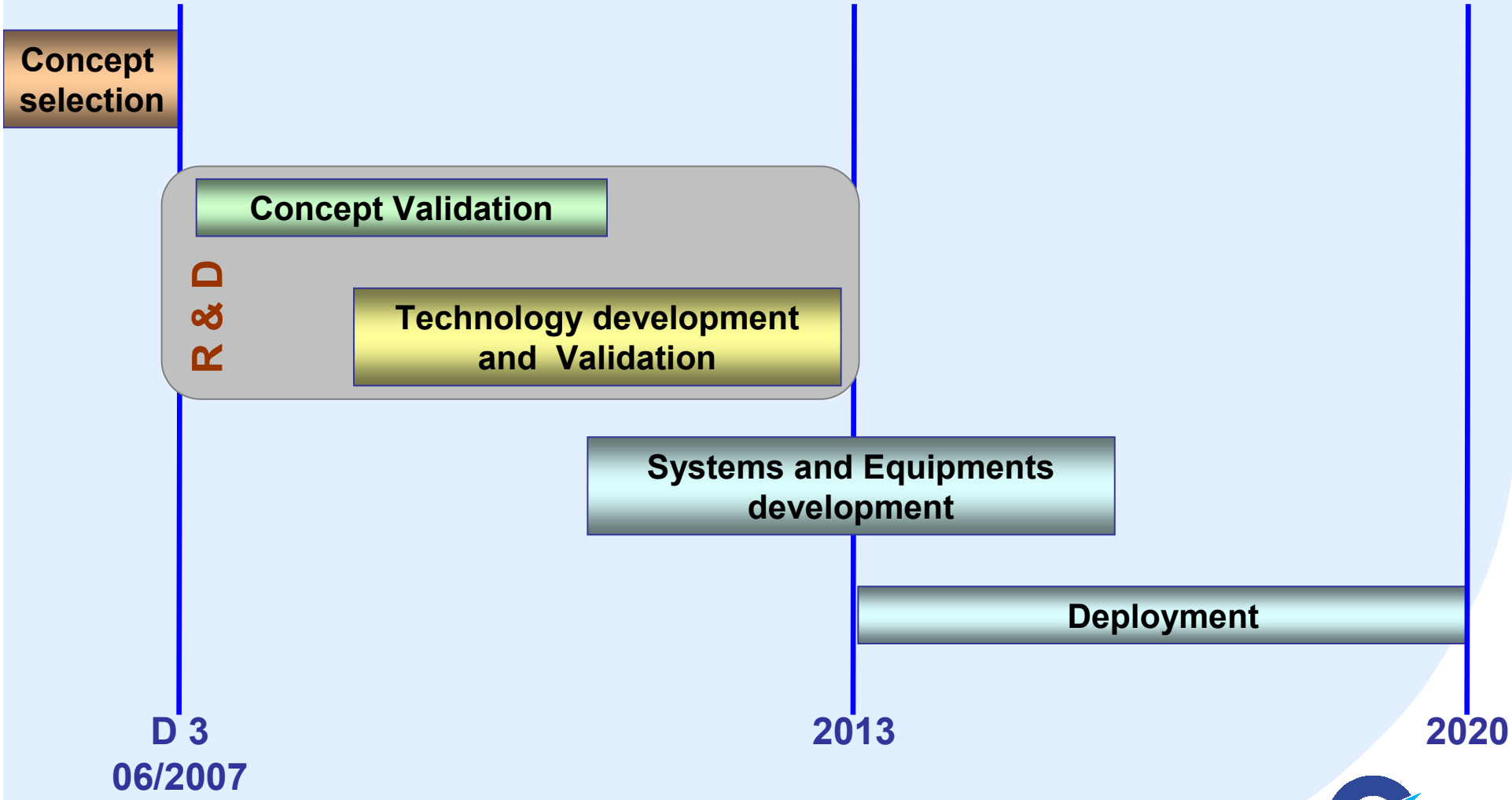
Potential Research Activities



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Technology development and Validation

Potential Research Activities

The main objective of Technology development and validation is:

- **To identify the impact of the future concept on the ATM system architecture,**
- **To assess the technological feasibility of the required evolution,**
- **To provide the evidence that the ATM system can deliver the required performances.**

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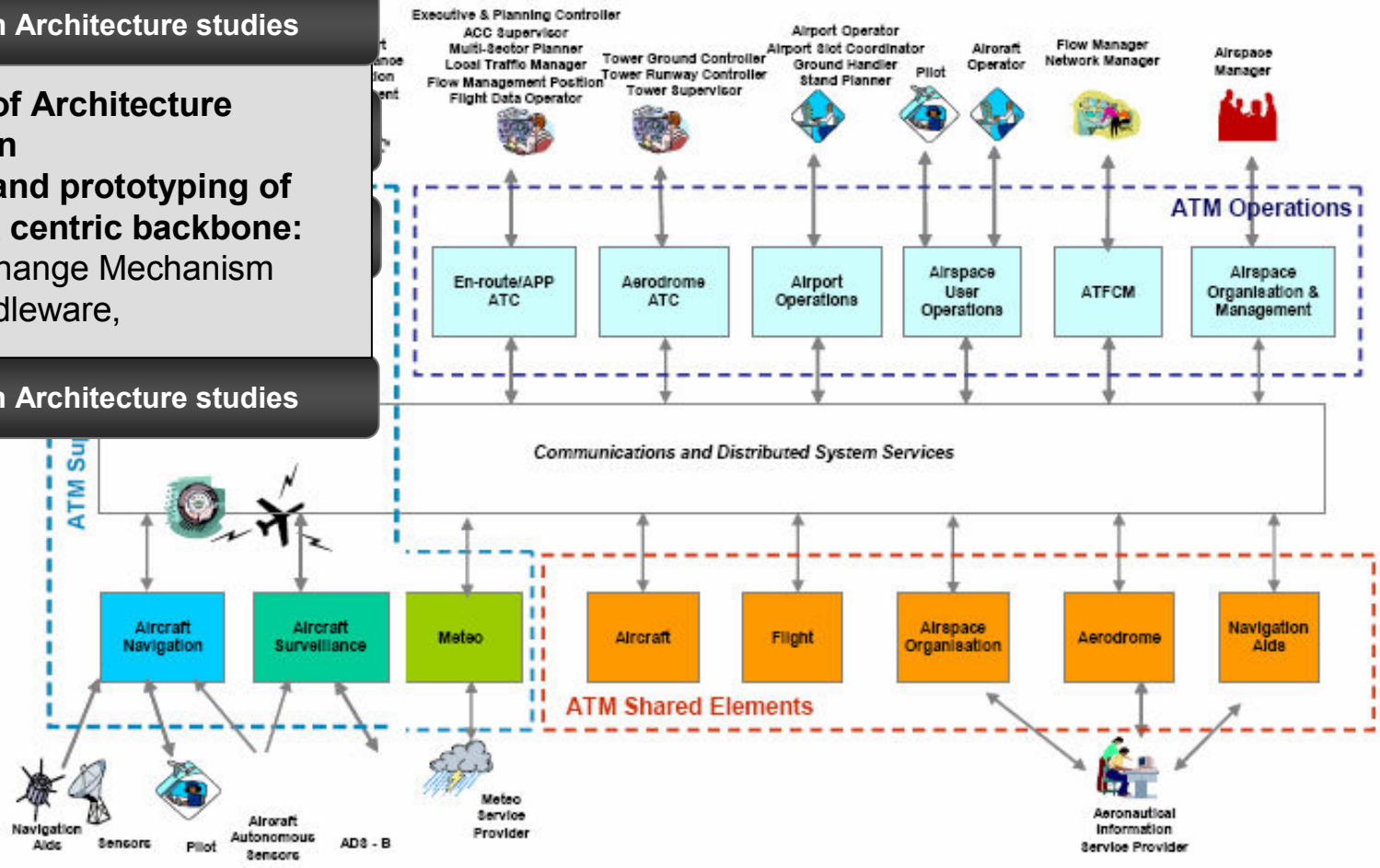
Potential Research Activities

Technology development and Validation

System Architecture studies

- **Design of Architecture evolution**
- **Design and prototyping of Network centric backbone:**
  - Exchange Mechanism
  - Middleware,

System Architecture studies



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Potential Research Activities

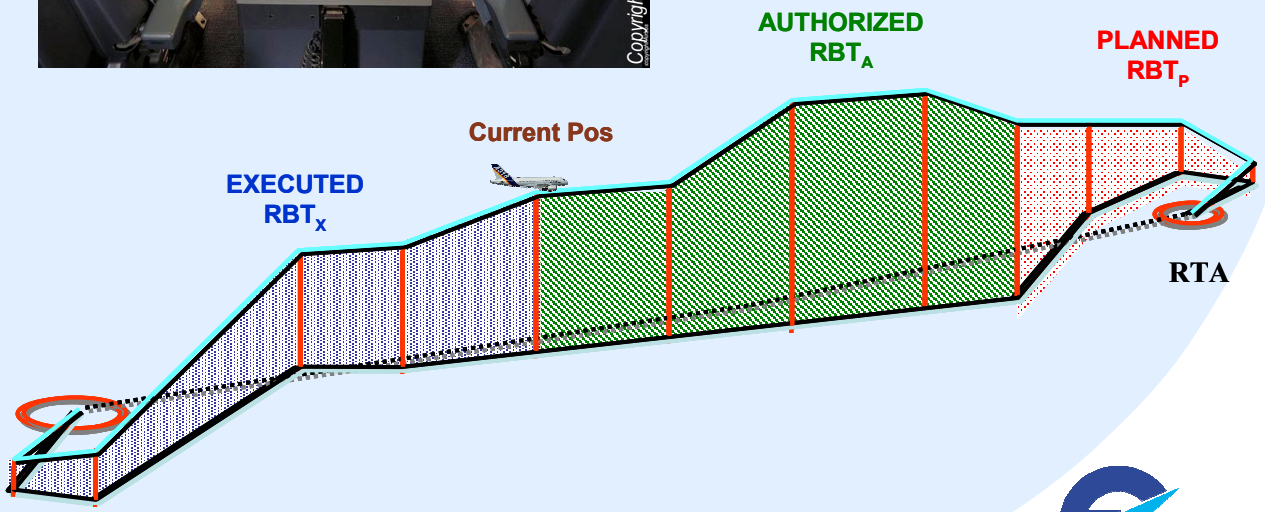
Technology development and Validation

System Architecture studies

Technology feasibility

- **Identification and feasibility studies (prototyping) of critical elements:**
  - A/G trajectory exchanges,
  - FMS / TP accuracy,
  - CDM mechanisms,
  - Controller tools,
  - Cockpit evolutions,
  - …

Technology feasibility



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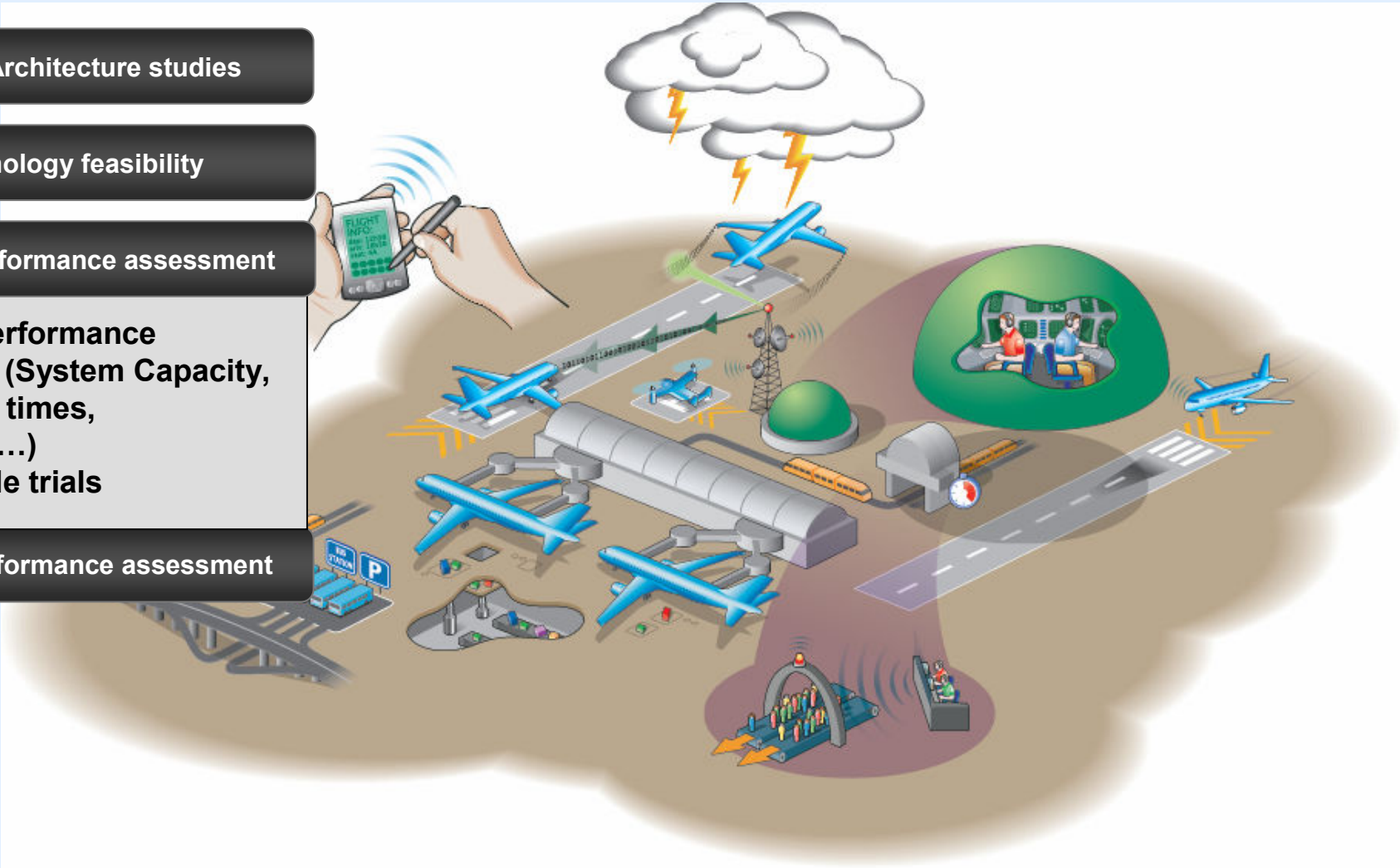
Potential Research Activities

Technology development and Validation

- **System Architecture studies**
- **Technology feasibility**
- **System Performance assessment**
  - **System performance modelling (System Capacity, Response times, Reliability…)**
  - **Large scale trials**
- **System performance assessment**



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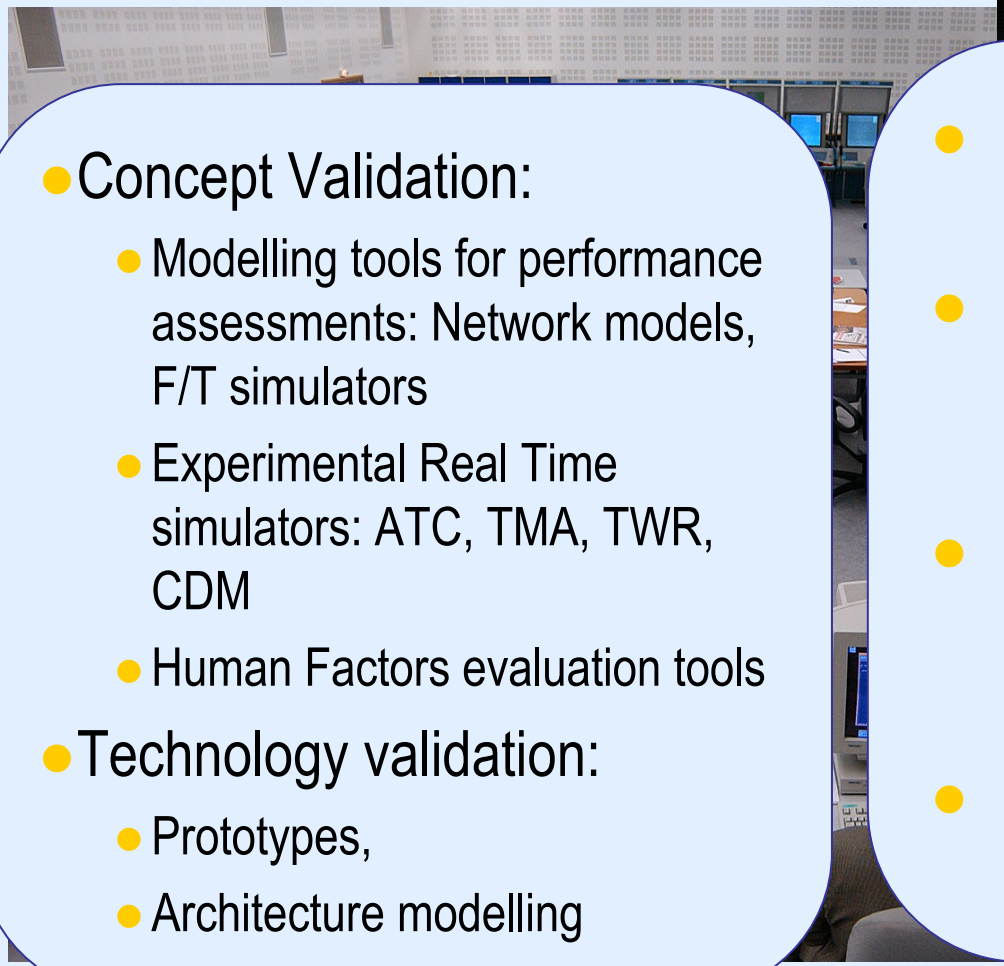
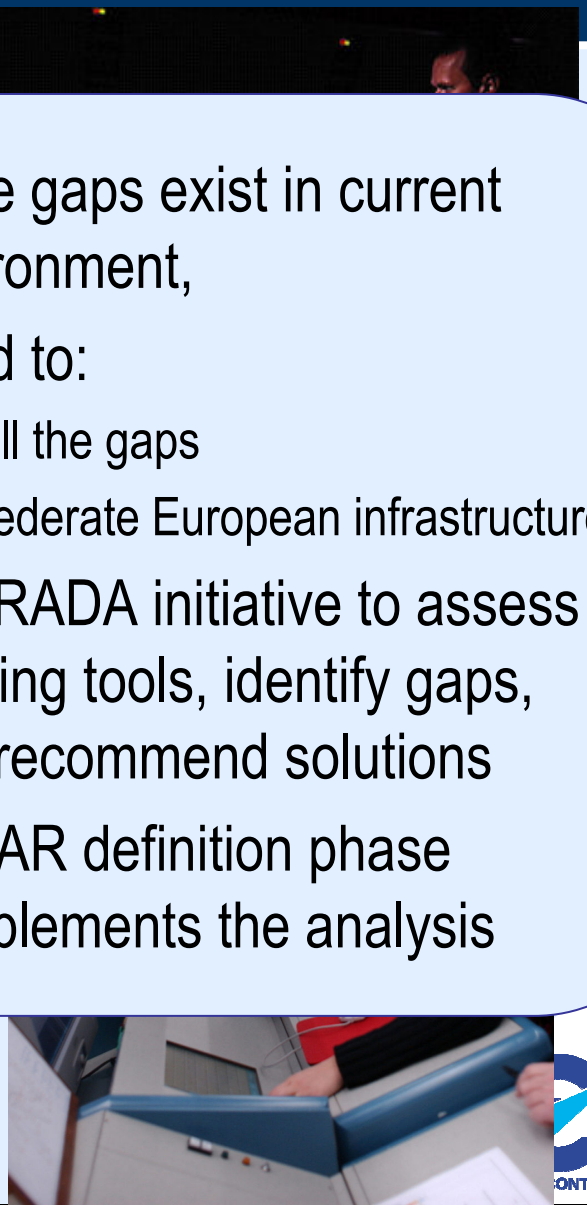
Research Enablers



- Concept Validation:
  - Modelling tools for performance assessments: Network models, F/T simulators
  - Experimental Real Time simulators: ATC, TMA, TWR, CDM
  - Human Factors evaluation tools
- Technology validation:
  - Prototypes,
  - Architecture modelling



- Huge gaps exist in current environment,
- Need to:
  - Fill the gaps
  - Federate European infrastructure
- EATRADA initiative to assess existing tools, identify gaps, and recommend solutions
- SESAR definition phase complements the analysis

Conclusion

- SESAR brings a new dimension to European ATM
- The challenge: agree on, and accept to change
- New challenges to European Research
- Success? Maybe not the panacea, but with SESAR we can take major steps forward efficiently by federating our forces!

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