



# SESAR PJ.18-04b-01

## CONTEXTUAL NOTE TRL6

### Ground Weather Management System (GWMS)

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# [PJ.18-04b]

## IMPROVED MET INFORMATION

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### Abstract

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This TRL6 Contextual note provides SESAR Solution description for the solution Ground Weather Management System and its associated capability and information service proposed by PJ.18-04b.



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# 1 Purpose

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This contextual note introduces the TRL6 solution GWMS in PJ.18-04b Improved MET information. The document presents a summary of the results stemming from R&D activities and contribution to deployment. It provides to any interested reader (external and internal to the SESAR programme) an introduction to the Solution in terms of scope, main benefits, relevant system impacts as well as additional activities to be conducted during the industrialisation phase or as part of deployment. This contextual note complements the technical data pack comprising the SESAR deliverables required for further industrialisation/deployment.

## 2 Improvements in Air Traffic Management (ATM)

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PJ.18-04b designs and develops improved Meteorological information (MET) services and capabilities that generate MET data and provide these data through information services, thereby contributing to enhanced information sharing. The activities of PJ.18-04b were organised with operational use cases in mind. Therefore, the information services were developed based on the need of operational solutions within the SESAR 2020 Industrial Research (IR) programme.

At the end of Wave 1, PJ.18-04b proposes two TRL6 solutions that have been matured in the course of Wave 1. This contextual note presents the solution Ground Weather Management System (GWMS) and the associated Glide Path Wind Profile capability and METForTAM information service.

The GWMS is a follow-up activity of implementing a local instance of the 4DWxCube in SESAR 1. In SESAR 2020, the activity aims to enhance the GWMS capability by making it 'SWIM' compatible for all its output (i.e. developing and implementing the MET-GATE Functional Block for the local instance of 4DWxCube) which therefore has crosslinks to new MET service developments e.g. METForTAM. The provision of METForTAM by GWMS has been designed and validated to be SWIM Technical Infrastructure Yellow Profile compliant using AMQP1.0 messaging. This information service should provide enhanced local MET information (e.g. METEO forecasts and observations) to a specific airport (airport operational centre, APOC).

The new capability Glide Wind Profile has been developed as the provider of glide wind data to the GWMS using mature sources like Radar and Lidar sensors. The purpose is to enhance separation procedures based on the collected wind data.

The developed capability and information service aim at enhancing MET data provision capabilities in order to improve the accuracy and timely delivery of expected Meteorological conditions at an airport. Specifically, supporting the airport operator and other local stakeholders and, in turn, airspace users to improve their situation awareness and decision making.

# 3 Operational Improvement Steps (OIs) & Enablers

The following OIs and ENs have been considered to address the solution which have been created and endorsed in DS 20:

- POI-0044-MET
- METEO-08c, METEO-11a/b, METEO-12a and SVC-037
- METEO-18, METEO-21, METEO-17 and METEO-23
- METEO-13 and METEO-19
- SWIM-APS-06b

The following picture displays the structure of OIs and ENs of the two PJ.18-04b solutions that have been endorsed in DS20:

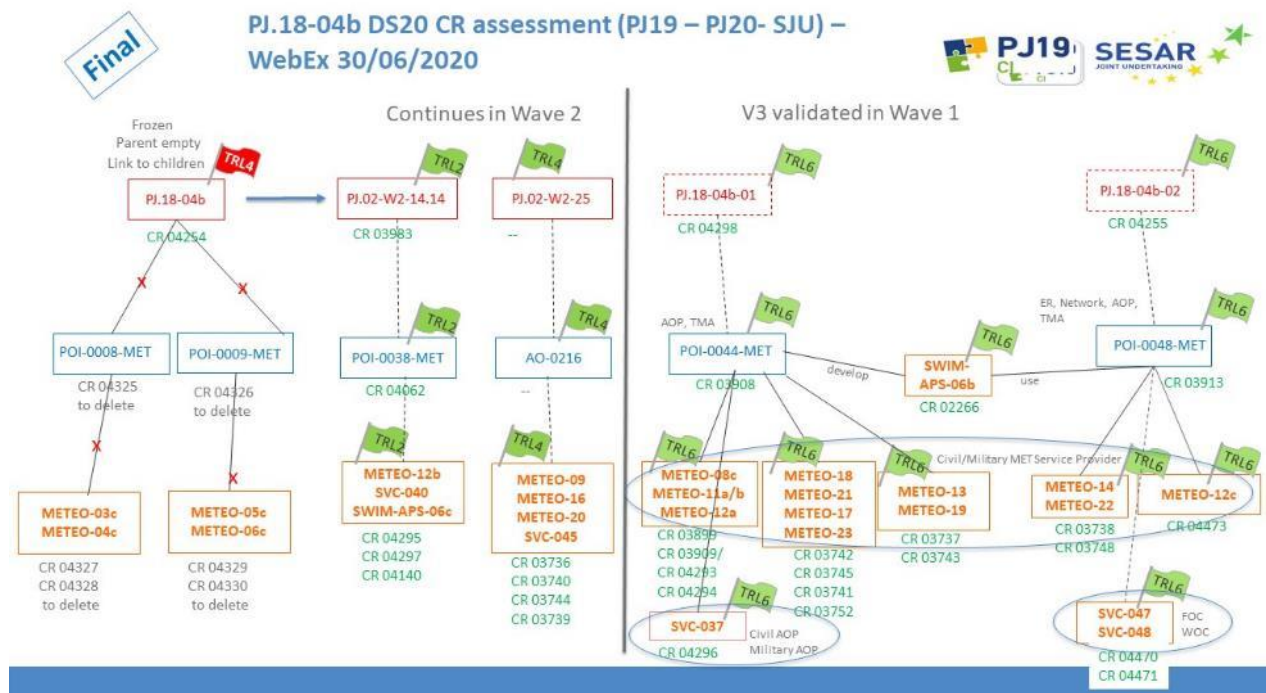


Figure 1: PJ.18-04b OIs and ENs

## 4 Background and validation process

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GWMS enhancement is an activity following developments related to 4DWxCube in SESAR 1, particularly in terms of adapting, prototyping and validating the MET-GATE functional block inside the Aerodrome ATM-MET Capability Configuration. As such, it is not separable from new processing capabilities and service developments dedicated to Airport/Aerodrome MET developed in SESAR 2020 Wave 1. Previous SESAR Solution #21 (Airport operations plan (AOP) and its seamless integration with the network operations plan (NOP)) and Solution #35 (MET information exchange) were used based on which the requirements were derived.

These requirements are the driver for the service payload of METForTAM. Additionally, as the GWMS output satisfying these requirements had been provided in a proprietary manner in EXE.669 of OFA05.01.01, the requirements on SWIM compliance for the 4DWxCube Technical System in the Aerodrome ATM-MET capability configuration that GWMS is prototyping had not been validated in SESAR 1. Therefore, the development of METForTAM has a link to the task of GWMS Enhancement where the gap of the MET-GATE functional block inside the Aerodrome ATM-MET CC is closed and requirements still in progress are validated in SESAR 2020 Wave 1. In collaboration with PJ.04-02, the provision of METForTAM by GWMS has been validated in PJ.04-02 validation exercise in a manner conformant to the SWIM Technical Infrastructure Yellow Profile.

Regarding the glide path wind profile capability, the development of this MET product is a new activity based on the requirements defined by PJ.02-01. The capability uses mature sources like Radar and Lidar sensors.

The objective of the technical validation is to validate that the developed components are fit for purpose in view of their incorporation in various ATM systems, serving the ATM operational objectives expressed by the Operational Solutions. Technical validation is considered to validate the Technical Solution on its operational usability in terms of providing the users (represented in an operational validation exercise) an indication of the confidence they will be able to place in the served information. Technical validation is conducted after verification, which is limited to verifying prototypes and provided information services against the stated requirements.



## 5 Results and performance achievements

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The solution performed two technical validation exercises within PJ.18-04b and one supporting PJ.04-02. The validation exercises addressed the validation objectives and corresponding success criteria described in the PJ.18-04b technical validation report. The results have shown that the output is as expected and requirements are met.

The results have demonstrated the following:

- Glideslope wind profile demonstrated in comparison with MODE-S data very useful input for separation planning. It showed also the application limitations in terms of abnormal situations like the passage of a gust front. As for every remote sensing measurement, usefulness of data depends on the siting and therefore coverage of airport and runways in dependence of the viewing angle. This MET product reached TRL6.
- GWMS Enhancement – SWIM: as local 4DWxCube the GWMS prototype demonstrated SWIM capability and compliance by building a MET-GATE Functional Block in the Aerodrome ATM-MET CC for MET Services for Yellow and Purple Profile using respective infrastructure setup provided by PJ.17-01. Down- and uplink services were part of the tests and demonstrated the TRL6 readiness.
- As a local 4DWxCube, the GWMS prototype offers MET services, but the message payload may depend on different inputs or the input could be swapped due to unavailability of one MET provider. This swapping has been successfully demonstrated for the convection elements of the METForTAM service. This exercise reached TRL6.

## 6 Recommendations and Additional activities

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The following recommendations can be considered:

- Develop more SWIM services based on all the provided local MET capabilities based on the requirement of specific working areas
- A long-term validation exercise (VLD) for the testing of handling of several services at more than one airport, if possible, directly supporting the operational projects, would be necessary to demonstrate the full scope of capabilities of a local 4DWxCube instead only isolated capabilities. This would present an adequate environment for the two TRL 6 solutions where all functional blocks of the local 4DWxCube would be deployed together on site and at several airports, tailored to their specific needs, respectively.
- Such a VLD should be realised in shadow mode trials (depending on available MET data) to demonstrate the clear benefit compared to currently available MET data and data provision
- This would also help to refine requirements for MET data (more clear description)
- Address safety related aspects in an operational context.

## 7 Actors impacted by the SESAR Solution

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The following actors could be impacted by the Solution:

- Airport operator
- Meteorological Service Provider
- Air Traffic Control

## 8 Impact on Aircraft System

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The solution mainly address local MET information to airports, no specific impact expected on aircraft systems.

## 9 Impact on Ground Systems

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The solution addresses the provision of local MET information to airports and considers the use of existing sensors and MET capabilities for the measurement and generation of MET data. No specific impact is expected on the existing ground systems.

# 10 Regulatory Framework Considerations

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No specific considerations on regulatory framework.

# 11 Standardization Framework Considerations

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The solution applies the principles and guidance related to SWIM Technical Infrastructure Yellow Profile.

Depending on further evolution of the solution, standardisation activities could be needed in future.

## 12 Solution Data pack

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The Data pack for this Solution includes the following deliverables:

- TS/IRS D4.2.210 SESAR 2020 PJ.18-04b TRL6 Technical Specification, Edition 00.02.00.
- TVALR D4.2.200 SESAR 2020 PJ.18-04b TVALR for TRL6, Edition 00.01.07.



