Workshop on Aviation and the Environment
Cologne, 29th November 2007

Single European Sky and its impacts on CO_2 emissions

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Introduction – objectives of the study

Analyse the impacts of the Single European Sky (SES) in terms of CO_2 emissions.

→ Estimation of the highest theoretical level of reduction.

Introduction – future developments

Future Development in the Airline Industry

- Strongly growing demand in air passenger and freight transport
- Changes in business models of airlines
- Tremendous enhancement in airport capacity especially in Asia
- Expansion of local/regional airports
- Development in airplane design
- Increasing cooperation in terms of alliances

BUT this is only one side of the game....

Introduction – impacts of growth

Impacts of Growth

- Congestion (especially at airports)
- Noise (especially in highly populated regions)
- Emissions (especially CO_2 and NO_x)

According to recent studies the external impacts of aircrafts are around **52.5 EUR per 1,000 passenger kilometres** (UIC, 2004), which is very high compared to rail transportation (22.9 EUR).

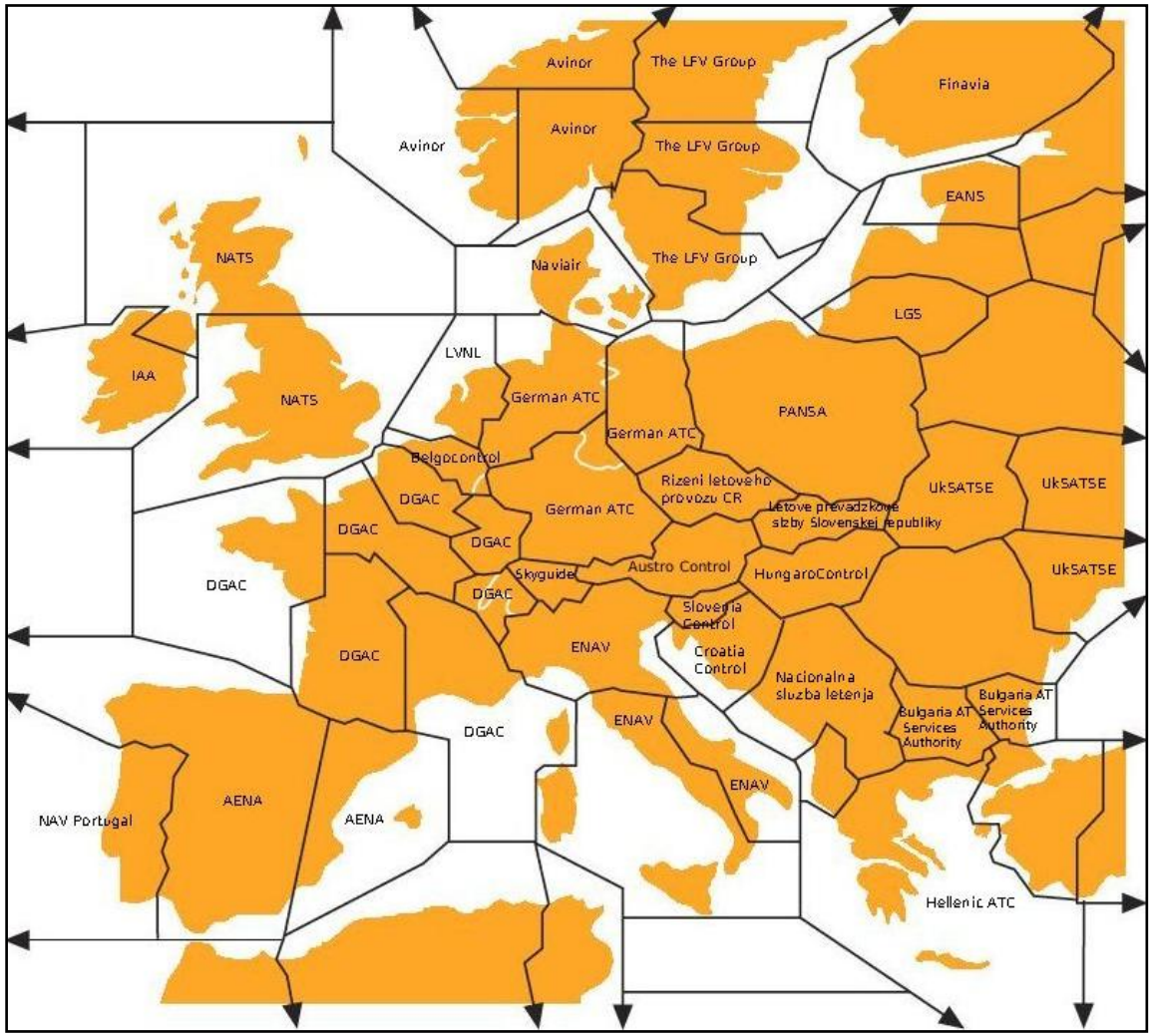
→The challenging task for the future will be to **decouple** emissions from passenger growth as well as from economic growth.

→ Possible solution: **Single European Sky** (SES) **?**

European air traffic control network – current status

- **International Commission for Air Navigation (ICAN) since 1919**
  (Source: Arndt, 2004)
  - Created to develop general rules for air traffic and air traffic control
- **Further attempts to unify the network since then (especially in the 1960s)**
- **Current situation in Europe (Source: Lufhansa, 2006):**
  - 25 civil air traffic control agencies including
    - ⇨ 58 control centres and
    - ⇨ 22 operating systems

European air traffic control network – current status II



Source: Own composition based on Lufthansa, 2006

European air traffic control network – future vision

Single European Sky (SES)

- Overcome the **inefficient situation** in air traffic control
- **Objective**: create a single traffic control system independent from national borders
- First ideas since 1960s when **EUROCONTROL** has been founded
  - ⇨ European Organisation for the Safety of Air Navigation (EUROCONTROL)
  - ⇨ Its major objective is to establish a **single upper sky** which enables the efficient use of airspace
  - ⇨ Avoid detours and holding patterns which results in addition kerosene consumption
- SES **legislation** launched by the European Commission in March 2004 but implementation still missing and far from realisation

⇨Optimised flight routes enable reduction potentials also for CO_2 emissions

unified ATC → optimised and shorter routes → lower emissions

CO_2 emission reduction potentials by optimising flight routes – background of the approach

In our calculation of CO_2 emission potentials we

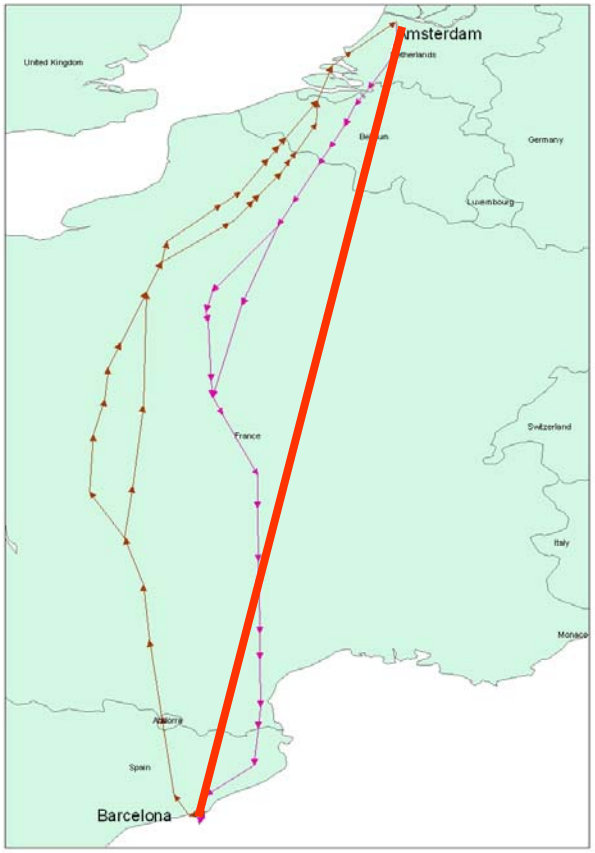
- assume that aircrafts consume a constant amount of kerosene per km between origin and destination,
- thus **only the length of the flight routes** is determining CO_2 emissions.

⇨ **We are comparing current flight routes with the shortest possible connection, the bee-line.**

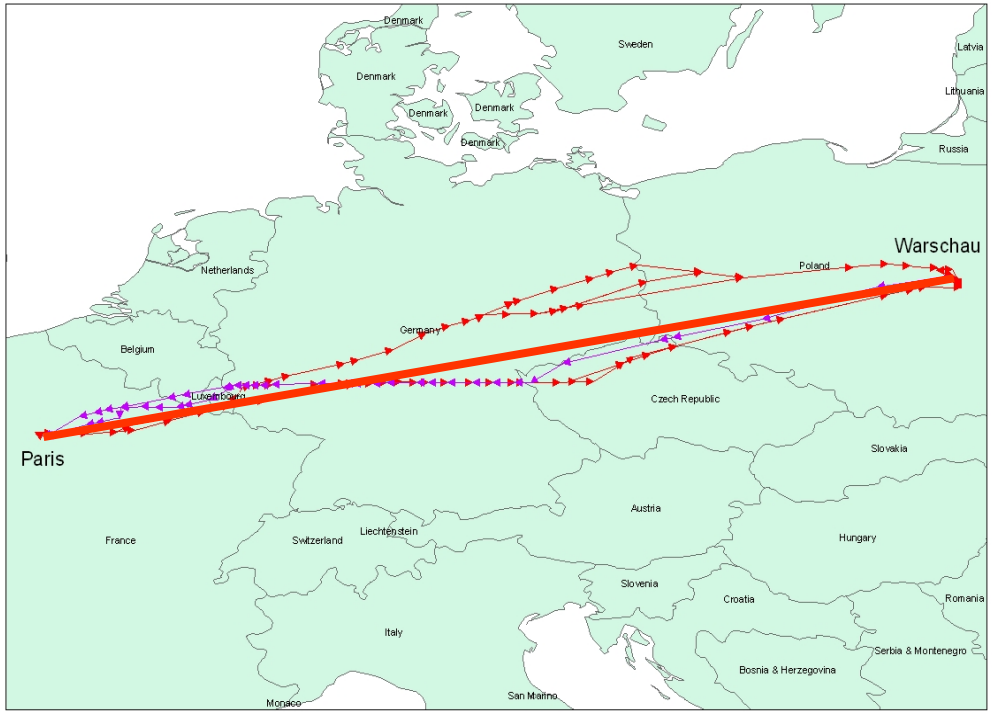
As the bee-line is in reality very unrealistic (also with a Single European Sky) our approach can be interpreted as an optimistic estimation of the upper CO_2 reduction potential of the SES.

CO_2 emission reduction potentials by optimising flight routes – routes under consideration

Barcelona - Amsterdam

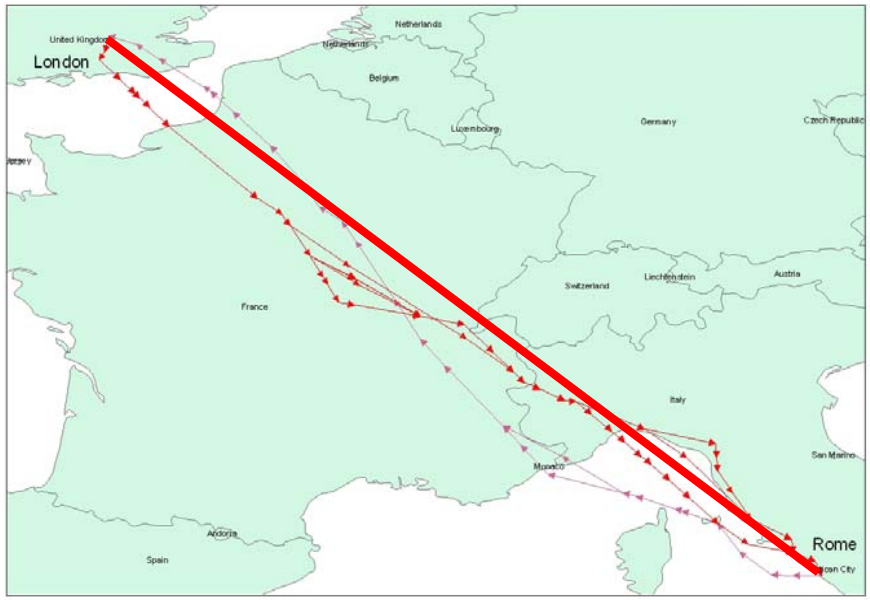


Paris - Warsaw



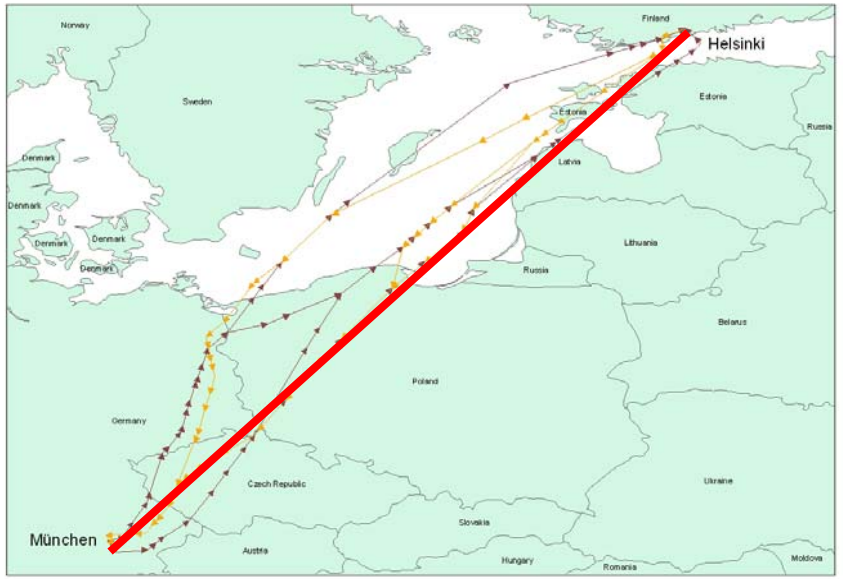
Analysis is based on more than 6,000 flights in August 2007
Data has been provided by EUROCONTROL (Special thanks to Patrick Tasker)

CO_2 emission reduction potentials by optimising flight routes – routes under consideration



London – Rome

Munich – Helsinki



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CO_2 emission reduction potentials through optimising flight routes - the calculation

- Current flight routes data include latitude and longitude as well as the flown real distance
- Shortest distance has been calculated for each pair of airports by using GIS software

Origin	Destination	Savings [%]
Munich (MUC)	Helsinki (HEL)	5
Helsinki (HEL)	Munich (MUC)	8
London (LHR)	Rome (FCO)	9
Rome (FCO)	London (LHR)	6
Amsterdam (AMS)	Barcelona (BCN)	8
Barcelona (BCN)	Amsterdam (AMS)	9
Warsaw (WAW)	Paris (CDG)	5
Paris (CDG)	Warsaw (WAW)	9

→ Savings **can be achieved** by implementing a Single European Sky
→ Level of saving dependent on location of origin and destination, the total distance and the number of overflown ATC zones
→**Average saving is only 7.4% (the average passenger growth rate in the EU 25 was 8.5% in 2005)**

Conclusion

Effects of SES on emission reduction potential

- Significant **reduction** in trip length and therefore on emissions
- **Optimised** schedules with less congestion are possible
- Some **savings** seem feasible

→ **Positive aspects on a short term view**

Long term perspective:

→ Costs of operation will decrease (savings in kerosene),

→ Competition will lead to lower prices,

→ Demand will increase,

→ **Energy consumption will go up again!**

→ To reduce external effects additional measurements are necessary beside SES, e.g. **emission trading system** (covers total economy and leads to a better allocation of resources)

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Feedbacks are welcome!

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