Digital transformation of aviation

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SESAR Joint Undertaking

18th May 2018

SESAR

SECURITY
- Ensuring high levels of security

COST EFFICIENCY
- Up to **40%** reduction in air navigation services costs per flight

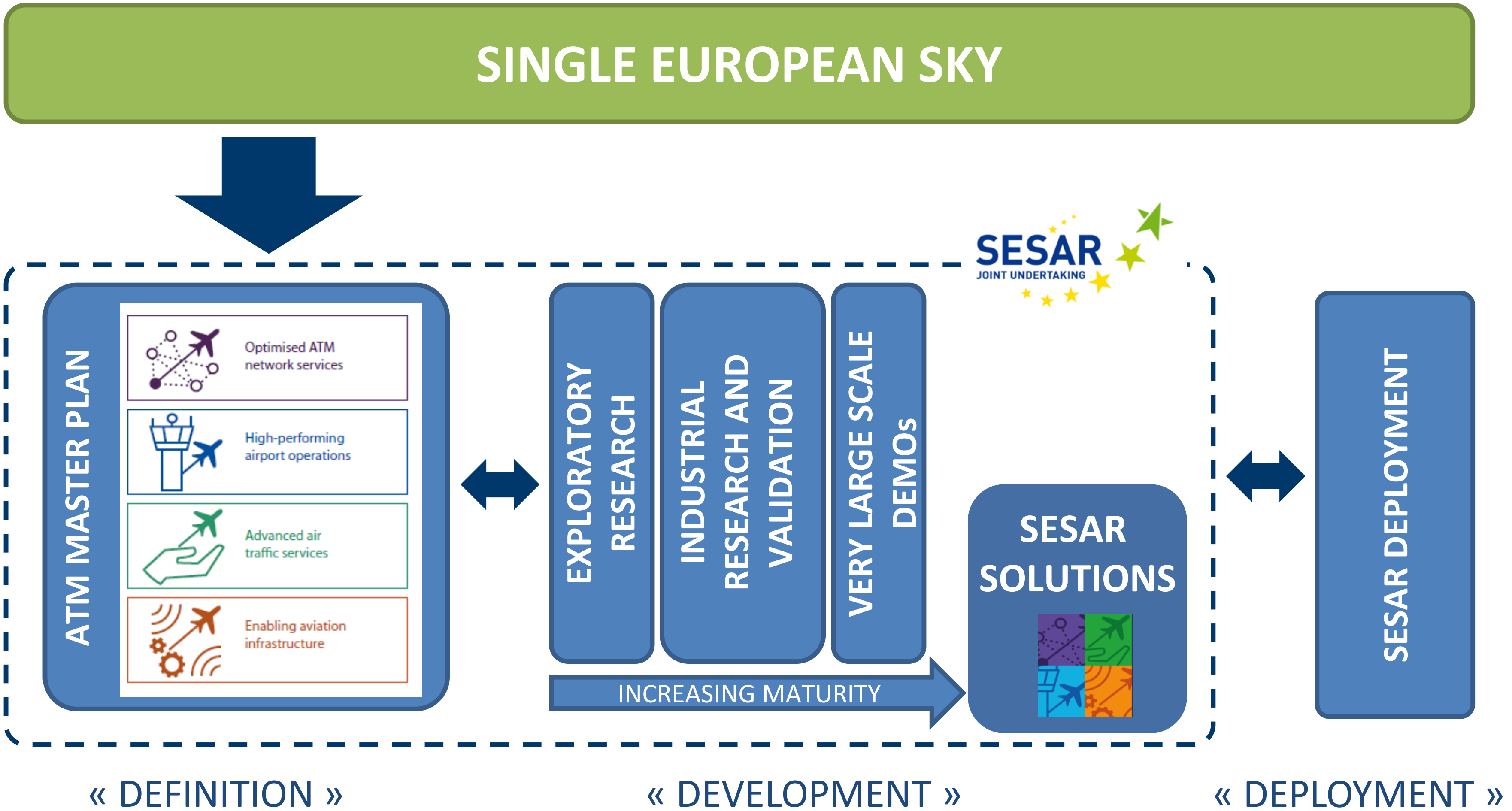
CAPACITY
- Up to **30%** reduction in departure delays
- Up to **10%** additional flights landing at congested airports
- A system capable of handling up to **100%** more traffic

ENVIRONMENT
- Up to **10%** reduction in CO_2 emissions
- Positive impact on noise and air quality

OPERATIONAL EFFICIENCY
- Up to **6%** reduction in flight time
- Up to **10%** reduction in fuel burn

SAFETY
- Improvement by up to a factor of **4**

The SESAR Factory



Digitalisation in already “ON”: examples

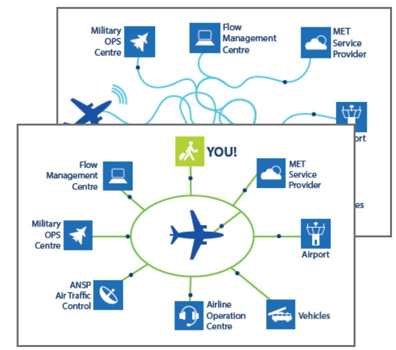
Remote tower and virtual center

Satellite connectivity

AR for ATC

AR and SR in the cockpit

U-space



IP Network

Big Data

AI and Machine Learning

Infrastructure as a service

"A Digital Sky": the necessary step to build an infrastructure suited for the future of aviation

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Today, thousands of aircraft in the sky

Traditional piloted airplanes and rotorcrafts with limited connectivity

Airspace is mainly occupied by traditional manned aviation

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

Connected airplanes and rotorcraft, drones, air taxi & services and urban air mobility

Digital Aviation infrastructure to enable all air operations

Source: Pictures from Airbus, Uber

In addition, safely managing the future controlled traffic (both manned and unmanned) will be economically unviable at current productivity levels

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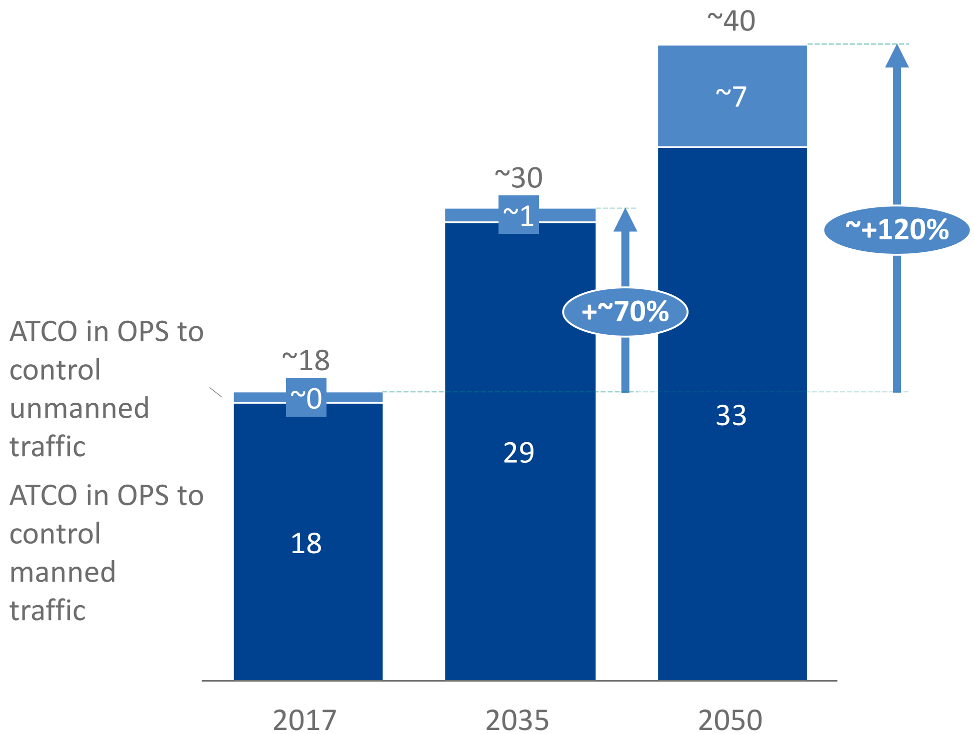
Key assumptions

- **Only controlled traffic taken into account**
- **ATCO OPS workforce** in 2017 under ACE benchmark scope[1]
- **Constant productivity** for terminal and en-route ATCOs[2]
- **Growth in workforce** hence equal to growth in flight hours in controlled airspace[3]

1 En-route: ~10,600 FTE; Terminal: ~7,500 FTE
2 And at similar level for manned and unmanned
3 En-route: driven by growth in total (manned and unmanned) flight hours; Terminal: driven by growth in manned flight hours

ATCO OPS workforce required to maintain capacity at current level of productivity, Thousand FTE



Controlled airspace only (manned + unmanned)

- **At current technology and productivity, number of ATCO will need to increase substantially going forward**
- Given the **order of magnitude of the increase,** the unsustainability is **largely independent of the exact traffic forecast** used
- Safely managing this future traffic will be **economically unsustainable** given
  - **Cost implications**
  - **Limited gains in efficiency** (airspace elasticity)
- **Infrastructure limitations will worsen the case**

SOURCE: SESAR Drone – Supporting presentation to final report, SESAR (2016), ATM Cost-Effectiveness (ACE) Benchmarking Report (2015), Challenges for growth report with LT forecasts for IFR lights, Eurocontrol (2013)

The increase complexity and heterogeneity in traffic beyond 2035 call the end-state of SESAR to be driven by automation and connectivity

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Key developments beyond 2035

Disruptive growth in traffic size

- Tens of millions of **digitally connected** flights in the airspace in 2050
  - **19 millions traditional** (IFR) flights
  - **85 million unmanned** flights

Interactions not necessarily driven by human

- Interactions **not necessarily driven by human** e.g.,
  - **Singe Pilot Operations**
  - **Urban Air Mobility**
  - **Cargo drones**

Unprecedent level of heterogeneity and complexity

- Those developments will lead to **unprecedented level of heterogeneity and complexity²**

Key drivers of end-state of SESAR

Preserving capacity of the controlled airspace requires dramatic transformation

This unprecedented level of heterogeneity and complexity will require further

- **Automation**
- **Connectivity**

to ensure a **scalable, cost-effective system** with **safety at or above current levels**

Air and ground automation

Connectivity

SESAR 2020: next wave of digital transformation

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60+ projects underway

Exploratory research, industrial research, demonstrations

- Virtual technologies
- Mobile, terrestrial & satellite-based communications
- Digital & automated tools
- Higher levels of autonomy & connectivity
- Video, synthetic & enhanced sensor tech
- Big data analytics & open source data usage
- System modularity
- System flexibility


Towards a Digital European Sky
#DigitalTransport

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