

AIR TRAFFIC CONTROL IN DENSELY AND THINLY POPULATED AREAS: SIMILARITIES AND DIFFERENCES

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Setting the scene

The European experience:

- ▶ Is density of population really an issue?
- ▶ Should we not better speak about
 - ✓ short distances between national hubs
 - ✓ complexity of airspace
 - ✓ fragmentation of systems
 - ✓ the looming challenge of new entrants (E.g. drones, urban mobility...)?
- ▶ What are the European issues and how can they be addressed?

Airports with most movements are often not in most densely populated areas

2017 statistics

[Airports Council International](#)'s final full-year figures

Rank ↕	Airport ↕	Location ↕	Code ↕	Total Movements ↕
1.	 Hartsfield-Jackson Atlanta International Airport	Atlanta, Georgia, United States	ATL/KATL	879,560
2.	 O'Hare International Airport	Chicago, Illinois, United States	ORD/KORD	867,049
3.	 Los Angeles International Airport	Los Angeles, California, United States	LAX/KLAX	700,362
4.	 Dallas/Fort Worth International Airport	Coppell, Euless, Grapevine, and Irving, Texas, United States	DFW/KDFW	654,344
5.	 Beijing Capital International Airport	Chaoyang-Shunyi, Beijing, China	PEK/ZBAA	597,259
6.	 Denver International Airport	Denver, Colorado, United States	DEN/KDEN	574,966
7.	 Charlotte Douglas International Airport	Charlotte, North Carolina, United States	CLT/KCLT	553,817
8.	 McCarran International Airport	Paradise, Nevada, United States	LAS/KLAS	542,994
9.	 Amsterdam Airport Schiphol	Haarlemmermeer, North Holland, Netherlands	AMS/EHAM	514,625
10.	 Shanghai Pudong International Airport	Pudong, Shanghai, China	PVG/ZSPD	496,774
11.	 Charles de Gaulle Airport	Paris, France	CDG/LFPG	482,676
12.	 London Heathrow Airport	London, England, United Kingdom	LHR/EGLL	475,915

Note: Atlanta population is 486 290 in 2017, Georgia is about 10 Million

➔ The airport with most movements is a hub in a relatively small city in an average-populated USA State, not a metropolis

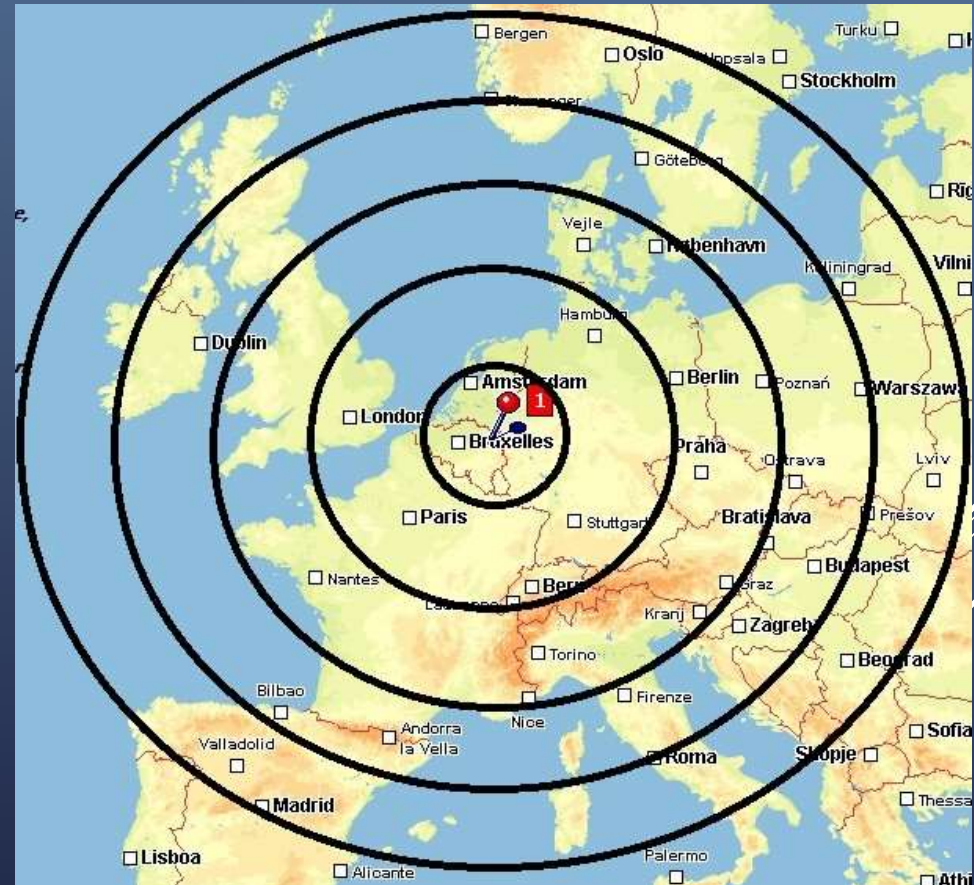
Cities proper by population

Rank ↕	City ↕	Image ↕	Population ↕
1	Chongqing		30,165,500 ^[9]
2	Shanghai		24,183,300 ^[9]
3	Beijing		21,707,000 ^[10]
4	Istanbul		15,029,231 ^[11]
5	Karachi		14,910,352 ^[13]
6	Dhaka		14,399,000 ^[15]
7	Tokyo		13,515,271 ^[17]
8	Moscow		13,200,000 ^[18]
9	Guangzhou		13,081,000 ^[22]
10	Shenzhen		12,528,300 ^[23]

The European specificity is that the capital cities are very close to each other



20 of the 28 EU capital cities are 1250 km or less from Brussels

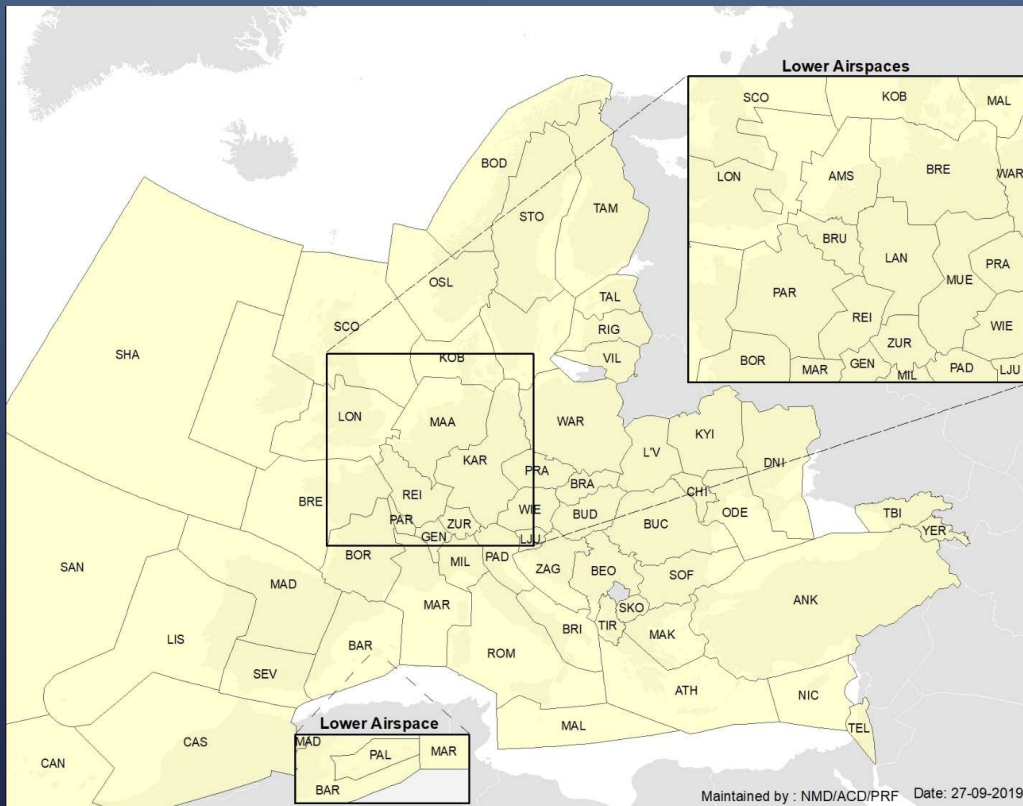


Europe needs to accommodate a very dense and growing traffic

The NATS logo is centered within a black rectangular box. The word "NATS" is written in a white, bold, sans-serif font. The 'N' is stylized with a slight curve at the top. To the right of the black box, there are several white diagonal lines of varying lengths and thicknesses, extending from the top right towards the bottom left.

NATS

European challenge is the large number of imbricated States



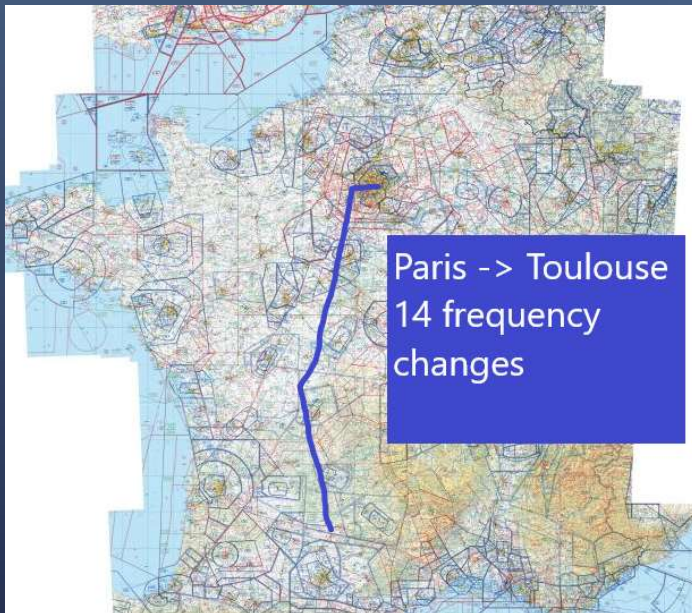
Eurocontrol

- ❑ 41 Member States, typically each with its own ANSP
- ❑ About 63 Area Control Centres (ACC)
- ❑ Over 700 sectors when at full capacity
- ❑ Approx. 17000 Air Traffic Controllers
- ❑ Approx. 41000 other staff
- Total employees 58000
- Total revenue per year B€10 per year (en-route plus terminal charges)



Article 1 Chicago Convention: complete and exclusive sovereignty over airspace above national territory

Complexity is the key word



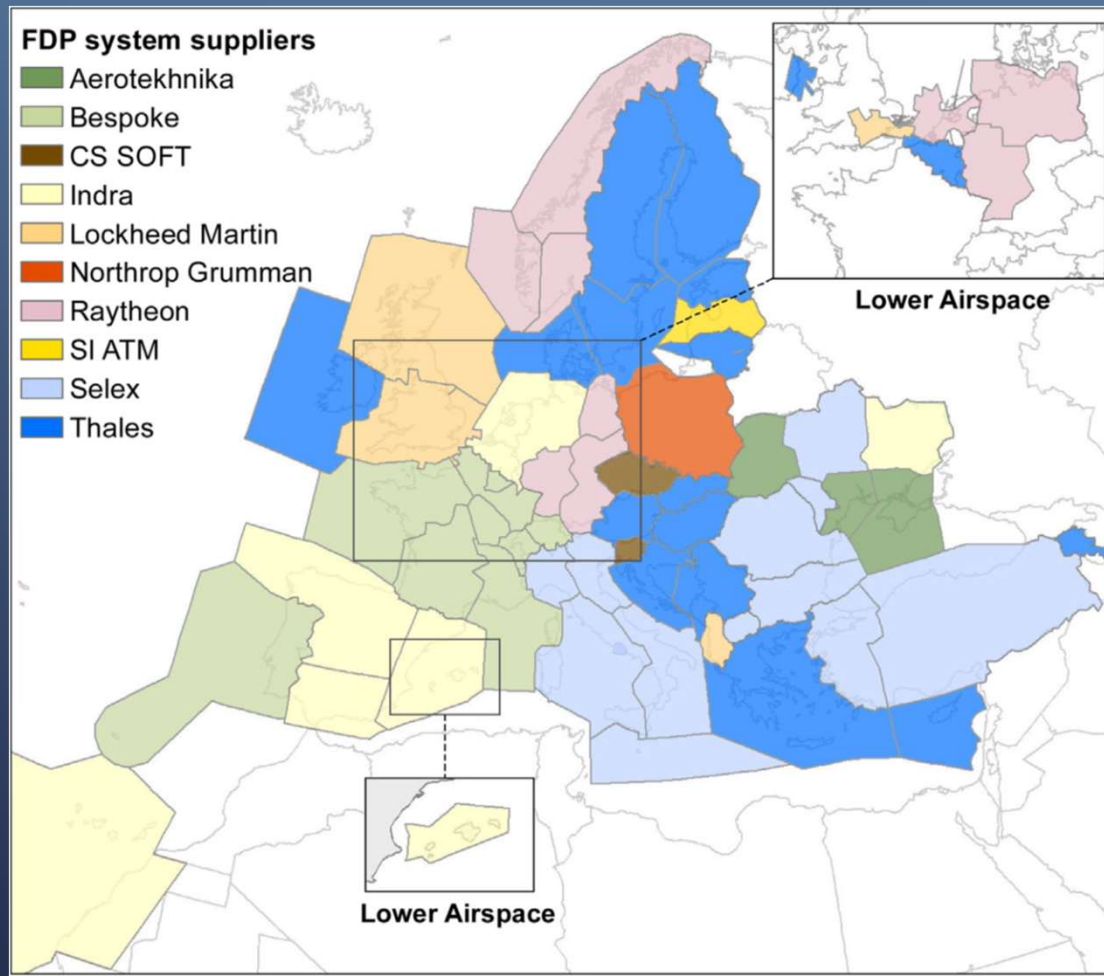
Source Airbus



Credit Christian Riehoff / science photo library

Air traffic over Europe, computer artwork

- ❑ Visualisation based on the flight schedules of over 30 airlines
- ❑ Vertical words are names of airports
- ❑ The height of the airport name represents the number of departures
- ❑ The lines connecting the airports represent the flight route
- ❑ This shows the progress of 4,720 flights at one particular moment during the day.
- ❑ The projection is from a high arctic latitude viewing south



Source: Performance Review Commission, 2014

... And also the fragmentation of systems

The upcoming challenge: The new entrants in the system

Today, thousands of aircraft in the sky

Traditional piloted aircraft & rotorcraft with limited connectivity



Today's capacity crisis is already showing the limits of the current system



Tomorrow, hundred of thousands of connected flying devices in the sky

Connected & more autonomous aircraft



Future traffic and growing environmental concerns call for more radical transformation of ATM

The game changer: the new entrants, generating more and more complex traffic flows of heterogeneous flying objects (1/2)

Today's air traffic evolution over Paris



The game changer: the new entrants, generating more and more complex traffic flows of heterogeneous flying objects

Future (2035) air traffic evolution over Paris

Increased traffic levels and new forms of unmanned traffic will lead to unprecedented levels of heterogeneity and complexity in ATM, requiring further automation to ensure a cost-efficient system with safety at or above current levels

Europe's key goals: Digitalisation, connectivity, scalability

The European endeavour is to

- ✓ Accommodate the planned traffic growth,
- ✓ Overcome the problems caused by complexity and fragmentation of the skies,
- ✓ Successfully address the integration of new entrants in the system,
- ✓ whilst improving further the overall performance and safety,

Through digitalisation of the European Aviation infrastructure, to enable

- ✓ decoupling infrastructure from service provision,
- ✓ fully interoperable, modular and scalable system(s),
- ✓ dynamic cross-border service provision and “capacity on demand”

Thank you for your attention!