

**Release 4 SESAR Solution #52**  
**Remotely Provided Air Traffic Services for Two Low Density Aerodromes**

***Contextual note – SESAR Solution description form for deployment planning***

***Purpose:***

*This contextual note introduces a SESAR Solution (for which maturity has been assessed as sufficient to support a decision for industrialization) with a summary of the results stemming from R&D activities contributing to deliver it. It provides to any interested reader (external and internal to the SESAR programme) an introduction to the SESAR Solution in terms of scope, main operational and performance benefits, relevant system impacts as well as additional activities to be conducted during the industrialization phase or as part of deployment. This contextual note complements the technical data pack comprising the SESAR deliverables required for further industrialization/deployment.*

**Improvement in Air Traffic Management (ATM)**

The Remote Tower concept enables Air Traffic Control (ATC) services and Aerodrome Flight Information Services (AFIS) to be provided at aerodromes where such services are either currently unavailable, or where it is difficult or too expensive to implement and staff a conventional manned facility.

The main change to today's current operations is that the ATC Officer (ATCO) or AFIS Officer (AFISO) will no longer be located in a conventional tower facility but can be located, either locally or remote to the aerodrome, in a Remote Tower Module (RTM) and possibly placed in a Remote Tower Centre (RTC) facility. The aerodrome view is captured by cameras and reproduced in the RTM. The visual presentation of the aerodrome view can be augmented with information from additional sources/sensors and enhanced through technology, for use in all visibility conditions. In addition, the controllers will have access to all necessary controls, including communications, lighting and traffic light controls, and access to flight and meteorological information.

This Solution is to remotely provide ATC services and AFIS for two low-density aerodromes, typically with traffic schedules comprising single movements, rarely exceeding two simultaneous movements per aerodrome. The basic configuration, which does not include augmentation features, is considered suitable for ATC and AFIS provision at these low density airfields. However, the level and flexibility of service provision can be enhanced through the use of augmentation technology, such as an ATC surveillance display, surveillance and visual tracking, infra-red cameras etc. Normal ATCO/AFISO practices allow the levels of simultaneous traffic to be kept manageable through the use of techniques such as holding aircraft at one airfield while a movement at the other is handled. However, some form of advanced planning between the RTM and the wider ATC network may help to smooth the flow, especially for IFR traffic.

## Release 4 SESAR Solution #52

### Remotely Provided Air Traffic Services for Two Low Density Aerodromes

#### Operational Improvements Steps (OIs) & Enablers

SDM-0205<sup>1</sup> - Remotely Provided Air Traffic Services for two low density Aerodromes: Aerodrome Control Service or Aerodrome Flight Information Service for two low-density aerodromes is provided by a single ATCO/AFISO from a remote location, i.e. not from a control tower local to any of the aerodromes. The ATCO/AFISO in this facility performs the remote ATS/AFIS for the concerned aerodromes.

Enablers:

- AERODROME-ATC-54: "Provide a Remote Tower Centre (RTC) position that enables one ATCO to control multiple remote towers simultaneously or in sequence";
- CTE-S02d "Video Surveillance".

#### Background and validation process

The development and validation of the concept and technology followed a stepwise approach, starting from the already validated SESAR Solution #71 - ATC and AFIS service in a single low density aerodrome from a remote CWP.

A series of validation activities involving ATCOs and AFISOs and testing different operating environments proved that the concept was feasible.

The validation process consisted of a multiple (1:3, operator to aerodrome ratio) TWR V2 to V3 Real Time Simulation, a multiple (1:2) TWR V3 Passive Shadow Mode validation and a multiple (1:2) AFIS V3 Passive Shadow Mode validation. All these trials helped to mature the concept and technology for the remote provision of air traffic services for two low-density aerodromes to reach a full V3 maturity.

#### Results and performance achievements

ATCO/AFISOs reported a good level of trust in the concept and systems.

Overall the Out-The-Window (OTW) view received positive feedback especially concerning the resolution, screen size and contrast. Observations indicated that the visual presentation was of a high quality and provided improved accuracy compared to the previous platform versions tested. This was optimized by the filters which the ATCO/AFISOs found beneficial in blocking out the direct sunlight which at times shone directly into the cameras. The ATCO/AFISOs mentioned that the OTW view was even sharper than in a local tower, the Infrared (IR) and Pan Tilt-Zoom (PTZ) cameras contributing to the clarity of the image. The ATCO/AFISOs found the IR and the PTZ cameras useful and intuitive. They considered that these cameras improved their situational awareness both in good and limited visibility. The lowest trust was found in the reliability and robustness of the system. This was due to the technical issues experienced throughout the trial. However this did not seem to impact the ATCO/AFISO's judgement of how useful, accurate and understandable the system was. This led to a high confidence level in the system.

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<sup>1</sup> Integrated Roadmap DS14 (<https://www.atmmasterplan.eu/working>)

## Release 4 SESAR Solution #52

### Remotely Provided Air Traffic Services for Two Low Density Aerodromes

The acceptability of the working methods for operations in both Visual Meteorological Conditions (VMC) and Instrument Meteorological Conditions (IMC) was high. Traffic was successfully controlled under Instrument and Visual Flight Rules (IFR and VFR) in both nominal and non-nominal conditions. Feedback regarding the allocation of roles and responsibilities indicated that they were clear and acceptable. The ATCO/AFISOs felt that there was no difference between the roles or responsibilities when provided remotely compared to when they were provided locally.

Under certain circumstances, the existence of a supervisor could be beneficial, but this will depend on the complexity and characteristics of the deployed sites.

#### Recommendations and Additional activities

The following activities are relevant once transitioned to industrialization (V4):

- Support the development and modification of international standards and regulations;
- Develop appropriate ATCO/AFISO training and manage change to ensure a safe and efficient transition from a physical tower to a remote tower module;
- Ensure ATCO/AFISOs are trained to manage movements at both airfields simultaneously;
- Develop operational and technical procedures to mitigate and manage system failures;
- Develop procedures detailing how information gained from technical enablers and systems can be used in operations, for example regarding the visual and radar tracking and PTZ camera. Performance and limitations should be considered;
- The system should minimise any discrepancy or inaccuracies in information such as radar tracking information. If inaccuracies cannot be minimised then mitigation procedures defining how operators can use this information must be defined;
- The system should be optimised with respect to specific implementation environments; this includes the camera positioning and improvements to the reliability of key features such as visual target tracking, PTZ camera target tracking, the e-strips and HMI aspects;
- Further assessment on the integration of tools into the visual presentation i.e. what tools the HMI should include, based on the operational conditions, the target environment and the ATS being provided.

#### Actors impacted by the SESAR Solution

- AFIS Officer (AFISO)
- Air Traffic Control Officer (ATCO)

**Release 4 SESAR Solution #52**  
**Remotely Provided Air Traffic Services for Two Low Density Aerodromes**

**Impact on Aircraft Systems**

None

**Impact on Ground Systems**

The visual presentation in the Remote Tower replaces the OTW view from the local tower building.

The OTW view is obtained by a number of cameras, mounted on top of a suitably located or designed structure, covering the aerodrome manoeuvring area and (partially or totally) the aerodrome vicinity. Those cameras capture the image at the local aerodrome. It is then reproduced over display screens arranged around the controller.

A mixture of basic and advanced technical features was highlighted as increasing the ATCO/AFISO situational awareness:

- Basic features:
  - Visual display; and
  - Pan-Tilt Zoom (PTZ) camera.
- Advanced Features are features that augment the tools available in the basic configuration and include:
  - ATC surveillance (radar, ADS-B, Multilateration);
  - ATC surveillance tracking (marking a radar target/echo in the OTW, e.g. with a rhomb. To this rhomb a radar label could be coupled, with info such as callsign, altitude/flight level, speed etc.);
  - Background sounds, captured with a microphone and played back in the RTC; and
  - IR camera.
- Advanced Visual Features (AVF) are optional features that enhance vision and operator situational awareness, including during low visibility conditions:
  - Automatic visual tracking: the system tracks moving objects in the visual presentation (OTW) and highlights them, e.g. with a rectangle around the object. This visual tracking overlay increases the ATCO's / AFISO's ability to spot and follow relevant moving objects;
  - Overlay information: The visual presentation may be enhanced with additional overlaid information, such as meteorological conditions (e.g. QNH, actual wind, RVR...), flight information obtained from flight plan data, etc;
  - Additional cameras may be used at selected positions such as hot spots or dead zones not visible from the local tower to enhance the situational awareness of the controller.

**Regulatory Framework Considerations**

## **Release 4 SESAR Solution #52**

### **Remotely Provided Air Traffic Services for Two Low Density Aerodromes**

As International PANS-ATM rule changes are subject to long lead times, new concepts are often endorsed in the first instance by the relevant National Safety Authority (NSA) following standard safety assessment requirements. Then when experience shows that a certain concept is robust and safe and if this concept becomes more and more widespread, the need for new ICAO recommendations or rule changes will be the logical next step. Some countries have already implemented different types of remote ATS (e.g. Japan, Canada and Sweden).

Representatives of the Dutch, Swedish and Norwegian NSAs visited the validation facilities.

EASA is informed about the concept and will request input from European stakeholders regarding licensing of Air Traffic Controllers working at Remote Tower Facilities.

#### **Standardisation Framework Considerations**

The standardisation work is ongoing within EASA and EUROCAE WG-100. The solution data pack will contribute to these standardisation activities.

Aspects that should be addressed at ICAO level should include:

- Requirements for the use of sensors and display technologies to replace visual observation of traffic in the provision of Air Traffic Control and Flight Information Services; and
- Additional requirements for surveillance (radar) and ground/ground communications systems to adapt to the above.

#### **Considerations of Regulatory Oversight and Certification Activities**

In general the impact on regulatory activities will primarily be to update policy, regulation and other working methods to include providing ATS and AFIS from a remote location. Procedures for degraded mode and failure will have to be developed in line with the existing methods. It is reasonable to assume that the same methods or principles will apply regardless of whether insufficient visibility is caused by meteorological factors or by a visual presentation that is for some reason degraded. However, in the case of degraded mode operations, care must be taken to ensure all involved actors are aware of what each other can see. The ATCO/AFISO shall use relevant meteorological information, in accordance with ICAO Annex III and national regulations.

In order to allow the competent authorities to issue the appropriate authorisations to remotely operate aerodrome control or aerodrome flight information service, while ensuring global interoperability, there is a need to have in place ICAO provisions and industry standards which do not currently exist, and which will serve as the basis for national regulatory frameworks on this topic. This regulatory aspect will therefore need assessment and further development before deployment of the remote tower operations.

**Release 4 SESAR Solution #52**  
**Remotely Provided Air Traffic Services for Two Low Density Aerodromes**

**Solution Data pack**

The Data pack for this Solution includes the following documents:

- Regulatory overview;
- OSED & SPR: 06.09.03-D35 Edition 00.06.02 20/11/2015;
- Safety Assessment Report (SAR): 06.09.03-D32 Edition 00.01.01 18/11/2015;
- Human Performance Assessment Report (HPAR): 06.09.03-D28 edition 00.01.01 01/09/2015;
- TS: 12.04.07-D07 edition 00.03.05 24/11/2015.

**Intellectual Property Rights (foreground)**

The foreground is owned by the SJU.