European examples of CNS/ATM environmental benefits

Ted Elliff
EUROCONTROL

ATM goals for environment / emissions

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Efficiency

More direct (horizontal)

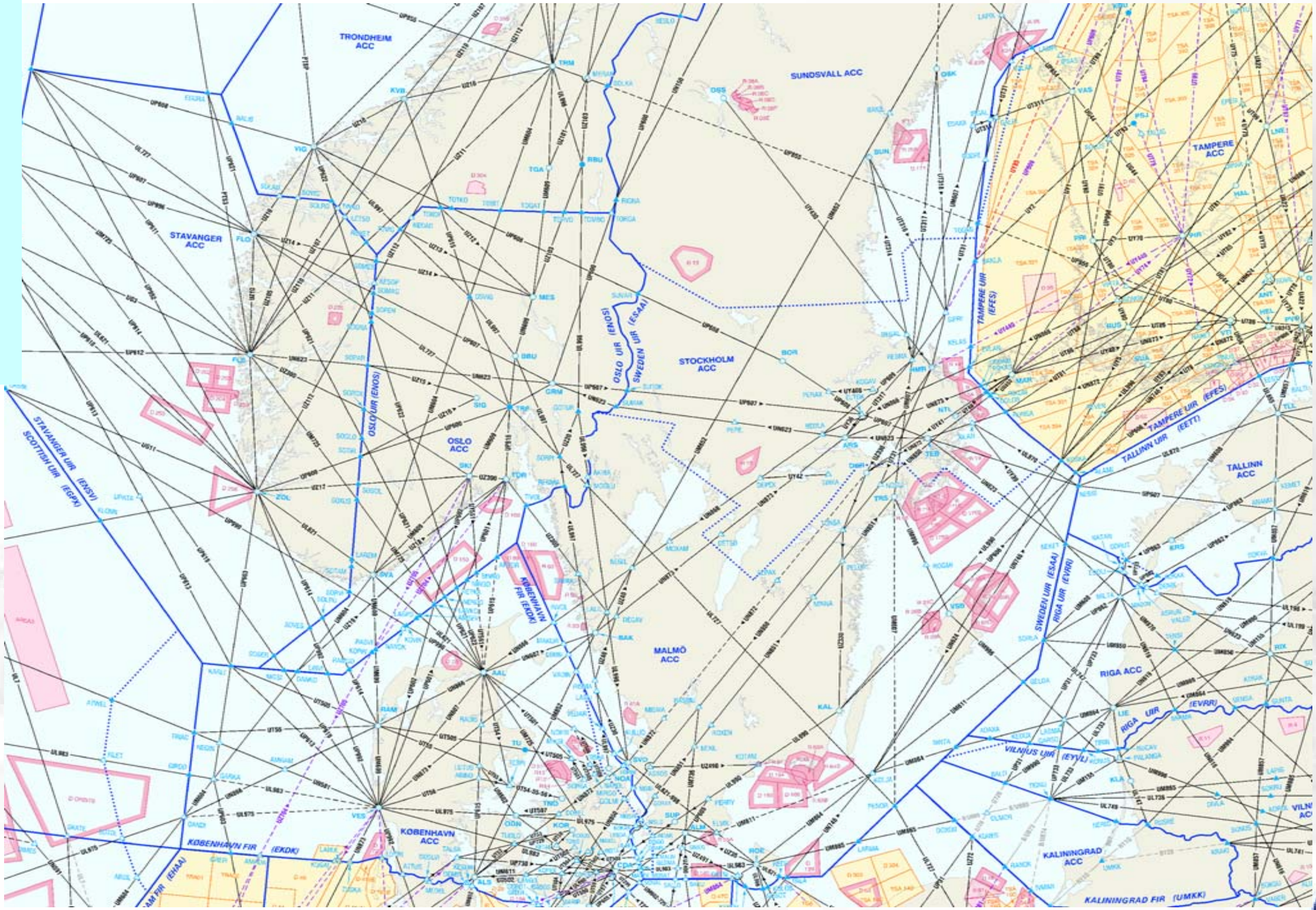
Optimal (vertical) trajectory

Minimize air & ground holding

Horizontal Efficiency

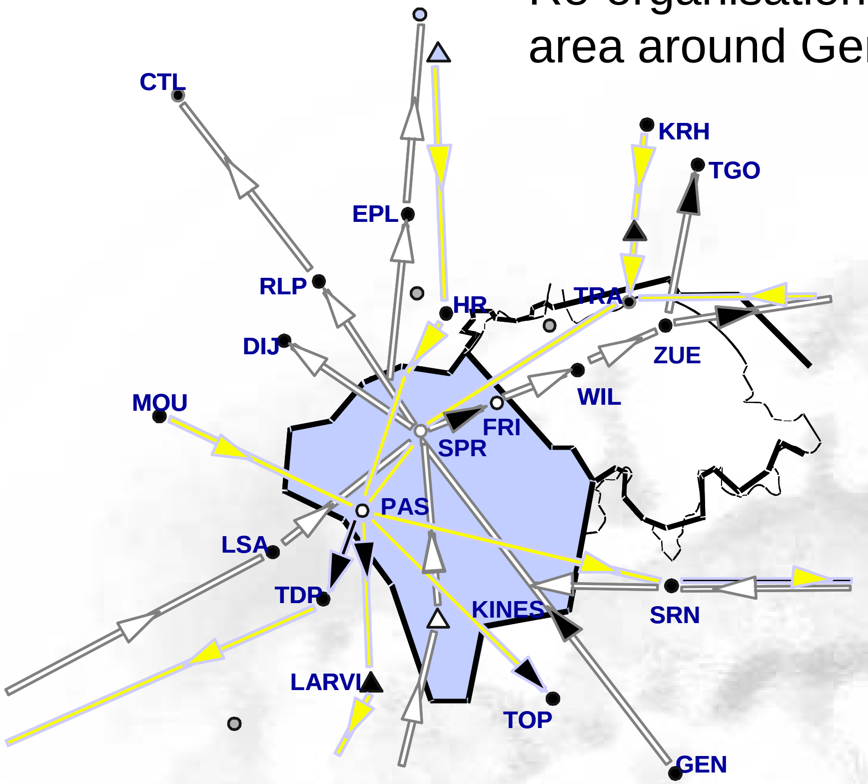
Principles

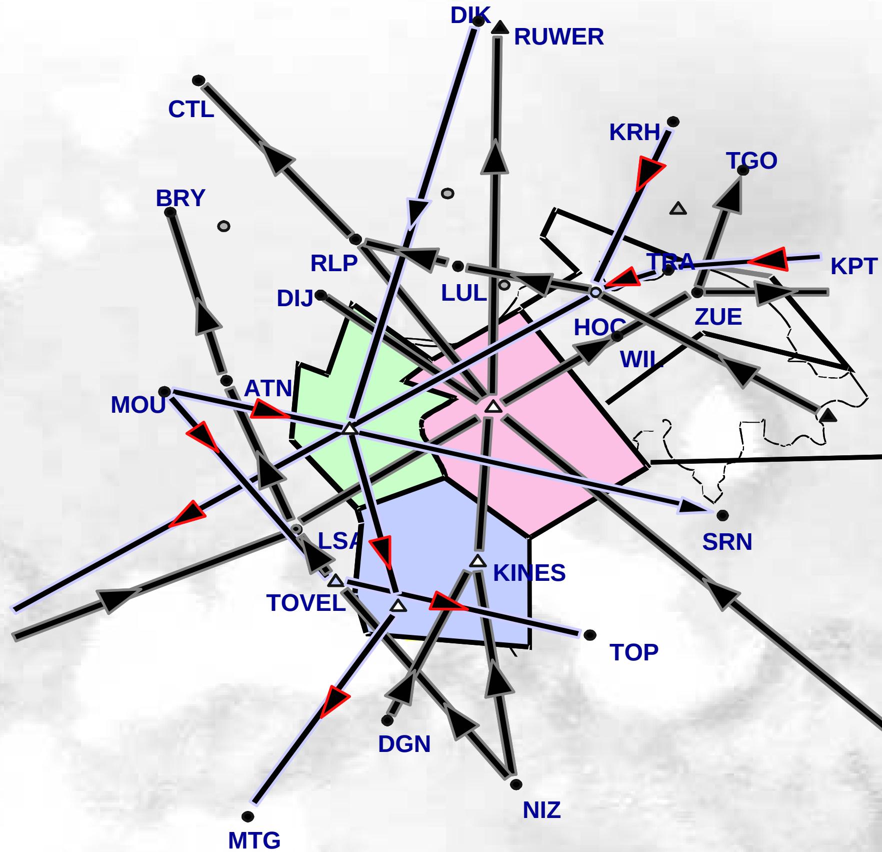
- increase capacity
- reduce complexity
- shorten average route lengths



ATS Route Network Developments

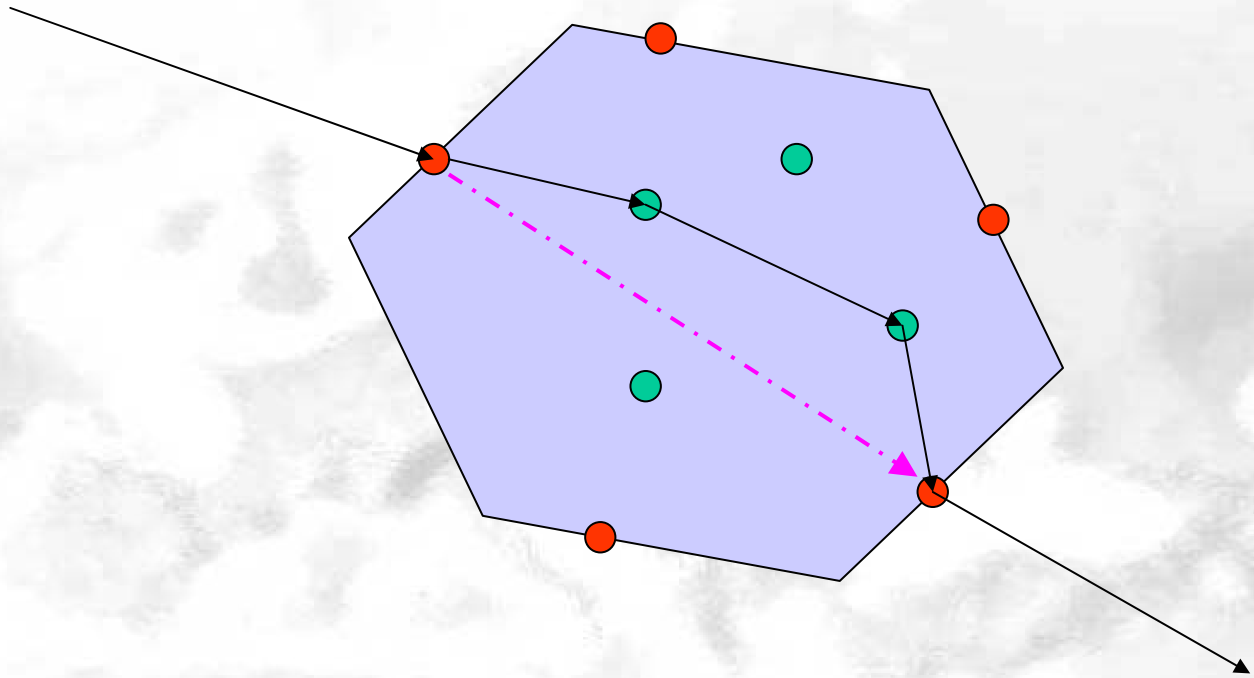
Re-organisation of air traffic routes to ease congestion in important area around Geneva



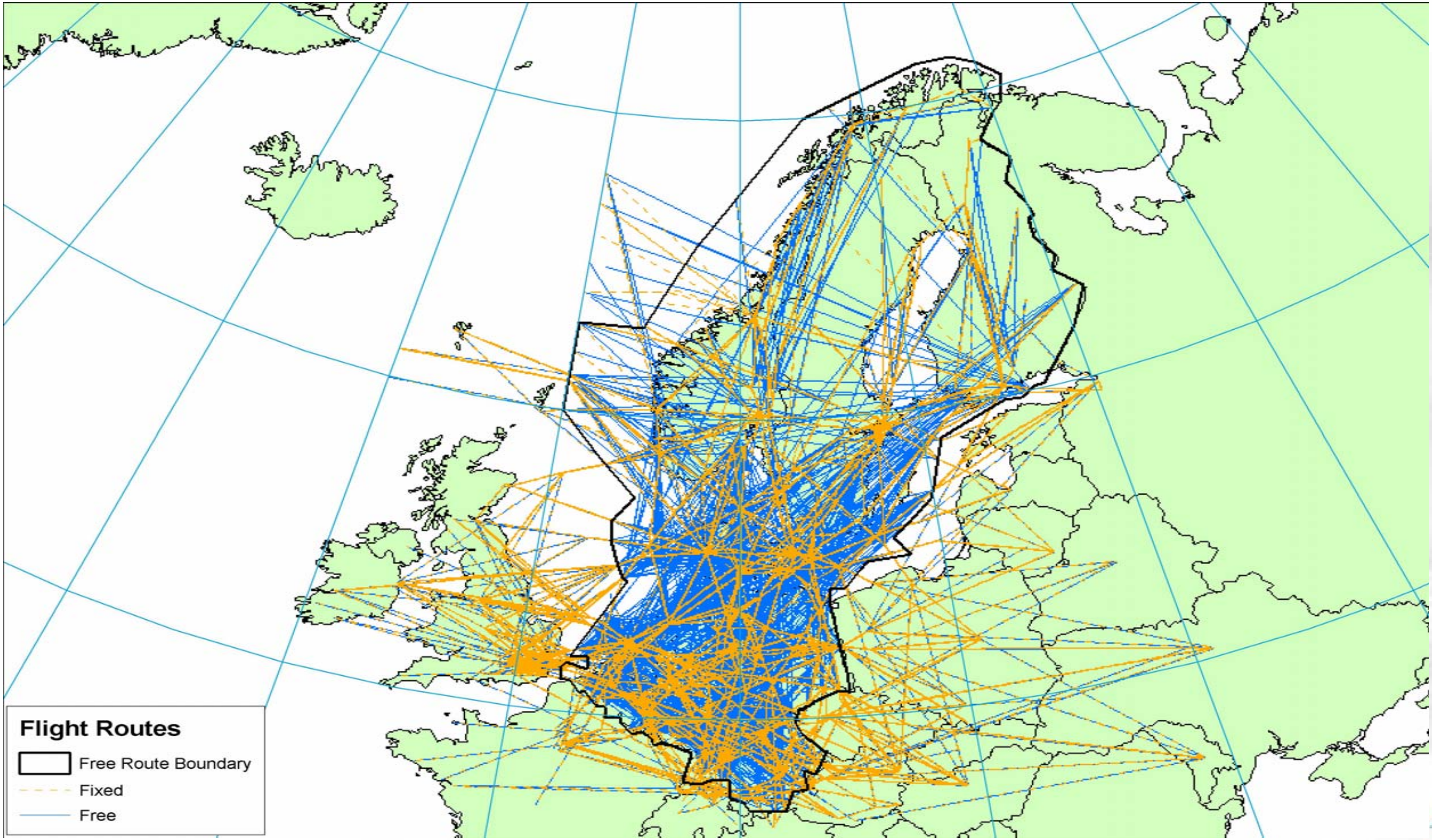


- capacity gain ~ 30%.
- more direct routes
- more optimum flight profiles
- reduced flight times

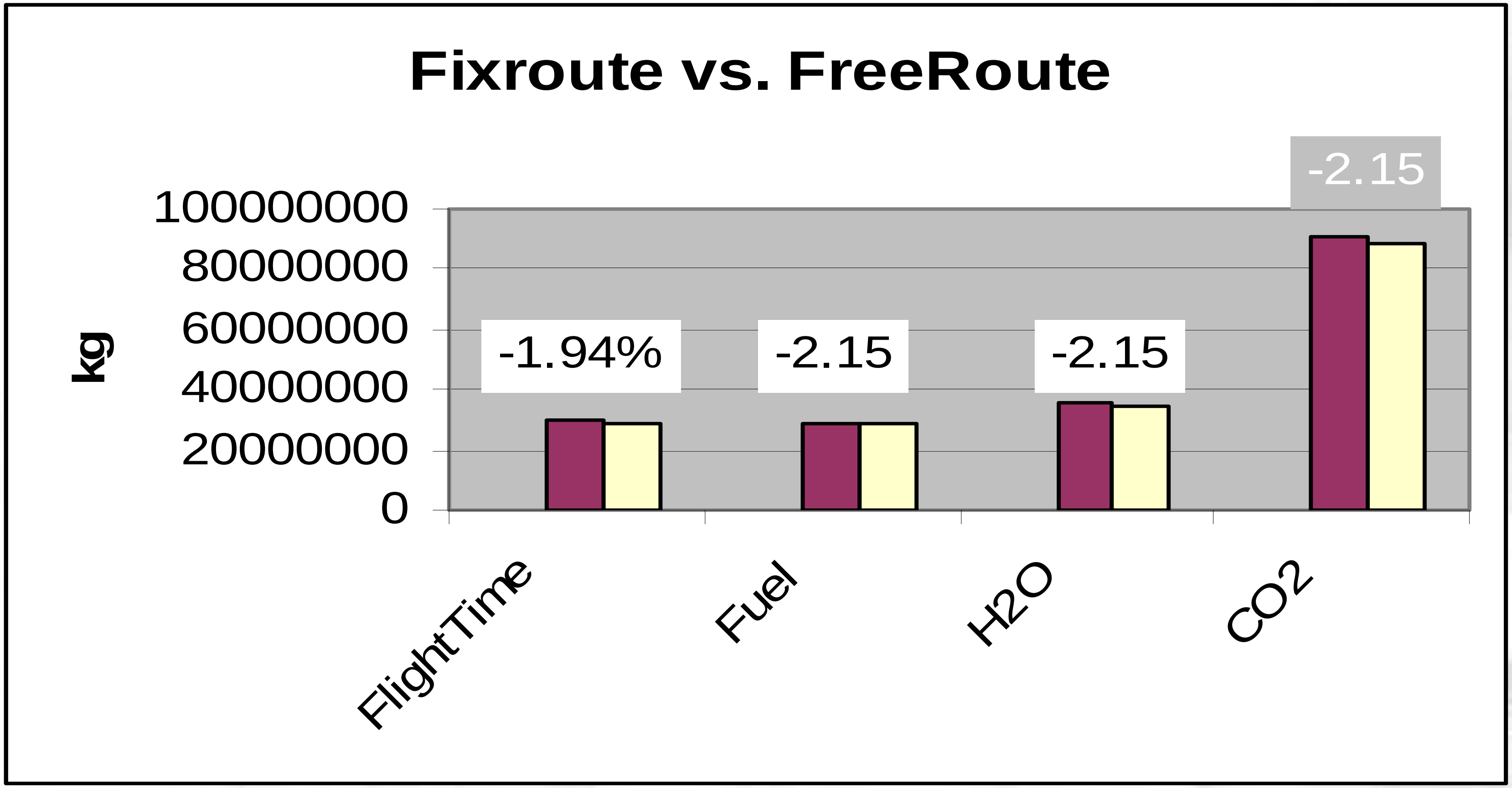
Horizontal Efficiency – Free Routes



Free Routes Airspace Project



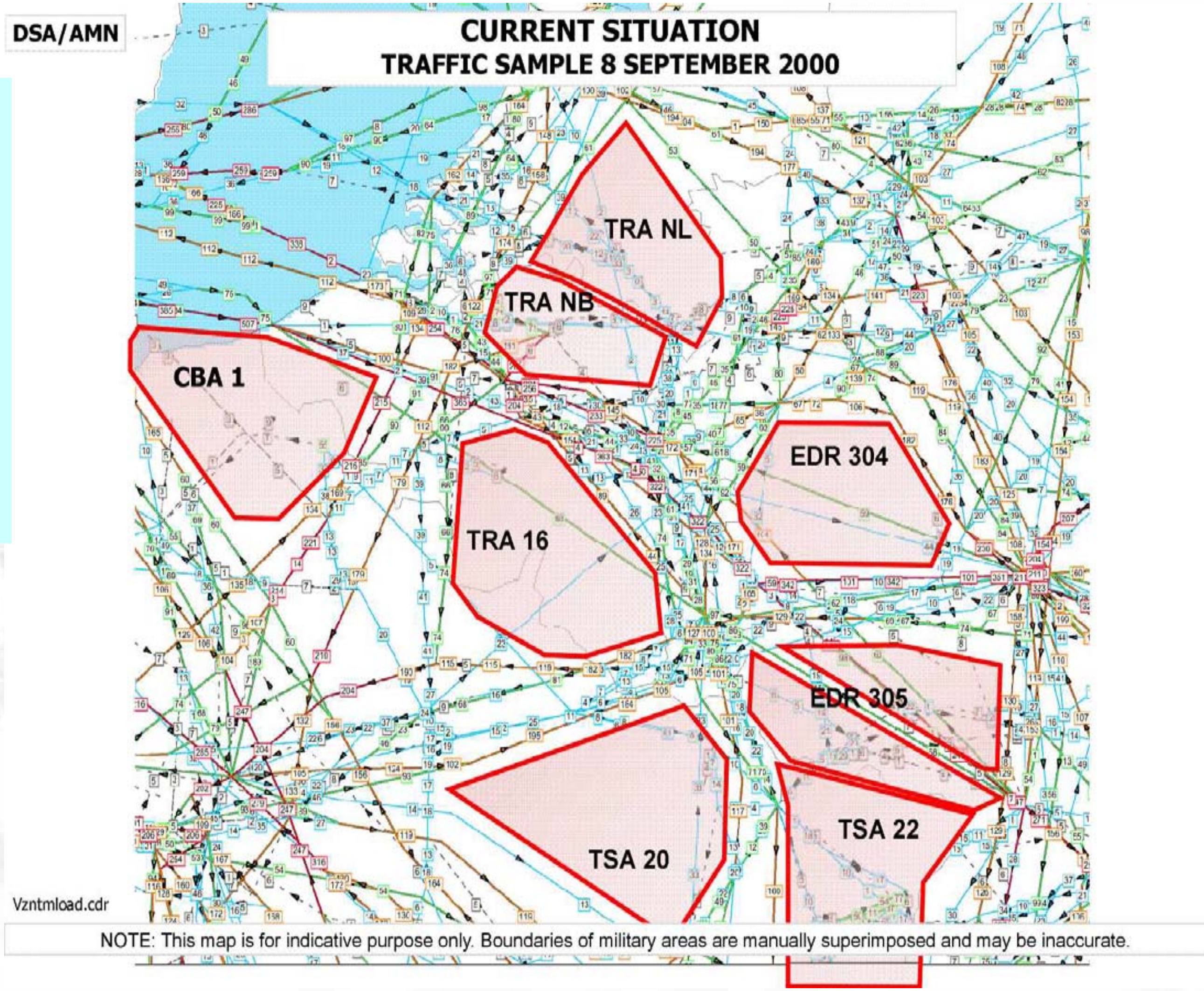
Free Routes Airspace Project



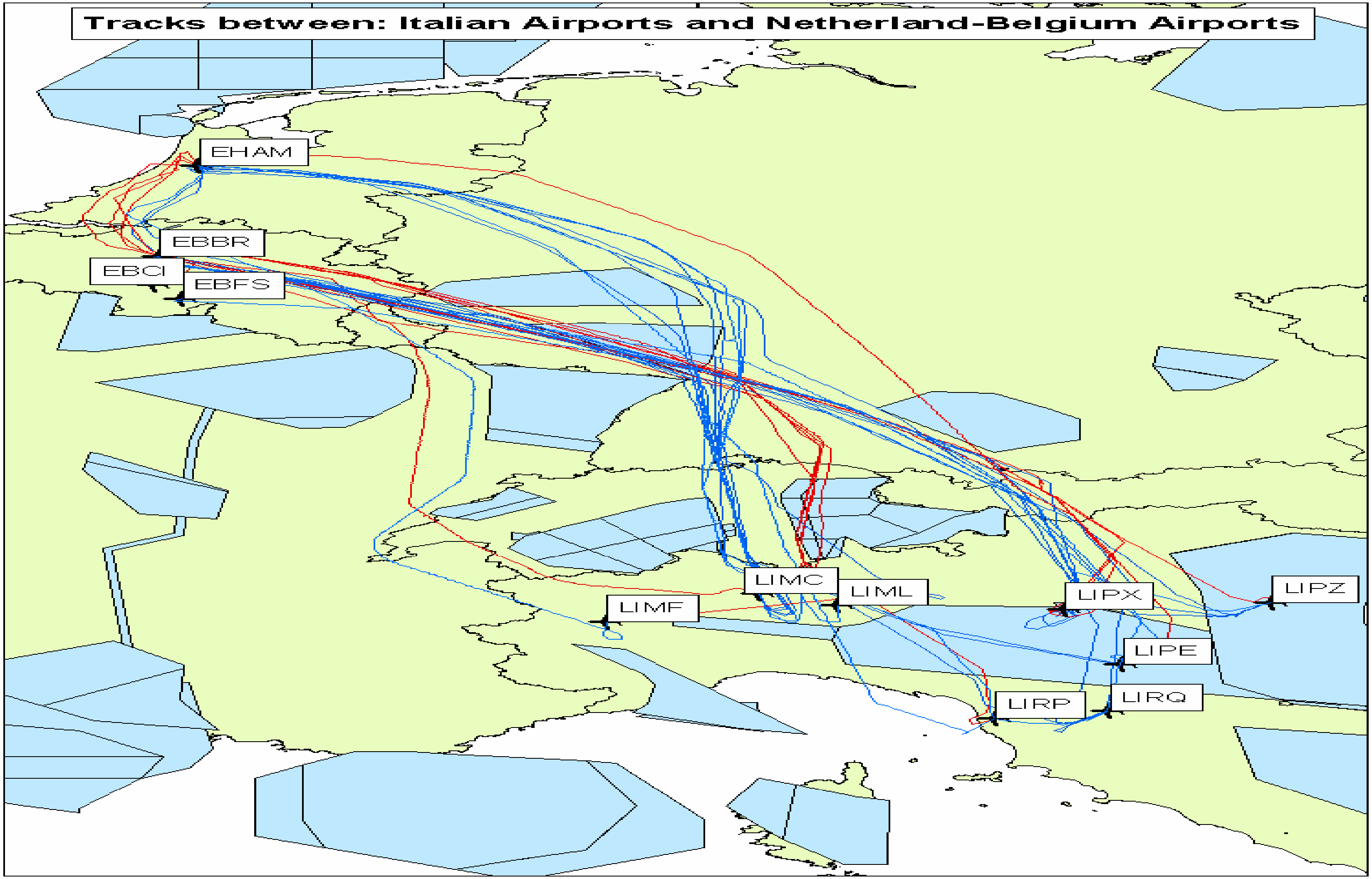
Horizontal Efficiency – Flexible Use of Airspace

Principles

- airspace available to all user groups
- security and military needs satisfied
- more direct routings



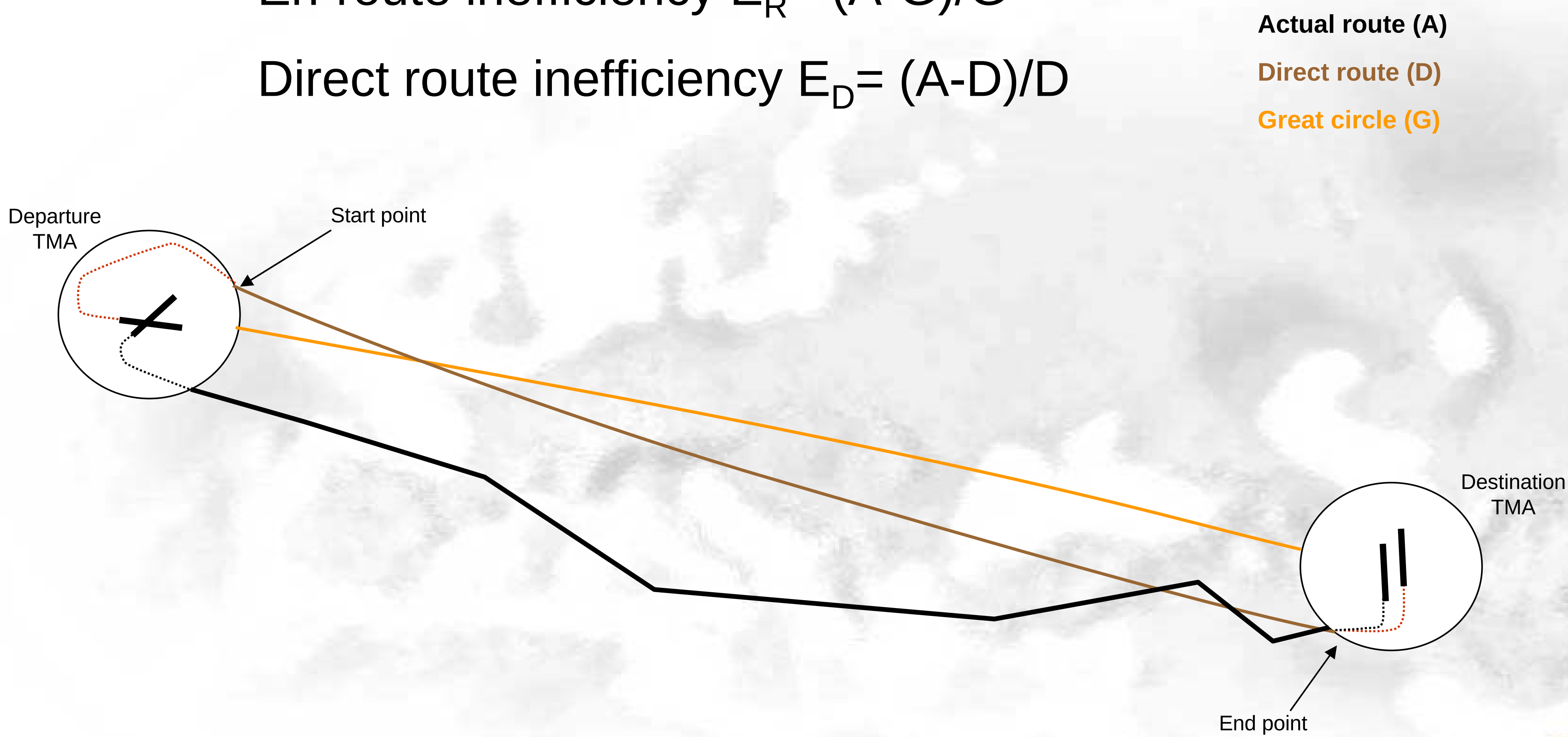
Horizontal Efficiency – Flexible Use of Airspace



Horizontal Flight Efficiency Indicators

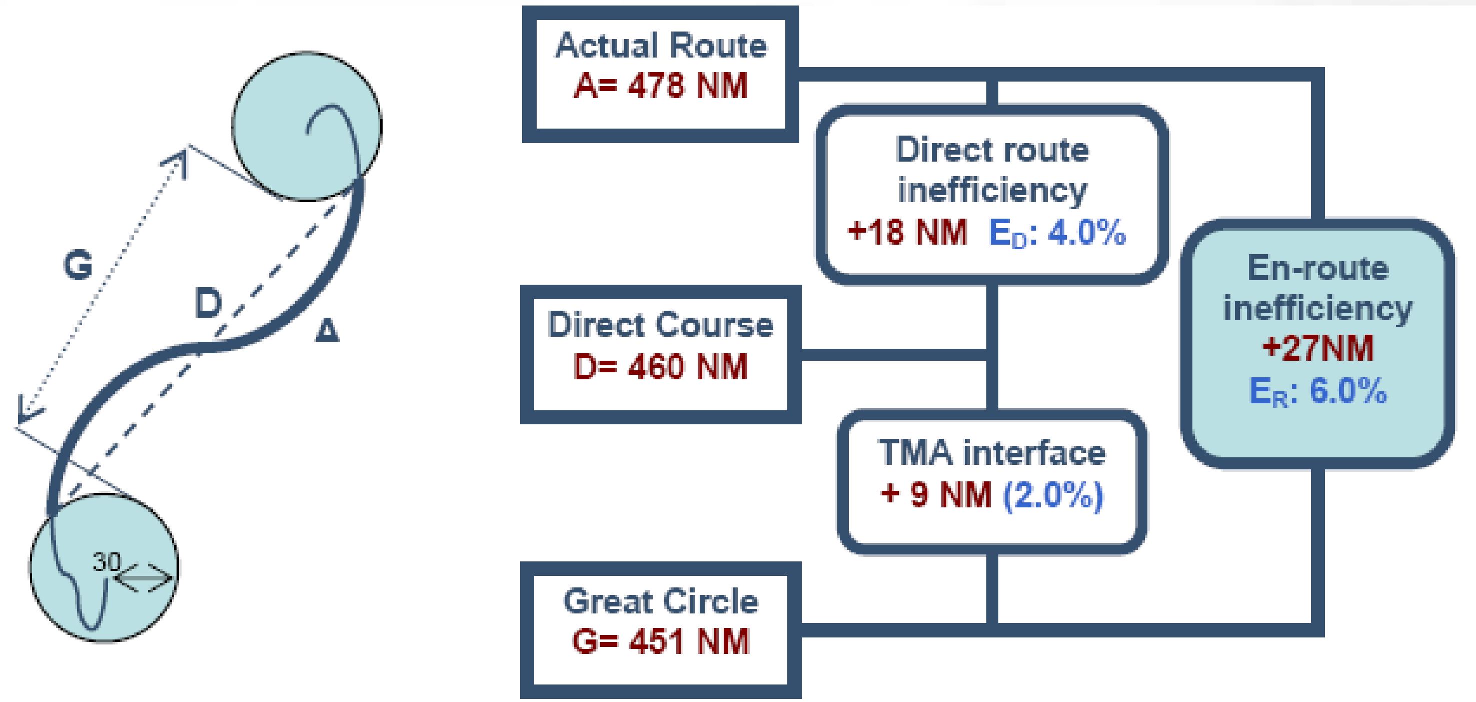
En-route inefficiency E_R= (A-G)/G

Direct route inefficiency E_D= (A-D)/D



Ref: PRR2005

Horizontal Flight efficiency – Europe 2005



Distance shown are average for all city pair in Europe in 2005. Where the flight originates or ends outside Europe only the portion of flight inside the IFPS zone has been taken into account

Ref: PRR2005

En-route inefficiencies and estimated cost

Year	Direct Route Inefficiency	Estimated cost
2004	4.2%	1000M€
2005	4.0%	1400M€ *

* Cost is higher in 2005 due to fuel price increases

Ref: PRR2005

Horizontal Efficiency - Regulation

The Single European Sky

- to improve and reinforce safety, to restructure European airspace as a function of air traffic flow, rather than according to national borders, to create additional capacity and to increase the overall efficiency of the air traffic management system (ATM).
- integrated air traffic management architecture based on demand driven service provision.
- will enhance cross-boarder co-ordination, remove administrative and organisational bottlenecks in the area of decision-making and enhance enforcement in ATM.

SESAR

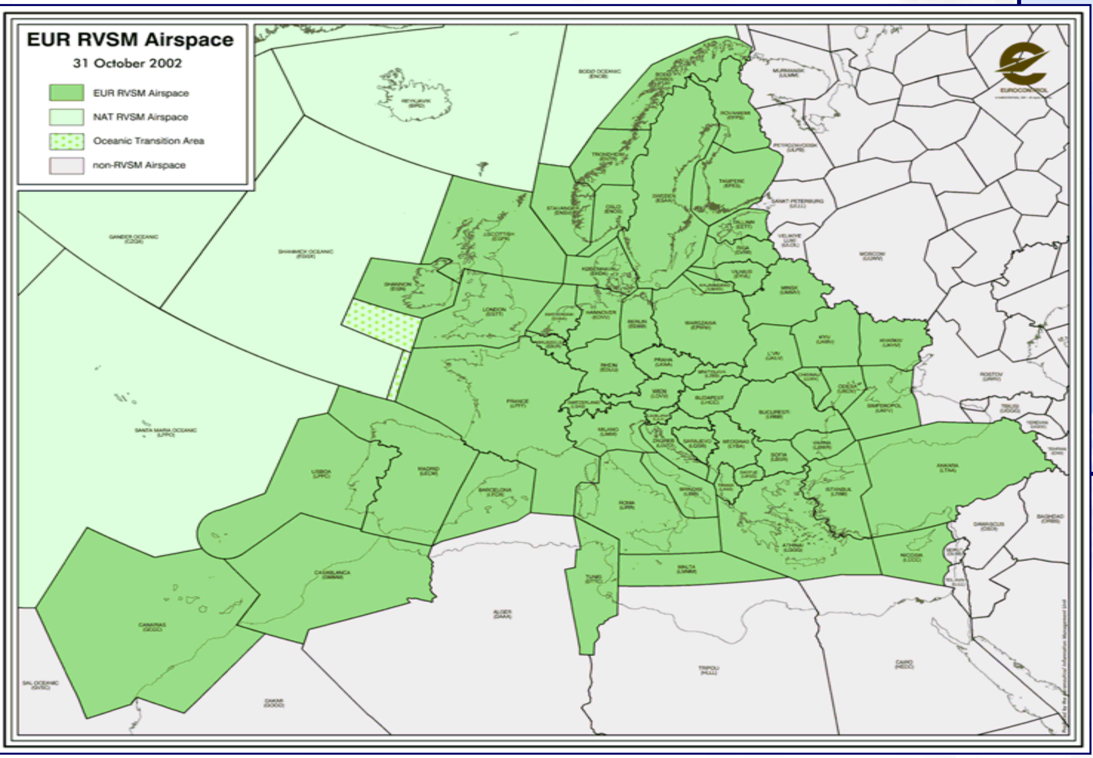
SESAR:

- the Single European Sky implementation programme
- Industry convergence
- ATC infrastructure modernisation programme
- Implementation phase will span from 2007 to 2020+
- Will facilitate uptake of CNS/ATM technologies

More optimum vertical efficiency (RVSM)

6 new flight levels

15% capacity increase



24 January 2002 - Applicable in 41 States

More optimum vertical efficiency (RVSM)

Annual savings (tonnes)*

CO_2	-975 000
H_2O	-381 000
Fuel	-310 000
NOx	-3 500
SOx	-260

Cruising altitudes

NOx	-4.4%
H_2O	-5.0%

Equivalent emissions avoided

- 4 days' intra-ECAC traffic
- 5600 transatlantic flights

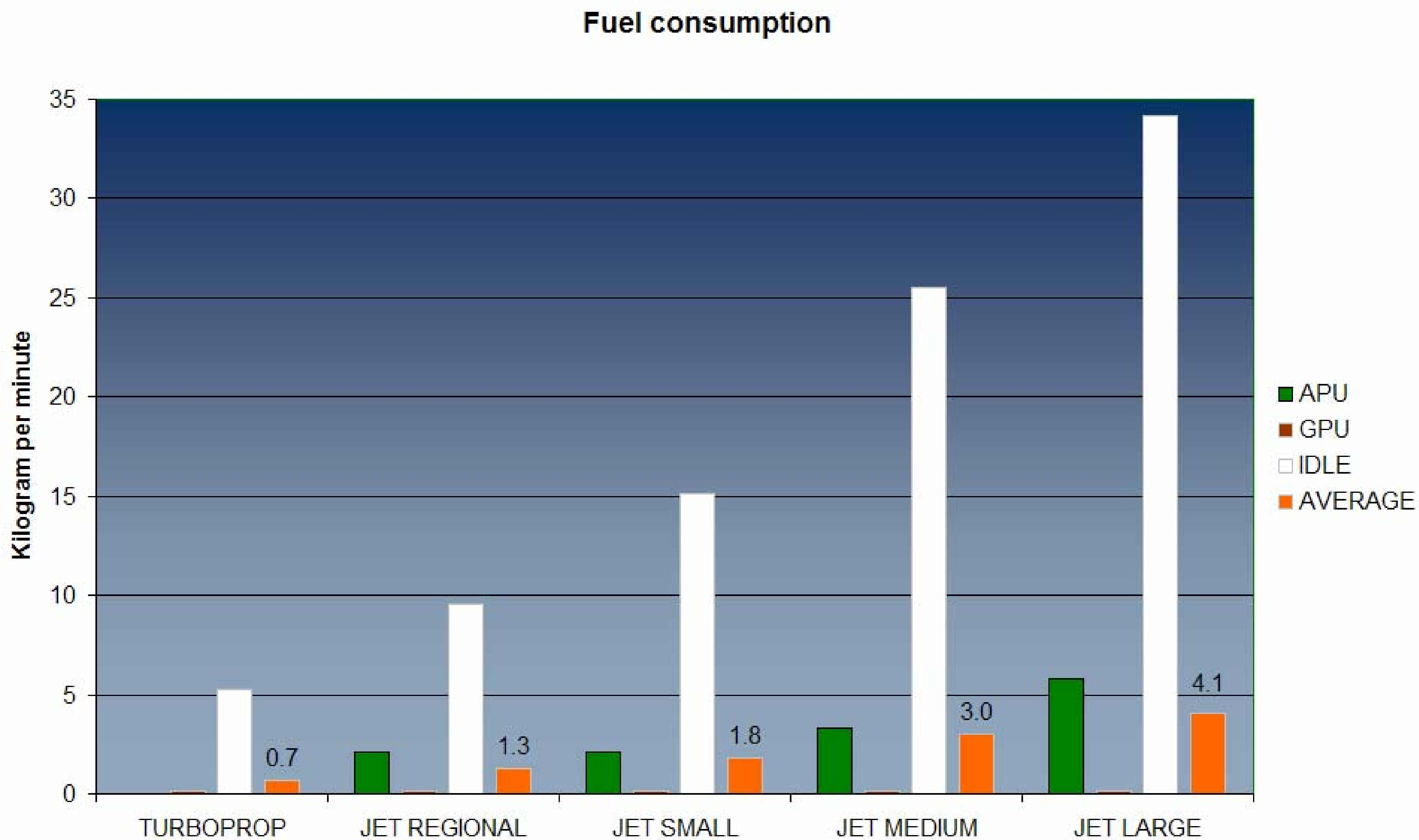
Air Traffic Flow Management (ATFM)

- Balance demand with capacity
- Protect ATC systems from overload

- **Re-routings**
  - → **avoid congested areas**

- **Aircraft held at airports**
  - → **engines shut down**
  - → **avoid en-route and approach holding**
  - → **avoid taxi queuing**

Average fuel consuption impact of a one minute ground delay



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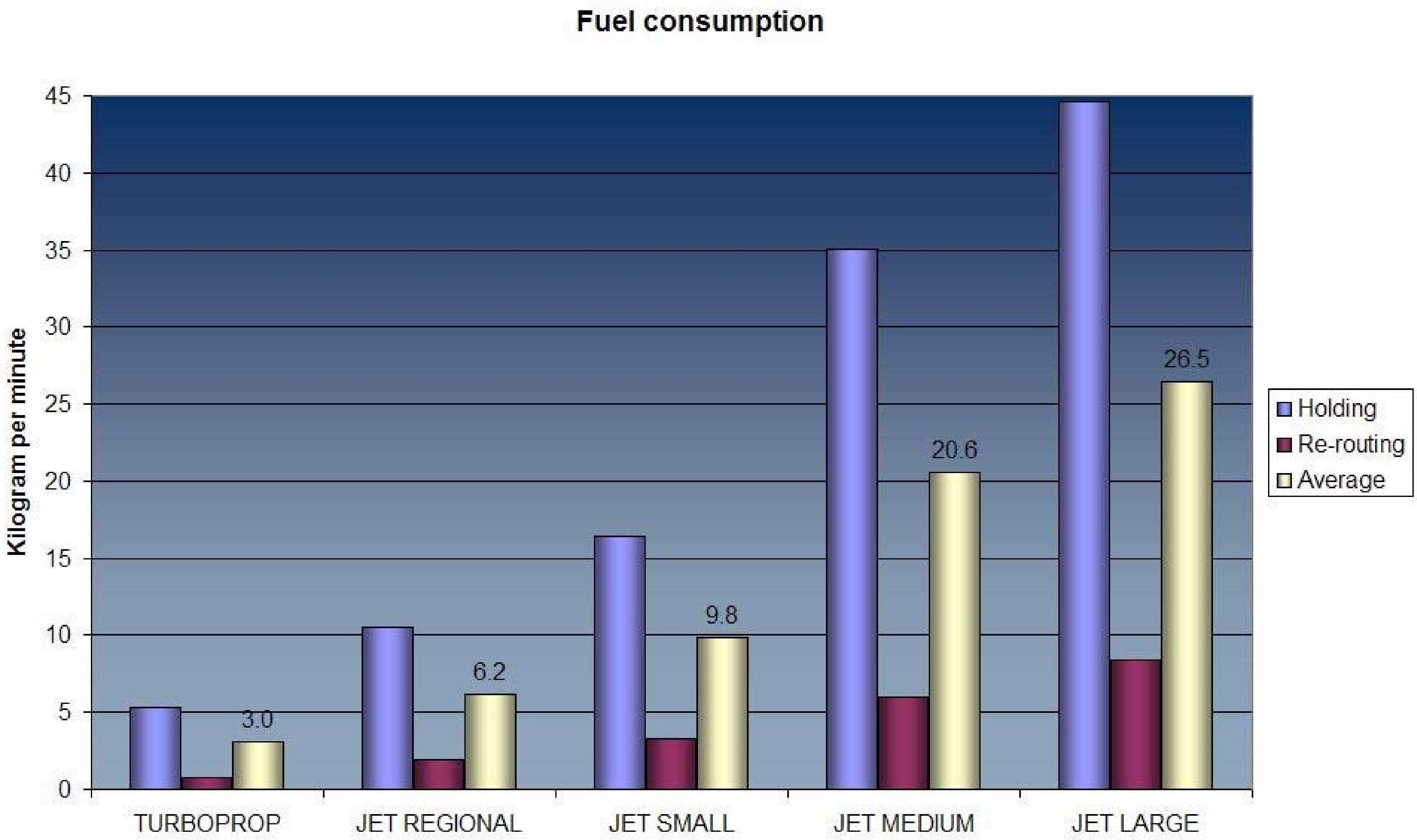
Average fuel consumption impact of a one minute airborne delay



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Ground v. Airborne delay

- There is a direct fuel consumption benefit of applying ground delays rather than airborne delay. Typically airborne delay fuel flow is estimated to be 5.7 times higher than ground fuel flow. Non-linear emissions (e.g. NOx, HC and CO) are about 3 times higher with airborne delay.
- The annual benefit of ground delays (as opposed to airborne) is estimated to be around 60 M€ savings for airlines in fuel costs annually, and an additional 20 M€ euros savings for the environment (indirect or external costs).

Ref:

Questions?