Release 5 SESAR Solution #48

Virtual block control in low-visibility procedures

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.

Improvements in Air Traffic Management (ATM)

The SESAR Solution "Virtual block control in low-visibility procedures" is intended for controllers and builds on the availability of Controller Working Positions (CWPs) in the tower and of improved aerodrome surveillance. It is a ground-based service which allows defining Virtual Stop Bars (VSBs) at pre-defined aerodrome locations where intermediate holding points exist, but where there is no physical stop bar. These virtual stop bars complement the physical stop bars implemented on the aerodrome and may increase the number of blocks which the controller can work with when low visibility procedures are applied and he/she has to perform block control. The status of virtual stop bars, determined according to the clearances given by the controller, is indicated on his/her CWP and the position of aircraft regarding each stop bar, either physical or virtual, is monitored to detect any violation and alert the controller.

Flight crews rely on the visual observation of ground markings, signage or lights available at the intermediate holding point where the virtual stop bar has been set to identify the limit of the clearance given by the controller.

Working procedures for the controllers and the flight crew have to be adapted to ensure that the clearance limits given to fight crews through virtual stop bars are input in the system by the controllers and correctly identified on the ground by flight crews.

The benefits of this SESAR Solution are:

- In **controller performance** because they can rely on a visual display which supports the application of block control procedures and have a reduced workload when monitoring the traffic when low visibility procedures are applied.
- On **safety** as the notification of virtual stop bar infringement will allow controllers to recognize hazardous situations and make any recovery decision in a timely manner.

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Operational Improvement Steps (OIs) & Enablers

The following Operational Improvement is under the scope of SESAR Solution #48:

- AO-0223: Enhanced safety in LVP through use of virtual block control

The following required enablers are supporting SESAR Solution #48:

- AERODROME-ATC-07: Surface movement control workstation equipped with tools for detection and alerting of non-conformance to ATC instructions or procedures for surface movements, including apron and taxiways (partially covered)
- AERODROME-ATC-50: Advanced Controller Working Position (A-CWP) supporting A-SMGCS functionalities (partially covered)
- AERODROME-ATC-67: Surface movement control workstation equipped with tools for management of Virtual Block Control supporting LVP (fully covered)

Applicable Integrated Roadmap Dataset is DS16.

Note: following the conclusions achieved by SESAR 1 on Solution #48, there is a need to consider updating its description in DS17. To this effect, AO-0223 has been requested to be split in versions AO-0223-A and AO-0223-B, with AO-0223-A corresponding to the elements covered in the solution. AO-0223-A will thus be fully covered by this Solution.

This Solution depends on SESAR Solution #02 for the issuance of alerts in case of virtual stop bar infringement.

Background and validation process

Solution #48 has been validated at V2 and V3 maturity levels through a series of three real time simulations conducted in the Milan Malpensa tower environment to demonstrate the operational feasibility of the virtual block control concept through the use of virtual stop bars, to assess utility and usability of the operational concept by controllers and to evaluate the performance benefits offered by this Solution.

Results and performance achievements

The above-mentioned validation exercises have provided the following main findings. From controllers' point of view, the alerting functionality associated to the implementation of Virtual Block Control notifies the controllers about any VSB infringement (with a positive impact on safety level). Controller situational awareness is also improved thanks to the support of the visual display of VSBs and of corresponding control blocks.

The validation activities have shown that safety has been improved for all actors in low visibility conditions.

Recommendations and Additional activities

VSB location and status could be uplinked to the aircraft, so as to be displayed on its Airport Moving Map (AMM). This feature has been investigated in SESAR 1, but has not achieved a sufficient maturity level to retain it in the scope of the Solution proposed for industrialisation. Validation activities have demonstrated the on-board display of VSBs position and status supports pilots' navigation during surface ground operations especially during low visibility conditions and improves their situational awareness.

In order to implement this uplink of VSB information, both the ground and the aircraft data link functions would have to be upgraded to implement the corresponding messages. The Datalink Control and Display Unit (DCDU) will also need to be upgraded in order to display data link messages received from ATC and to allow the flight crew to select and to build answers and requests to ATC. Lastly, the on-board AMM will need to graphically display the position and status of virtual stop bars, thus requiring to manage additional data.

Actors impacted by the SESAR Solution

Airspace Users (Pilots), Tower Ground Controllers.

Impact on Aircraft System

None

Impact on Ground Systems

The A-SMGCS safety net function (SESAR Solution #02) will need to be adapted to consider virtual stop bars in the same way as physical ones and issue alerts in case of violation.

The controller working positions will also need to be upgraded to allow commanding virtual stop bars and displaying their status on the radar display.

Regulatory Framework Considerations

Currently, no regulatory activity is identified specifically for SESAR Solution #48, and the Integrated Roadmap of the European ATM Master Plan does not associate any regulatory enablers to this Solution.

Due to the safety implications of SESAR Solution #48 (reduced spacing between aircraft in low visibility conditions, increased dependency on automation to manage safety critical phases of the flight), it is expected the regulatory needs, in case of its deployment, will be defined by the European Aviation Safety Agency (EASA) through a dedicated Rulemaking Task (currently not identified).

Standardization Framework Considerations

The ICAO guidelines on establishing aerodrome procedures for low visibility conditions (PANS-ATM - Doc. 4444, Manual of Surface Movement Guidance and Control Systems - Doc 9476) should be updated to reflect the possibility to use virtual stop bars to perform block control.

Considerations of Regulatory Oversight and Certification Activities

Although the Virtual Block Control procedures are identical to procedural control with position reporting, the associated added value concerns mainly the provision of a specific alert notifying virtual stop bars infringement. The introduction and the definition of such an alert as part of Airport Safety Nets is something to be considered by EASA and/or National Authorities.

Solution Data pack

The Data pack for this SESAR Solution includes the following documents:

- OFA04.02.01 (Integrated Surface Management) Final OSED; 06.07.02-D46; 00.01.02; 10/11/2016. This document contains the operational requirements of SESAR Solution #48, as part of the new operational service “Virtual Block Control”.
- OFA04.02.01 (Integrated Surface Management) Final SPR; 06.07.02-D45; 00.01.01; 24/10/2016. This document contains the safety and performance requirements of SESAR Solution #48, as part of the new operational service “Virtual Block Control”.
- OFA04.02.01 (Integrated Surface Management) Final INTEROP; 06.07.03-D28; 00.01.00; 16/09/2016. This document contains the interoperability requirements of SESAR Solution #48, as part of the new operational service “Virtual Block Control”.
- Final Technical Specifications for enhanced surface guidance; 12.03.04-D40; 00.02.00; 22/07/2016. This document contains the technical requirements of the surface guidance server supporting this SESAR Solution. However, it has not been

updated after the Release 5 activities. However, due to the closure of SESAR 1, the document was delivered after the verification results were known and after the last validation activities took place but before the results of these validations were published. Therefore, there may be discrepancies between the operational and the system requirements.

- 06.03.01 Validation Report Appendix A: HP Report, 06.03.01-D149, 00.01.01, 14/10/2016. This document contains the evidence gathered through the Human Performance (HP) activities conducted in Release 5 according to the HP assessment process, and the resulting recommendations and requirements.

Intellectual Property Rights (foreground)

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