Performance Review Commission

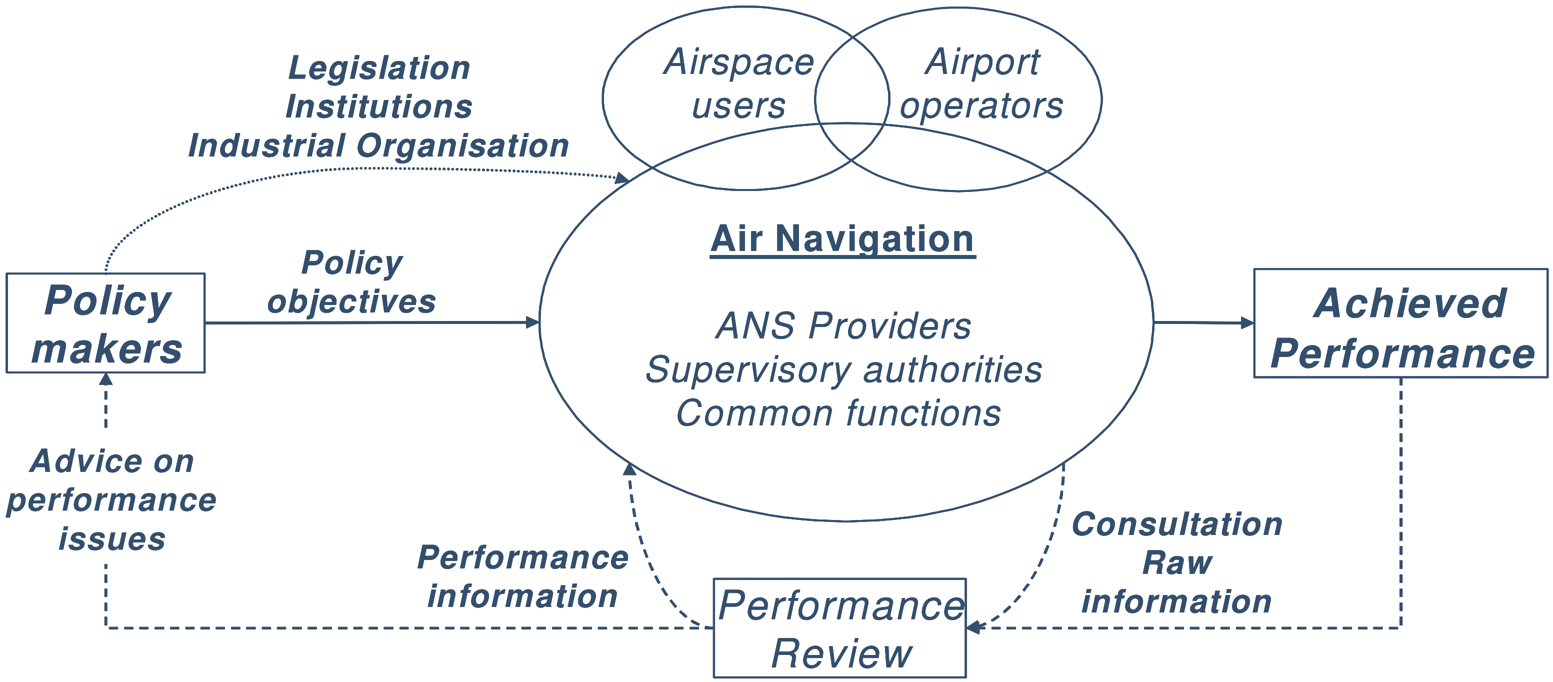
ATM Performance Framework

NAS Performance Workshop
5 September 2007

Xavier FRON

Performance Review Unit
EUROCONTROL

Role of performance review

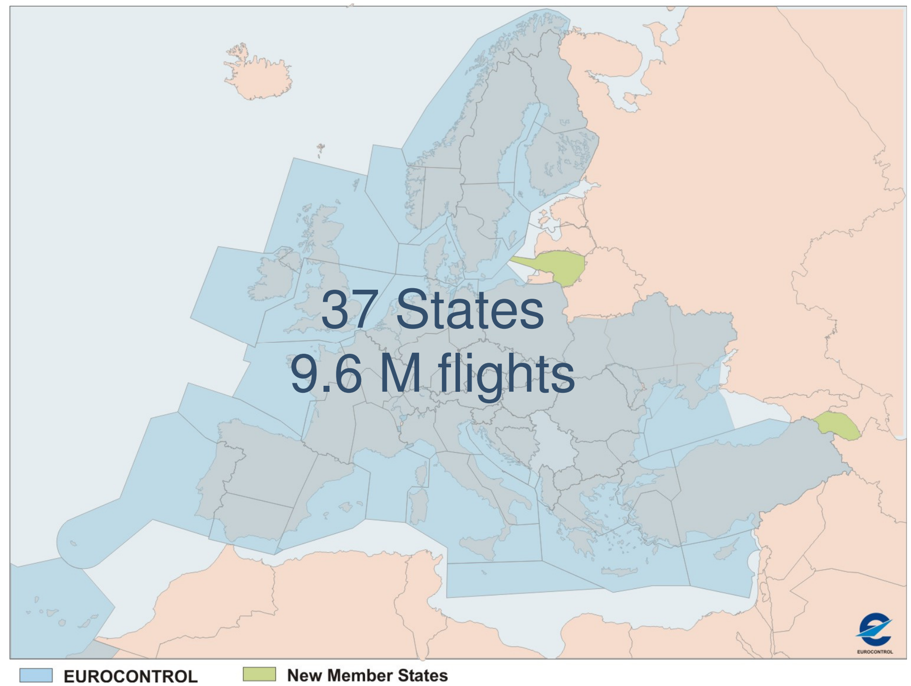


- Provide independent advice on ANS/ATM performance to policy makers and relevant information to all stakeholders (e.g. benchmarking and best practice), based on observation of achieved performance, consultation and information provided by relevant parties;
- Performance review closes the performance loop;
- It is the least intrusive form of regulation;

Performance Review Commission (PRC)

➔ **Independent advisory role to EUROCONTROL governing bodies**

➔ **Twelve commissioners supported by the PRU**



Objective

"to introduce strong, transparent and independent performance review and target setting to facilitate more effective management of the European ATM system…"

Annual Performance Review Reports (PRR)

- Traffic
- Key ATM Performance Areas
  - Safety
  - Cost-effectiveness
  - Quality of service/ Environment
  - Capacity

ANSP benchmarking reports (ACE)

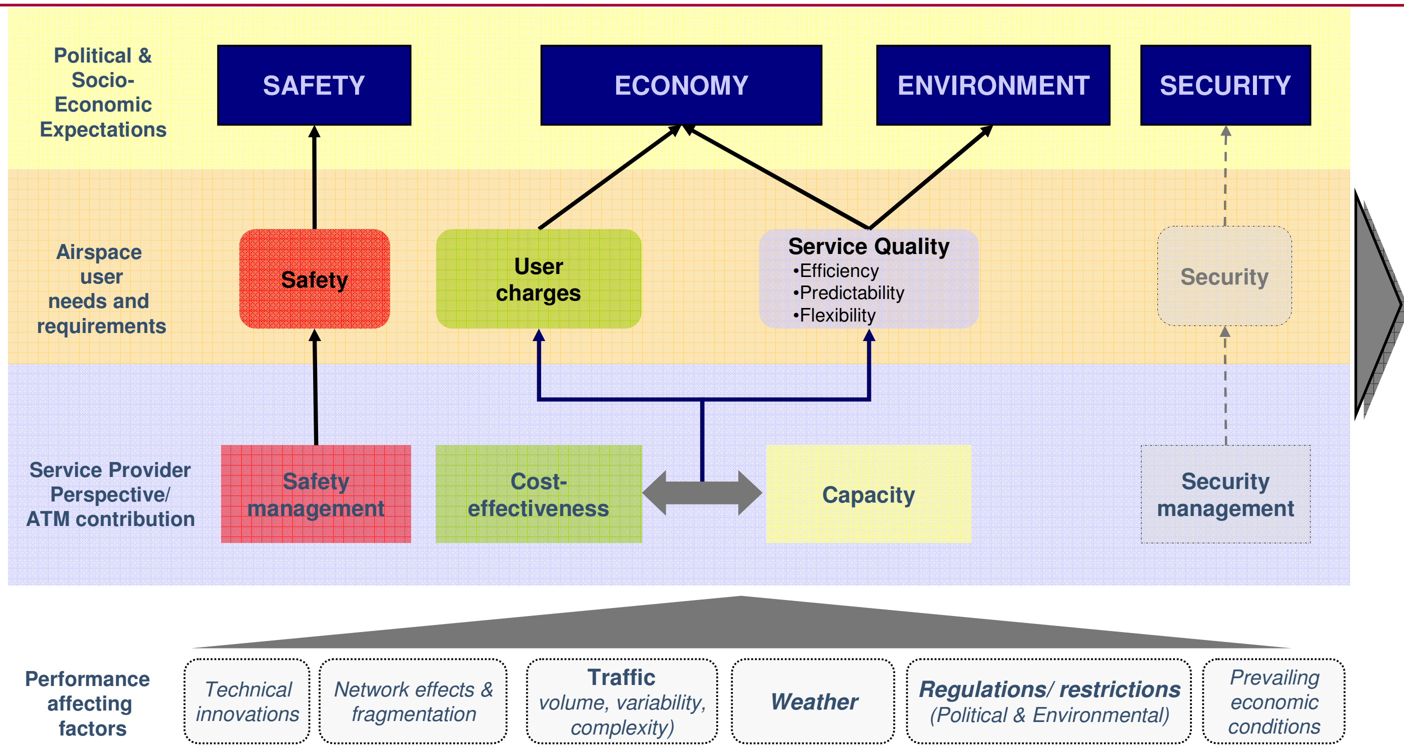
Special reports

- Evaluation of SES impact on ATM performance
- Fragmentation
- Punctuality drivers, etc.
- US/Europe comparison
- Comparison of aeronautical MET costs

PRR 2006 just published

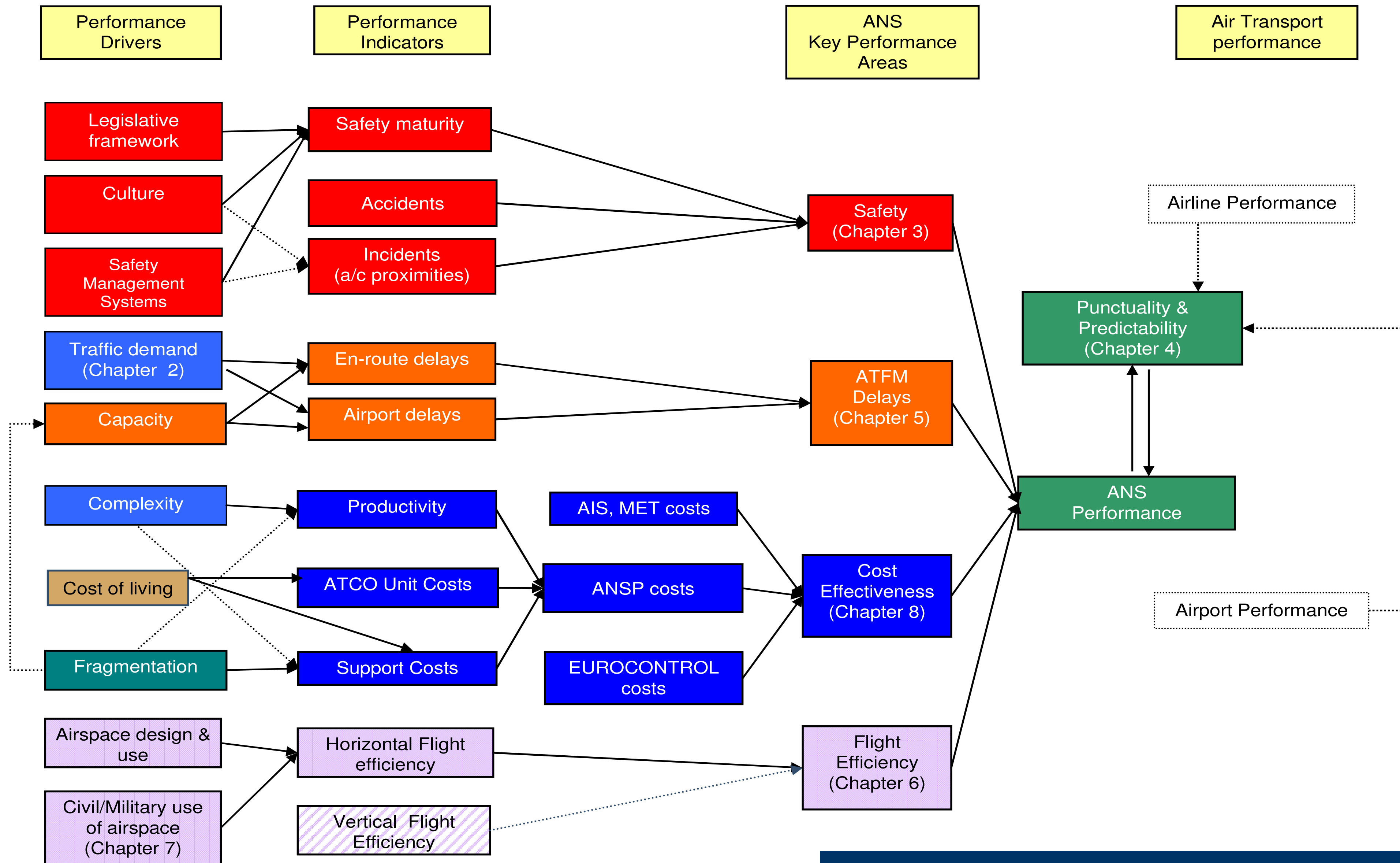
Performance Review Commission
www.eurocontrol.int/prc

Overview of ATM performance measurement framework

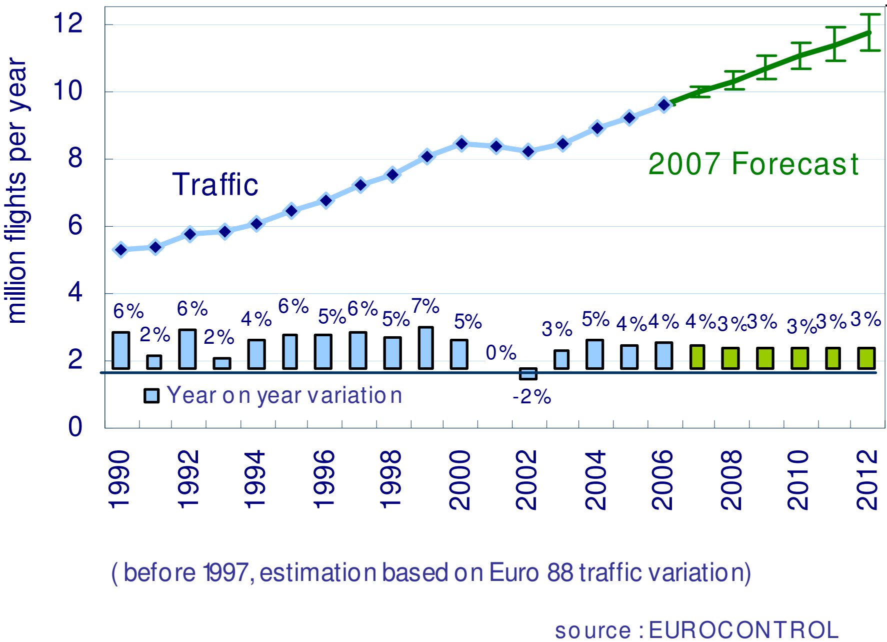


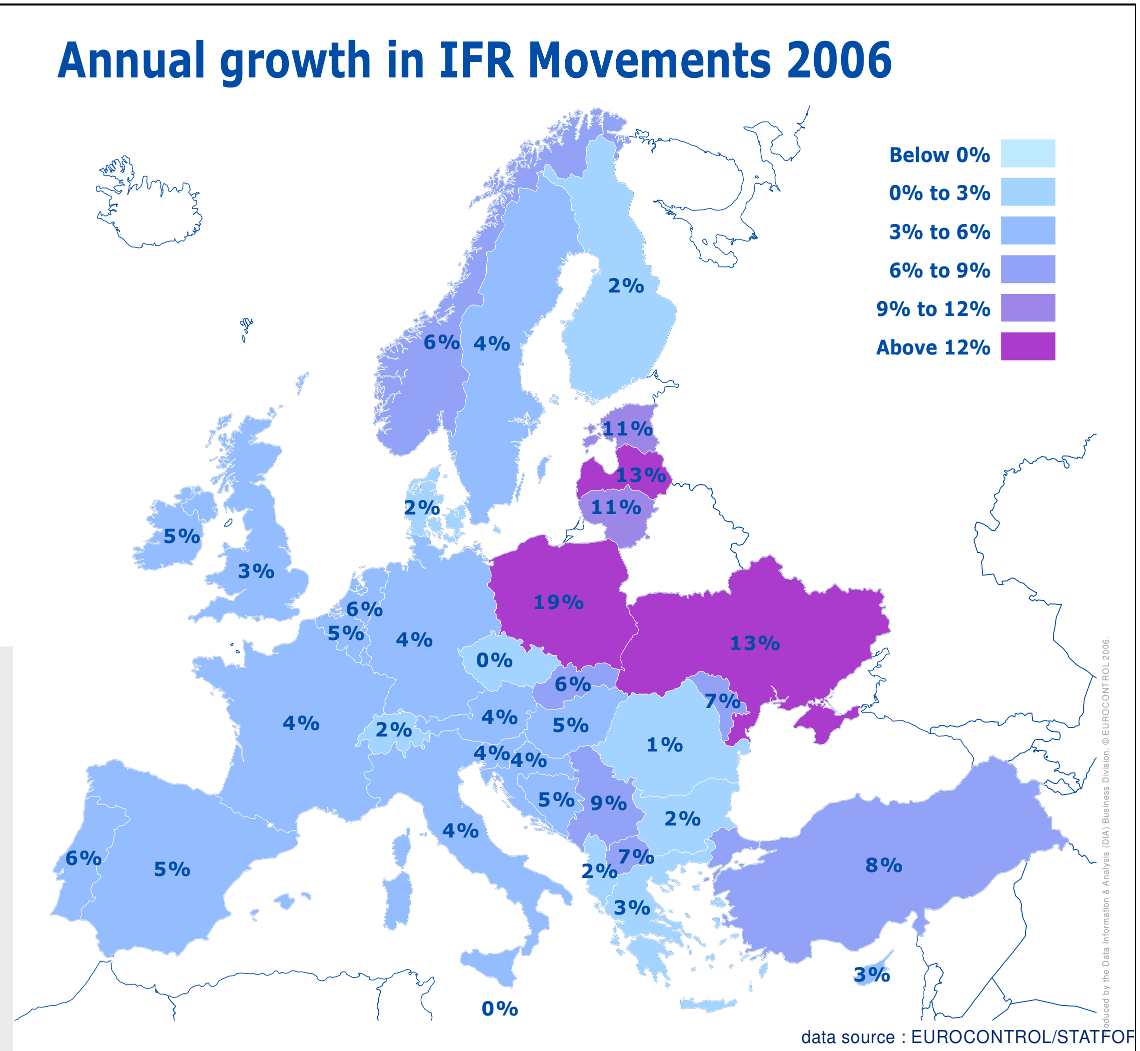
- Various perspectives on ATM performance (Political/ Social, User, Service provider);
- The PRC focuses on: Safety, Cost-effectiveness, Service Quality (Delays, flight efficiency) , Capacity and Environment (Global aspects)
- ATM performance is affected by trade-offs (capacity vs. delay, etc.) and a number of performance affecting factors (weather, complexity, etc.) which need to be captured in a balanced view

How the PRC analyses ANS performance



Air traffic demand in Europe



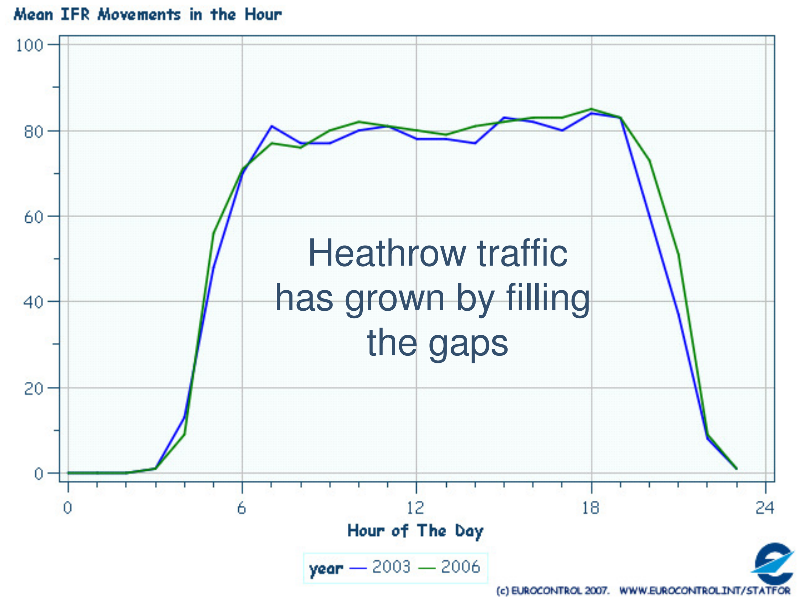


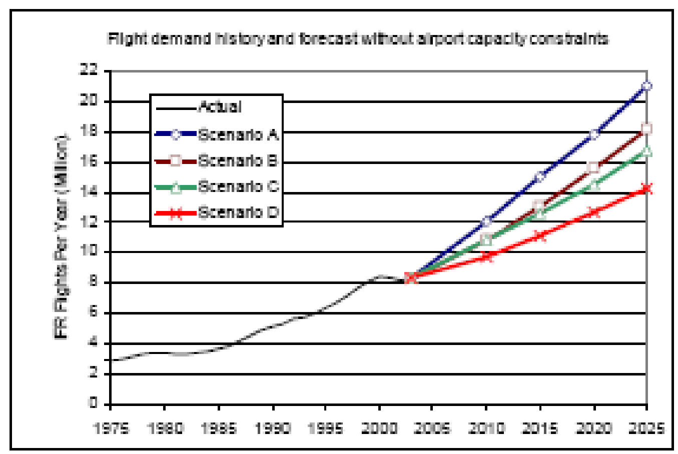
Sustained growth continued in 2006

- Average annual growth +4.1%;
- Between 0% and 19% at State level;
- +24% for “low fare” airlines (16% of traffic)
- +11% for business aviation (7% of traffic)

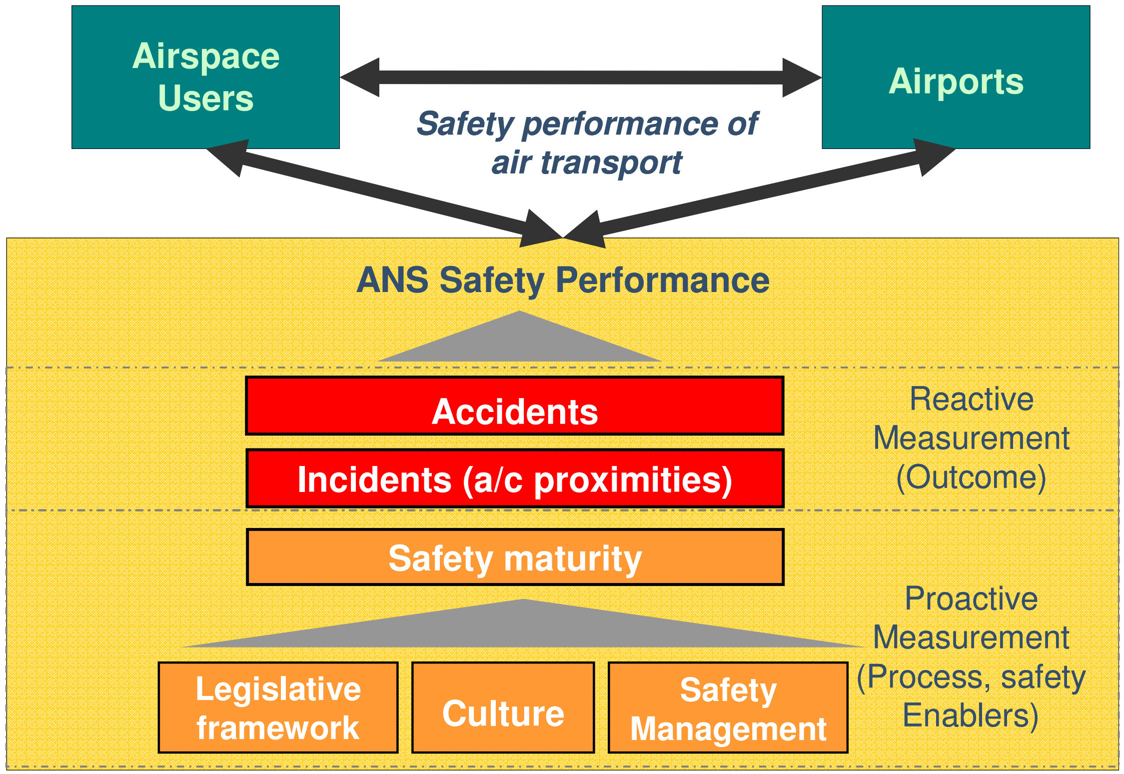
Traffic forecasts

- Short, medium , long term forecasts from EUROCONTROL STATFOR
- Challenges to Growth study (2004) being updated
- Suppressed demand due to airport capacity limitations



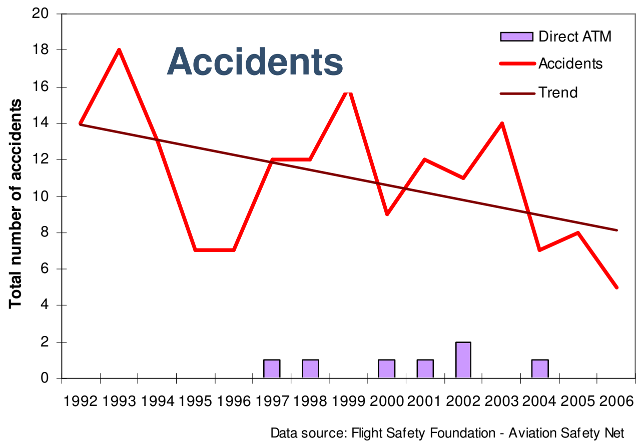


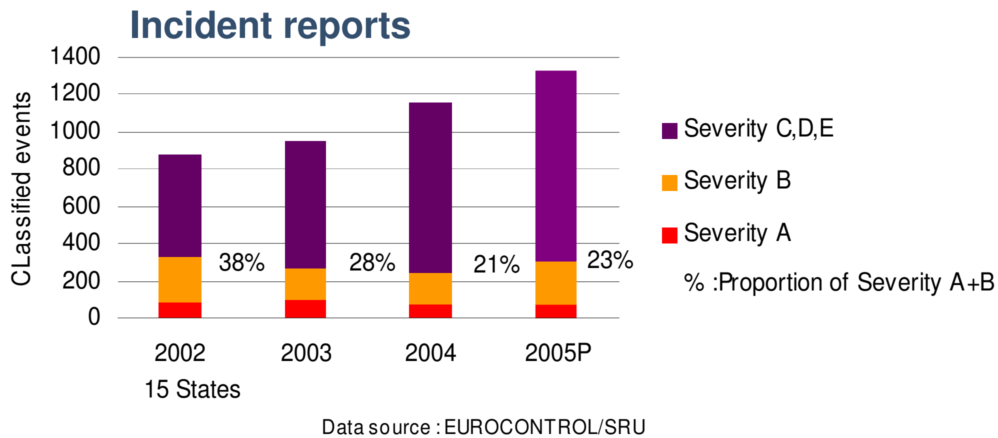
Measuring Safety Performance



- Approach to measuring safety is wider than merely focusing on the level of achieved safety of the existing ATM system under certain conditions (accidents, incidents);
- Maturity of safety processes are as important as the measurement of achieved safety;

Accidents/incidents

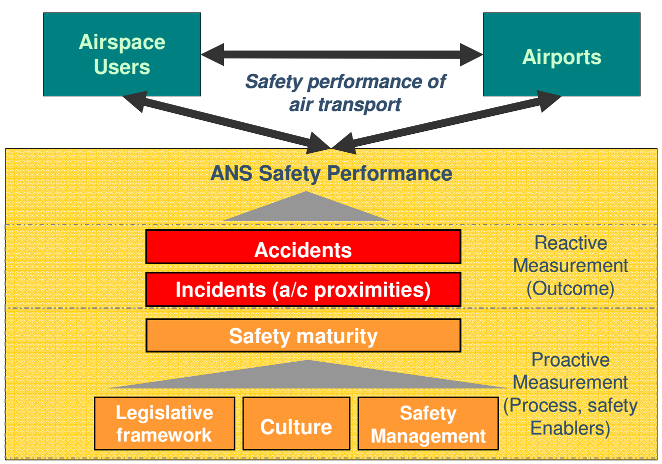




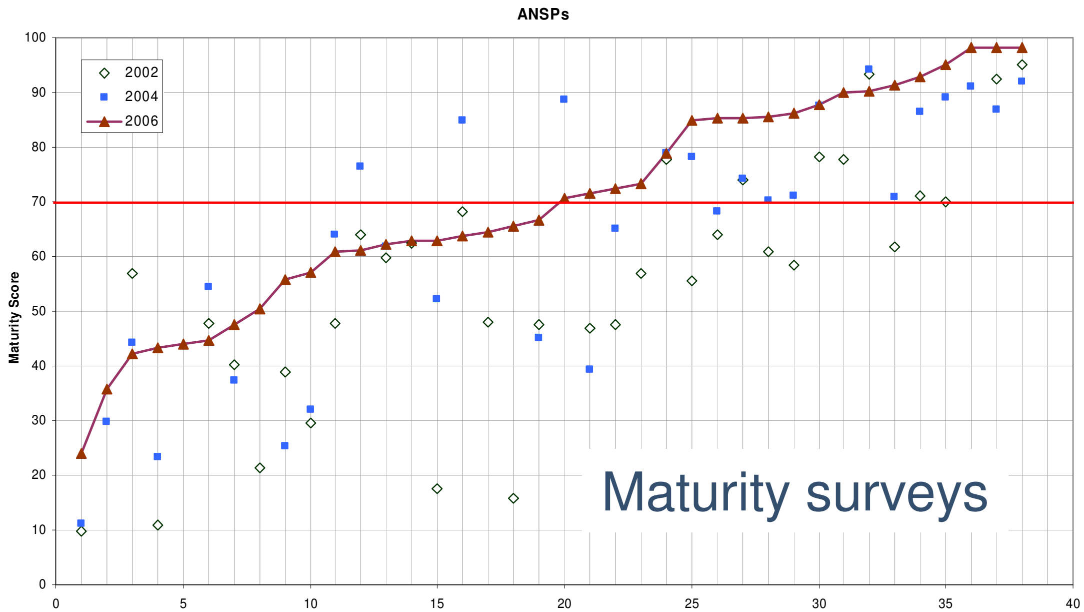
A posteriori check
Lagging indicator
It's too late!

Leading indicator
Informs safety management

Voluntary reports: Useful, but reliable?
Systematic screening
Loss of separation,
runway incursions, etc

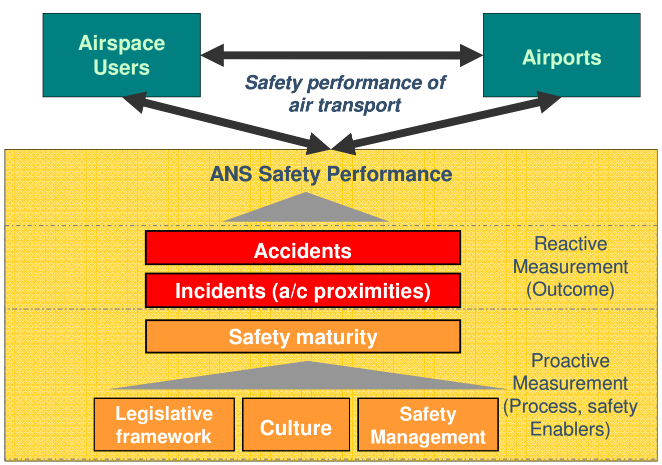


Safety maturity



Maturity surveys

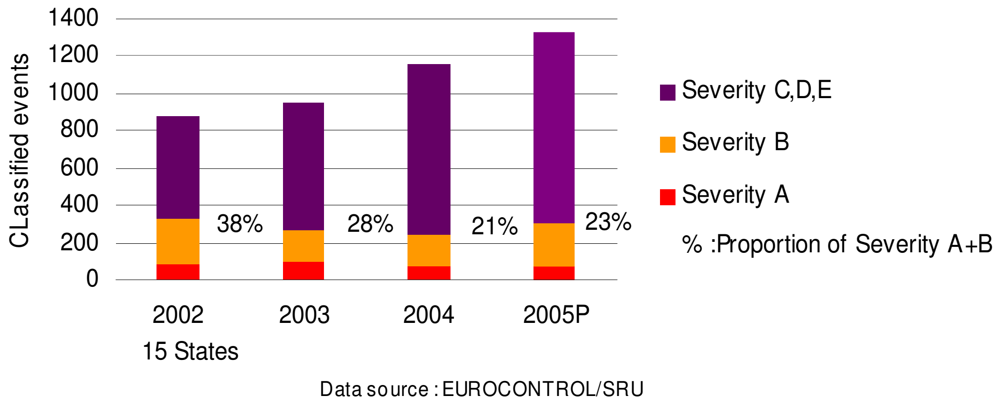
Are safety processes, legislation, culture in place?



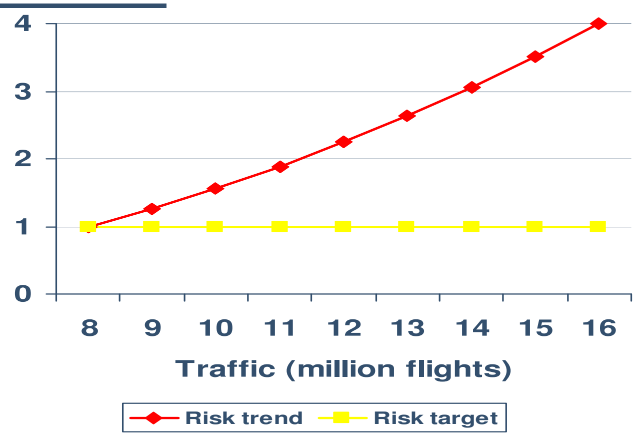
	Legislation	Culture
Austria		
Belgium		
Bulgaria		
Cyprus		
Czech Rep.		
Denmark		
Finland		
France		
Germany		
Greece		
Hungary		
Ireland		
Italy		
Luxembourg		
Netherlands		
Norway		
Poland		
Portugal		
Romania		
Slovakia		
Slovenia		
Spain		
Sweden		
Switzerland		
UK		

Safety Performance targets

TODAY



OUTLOOK



System risk is quadratic: Incidents/hour x4 when traffic x2

Aircraft risk is linear: Incidents per flight-hour x2 when traffic x2

SESAR target

- System risk does not increase (no more accidents)
- 2020: Traffic: +73% => Safety x3 vs trend
- Later: Traffic x3 => Safety x10 vs trend

Performance to date

- Increasing number of incidents reports: more opportunities for learning, prevention
- Severe incidents (A&B) don't appear to increase in sample of 15 "mature" European States

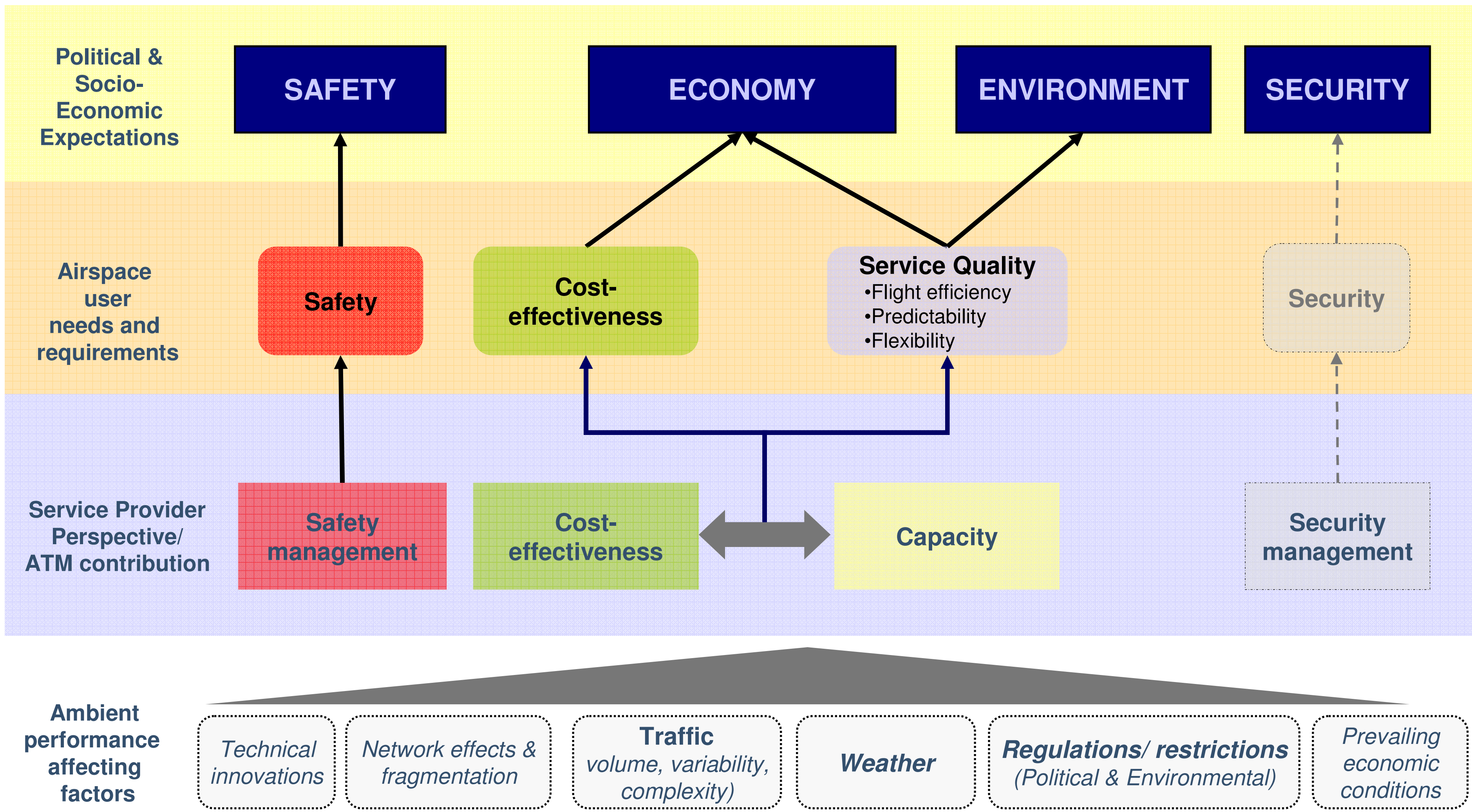
Target (s)

- European (ATM 2000+) objective: **Number of accidents and serious incidents not to increase: Very challenging!**
- Current target: <1.55.10^{-8} accident per flight hour No corresponding indicator so far
- PRC proposed interim target (maturity)

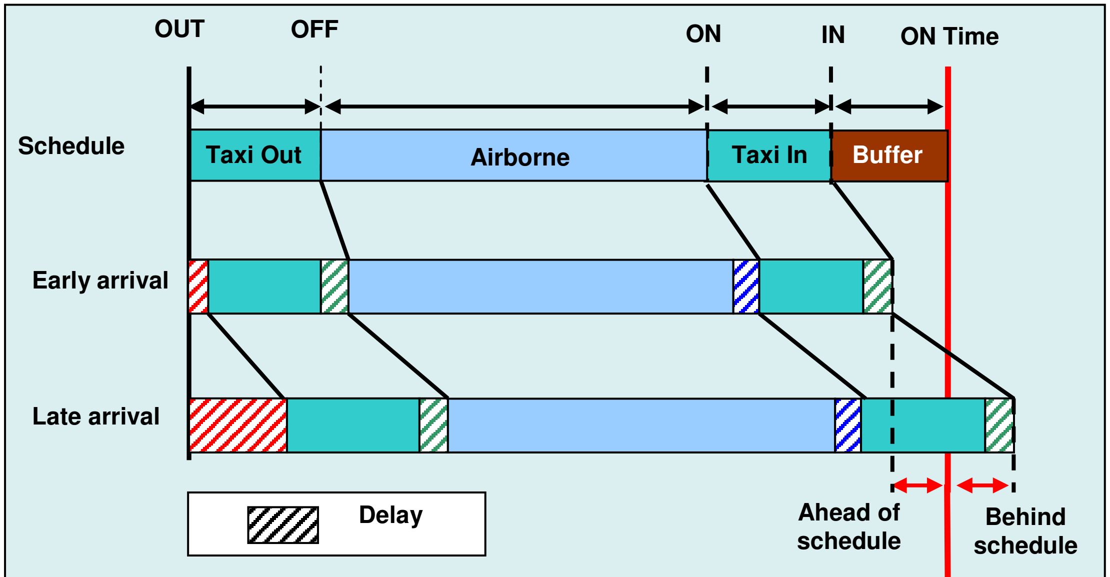
Future system

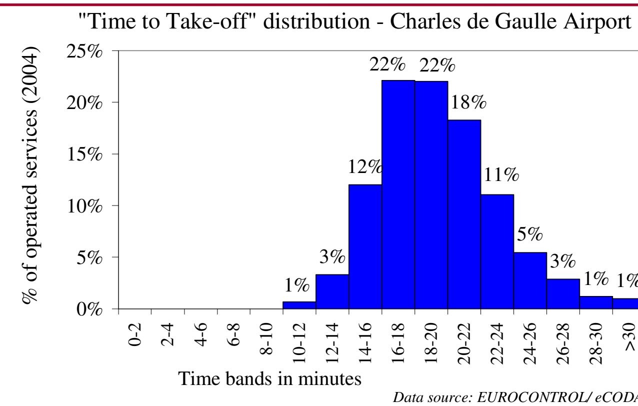
- Safety may be the most challenging
- Safety needs to be engineered in next generation design from the start

Service quality



Analysis of Air transport delays

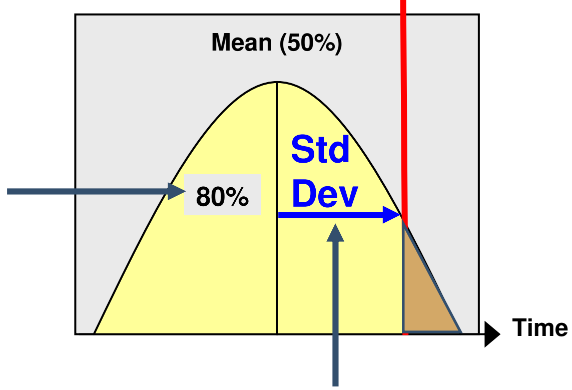




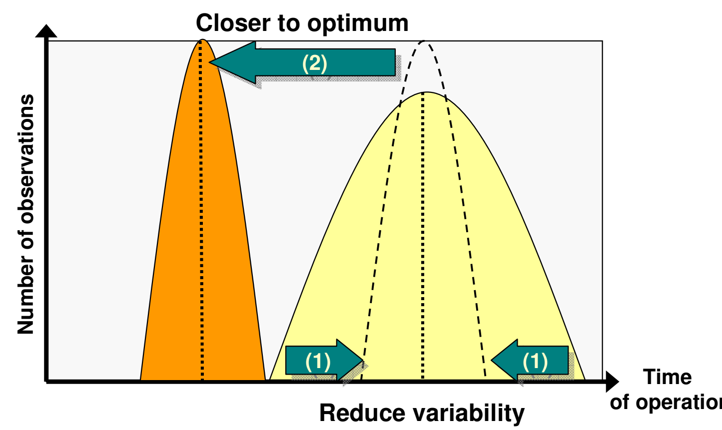
Optimising performance

High added-value:
Compressing half of European flight schedules by 5 minutes is worth some €1,000M p.a.

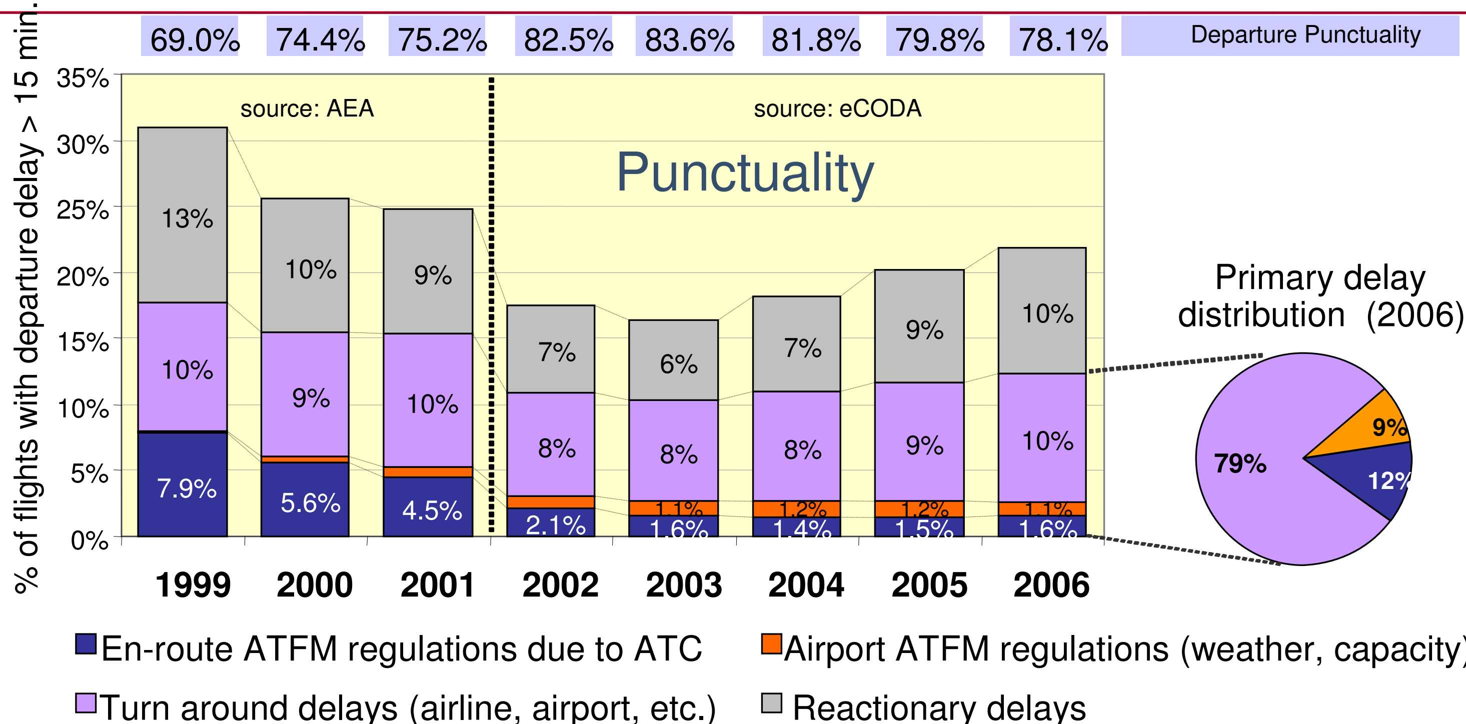
Punctuality
% On-time



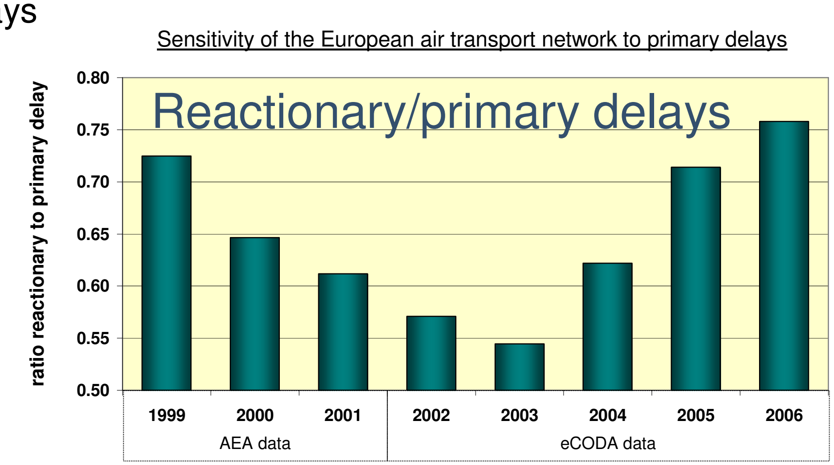
Predictability
Spread
(Standard deviation)



Departure punctuality

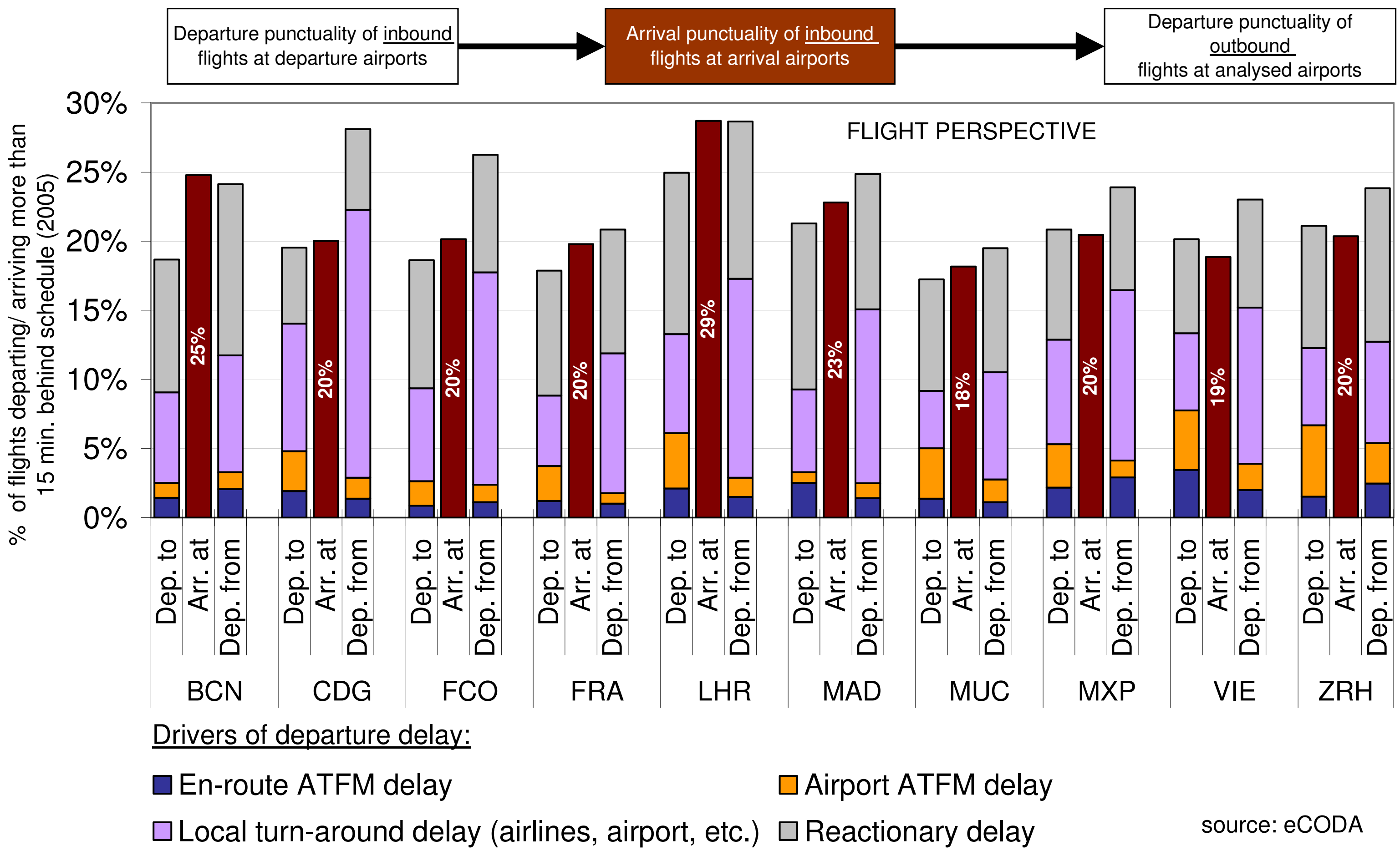


- 21.4% of flights arrived late in 2006 (23.1% in US)
- Departure delays originate principally from turn-around processes (79% of primary dep. delays)
- Reactionary delays are increasing



Primary delay includes local turn around delays and en-route and airport ATFM delays

Arrival and departure delays



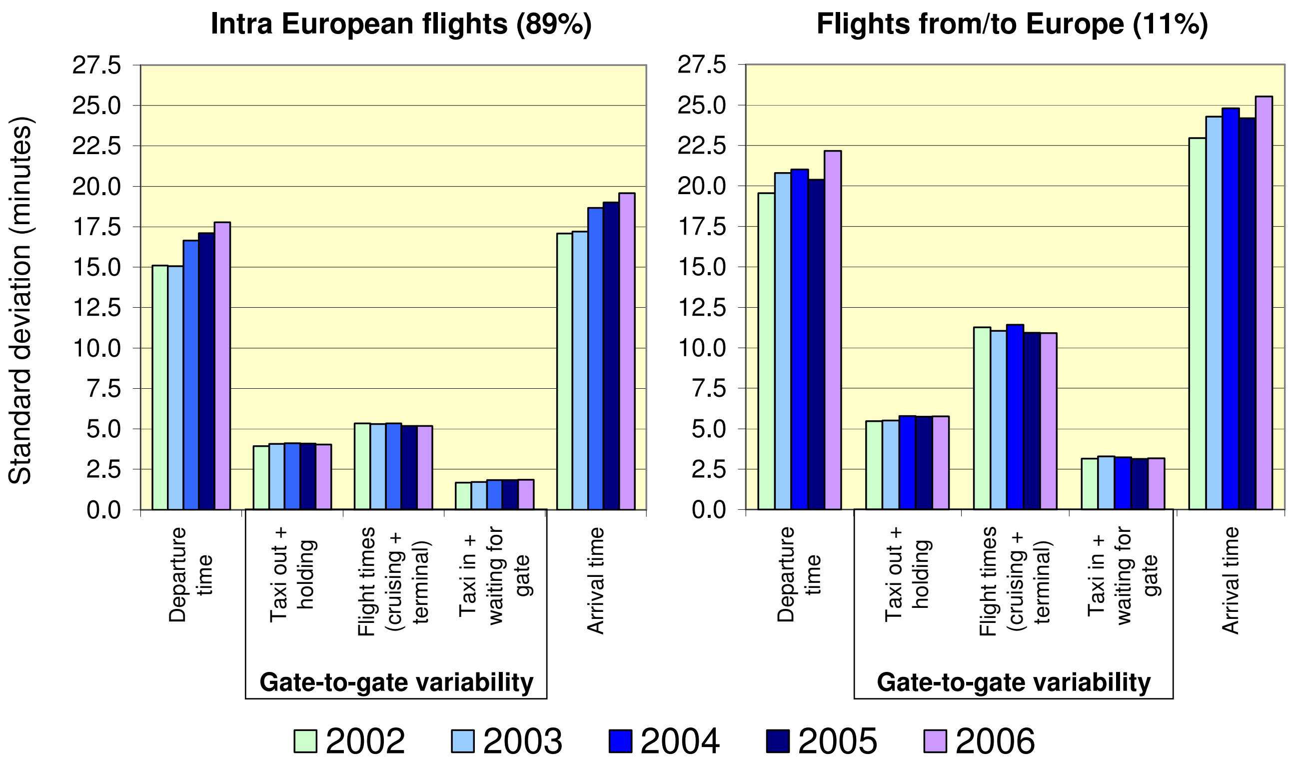
Arrival delays are mostly driven by departure delays

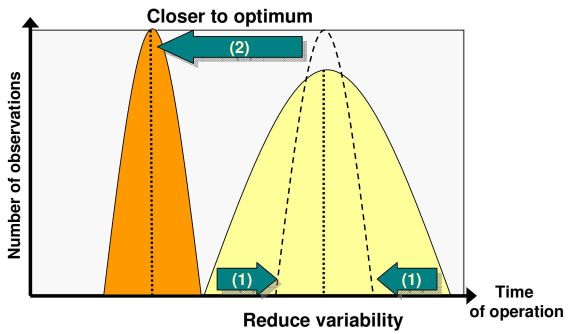
Departure delays mostly from airlines/airports processes

Amplification of delays at some airports

(Departure delays > arrival delays)

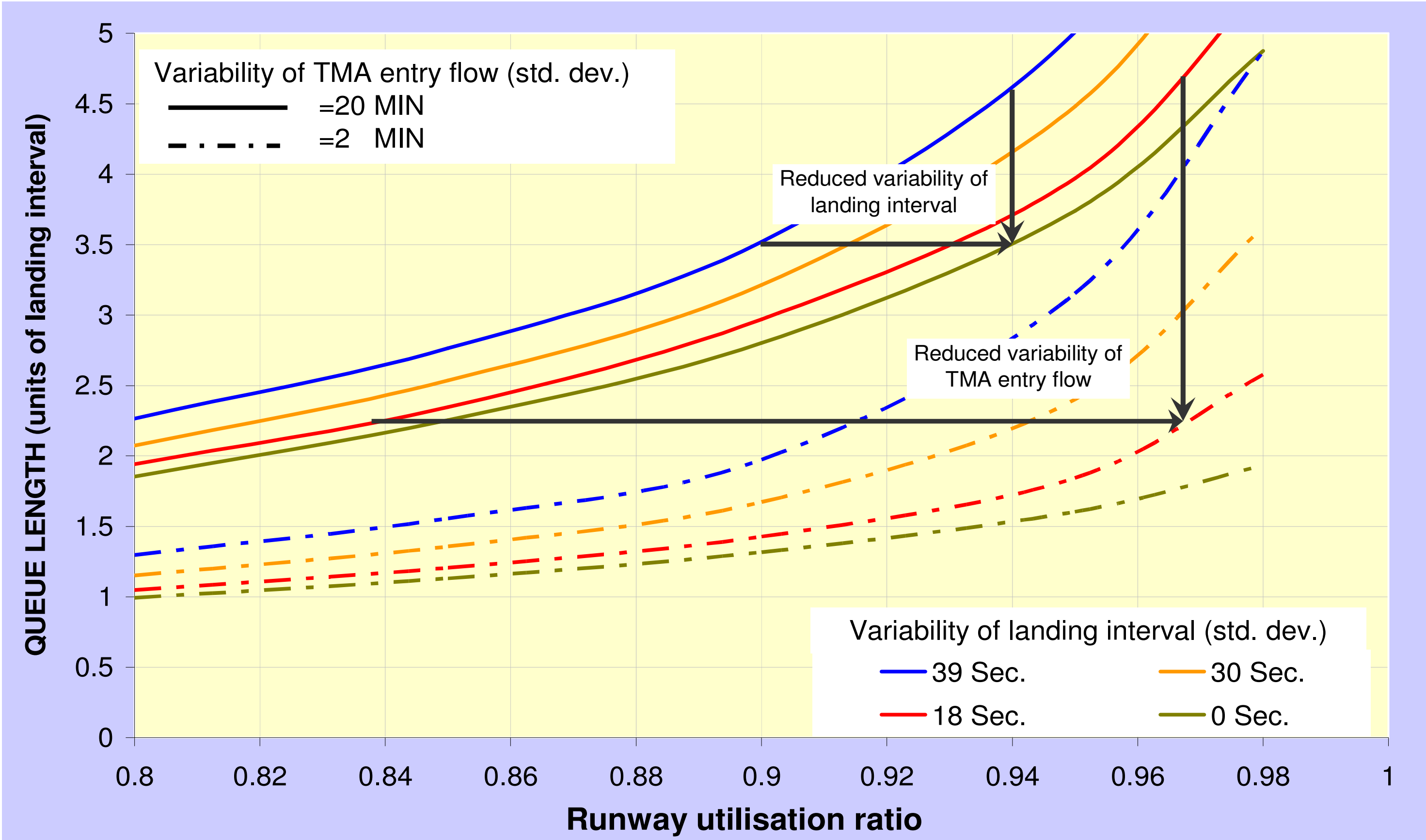
Air transport predictability





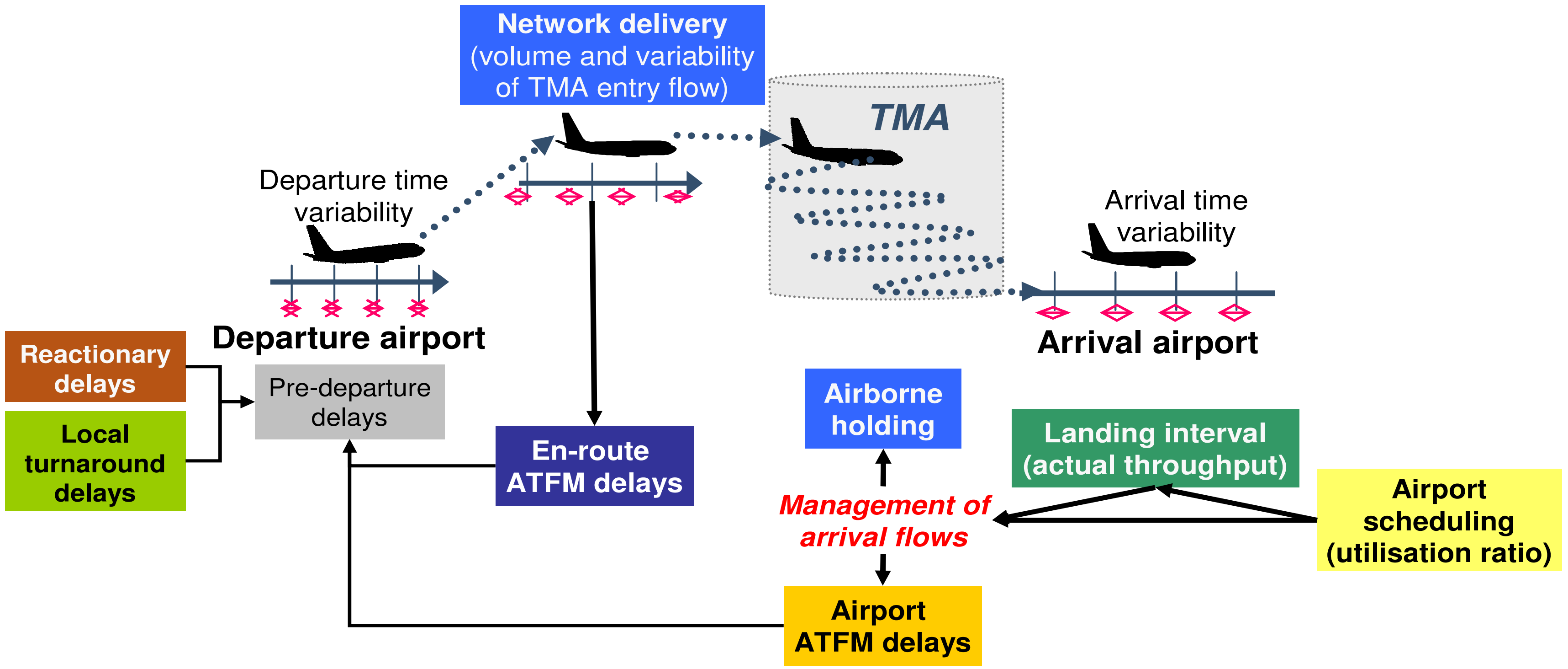
- Standard deviations of departure and arrival times reached 18 and 20 minutes respectively
- Pre-departure processes play a main role in this poor predictability, and ATM only a minor role.
- Lower punctuality and predictability negatively impacts the ability of airlines and airports to build and operate reliable and efficient schedules.

Airport capacity/ delay trade-off



- Trade-off airport capacity / airborne delay
- Airport scheduling impacts ATM performance (TMA holding, environmental impact)
- Smoothing arrival flows and landing rates significantly improves the trade-off

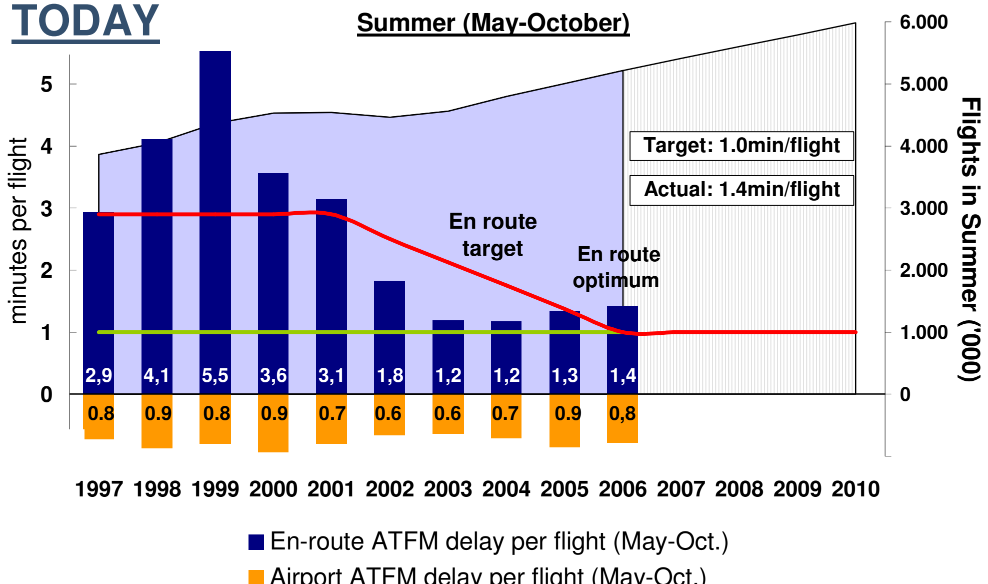
Improving air transport network performance



- Air transport punctuality and predictability could be improved in several ways:
  - *Improving adherence to scheduled departure times*
  - *Maximising the use of airport capacity whilst minimising delays.*
  - *Optimising the ground vs. airborne holding trade-off.*
- SESAR places emphasis on flexibility (ability to recover from non nominal situations)
- Comparable metrics to be developed and agreed (Punctuality, ATM ground and airborne delay, etc).

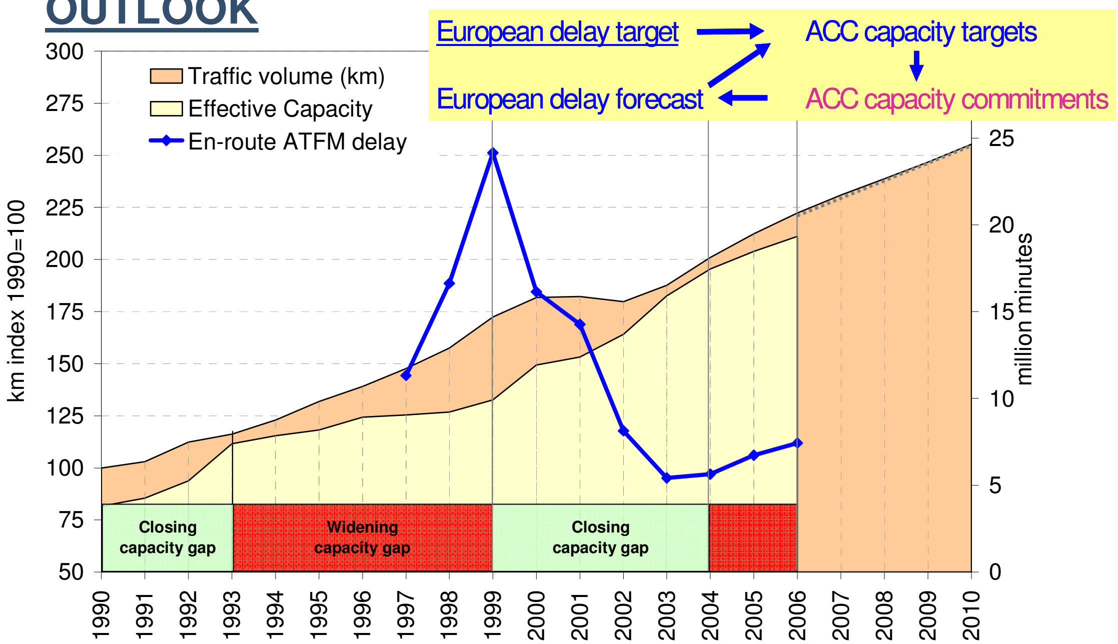
Ground delays managed by ATM

TODAY



source : EUROCONTROL/CFMU

OUTLOOK



source : EUROCONTROL

ATFM delays (ground)

- Flows essentially controlled through ground delays in Europe, MIT in US
- Major improvement in Europe since 1999
- 2002-05 ATFM en-route target met;
- ATFM delays increasing again since 2004;
- Estimated en-route ATFM delay costs: € 550 M in 2006

Target (s)

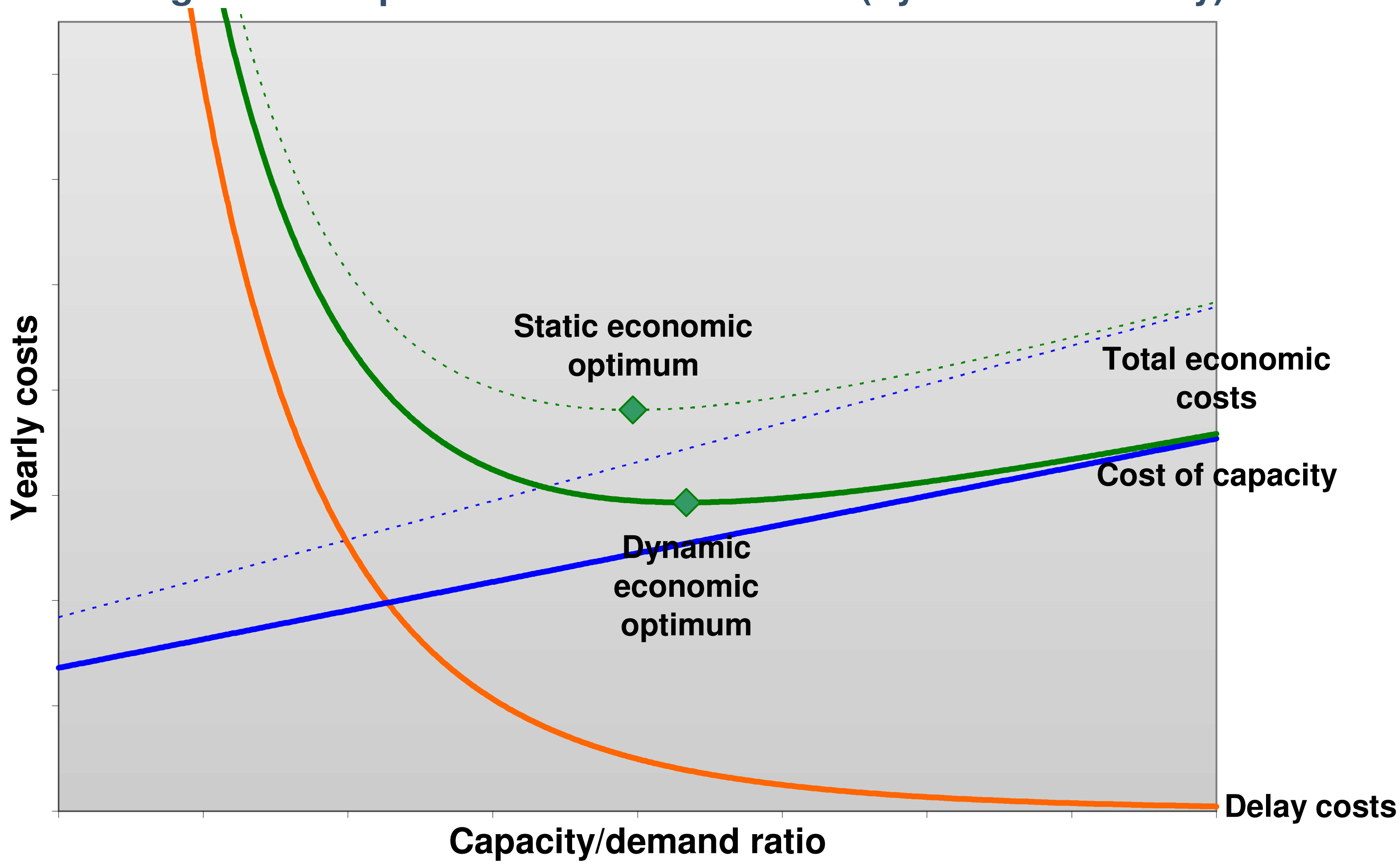
- Trade-off delay/cost of capacity;
- Set with reference to optimum capacity/delay
- En-route ATFM: 1 minute per flight
- Others (i.e. ACC) to be developed

Management

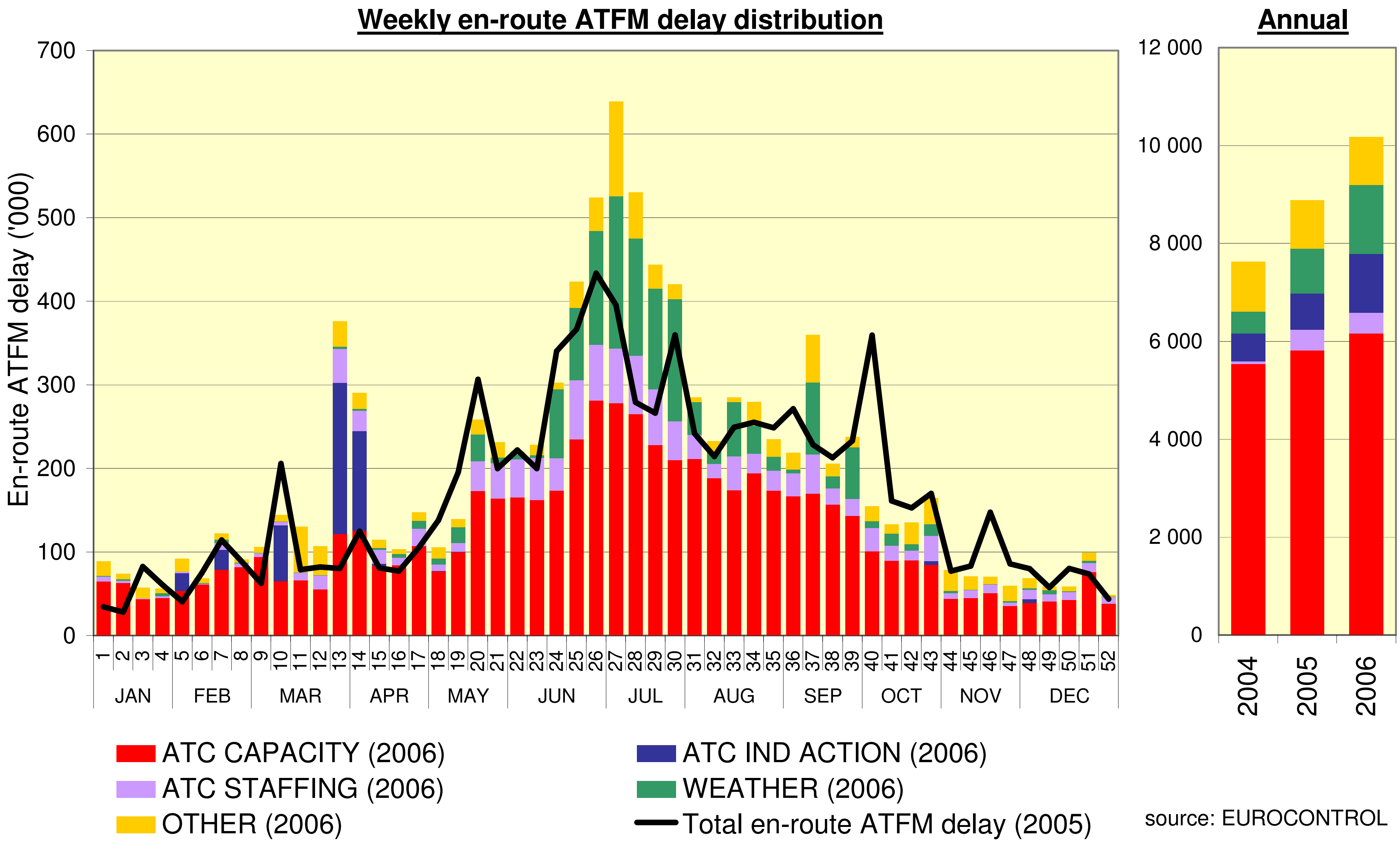
- Co-operative capacity management;

ATFM Delays: Target setting

- Trade-off delay/cost of capacity
- Target setting based on understanding of optimum
- Optimum changes with improved cost-effectiveness (dynamic efficiency)

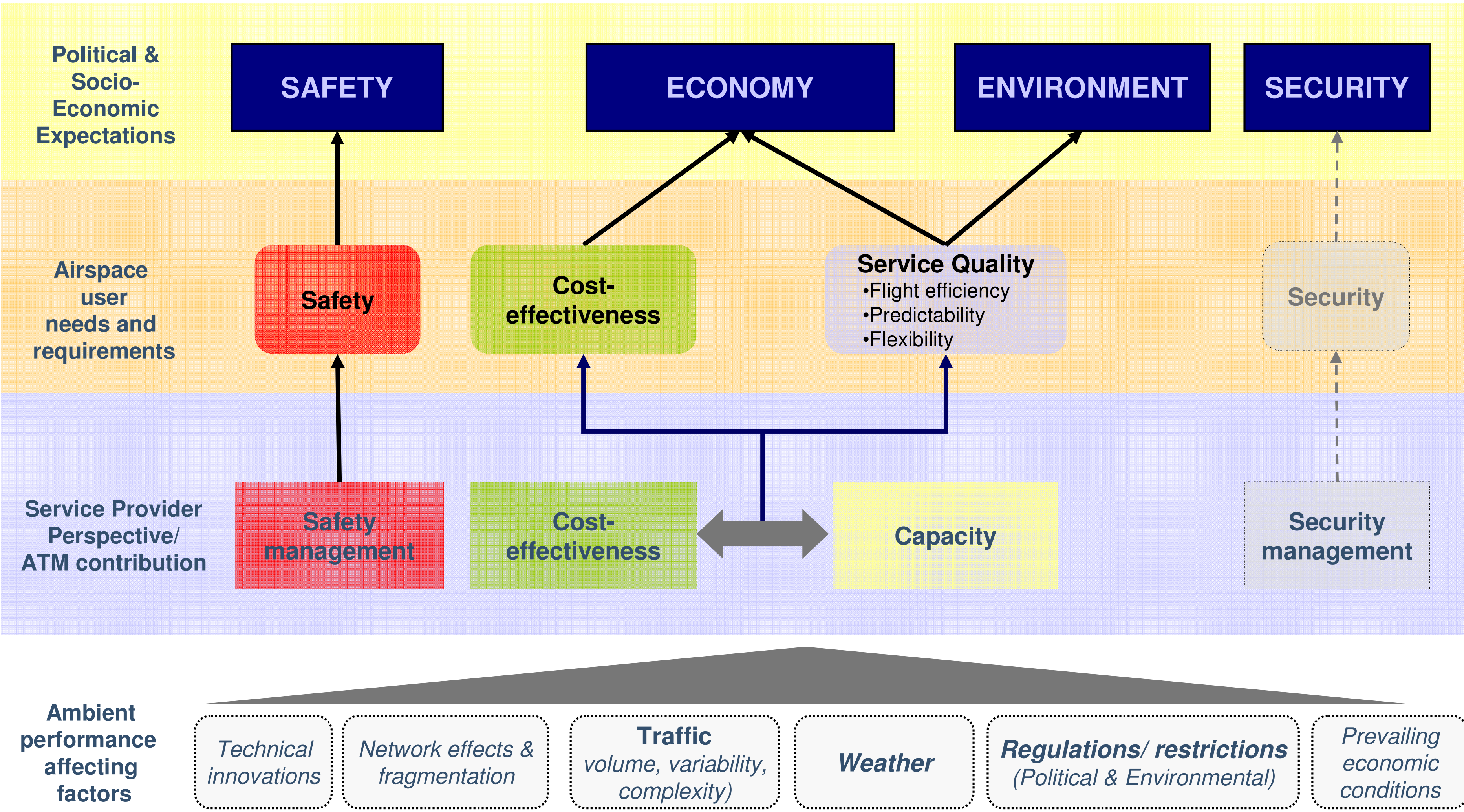


ATFM delay causes

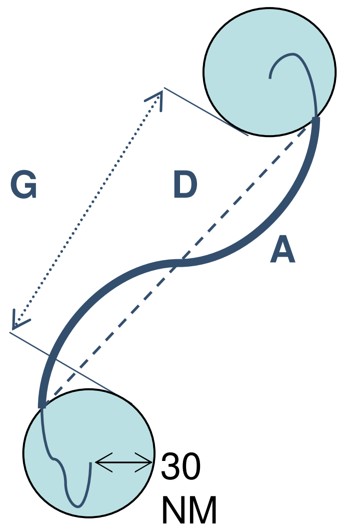


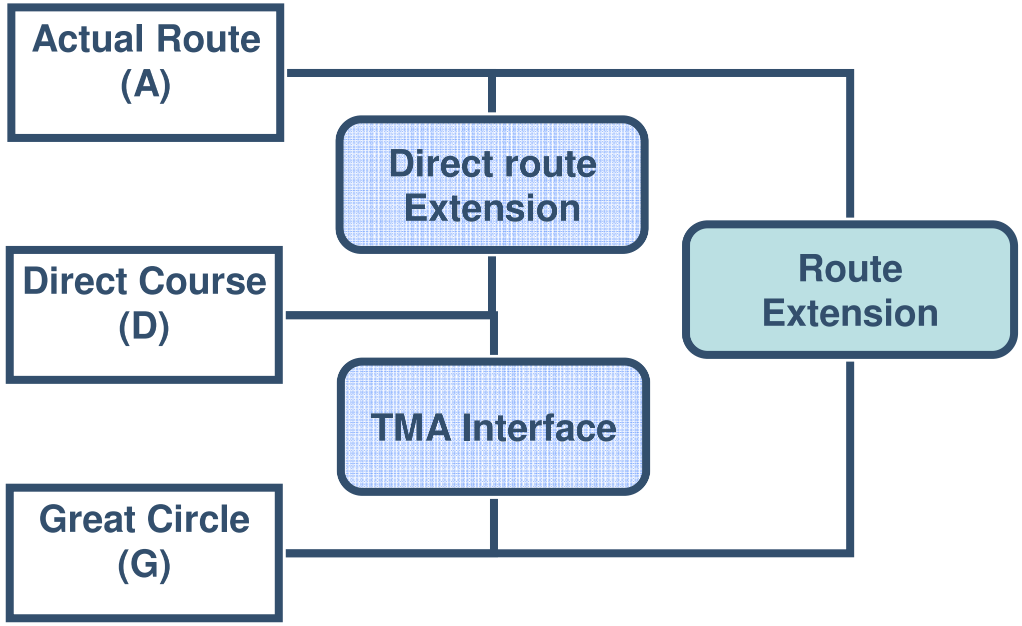
source: EUROCONTROL

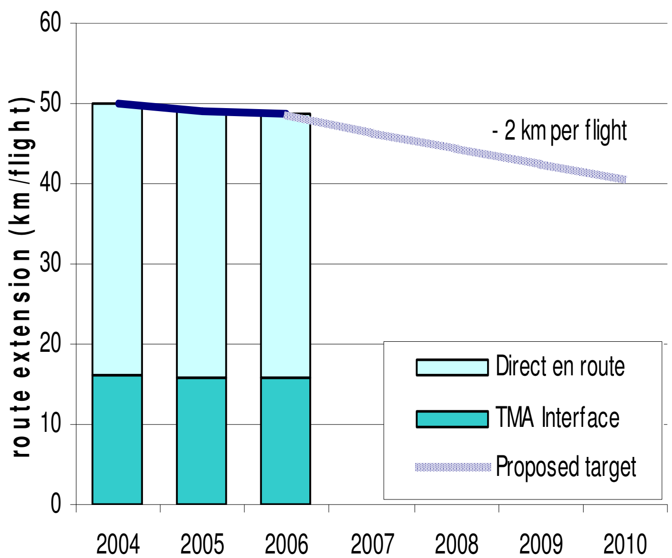
Service quality (continued)



Flight Efficiency



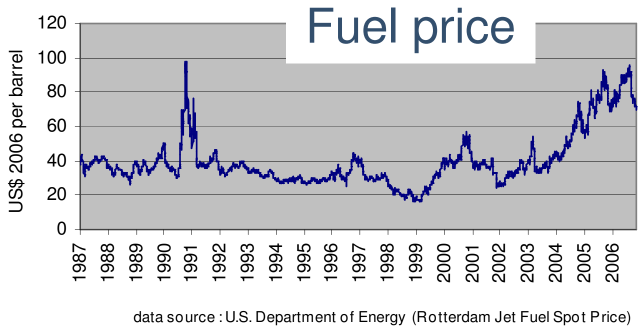




PRC uses same framework
as ICAO ANSEP

Flight efficiency (horizontal)

	Total 2006
Route Extension (%)	**5.9%**
Extension per flight	**48.6 km**
Additional distance	**441 M km**
Estimated costs to airspace users	**€ 2 230 M**
Additional CO_2 emissions	**4.7 M tons**

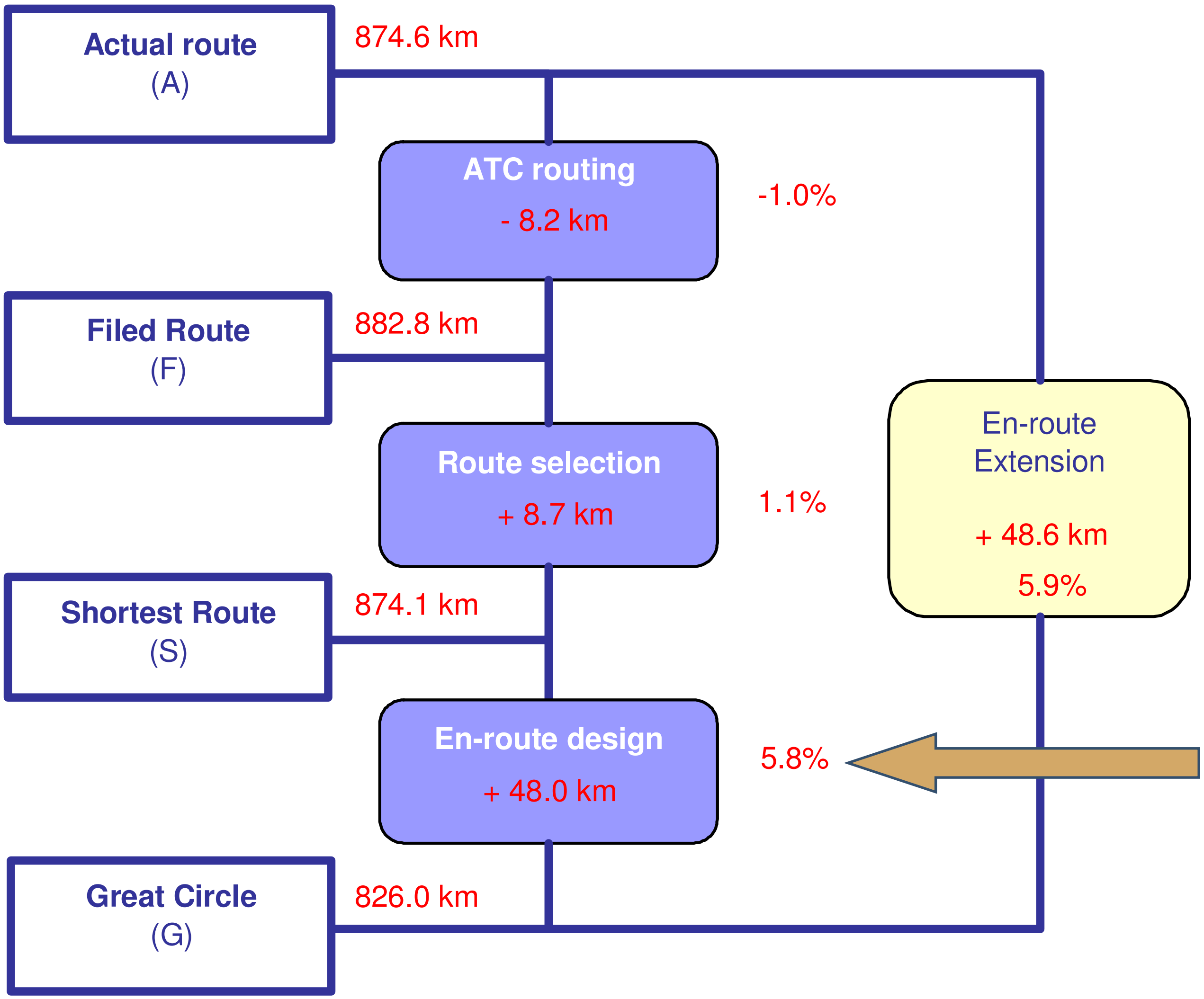


Flight-efficiency is a main issue

Direct link with environmental impact

- Cost of horizontal route inefficiencies is estimated at 2.2 billion euro, to which vertical and TMA inefficiencies have to be added.
- Significant environmental impact (4.7 million tons of CO_2 per annum)
- Costs increased further due to higher fuel prices in 2006

Improving Flight-efficiency

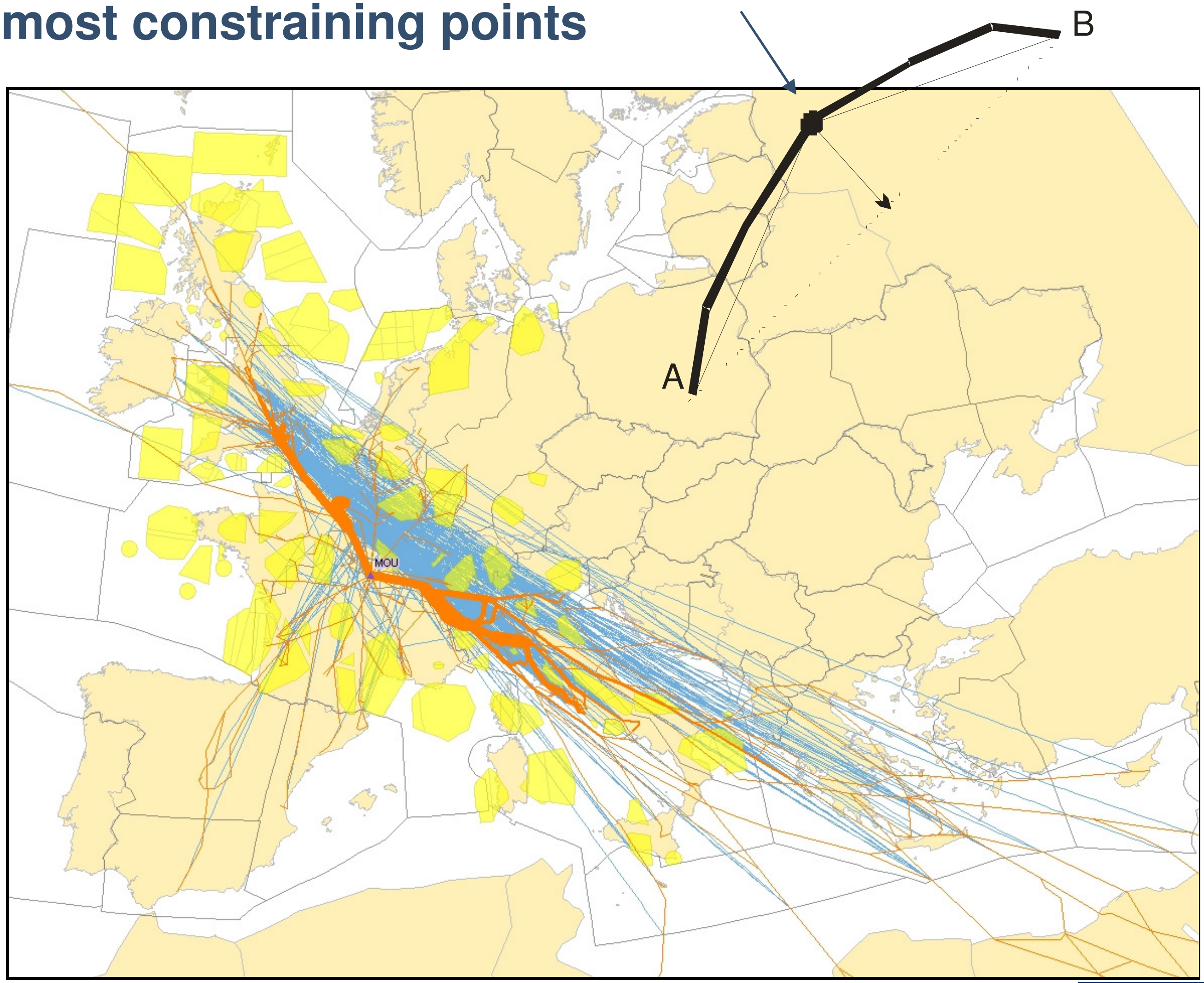


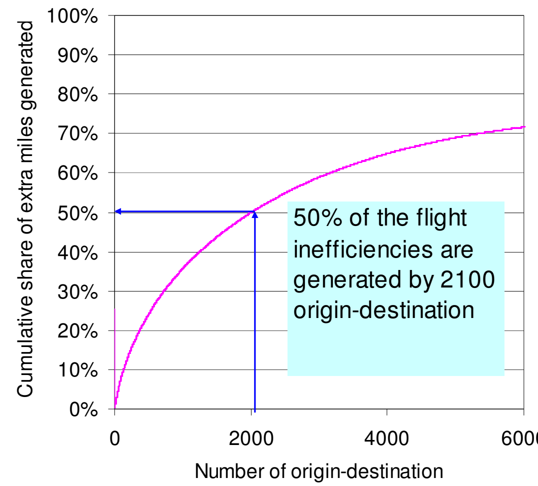
Strategic design and use of airspace are the main origins of route inefficiencies

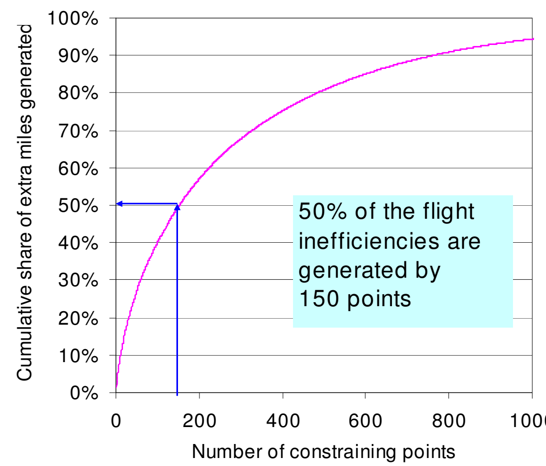
En-route design

2000 city pairs or 150 most constraining points

Most constraining point

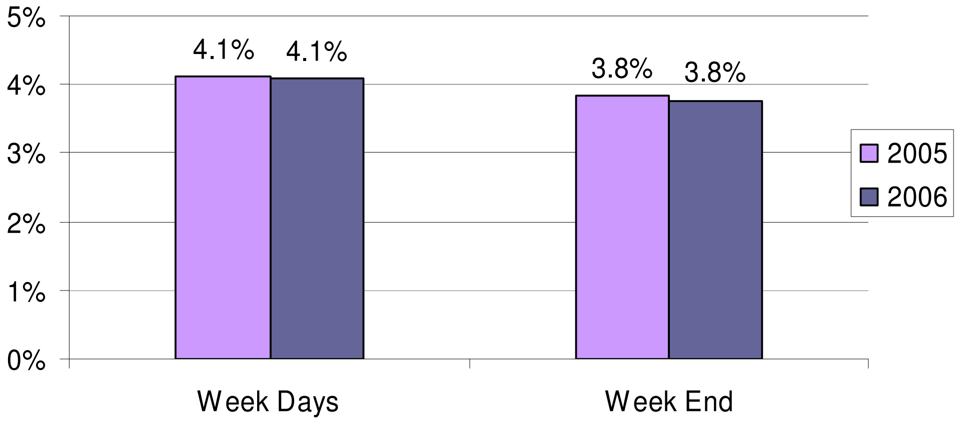






Flight efficiency (horizontal)

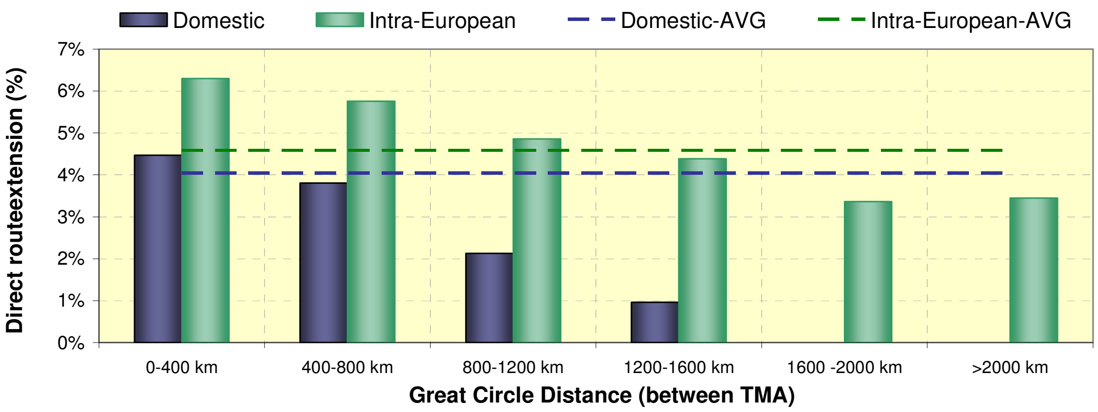
There appears to be room for significant improvements:



Direct route efficiency

- Only minimal improvements in flight efficiency during week-ends (essentially no airspace restrictions)

=> 130 million Euro could be saved every year if the route network was one third more efficient during week-ends.

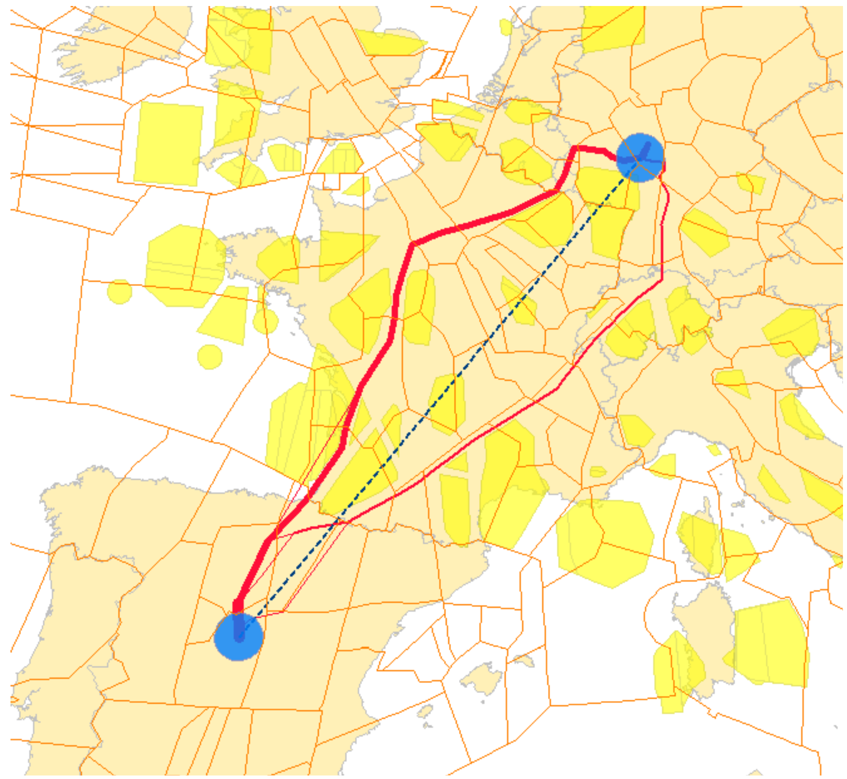


- Intra-European routes are significantly less efficient than domestic routes.

=> If the European route network was as efficient as the domestic networks, as one would expect under the SES, 150 to 300 million Euro could be saved every year.

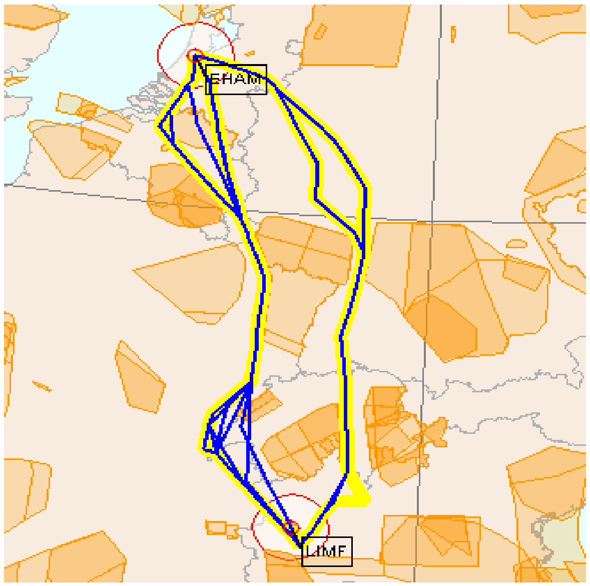
Flight efficiency (horizontal)

- Trade-off capacity – flight-efficiency: don’t jeopardize capacity where little margin
- Objective: a more efficient Trans-European network of upper airways

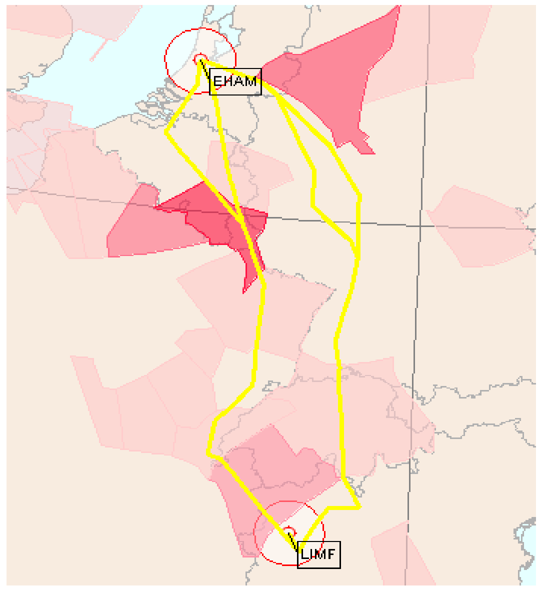


Flight-efficiency: Route selection

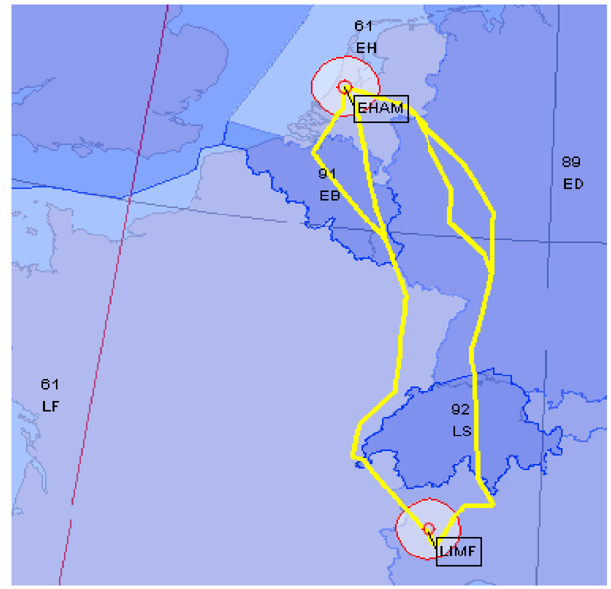
Example: Amsterdam to Torino



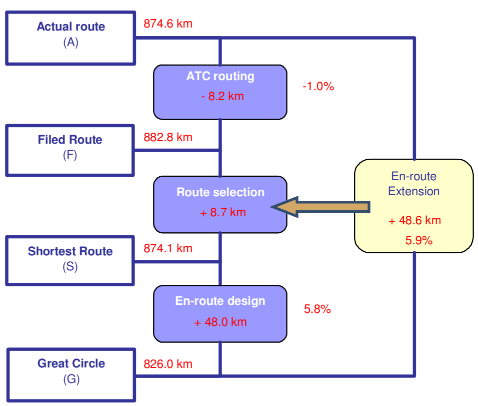
Airspace structure



En-route congestion



Route charge differentials



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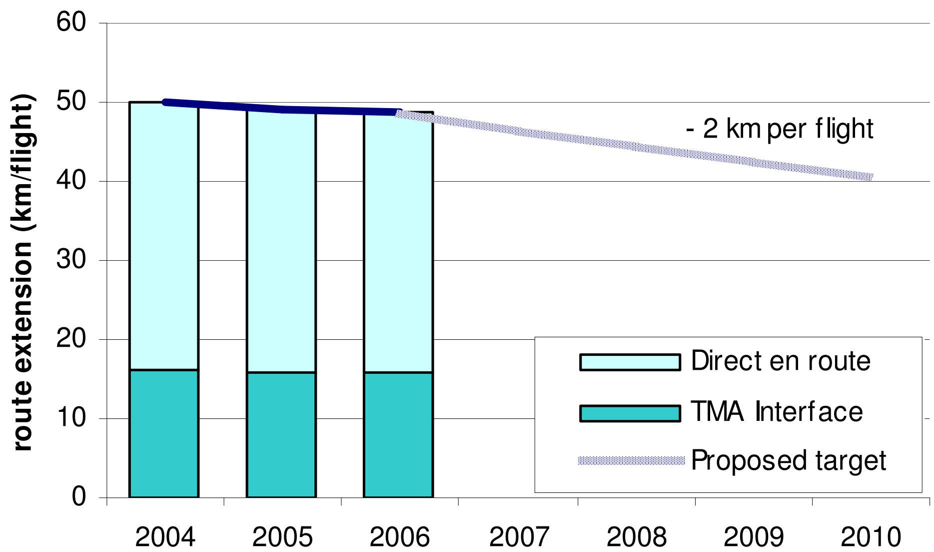
Flight Efficiency (horizontal): Conclusions

Target



OUTLOOK

	2006	2007	2010	Total
Number of flights (million)	9.6	10.0	11.2	
Target (km per flight)	48.6	46.6	40.6	
Distance saved (million km)	0	-20	-90	-216
Cost savings (million euro)	0	-100	-450	-1 080
CO_2 savings (million tons)	0	-0.2	-1.0	-2.3

Performance to date

- Horizontal en-route flight efficiency is a major ATM performance issue;
- Cost of horizontal en-route route inefficiencies is estimated at 2.2 billion Euro;
- Significant environmental impact (4.7 million tons of CO2 per annum);
- Costs increased further due to higher fuel prices in 2006;

Indicators and trade-offs

- Safety and capacity gains require a certain level of “inefficiency” in the route network;
- Focus has been on safety and capacity so far;
- Need to develop indicators to measure vertical flight efficiency and TMA inefficiencies (airborne holdings);

Target

- Agreed target is to reduce the additional distance flown due to route extension by 2 km per flight each year until 2010

Framework for analysis of ATM performance