Digital transformation of aviation

Marouan CHIDA
Digital Transformation & Innovation Manager
SESAR Joint Undertaking
18th May 2018
An Aviation Strategy FOR EUROPE

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

SAFETY
- Improvement by up to a factor of 4

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

ENVIRONMENT
- Up to 10% reduction in CO₂ emissions
- Positive impact on noise and air quality
The SESAR Factory

SINGLE EUROPEAN SKY

ATM MASTER PLAN
- Optimized ATM network services
- High-performing airport operations
- Advanced air traffic services
- Enabling aviation infrastructure

EXPLORATORY RESEARCH

INDUSTRIAL RESEARCH AND VALIDATION

VERY LARGE SCALE DEMOS

INCREASING MATURITY

SESAR SOLUTIONS

« DEFINITION »

« DEVELOPMENT »

« DEPLOYMENT »
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

Today, thousands of aircraft in the sky

Traditional piloted airplanes and rotorcrafts with limited connectivity

Airspace is mainly occupied by traditional manned aviation

Source: Pictures from Airbus, Uber

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

Key assumptions

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

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

- 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


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

Key developments beyond 2035

- 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** e.g.,
  - Single Pilot Operations
  - Urban Air Mobility
  - Cargo drones
- Those developments will lead to an **unprecedented level of heterogeneity and complexity**²

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

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