SESAR – Delivering Digital Remote Tower Solutions

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Agenda

• Introduction to SESAR
• Delivered SESAR Remote Tower Solutions and Past Demonstration Activities
• Ongoing SESAR Remote Tower Industrial Research and Exploratory Research Activities
• Conclusion
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SESAR lifecycle

Definition
- European ATM Master Plan

Development
- SESAR Solutions
- SESAR 2020
- Exploratory research
- Industrial developments
- Very large-scale demonstrations

Deployment
- Deployment Programme
The power of partnership

founding members

AIRBUS
AT-One
B4 CONSORTIUM
COOPANS
DASSAULT AVIATION
DFS Deutsche Flugsicherung
dgac
ENAIRE
Enav
FREQUENTIS SESAR PARTNERS
Honeywell
Indra
Leonardo
NATMIG
NATS
SEAC
skyguide
THALES

SESAR – Delivering Digital Remote Tower Solutions
SESAR 1 (2008-2016)

1 unique public-private partnership

2 founding members

+60 research organisations
Universities/SMEs/research centres

15 industry members

+20 million hours of work

+60 technical & operational solutions

+30,000 flight trials

+90 prototypes

+3,000 ATM experts

+100 companies

+350 validations
The SESAR 2020 pipeline to innovation

3 research strands

- **EXPLORATORY RESEARCH**
- **INDUSTRIAL RESEARCH**
- **LARGE-SCALE DEMONSTRATION**

**Budget:** EUR 1,6 billion  
**Timeline:** 2016-2024  
**Calls:** open and closed

Visit the SESAR Solution portal: sesarju.eu/activities-solutions
A changing world

Traffic growth
- World’s population to grow to ~9.7B in 2050
- Reduced share of Europeans (~7%)
- Two thirds in urban areas & new middle class
- Emergence of megacities
- Increased need for mobility

Technology disruption
- Augmented/virtual reality/Internet of things/drones
- Entry of digital players
- Accelerated technology lifecycle

Customer expectations
- Hyper or 'always-on' connectivity
- Personalised, data-driven customer experience
- Door-to-door service capabilities.

Automation
- Application of machine learning & mobile robotics
- Changing role of human
- Enriching talent pool

Global competition
- Reshaped with new global leaders (China, India)
- Growing influence of non State players (e.g. Google, Amazon, Facebook and alike)
What does this mean for aviation?

- **High performing connected aircraft**
  - Industry is constantly developing and improving its products in response to competition
  - New entrants in a global market drive innovation
  - Technology lifecycles are accelerating

- **Optimised airline operations**
  - Competition leads to improvement of services while putting pressure on costs
  - Mobility as a service to passenger vs. air transport

- **An ecosystem that will have to adapt**
  - Technology, regulation and policy are key drivers
  - Management of information at the core of the system
  - Reform while leading change is our major challenge
The SESAR digital transformation

**SESAR Innovations**

**Virtualisation**
- Virtual & Augmented Reality
- Virtual Centres
- Remote Tower

**Connectivity**
- Cockpit evolution
- U-Space

**Data sharing**
- Collaborative Airport and Network
- Digital Aeronautical Information (AIM-MET)
- Flight object sharing (IOP)
- Cloud based drone information management

**Coming Next**

**Defragmented European Sky**
- All weather operations
- CNS as a service
- Resilient operations

**Pan European service provision capability**
- Fully Dynamic Airspace
- Pan European Mobility of staff
- Hyper Connectivity for High Automation
- Next generation links
- Internet of Things for aviation
- Future Data services and applications
- Interconnected Network
- Passenger centric ATM
- Advanced analytics for decision making
- Open Data
- Multimodality

**New standards for safety and security**
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Small or local airports are a life-line for a local economy, however they cannot always afford to operate a control tower around the clock. SESAR’s remote tower services offer the means to provide air traffic services in a cost-efficient way to such airports, as well as non-towered ones.

BENEFITS

- Increased cost efficiency
- Increased accessibility to and support for regional economies

In 2014, the world’s first remotely-operated tower was opened at Örnsköldsvik, controlled remotely from Sundsvall centre over 150 km away.

Operational standards for remote tower services currently match those for real operations and approval is based on the same service delivery requirements as existing ICAO rules.
Solution #71 Final Validations

1st V3 shadow mode trial of a ‘Single Remote Tower’
- Ängelholm airport TWR ATS from Malmö airport, Sweden
- Q4 2011

2nd V3 shadow mode trial of a ‘Single Remote Tower’
- Ängelholm airport TWR ATS from Malmö airport, Sweden
- Q2-Q3 2012

V3 shadow mode trial of a ‘Single Remote AFIS’
- Værøy airport AFIS from Bodø airport, Norway
- Q4 2012 / Q1 2013
Remote Tower For Two Low-Density Aerodromes

Having proved controllers can provide air traffic control services to an airport remotely, SESAR validated the feasibility of providing simultaneous services to two airports from a single location.

SJU references:
#52 / Release 4

BENEFITS
- Operational and technology-related cost efficiency

Multiple remotely controlled airports contribute to SESAR cost-efficiency performance targets
Solution #52 Final Validations

V2 real time simulation of 3 small remote ATS
- Ängelholm, Halmstad and Kristianstad airports, Sweden
- February 2014

V2 shadow mode of 2 small remote ATS
- Örnsköldsvik and Sundsvall airport TWR ATS from Sundsvall airport, Sweden
- September 2014

V3 shadow mode of 2 small AFIS
- Værøy heliport and Røst aerodrome from Bodø, Norway
- December 2014
Remotely-Provided Air Traffic Services For Contingency Situations At Aerodromes

Security alerts can shut down control towers. How does the airport ensure minimum disruption in an emergency? This question has been addressed by SESAR looking at contingency situations for airports.

**BENEFITS**

- Increased cost efficiency
- Improved resilience in degraded situations

Contingency towers deliver increased operational resilience for medium-sized airports

Building infrastructure off-site is more cost-efficient, and easier to maintain

**STAKEHOLDERS**

- ANSP
- AO
- AU
- NM

**SJU references:**

#13 / Release 5
Solution #13 Final Validations

V3 shadow mode contingency operations
- Göteborg Landvetter airport, Sweden
- March 2015

V3 shadow mode contingency operations
- Girona airport, Spain
- November 2015
Conventional control towers are expensive to operate and maintain, and even at a medium-sized airport can become too costly if the number of flights is insufficient to cover the running costs. SESAR’s remote tower services offer the possibility to enhance safety and efficiency at airports where it is too expensive to build, maintain and staff conventional tower facilities and services. The solution is already deployed at small airports, and is under test at medium-sized airports.
Solution #12 Final Validations

V3 shadow mode
- Saarbrücken airport from Saarbrücken, Germany
- January 2016

Demo, shadow mode
- Saarbrücken airport from Saarbrücken, Germany
- August 2016

Demo, live trials
- Groningen airport Eelde from Schiphol, The Netherlands
- September 2016

Demo, live trials
- Cork and Shannon airports from Dublin, Ireland
- Q2/Q3 2016
ENAV led 2-years project aiming at demonstrating:

- The provision of ATC services to a single runway aerodrome from a remote location, under given operational conditions and technical assumptions (low traffic conditions, good weather condition)
- The sharing of ATS services for Multiple airport, under given operational conditions and technical assumptions (low traffic conditions, good weather condition)
- *Acceptability/flyability of RNP-APCH (APV-BARO and PInS) procedures and GNSS monitoring*
Large Scale Demonstration – RACOON

Remote airport: Milan Linate

Remote airport: part of Milan Malpensa

Physical airport: Milan Malpensa

RACOON RTC – Milan Malpensa

All scenarios in low traffic, nominal conditions, good weather and day & night
Large Scale Demonstration – Remote Towers

IAA led 2-years project aiming at demonstrating the provision of air movements control and surface movement control for Cork and Shannon airports remotely from the Dublin Air Traffic Control Centre in multiple aerodrome configuration using remote tower technology.

Incremental approach:
• Surface movements then air movements
• Vehicles then aircraft
• Single then multiple
Large Scale Demonstration – RTO

LVNL led 2 years project aiming at demonstrating that:

• It is possible to provide a basic solution for RTC with a reduced number of screens displaying a reduced view (full view selectable) and with a less complex CWP
  • Leader: LFV
  • Single remote tower (AFIS for a very small aerodrome)
  • Passive shadow mode
  • RTC: Sundsvall, Sweden
  • Remote airport: Gällivare, Sweden
LVNL led 2 years project aiming at demonstrating that:

- Remote ATS can be provided to a medium size airport in an operational and technical environment
  - Leader: DFS
  - Single remote tower (ATS for a medium sized airport)
  - Passive shadow mode then live trials
  - RTC: Saarbrücken, Germany
  - Remote airport: Saarbrücken, Germany
Large Scale Demonstration – RTO

LVNL led 2 years project aiming at demonstrating that:

• Remote ATS can be provided to a medium size airport in an operational and technical environment

• Remote ATS can be provided to a medium size airport in an operational and technical environment and a small size airport simultaneously in a simulated environment
  
  • Leader: LVNL
  
  • Single remote tower (ATS for a medium sized airport) & multiple remote tower (ATS for a small and a medium airport)
  
  • Live trials & real time simulation
  
  • RTC: Schiphol airport, The Netherlands

• Remote airports: Groningen Airport Eelde (live trials) and Maastricht Aachen Airport Beek (simulated)
Large Scale Demonstration – Budapest 2.0

PildoLabs led 2 years project aiming at demonstrating how the implementation of new solutions and concepts developed within SESAR can contribute to improve operations, and provide most cost-effective business models for small/medium airport stakeholders and airspace users. These solutions include:

- Single Remote Tower Operations For Medium Traffic Volumes
  - Shadow mode then live trials for one then two runways of Budapest airport
  - 586 aircraft controlled during live trials
- *CDO enhancement tool*
- *RNP-based operations*
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SESAR 2020 PJ05 – Remote Tower Beneficiaries
Remotely Provided Air Traffic Service for Multiple Aerodromes

Provision of Aerodrome Control Service or Aerodrome Flight Information Service for more than one aerodrome by a single ATCO/AFISO from a remote location. The ATCO (or AFISO) in this facility performs the remote ATS for the concerned aerodromes. It includes further development of the CWP and MET information from multiple airports. This solution goes beyond the scope of solution #52 (two small aerodromes).
Remotely Provided Air Traffic Services from a Remote Tower Centre with a flexible allocation of aerodromes to Remote Tower Modules

Provision of remote tower services to a large number of airports with a flexible and dynamic allocation of airports connected to different RTM over time. It includes the development of RTC supervisor and support systems and advanced automation functions for a more cost efficient solution, integration of approach for airports connected to the remote centre and connections between RTCs with systems for flow management between remotely connected airports and development of tools and features for a flexible planning of all aerodromes connected to remote tower services.
MOTO – the embodied remote tower

The overall objective of the project was to **identify** the key multimodal stimuli required on RTO to enhance the sense of presence experienced by ATCOs.
In the RETINA concept, controllers are no longer limited by what the human eye can physically see out of the tower windows.

As trust in digital data will continue to grow, RETINA’s concept allows the controller to have a head-up view of the airport traffic even in low visibility conditions similar to the synthetic vision currently used in the cockpit.

RETINA builds upon the technologies developed in SESAR, such as remote tower, safety nets, SWIM, to provide augmented reality tools for the tower controller.
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Conclusion

- Remote tower is part of the digital transformation needed to sustain the future of European aviation
- It supports the regional connectivity the European citizens are entitled to
- Several SESAR remote tower solutions are ready for deployment
- R&D continues to explore new safe, cost efficient and resilient solutions
SESAR – Delivering Digital Remote Tower Solutions
Thank you very much for your attention!

For more information: https://sesarju.eu/