



# European ATM R&D Overview

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EUROCONTROL Experimental Center



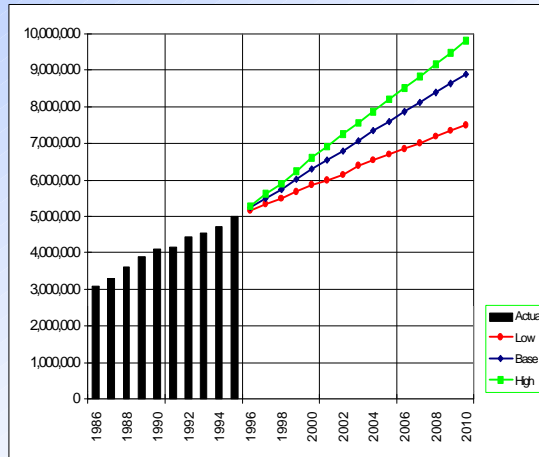
## European ATM R&D Overview

- ➔ **1. European Challenge**
- 2. European response**
- 3. Some R&D results**
- 4. Conclusion**

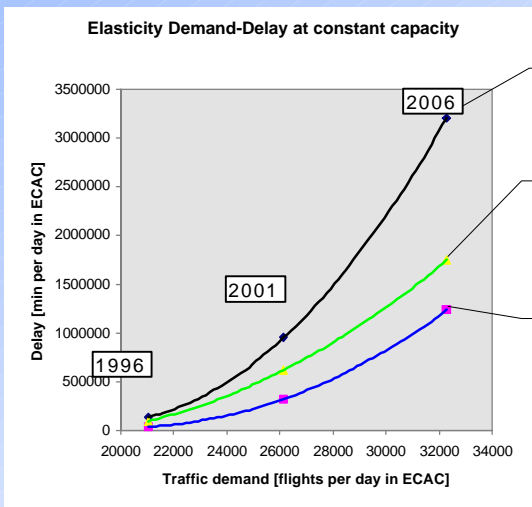


# European challenge

- Forecast traffic increase
- Delay trends
- Cost trends
- Future safety levels



# Delay forecast (do nothing)



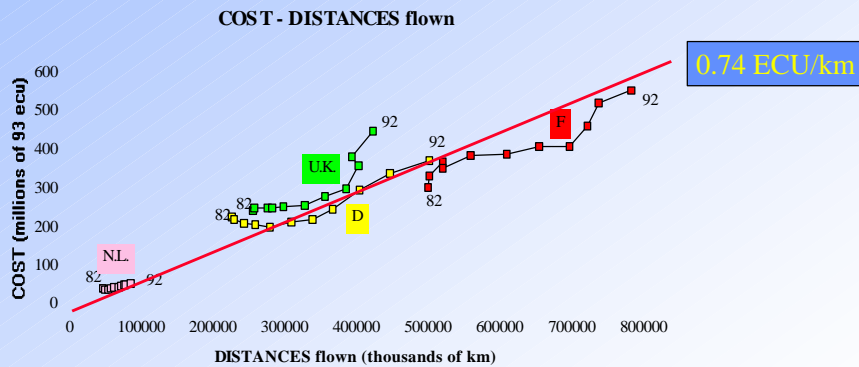
**Total delay** due to ACC AND airport capacity shortfalls

**Delay due to airport capacity shortfalls** (with ACC capacity constraint)

**Delay due to ACC capacity shortfalls** (with airport capacity constraint)



## Cost trend



**Linear trend (long term)**



## Orders of Magnitude

European Air Transport	\$ Billion 1995
Airline turnover	50
Route charges	3
ATM Related Delay costs	2.3
Route extension costs	0.7
ATM R&D Expenditure	0.14



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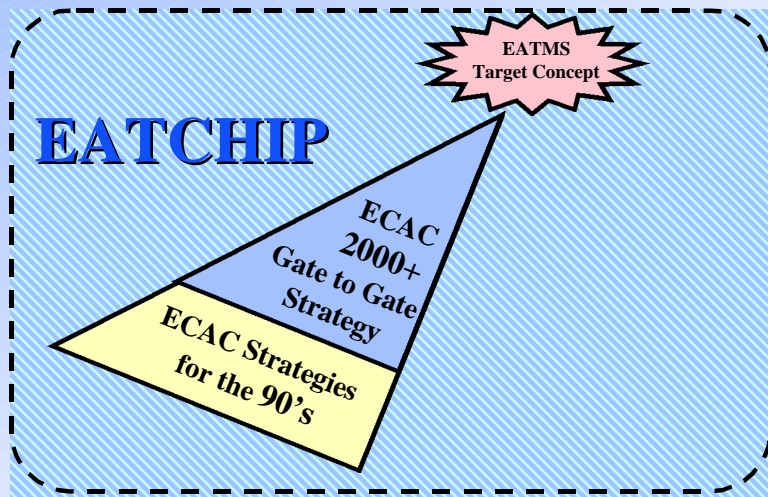


## MATSE Meetings

- |      |  |
|------|--|
| 1988 | CFMU (Central Flow Management)                                   |
| 1990 | ECAC Strategy for 90's, EATCHIP                                  |
| 1992 | EATMS (Future ATM), APATSI (Airports)                            |
| 1994 | Prepare institutional Arrangements                               |
| 1997 | New Institutional Arrangements<br>EUROCONTROL Revised Convention |



## EATCHIP/EATMS Context



## The EATMS Goals

The Vision:

To allow all airspace users the maximum freedom of movement subject to the needs for safety, cost-effectiveness, environmental aspects and national security requirements

Main Objectives:

Safety	Capacity
Efficiency	Cost-
effectiveness	
Uniformity	National Security
Environment	



# Roles and Responsibilities

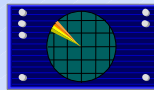
## Procedural



Guessing where is the current position



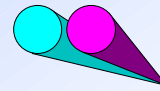
## Radar



Knowing the current position



## Future



Knowing the future position  
INTENTS

Human Centered Design  
Task sharing to be focused on enhancing the differing strengths of human and machine



# Airspace Regimes

## Managed Airspace

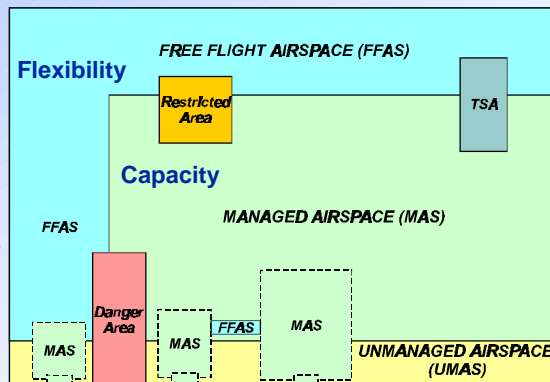
- Known Traffic Environment
- Route Network 2D / 3D and Free Routings
- Separation Responsibility on the Ground

## Free Flight Airspace

- Known Traffic Environment
- Free Routing and Autonomous operations
- Separation Responsibility in the Air

## Unmanaged Airspace

- Unknown Traffic Environment
- Rules of the Air





## MATSE 5

### ECAC Institutional Strategy

- **New institutional structure** (Assembly, Council,...)
- **Performance Review**    Performance Review Commission
  - ⇒ Performance indicators, targets, tradeoffs, economic regulation
  - ⇒ Capacity/delays, cost-effectiveness, quality of service,...



## MATSE 5

### ECAC Institutional Strategy

- **New institutional structure** (Assembly, Council,...)
- **Performance Review**    Performance Review Commission
  - ⇒ Performance indicators, targets, tradeoffs, economic regulation
  - ⇒ Capacity/delays, cost-effectiveness, quality of service,...
- **Safety Regulation**    Safety Regulation Commission
- **Enhanced R&D** ⇒ R&D Strategy
- ...



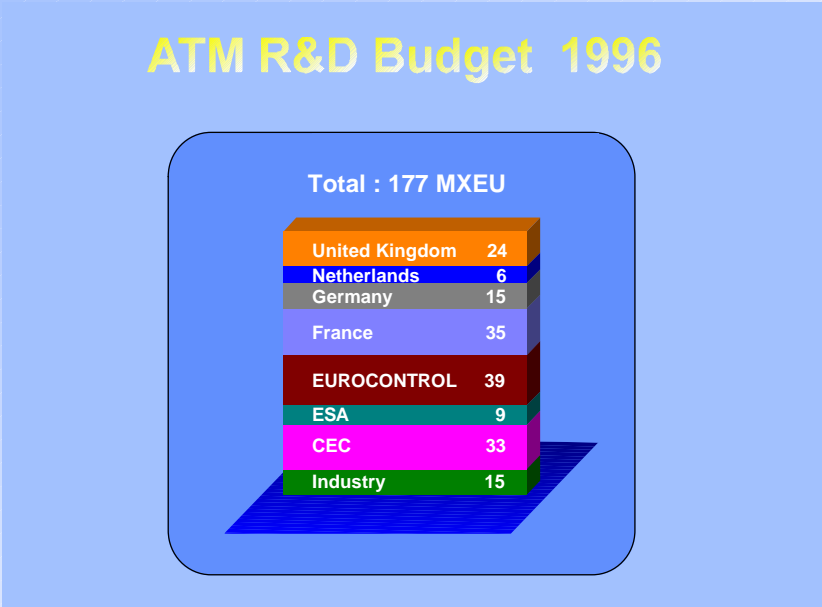
# R&D Management

R&D Coordination

R&D Strategy

R&D Program  
EUROCONTROL  
UK  
...

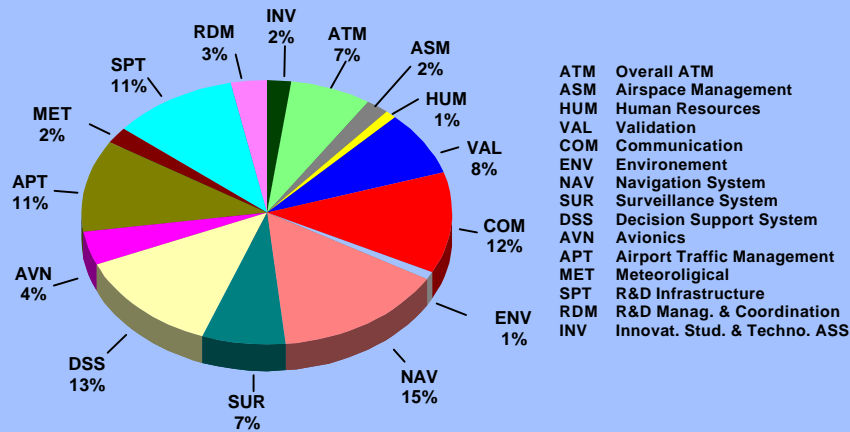
ARDEP  
96







## Planned R&D Budget by domain 1996



- ATM Overall ATM
- ASM Airspace Management
- HUM Human Resources
- VAL Validation
- COM Communication
- ENV Environement
- NAV Navigation System
- SUR Surveillance System
- DSS Decision Support System
- AVN Avionics
- APT Airport Traffic Management
- MET Meteorological
- SPT R&D Infrastructure
- RDM R&D Manag. & Coordination
- INV Innovat. Stud. & Techno. ASS



## Co-operative programmes

### PHARE

Investigate and prove the feasibility and merits of a future **Air-Ground** integrated ATM system

#### PARTICIPANTS

CAA/NATS (DRA), UK  
 CENA and STNA, France  
 DFS and DLR, Germany  
 RLD/LVB and NLR, Netherlands  
 EUROCONTROL AGENCY

#### Participation And Support

Commission of the European Communities

#### Co-operation

FAA and Transport Canada



## Co-operative programmes

### ECARDA

**SPONSOR**

Commission of the European Communities

**Advice And Support**

EUROCONTROL

**Execution**

Consortia (Industry, Research Labs)



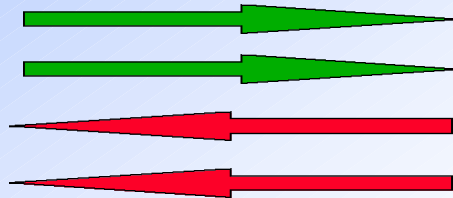
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## Continental RVSM

- Target implementation date: 2001
- High capacity gains demonstrated in simulation
- "Double alternate" is best option
- Buys some time for more elaborate solutions



## Session 1 Conflict Detection and Resolution

<b>CDR: Genetic Algorithms</b>	<b>N. Durand</b>
<b>CDR: Genetic Algorithms</b>	<b>I. Gerdes</b>
<b>HMI Design</b>	<b>R. Graham</b>
<b>HMI Performance Measurement</b>	<b>P. Jorna</b>
<b>Human factors</b>	<b>B. Kirwan</b>
<b>Conflict Probing</b>	<b>Kremer/Bakker</b>
<b>Cooperative Tools</b>	<b>M. Leroux</b>
<b>Oceanic HIPS</b>	<b>Price/ Meckiff</b>
<b>Medium Term Conflict Detector</b>	<b>Vink/ Beers</b>



## Session 2 Airborne Separation Systems

<b>ASAS</b>	<b>F. Casaux</b>
<b>FREER</b>	<b>V. Duong</b>
<b>CDTI experiments</b>	<b>L. Lindberg</b>
<b>Cockpit Assistant</b>	<b>R. Onken</b>
<b>ASAS Operational requirements</b>	<b>B. Wigger</b>



## Session 3 ATM Performance

<b>ATM Capacity</b>	<b>J.F. Bosc</b>
<b>ATM Economics</b>	<b>J.C. Hustache</b>
<b>Cost of ASM/ATFM Measures</b>	<b>S. Manchon</b>
<b>Models and Algorithms for ATFM</b>	<b>V. Totic</b>
<b>Airport Traffic Modelling</b>	<b>R. Polak</b>
<b>ATM Performance</b>	<b>J.M. Pomeret</b>
	<b>S. Mahlich</b>



## Demonstrations

EUROCONTROL  
Experimental Centre

FREER or CTAS

EATCHIP III

PHARE Demonstration 3

RAMS

Oceanic HIPS

Tour

CENA

Departure Manager

SHAMAN

GRIOT

ERATO



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## Tentative EATMS roadmap



Reasonable confidence  
to show at least one solution  
meeting Performance criteria

Free Flight ?

Co-operative  
ATM

Free Routes

RVSM

Improve present  
system

CFMU

EUROCONTROL EXPERIMENTAL CENTRE 



## Conclusions

New EUROCONTROL Organisation being created

ATM 2000+ Strategy

- Performance oriented
- R&D is key component



Guidance from Seminar should be precious



## Conclusions

### New EUROCONTROL Organisation being created

#### ATM 2000+ Strategy

- Performance oriented
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➡ Guidance from Seminar should prove precious

### Worldwide Compatibility is a must