***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 “Manual Taxi Routing” is intended to be used by flight crews and is independent of any ground systems. It allows them to enter taxi routes (cleared or expected) received by R/T into the cockpit systems via a Multifunction Control Display Unit (MCDU) and have these routes displayed as a graphical path on the aircraft Airport Moving Map (AMM). The manual taxi routing function thus supports the flight crew during taxi operations, with enhanced awareness and with overall guidance regarding their intended route.

Thanks to an Aerodrome Mapping Data Base (AMDB), the taxi route elements entered by the flight crew in the cockpit systems are interpreted and translated into a graphical depiction on the AMM. Once a taxi route is displayed, the flight crew can also modify or delete this route if the taxi clearance is revised or cancelled by the tower controller.

Working procedures for the flight crew shall be adapted to define how the Manual Taxi Routing function is used, notably in conjunction with ATC instructions and in the overall taxi operations.

The benefits of this SESAR Solution are in **flight crew performance** because they can use a visual display which supports the navigation task during the taxi phases of the flight and which increases their overall situational awareness.

**Operational Improvement Steps (OIs) & Enablers**

The following Operational Improvement is under the scope of SESAR Solution #26:

* AUO-0603-A: Enhanced Guidance Assistance to Aircraft on the Airport Surface Combined with Routing in Step 1.

The following enablers are supporting SESAR Solution #26:

* A/C-24: Airport moving map and own aircraft position display in cockpit
* A/C-31a: Controller pilot data link communication (CPDLC) compliant with ATN baseline 2 (FANS 3/C)
* A/C-42a: On-board graphical display of taxi clearance using common air/ground airport database
* Optionally, REG-0200: Safety Targets in Relation to Reductions of Runway Incursions

Applicable Integrated Roadmap Dataset is DS16.

**Background and validation process**

Solution #26 has been tested through a live trial conducted in Milan Malpensa, with an objective to assess the utility and usability of the operational concept by flight crews, and to evaluate the human performance benefits offered by this Solution.

**Results and performance achievements**

The above-mentioned validation exercises have provided the following main findings:

* From pilots’ point of view:
  + situation awareness is improved, especially at the gate in static environment;
  + workload is increased with the use of manual taxi as the HMI maturity and a lack of usability contributed to a lot to pilots having difficulties in using the system.

SESAR Solution #26 clearly provides benefits in situational awareness compared to current operations, especially on complex and/or unknown airports, as it provides the flight crew with a display of the trajectory and the aircraft position along it.

**Recommendations and Additional activities**

The Human-Machine Interface for this SESAR Solution needs to be improved in order to allow the flight crew inputting taxi clearances in a timely manner and with a limited impact on their workload. More use-friendly implementations have to be developed and further assessed through future validation activities.

**Actors impacted by the SESAR Solution**

Airspace Users (Pilots)

**Impact on Aircraft System**

The aircraft’s function will need to be upgraded in order to allow the flight crew inputting, modifying and erasing a taxi route.

The on-board AMM will need to display the graphical path resulting from the interpretation by the system of the taxi clearance input by the flight crew. It relies on an AMDB associated with an Aerodrome Surface Routing Network (i.e. a graph network with nodes and edges modelling taxiway and runway connectivities within an airport). Such an AMDB needs to be compatible with the ARINC 816-3 standard.

**Impact on Ground Systems**

N/A

**Regulatory Framework Considerations**

Currently, no regulatory activity is specifically identified for SESAR Solution #26, and the Integrated Roadmap of the European ATM Master Plan does not associate any required regulatory enabler to this Solution.

As SESAR Solution #26 affects existing certified cockpit systems, it is expected the regulatory needs in case it is deployed will be defined with EASA through a dedicated Rulemaking Task (currently not identified).

**Standardization Framework Considerations**

The existing standards do not need to be updated in order to allow implementing SESAR Solution #26. Applicable standards are:

* RTCA DO-272D/EUROCAE ED-99D: User Requirements for Aerodrome Mapping Information
* RTCA DO-291C/EUROCAE ED-119C: Interchange Standards for Terrain, Obstacle, and Aerodrome Mapping Data
* RTCA DO-342/EUROCAE ED-220: Guidelines for the Verification and Validation of AMDB ASRN for Routing Applications
* ARINC 816-3: Embedded Interchange Format for Airport Mapping Database

**Considerations of Regulatory Oversight and Certification Activities**

N/A

**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; 00.01.00; 08/09/2016. This document contains the operational requirements of SESAR Solution #46, as part of the new operational service “Manual Taxi Routing”.
* OFA04.02.01 (Integrated Surface Management) Final SPR; 06.07.02-D45; 00.01.00; 09/09/2016. This document contains the safety and performance requirements of SESAR Solution #26, as part of the new operational service “Manual Taxi Routing”.
* Release 5 Validation Report; 06.03.01-D149; 00.01.00; 02/09/2016. This document contains the results of the Release 5 Real Time Simulation exercise which has addressed this SESAR Solution.
* WA1 High Level Functional Requirement Definition (FRD) for D-Taxi - Advanced Package - Final Version; 09.13-D47; 00.01.00; 05/04/2016. This document contains the functional requirements Taxi Routing function, including the Manual Taxi Routing configuration corresponding to this SESAR Solution. However, it has not been updated after the Release 5 activities.

**Intellectual Property Rights (foreground)**

The foreground is owned by the SJU.