SESAR Solution #118 - SPR/INTEROP-osed - Part V - Performance Assessment Report

Topic: ATM Operations
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## Authoring & Approval

### Authors of the document

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<th>Name/Beneficiary</th>
<th>Position/Title</th>
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### Reviewers internal to the project

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### Approved for submission to the SJU By - Representatives of beneficiaries involved in the project

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<td>15/05/2018</td>
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### Rejected By - Representatives of beneficiaries involved in the project

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### Document History

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<td>Draft</td>
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<td>01.00.01</td>
<td>15/05/2018</td>
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Abstract

This document provides the Performance Assessment Report (PAR) for Solution #118: Basic EAP (Extended ATC Planning) function.

The basic EAP (bEAP) function concept describes an automated tool supporting the basic communication between the Local DCB position and the Controllers' Work Positions to be deployed in En-route operating environments of Medium and High complexity.

The basic EAP function is expected to facilitate the implementation of ATFCM measures to better match capacity to predicted demand and to reduce the complexity of traffic presentation in order to suit available capacity.
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1 Executive Summary

This document provides the Performance Assessment Report (PAR) for Solution #118: Basic EAP (Extended ATC Planning) function.

DISCLAIMER

This PAR presents the Performance assessment results from the SESAR1 validation exercise VP-687 performed in Reims ACC in June 2015 by the project P04.07.08. This issue of the PAR has been prepared in order to meet the requirements of a SESAR Solution datapack for V3 phase; it is however the simple adaptation of the existing results presented in the V3 Validation Report for exercise VP-687 [44].

Description:

The basic EAP function is expected to facilitate the implementation of ATFCM measures to better match capacity to predicted demand and to reduce the complexity of traffic presentation in order to suit the available capacity.

The Basic EAP (Extended ATC Planning) concept consists in the definition of an automated tool supporting the basic communication between the Local DCB position and the Controllers’ Work Positions to be deployed in En-route operating environments of Medium and High complexity.

The PAR is consolidating Solution performance validation results addressing KPIs/PIs and metrics from the SESAR2020 Performance Framework.

More Information can be found in Chapter 2!

Assessment Results Summary:

The following table summarises the assessment outcomes per KPI and puts them side-by side to Validation Targets from PJ19:

- An assessment result of 0 with confidence level N/A, for not applicable, indicates that the Solution is not expected to impact the KPI;

- An assessment result of 0 with confidence level other than N/A means that the Solution was expected to (possibly) impact the KPI but has been assessed not to do so.
<table>
<thead>
<tr>
<th>KPI</th>
<th>Validation Targets – Network Level (ECAC Wide)</th>
<th>Performance Benefits Expectations at Network Level (ECAC Wide)</th>
<th>Confidence in Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>FEFF1: Fuel Efficiency – Fuel burn per flight</td>
<td>0</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>CAP1: TMA Airspace Capacity – Throughput / airspace volume &amp; time</td>
<td>0</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>CAP2: En-Route Airspace Capacity – Throughput / airspace volume &amp; time</td>
<td>+6,50%</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>CAP3: Airport Capacity – Peak runway throughput (mixed mode) flights/hour</td>
<td>0</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>PRD1: Predictability – Flight duration variability, against RBT</td>
<td>0</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>PUN1: Punctuality – % AOBT within +/- 3 minutes of SOBT</td>
<td>-</td>
<td>*</td>
<td>High</td>
</tr>
<tr>
<td>RES1: Airport Resilience – % avoided loss of capacity</td>
<td>0</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>RES2: Airspace Resilience – % Avoided loss of capacity</td>
<td>0</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>CEF2: ATCO Productivity – Flights per ATCO hour</td>
<td>+2,50%</td>
<td>+2%</td>
<td>High</td>
</tr>
<tr>
<td>CEF3: Technology Cost – Cost per flight</td>
<td>0</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

Table 1: KPI Assessment Results Summary

1 Negative impacts are indicated in red.

2 High – the results might change by +/-10%
Medium – the results might change by +/-25%
Low – the results might change by +/-50% or greater
N/A – not applicable, i.e., the KPI cannot be influenced by the Solution
2 Introduction

2.1 Purpose of the document

The Performance Assessment covers the Key Performance Areas (KPAs) defined in the SESAR2020 Transition Performance Framework [7], with the exception of Safety, which is discussed in a dedicated assessment report. Assessed are at least the Key Performance Indicators (KPIs) and the mandatory Performance Indicators (PIs), but also additional PIs as needed to capture the performance impacts of the Solution. It considers the guidance document on KPIs/PIs [3] for practical considerations, for example on metrics.

The purpose of this document is to present the performance assessment results from the validation exercises at SESAR Solution level. The KPA performance results are used for the performance assessment at strategy level and provide inputs to the SESAR Joint Undertaking (SJU) for decisions on the SESAR2020 Programme.

In addition to the results, this document presents the assumptions and mechanisms (how the validation exercises results have been consolidated) used to achieve this performance assessment result.

One Performance Assessment Report shall be produced or iterated per Solution.

DISCLAIMER

This PAR presents the Performance assessment results from the SESAR1 validation exercise VP-687 performed in Reims ACC in June 2015 by the project P04.07.08. This issue of the PAR has been prepared in order to meet the requirements of a SESAR Solution datapack for V3 phase; it is however the simple adaptation of the existing results presented in the V3 Validation Report for exercise VP-687 [44].

2.2 Intended readership

The intended audience for this PAR is:

- The SESAR performance management process is PJ19, which will collect and combine KPI results at network level, and provide the data to PJ20 for considering the performance data for the European ATM Master Plan;

- The key stakeholders targeted by the Solution, i.e.

  - Airspace Users who will be directly impacted by the deployment of the basic EAP function in En-Route airspace;
Air Traffic Controllers who will benefit from a smoothed workload and less complex traffic situations thanks to the STAM or decomplexification measures enabled by the basic EAP function, especially in hotspot areas;

- SESAR 2020 PJ09.02 members
- SESAR 2020 Projects developing solutions that can benefit from the deployment of the basic EAP function.

2.3 Inputs from other projects

PJ19 will manage and provide common assumptions and aggregation assumptions which are needed for producing this report.

2.4 Glossary of terms

See the AIRM Glossary [1] for a comprehensive glossary of terms.

2.5 Acronyms and Terminology

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANS</td>
<td>Air Navigation Service</td>
</tr>
<tr>
<td>ANSP</td>
<td>Air Navigation Service Provider</td>
</tr>
<tr>
<td>ATFM</td>
<td>Air Traffic Flow Management</td>
</tr>
<tr>
<td>ATM</td>
<td>Air Traffic Management</td>
</tr>
<tr>
<td>BAD</td>
<td>Benefits Assessment Date</td>
</tr>
<tr>
<td>BAER</td>
<td>Benefit Assessment Equipment Rate</td>
</tr>
<tr>
<td>BIM</td>
<td>Benefit and Impact Mechanism</td>
</tr>
<tr>
<td>CBA</td>
<td>Cost Benefit Analysis</td>
</tr>
<tr>
<td>DOD</td>
<td>Detailed Operational Description</td>
</tr>
<tr>
<td>E-ATMS</td>
<td>European Air Traffic Management System</td>
</tr>
<tr>
<td>ECAC</td>
<td>European Civil Aviation Conference</td>
</tr>
<tr>
<td>DB</td>
<td>Deployment Baseline</td>
</tr>
<tr>
<td>KPA</td>
<td>Key Performance Area</td>
</tr>
<tr>
<td>KPI</td>
<td>Key Performance Indicator</td>
</tr>
<tr>
<td>Acronym</td>
<td>Definition</td>
</tr>
<tr>
<td>---------</td>
<td>------------</td>
</tr>
<tr>
<td>N/A</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>OI</td>
<td>Operational Improvement</td>
</tr>
<tr>
<td>PAR</td>
<td>Performance Assessment Report</td>
</tr>
<tr>
<td>PI</td>
<td>Performance Indicator</td>
</tr>
<tr>
<td>PRU</td>
<td>Performance Review Unit</td>
</tr>
<tr>
<td>QoS</td>
<td>Quality of Service</td>
</tr>
<tr>
<td>RBT</td>
<td>Reference Business / Mission Trajectory</td>
</tr>
<tr>
<td>SESAR</td>
<td>Single European Sky ATM Research Programme</td>
</tr>
<tr>
<td>SJU</td>
<td>SESAR Joint Undertaking (Agency of the European Commission)</td>
</tr>
<tr>
<td>SESAR2020 Programme</td>
<td>The programme which defines the Research and Development activities and Projects for the SJU.</td>
</tr>
</tbody>
</table>

**Table 2: Acronyms and terminology**
3 Solution Scope

3.1 Detailed Description of the Solution

The SESAR Solution #118 - Basic EAP (Extended ATC Planning) function is defined in the applicable version of EATMA (Dataset 18) as follows:

Solution #118 — Basic EAP (Extended ATC Planning) function

The basic Extended ATC Planner aims at bridging the gap between Air Traffic Flow and Capacity Management (ATFCM) and Air Traffic Control (ATC) providing real-time and fine-tuning measures to solve ATFCM hotspots and to perform early measures to alleviate complexity closest to ATC activities.

The solution consists of an automated tool and associated procedures supporting the basic communication between the Local DCB position and the Controllers’ Work Positions allowing the EAP and the ATC team in identifying, assessing and resolving local complexity situations. The basic EAP relies on a real time integrated process for managing the complexity of the traffic with capability to reduce traffic peaks through early implementation of fine-tuned solutions to solve workload imbalances at the local level, compatible with the short term timeframe of execution phase of the flights.

Operational improvement and expected benefits

The basic EAP (Extended ATC Planning) function introduces an initial automated interface together with the related procedures that will facilitate the communication between local DCB position and the Controllers’ Work Positions through the provision of optimised solutions to solve workload imbalances compatible with the short term timeframe of execution phase of the flights.

Figure 1: The EAP role fills the gap between ATFCM and ATC

The basic EAP concept introduces also a new role, the EAP role (Extended ATC Planning), which is intended to fill the gap between ATFCM and ATC as illustrated on Figure 1 above:

- The EAP is not an additional staff: it is a role covering a set of services/functions that can be assumed by different personnel of the ATSU (already existing actors, like TC or new actors like MSP or LTM);
• It is highly recommended that the EAP is holding or has held an ATCO rating in the concerned ATSU’s airspace

The main benefits expected from the basic EAP function are principally:

• To help providing a better service to airspace users through reduced delays, better punctuality, less ATFCM regulations, whilst maintaining or even increasing safety.

• To increase the controllers’ productivity contributing thus to increase of the overall en-route capacity of the ACC.

In addition, the basic EAP concept can be considered as a potential enabler for the deployment of functionalities such as Extended AMAN or Free Routing operations.

3.2 Detailed Description of Interactions with other Solutions

N/A

3.3 Detailed Description and Issues of the OI Steps

<table>
<thead>
<tr>
<th>OI Step ID</th>
<th>Title</th>
<th>Step</th>
<th>Consistency with latest Dataset</th>
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</thead>
<tbody>
<tr>
<td>CM-0106</td>
<td>Initial support to INAP: basic EAP (Extended ATC Planning) function</td>
<td>1</td>
<td>Dataset 18</td>
</tr>
</tbody>
</table>

Table 3: OI Steps allocated to the Solution

3.4 List of Enablers

The enablers considered essential by the Solution project are provided below.

<table>
<thead>
<tr>
<th>Enabler ID</th>
<th>Title</th>
<th>Related OI Step ID</th>
<th>Consistency with latest Dataset</th>
</tr>
</thead>
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<tr>
<td>ER-ATC-164</td>
<td>ATC tools to re-organize traffic flows to reduce complexity in the execution phase</td>
<td>CM-0106</td>
<td>Dataset 18</td>
</tr>
<tr>
<td>PRO-220a</td>
<td>ATC Procedures related to Detection and Resolution of Complexity, Density and Traffic Flow Problems</td>
<td>CM-0106</td>
<td>Dataset 18</td>
</tr>
<tr>
<td>PRO-220b</td>
<td>FCM procedures to describe how detection and resolution of complexity, density or traffic flow issues are managed.</td>
<td>CM-0106</td>
<td>Dataset 18</td>
</tr>
</tbody>
</table>

Table 4: Essential Enablers
Note on the OIs and Enablers linked to the Solution #118

The EAP concept has been initially developed by DSNA within SESAR 1 P04.07.08 (OIS CM-0104-A) and validated through the exercise VP-687 in Reims ACC in June 2015 as part of Solution #19 in R5.

However, the R5 review has stated that the OIS CM-0104-A has only been partly addressed in Solution #19 in R5, and that consequently there was “a need to submit a CR in Dataset 18 in order to review the scope of CM-0104-A, PRO-220a and PRO-220b (i.e. only address Traffic complexity resolution in the planning phase). The backlog of CM-0104-A, PRO-220a and PRO-220b should also be addressed by a CR in DS17.” The OIS CM-0104-B addresses the full EAP concept which is currently developed by PJ9.02 in which DSNA is involved. In this context, DSNA has discussed with SJU the possible solutions to follow the recommendations of R5 review regarding the OIS CM-0104-A.

The following updates of the EATMA have therefore been decided:

- The creation of a specific solution (#118) to cover the part not covered by solution #19;
- The creation of a specific OIS, CM-0106, to cover the part of OIS CM-0104-A not properly addressed in solution #19 and
- The creation of a specific enabler ER-ATC-164 attached to CM-0106.

The results of these changes for solution #118 are illustrated on Figure 2 below.

![Related Elements Diagram](image)

Figure 2: Solution #118 – Related OI and Enablers
4 Solution#118 Performance Assessment

4.1 Assessment Sources

No SESAR 2020 Validation Exercise is planned for Solution #118.

The previous Validation Exercises (pre-SESAR2020) relevant for this assessment are listed below.

<table>
<thead>
<tr>
<th>Organisation</th>
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<th>Publishing Date</th>
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<tr>
<td>DSNA</td>
<td>04.07.08 - D78 - Validation Report V2 VP-687, Edition 00.01.02 (42)</td>
<td>23/03/2016</td>
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<tr>
<td>DSNA</td>
<td>SESAR Solution#118 – Validation Report V3 - Basic Extended ATC Planning – 00.01.00 (44)</td>
<td>31/01/2018</td>
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</table>

Table 5: Pre-SESAR2020 Exercises

The two VALRs listed above in Table 5 describe the results of the validation exercise VP687 (as defined in the relevant Validation Plan [41]) prepared by the project P04.07.08) and performed by DSNA in June 2015 in the Reims UAC. To achieve a V3 maturity level, the VP687 VALR (D78) has been enriched with the outcomes from the 4ME system, a tool operationally deployed in Reims UAC since 2016, which is used as an enabler for basic EAP (to display information on CWPs).

The objectives of the validation exercise VP687 were:

1. To assess the added value of the EAP role for the management of hotspots regarding the following aspects:
   - Human performance, and
   - Capacity

2. To assess the roles and responsibilities of the different actors involved in the STAM process.

3. Exercise VP687 contributed to validate OFA 05.03.04 “Enhanced ATFCM Processes” and more precisely covered OI CM-0106 “Initial support to INAP: basic EAP (Extended ATC Planning) function”.

4. Project B04.01 has defined the following Validation targets for the OFA:

<table>
<thead>
<tr>
<th>KPA01.01</th>
<th>Safety</th>
<th>SAF1</th>
<th>% Change in accidents and incidents with ATM contribution per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>KPA02.01</td>
<td>Environment - Fuel Efficiency</td>
<td>ENV1</td>
<td>% Change in average fuel burn per flight</td>
</tr>
<tr>
<td>KPA03.01</td>
<td>Airspace Capacity - TMA</td>
<td>CAP1</td>
<td>% Change in TMA throughput per time unit (challenging airspace)</td>
</tr>
<tr>
<td>KPA03.02</td>
<td>Airspace Capacity - En-Route</td>
<td>CAP2</td>
<td>% Change in En-Route throughput per time unit (challenging airspace)</td>
</tr>
</tbody>
</table>
In this scope, VP687 investigated the following KPAs:

- Safety;
- Airspace Capacity – En-route;
- Predictability and more precisely the new KPA defined by B05: Punctuality;
- Cost Effectiveness was only partially addressed.

### 4.2 Conditions / Assumptions for Applicability

#### 4.2.1 Benefits Assessment Date (BAD)

The technical solution recommended for the basic EAP function support tools is not fully integrated into the operational equipment and systems deployed in an ACC as illustrated on the Figure 3 below.

![Figure 3: The Solution #118 — Basic EAP (Extended ATC Planning) function](image)
Indeed, the basic EAP support tool is based on software used to fulfil communication needs between the EAP role and the CWPs; therefore it does not necessarily require to be integrated in the existing operational environment and hence will not require expensive and time-consuming safety studies.

Taking account of the time required by the industry to develop a commercial solution, it is assumed that the operational implementation of the basic EAP function should be possible from early 2020 and onwards. This analysis allows concluding that the timeframe up to the Initial Operational Capability (IOC) should be relatively short. It is also assumed that the Full Operational Capability (FOC) should occur the same year.

Hence the Benefits Assessment Date (BAD) is considered to be 2020.

### 4.2.2 Operating Environments (OE)

The Solution #118 - Basic EAP (Extended ATC Planning) function is defined with reference to En-route operating environments of Medium and High complexity.

The following Table 7 summarises the applicable operating environments.

<table>
<thead>
<tr>
<th>OE</th>
<th>Applicable sub-OE</th>
<th>Special characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>En Route</td>
<td>En-Route High-Complexity</td>
<td>In the PRR 2013 [47], these operating environments are defined according to complexity and traffic volume by a traffic complexity score which is as follows:</td>
</tr>
<tr>
<td></td>
<td>En-Route Medium-Complexity</td>
<td>• En-Route High Complexity: traffic complexity score higher than 6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• En-Route Medium Complexity: traffic complexity score higher than 2 but lower than 6.</td>
</tr>
</tbody>
</table>

This complexity indicator is therefore representative of the level (and characteristics) of the traffic demand in the airspace (and the need for Enhanced DCB including Complexity Management at regional/sub-regional/local level and/or Enhanced Conflict Management and Automation at local level).

**Table 7: Applicable Operating Environments**

### 4.2.3 Geographical Scope

The Solution #118 - Basic EAP (Extended ATC Planning) function is defined for En-route operating environments of Medium and High complexity, with the aim to decrease the traffic complexity level and cope with high level traffic demand through the assessment and resolution of local complexity situations.

In the PRR 2013 [47], these operating environments are defined according to complexity and traffic volume by a traffic complexity score which is as follows:

• En-Route High Complexity: traffic complexity score higher than 6
En-Route Medium Complexity: traffic complexity score higher than 2 but lower than 6. This complexity indicator is therefore representative of the level and characteristics of the traffic demand in the airspace and the need for Enhanced DCB including Complexity Management at regional/sub-regional/local level and/or Enhanced Conflict Management and Automation at local level.

The validation results obtained for the bEAP function in the Reims ACC (score between 7 and 8) correspond to a high complexity En-route environment.

In order to properly extend these results at ECAC level, it is necessary to consider a geographical scope that will encompass the ACCs managing traffic of similar complexity. Hence the geographical scope of the CBA will focus on high complexity and/or high demand ACCs. The analysis of the Monthly Annual Network Operations Reports [50] and of the Performance Result Report [51] allows identifying the 12 ACCs with the highest delays (See Table 8) that will be used to extend the results at ECAC level.

The following Table 8 summarises the essential deployment details.

<table>
<thead>
<tr>
<th>Benefits Assessment Date (BAD)</th>
<th>Specific geographical and/or stakeholder deployment</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020³</td>
<td>Main target is en-route operating environments of Medium and High complexity ACCs managing traffic complexity similar to Reims UAC (i.e. high complexity and/or high demand ACCs)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Geographical scope of the Benefit Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATHINAI &amp; MACEDONIA</td>
</tr>
<tr>
<td>BARCELONA</td>
</tr>
<tr>
<td>BREST UACC</td>
</tr>
<tr>
<td>KARLSRUHE UAC</td>
</tr>
<tr>
<td>LANGEN ACC</td>
</tr>
<tr>
<td>LISBOA ACC UAC</td>
</tr>
<tr>
<td>MAASTRICHT UAC</td>
</tr>
<tr>
<td>NICOSON ACC</td>
</tr>
<tr>
<td>PARIS ALL ACC</td>
</tr>
<tr>
<td>REIMS UACC</td>
</tr>
<tr>
<td>WARSAWA ACC</td>
</tr>
<tr>
<td>ZAGREB ACC</td>
</tr>
</tbody>
</table>

Table 8: Deployment details

The quantification of benefits takes also into account the traffic evolution forecast based on the STATFOR analysis published in February 2017. According to this Medium-term traffic forecast, the most-likely of the 3 scenarios forecast for 2023 is 11.6 million annual IFR flight movements in Europe, which represents 17.2% more than in 2015.

³ See Cost Benefits Analysis for Solution#118 ([46])
The Table 9 below presents the forecasted annual growth rate for the 12 ACCs that define the geographical scope for the benefits assessment.

<table>
<thead>
<tr>
<th>Geographical Scope</th>
<th>STATFOR annual growth forecast (2017-2023)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATHINAI &amp; MACEDONIA</td>
<td>3.2%</td>
</tr>
<tr>
<td>BARCELONA</td>
<td>3%</td>
</tr>
<tr>
<td>BREST U ACC</td>
<td>1.8%</td>
</tr>
<tr>
<td>KARLSRUHE UAC</td>
<td>1.7%</td>
</tr>
<tr>
<td>LANGEN ACC</td>
<td>1.7%</td>
</tr>
<tr>
<td>LISBOA ACC UAC</td>
<td>2.5%</td>
</tr>
<tr>
<td>MAASTRICHT UAC</td>
<td>1.4%</td>
</tr>
<tr>
<td>NICOSIA ACC</td>
<td>4.4%</td>
</tr>
<tr>
<td>PARIS ALL ACC</td>
<td>1.8%</td>
</tr>
<tr>
<td>REIMS U ACC</td>
<td>1.8%</td>
</tr>
<tr>
<td>WARSZAWA ACC</td>
<td>3.0%</td>
</tr>
<tr>
<td>ZAGREB</td>
<td>2.6%</td>
</tr>
</tbody>
</table>

Table 9: Forecasted annual growth rate per selected ACC (Source STATFOR 2017)

4.3 Summary of Validation Exercise Performance Results

The following table provides a summary of information collected from available performance outcomes.

<table>
<thead>
<tr>
<th>Exercise</th>
<th>OI Step</th>
<th>Exercise scenario &amp; scope</th>
<th>Performance Results</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>VP-687</td>
<td>CM-0106</td>
<td>Reference scenario consisting in a simple recording of the actual operations in Reims UAC without the basic EAP function.</td>
<td>• 39 STAM requests were performed</td>
<td>Traffic values were similar for the two scenarios</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Solution scenario integrating the EAP role and its associated tools</td>
<td>• 52 STAM requests performed by the EAP.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• No capacity gain/reduction obtained during the exercise</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• The total delay on measured sectors was dropped down by 65%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Sight improvement of the Cost Effectiveness due to better ATCO productivity (+2% measured as “Flights</td>
<td></td>
</tr>
</tbody>
</table>
per En-Route ATCO-hour")

- Working method clear and widely accepted among controllers: Working with an electronic device (the CWP tool) was preferred to the paper method
- LTM workload slightly increased compared to the usage of CHMI

Table 10: Summary of Validation Results.
4.4 Environment / Fuel Efficiency

N/A

4.5 Environment / Noise and Local Air Quality

N/A

4.6 Airspace Capacity (Throughput / Airspace Volume & Time)

4.6.1 Performance Mechanism

The Benefit and Impact Mechanism illustrated on Figure 4 and Figure 5 below has been investigated for Solution #118.

---

**Figure 4: Solution #118 Benefit and Impact Mechanism - Part 1**
Figure 5: Solution #118 Benefit and Impact Mechanism - Part 2

In respect to (Airspace) Capacity, the following mechanisms apply:

(1f) The STAM coordination tool will replace pieces of paper physically brought by the LTM to the CWP. It is a key tool to ease the management of the whole STAM process.

(2i), (2j), (2k) and (2l) Thanks to a better STAMs coordination with the tool, the number of implemented standard or late STAM will increase, then the number of local regulations will consequently decrease and the number of flights/hour will increase.

(3i) This will improve the local En Route Airspace Capacity which links to Capacity.
4.6.2 Assessment Data (Exercises and Expectations)

The exercise VP687 attempted to demonstrate *inter alia* that:

- The EAP role contributes to increase controllers’ productivity by increasing overall capacity of the UAC;
- The EAP role brings an improvement in quality of service of ATS through a reduction of regulations, a capacity increase and a better punctuality of flights.

The overall methods and techniques used during the exercise VP-687 were as follows:

- Observation during the sessions from HF specialists
- Specific questionnaires to the participant controllers & FMPs
- Sessions debriefing
- Data logging and log analysis.

The following metrics have been logged during the experimentations.

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Traffic volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>End time</td>
<td>Start time</td>
</tr>
<tr>
<td>Flight List with all data in an array</td>
<td>Deletion time</td>
</tr>
<tr>
<td>Creation time</td>
<td>Use of the hour sorting function : value of the time frame</td>
</tr>
<tr>
<td></td>
<td>Use of criterions of flights sorting 1, 2 and 3</td>
</tr>
<tr>
<td></td>
<td>Use of the function Update Flight List Hot spot</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Hot spot identifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selected flight id</td>
<td>Selected flight trajectory</td>
</tr>
<tr>
<td>Cross sectors (Reims sectors)</td>
<td>Entry/Out time of crossed sectors</td>
</tr>
<tr>
<td>STAM Type</td>
<td>STAM Value</td>
</tr>
<tr>
<td>Implementing Sector</td>
<td>Time sending implementing sector</td>
</tr>
<tr>
<td>Time sending back implementing sector at each sending back</td>
<td>Late STAM?</td>
</tr>
<tr>
<td>off loaded sector</td>
<td>on loaded sector</td>
</tr>
<tr>
<td>Time sending on loaded sector</td>
<td>Delete time</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tablet</th>
<th>STAM Identifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Late STAM?</td>
<td>Display Time</td>
</tr>
<tr>
<td>Answer Time</td>
<td>Answer value</td>
</tr>
<tr>
<td>No answer</td>
<td></td>
</tr>
</tbody>
</table>

Table 11: Exercise VP-687 – Metrics logged
Regarding Capacity, the rationale was that it could be increased thanks to the better traffic conditions created by the increased STAMs coordination enabled by the basic EAP function. Indeed, as the number of STAM would increase, the number of local regulations would then decrease allowing thus more flights per hour.

Hence, Capacity variations have been evaluated through the measure of the Entry counts per hour on the entire Reims airspace (i.e. the number of flights entering Reims airspace in one hour).

As shown on Table 12 below, the maximum scores observed during the trials are almost the same for the reference scenario (without the Basic EAP) and for the solution scenario.

<table>
<thead>
<tr>
<th>Maximum entry count</th>
<th>Day 1</th>
<th>Day 2</th>
<th>Day 3</th>
<th>Day 4</th>
<th>Day 5</th>
<th>Day 6</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference scenario</td>
<td>178</td>
<td>190</td>
<td>191</td>
<td>219</td>
<td>214</td>
<td>203</td>
<td>199.2</td>
</tr>
<tr>
<td>Solution scenario</td>
<td>188</td>
<td>195</td>
<td>185</td>
<td>199</td>
<td>214</td>
<td>202</td>
<td>197.2</td>
</tr>
</tbody>
</table>

Table 12: Maximum entry count/h on Reims airspace (LFEE)

The small difference existing (1% of reduction for the solution scenario) is considered as non-significant (Student’s t-test, p=0.40) for comparable traffic.

Hence no significant capacity gains/loss was demonstrated during the exercise.

4.6.3 Aggregation

The overall rationale to transpose at network (ECAC wide) level the benefit values obtained at Solution validation level is to apply the filters described in section 4.2 regarding:

- The operating environment (i.e. Medium and High complexity En-route) and
- The geographical scope (i.e. the list of the 12 ACCs managing traffic of similar complexity than Reims ACC that could deploy the basic EAP function in order to generate the maximum benefits at ECAC level).

Based on the metrics obtained in the Reims ACC for the KPI, the results can be extrapolated to the 12 selected ACCs taking account their respective percentage of the managed traffic.

In the context of the CBA, the extrapolation shall be calculated over the number of years of operations retained for the Solution #118, taking into account the specific traffic forecast available for each ACC of the list for the considered period.

4.6.4 Discussion of Assessment Result

N/A

4.6.5 Additional Comments and Notes

N/A
4.7 Airport Capacity (Runway Throughput Flights/Hour)

N/A

4.8 Resilience (% Loss of Airport & Airspace Capacity Avoided)

N/A

4.9 Predictability (Flight Duration Variability, against RBT)

N/A
4.10 Punctuality (% Departures < +/- 3 mins vs. schedule due to ATM causes)

4.10.1 Performance Mechanism

The BIM investigated for Solution #118 is illustrated on Figure 4 and Figure 5. In respect to Punctuality, the following mechanisms apply:

(1f) The STAM coordination tool will replace pieces of paper physically brought by the LTM to the CWP. It is a key tool to ease the management of the whole STAM process.

(2h) The overall delay at ACC level will decrease, thanks to an increase number of implemented STAMs through the use of the coordination tool.

(3h) This will improve the Airports Capacity because the flights will depart on time more often. This links to Punctuality.

4.10.2 Assessment Data (Exercises and Expectations)

The exercise VP687 attempted to demonstrate *inter alia* that:

- The EAP role contributes to increase controllers’ productivity by increasing overall capacity of the UAC;
- The EAP role helps to better manage hotspot situations;
- The EAP role brings an improvement in quality of service of ATS through a reduction of regulations, a capacity increase and a better punctuality of flights.

Regarding Punctuality, the rationale was that it could be increased thanks to the increased STAMs coordination that would contribute to reduce airborne delay. Hence, Punctuality variations have been evaluated through the measure of the total delay during the validation exercise. As shown in Table 13, it was observed that the total delay on the measured sectors, dropped down by 57% between the reference scenario and the solution scenario.

<table>
<thead>
<tr>
<th>Minutes of delay</th>
<th>Day 1</th>
<th>Day 2</th>
<th>Day 3</th>
<th>Day 4</th>
<th>Day 5</th>
<th>Day 6</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference scenario</td>
<td>565</td>
<td>45</td>
<td>0</td>
<td>1981</td>
<td>3848</td>
<td>3656</td>
<td>10095</td>
</tr>
<tr>
<td>Solution scenario</td>
<td>549</td>
<td>0</td>
<td>0</td>
<td>623</td>
<td>2563</td>
<td>690</td>
<td>4425</td>
</tr>
</tbody>
</table>

Table 13: Minutes of delay induced by regulations on measured sectors

It is difficult to say that the EAP role and tools were the only cause of this significant improvement. Hence, the improvements on punctuality observed should be considered as trends due to the relatively short duration of the exercise.

4.10.3 Aggregation

The rationale presented in section 4.6.3 applies.
4.10.4 Discussion of Assessment Result

N/A

4.10.5 Additional Comments and Notes

N/A
4.11 Civil-Military Cooperation and Coordination (Distance and Fuel)
N/A.

4.12 Flexibility
N/A.
4.13 Cost Efficiency

4.13.1 Performance Mechanism

The BIM investigated for Solution #118 is illustrated on Figure 4 and Figure 5. In respect to Cost-Efficiency, the following mechanisms apply:

(1f) The STAM coordination tool will replace pieces of paper physically brought by the LTM to the CWP. It is a key tool to ease the management of the whole STAM process.

(2i), (2j), (2k) and (2l) Thanks to a better STAMs coordination with the tool, the number of implemented standard or late STAM will increase, then the number of local regulations will consequently decrease and the number of flights/hour will increase

(3j) As the number of implemented standard or late STAM will increase, there will be less need to split band boxed sectors. This links to Cost Effectiveness.

4.13.2 Assessment Data (Exercises and Expectations)

The exercise VP687 attempted to demonstrate *inter alia* that:

- The EAP role contributes to increase controllers’ productivity by increasing overall capacity of the UAC;

Regarding Cost Efficiency, the rationale was that it could be increased thanks to the increased STAMs coordination that would improve the ATCOs’ productivity. Indeed the results of exercise VP-687 show a positive increase of 2% of the ATCOs’ productivity (CEF2.3 Flights per En-route ATCO-Hour) compared to the reference scenario.

This metric has been obtained as follows:

During the exercise, based on the sector opening logs maintained by Reims UAC for post operational use, the number of ATCO-Hours has been recorded (see Table 14), considering that each sector is controlled by 2 ATCOs.

<table>
<thead>
<tr>
<th>ATCO hours</th>
<th>Day 1</th>
<th>Day 2</th>
<th>Day 3</th>
<th>Day 4</th>
<th>Day 5</th>
<th>Day 6</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reference scenario</strong></td>
<td>278.4</td>
<td>286.2</td>
<td>303.7</td>
<td>293</td>
<td>330.6</td>
<td>299.7</td>
<td>1791.6</td>
</tr>
<tr>
<td><strong>Solution scenario</strong></td>
<td>274.8</td>
<td>297.2</td>
<td>281.9</td>
<td>312.6</td>
<td>300.5</td>
<td>287.9</td>
<td>1754.9</td>
</tr>
</tbody>
</table>

*Table 14: ATCO hours on duty at Reims UAC*

The number of ATCO-Hours has been then correlated to the number of flights (Table 16) to calculate the KPI CEF2.3 “number of Flights per En-Route ATCO-hour” (Table 15).
### 4.13.3 Aggregation

The rationale presented in section 4.6.3 applies.

### 4.13.4 Discussion of Assessment Result

N/A

### 4.13.5 Additional Comments and Notes

N/A
4.14 Airspace User Cost Efficiency

N/A

4.15 Security

N/A

4.16 Human Performance

The Human Performance assessment is presented in the Human Performance Assessment Report describes the results of the Human Performance assessment work for the Solution #118 ([44]).
4.17 Other PIs

N/A

4.18 Gap Analysis

N/A
5 References

5.1 Applicable Documents

[1] 08.01.03 D47: AIRM v4.1.0
[2] B05 Performance Assessment Methodology for Step 1

Content Integration

[8] B.04.01 D138 EATMA Guidance Material
[9] EATMA Community pages
[10] SESAR ATM Lexicon

Content Development


System and Service Development

[12] 08.01.01 D52: SWIM Foundation v2
[13] 08.01.01 D49: SWIM Compliance Criteria
[14] 08.03.10 D45: ISRM Foundation v00.08.00
[15] B.04.03 D102 SESAR Working Method on Services
[16] B.04.03 D128 ADD SESAR1
[17] B.04.05 Common Service Foundation Method

Performance Management

[18] B.04.01 D42 SESAR2020 Transition Validation
[20] 16.06.06-D51-SESAR_1 Business Case Consolidated_Deliverable-00.01.00 and CBA

[22] ATM Cost Breakdown Structure_ed02_2014

[23] Standard Inputs for EUROCONTROL Cost Benefit Analyses

[24] 16.06.06_D26-08 ATM CBA Quality Checklist

[25] 16.06.06_D26_04_Guidelines_for_Producing_Benefit_and_Impact_Mechanisms

**Validation**

[26] 03.00 D16 WP3 Engineering methodology

[27] Transition VALS SESAR 2020 - Consolidated deliverable with contribution from Operational Federating Projects

[28] European Operational Concept Validation Methodology (E-OCVM) - 3.0 [February 2010]

**System Engineering**

[29] SESAR Requirements and V&V guidelines

**Safety**


[32] SESAR, Final Guidance Material to Execute Proof of Concept, Ed00.04.00, August 2015


**Human Performance**

[34] 16.06.05 D 27 HP Reference Material D27

[35] 16.04.02 D04 e-HP Repository - Release note

**Environment Assessment**


**Security**

[38] 16.06.02 D103 SESAR Security Ref Material Level

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5.2 Reference Documents

[41] 04 07 08-Validation Plan VP-687, Edition 00.00.07, 01/06/2015

[42] 04.07.08 - D78 - Validation Report VP-687, Edition 00.01.02, 23/03/2016

[43] SESAR Solution#118 – SPR/INTEROP/OSED V3 – Basic EAP - Part I Edition 01.00.01, 15/05/2018

[44] SESAR Solution#118 – SPR/INTEROP/OSED V3 - Basic EAP - Part IV - HPAR - Edition 01.00.01, 15/05/2018

[45] SESAR Solution#118 – Validation Report V3 - Basic Extended ATC Planning – Edition 01.00.01, 15/05/2018

[46] SESAR Solution#118 – CBA V3 - Basic Extended ATC Planning – Edition 01.00.01, 15/05/2018


[51] EUROCONTROL, Performance Results Report of 2015
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