PJ.W2 PROSA

# D4.2.020-PJ.10-W2-96 AG-TRL6

# Final TS-IRS-PAR

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# PJ.10-W2 PROSA

## SEPARATION MANAGEMENT AND CONTROLLER TOOLS

This ***Performance Assessment Report*** is part of a project that has received funding from the SESAR Joint Undertaking under grant agreement No 874464 under European Union's Horizon 2020 research and innovation programme.


### Abstract

Among the expected technological enhancements allocated by SJU to SESAR 2020-W2-PJ10 "***SEPARATION MANAGEMENT AND CONTROLLER TOOL***" are the development of new human machine interface (HMI) interaction modes and technologies for the CWP in the En-Route Environment, with the aim to minimize the load and mental strain on the ATCOs.

The high-level improvements addressed in the scope, defined above, may be applicable in current operations as well as in future operational concepts.

The Operational Improvements identified have been allocated to Solution 96 AG, under PJ.10-W2-WP4:

- ✓ PJ.10-W2-96 AG '*Attention Guidance*'

The validation activities planned for the Solutions comprise ***1*** Validation Exercise.

In line with the Performance Management Process, that regulates the post analysis phase at the end of the Validation Exercises, the Performance Assessment Report documents the benefits calculated from the KPAs' assessment, as reported into the VALR Deliverable, and to allow an assessment of performances, in comparison with expectations of the SESAR ATM Master Plan.

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# 1 Executive Summary

This document provides the Performance Assessment Report (PAR) for the Technological Solution in *SESAR2020 Wave 2 PJ.10-W2-* WP4, namely:

- ✓ PJ.10-W2-96 '*Attention Guidance*'

The PAR is consolidating Solution performance validation results addressing KPIs/PIs and metrics in line with the SESAR2020 Performance Framework [3], which defines the official performance indicators.

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- ✓ **Description:**

These Solutions address the development of new human machine interface (HMI) interaction modes and technologies at the Controller Working Position (CWP) for En.Route, that aim to minimise the load and mental strain on the ATCOs in different Operational situations. The solution is targeting TRL6 maturity level.

The PJ.10-W2-Sol.96 AG deals with new methods of controller interaction with Human Machine Interface (HMI), implementing a fade-out algorithm in a very high complexity environment to bring a positive effect on the controller productivity with no negative impact on human performance, safety and capacity.

The TVALP [10] includes the BIM (Benefits Impact Mechanism), which identifies and allocates the set of relevant KPAs and KPIs, defined in the SESAR2020 Performance Framework [3], to the Solution: namely Cost Efficiency, Human Performance and (indirectly) Safety.

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**Assessment Results Summary:**

The following tables summarises the assessment outcomes per KPI (Table 1) and mandatory PI (Table 2) puts them side-by-side against Validation Targets in case of KPI from PJ19 [8]. The impact of a Solution on the performances are described in Benefit Impact Mechanism. All the KPI and mandatory PI from the Benefit Mechanism identified for the Solution have to be assessed by means of validation results, expert judgment etc.

There are three cases:

1. An assessment result of 0 with confidence level other level High, Medium or Low indicates that the Solution is expected to impact in a marginal way the KPI or mandatory PI.

2. An assessment result (positive or negative) different than 0 with confidence level High, Medium or Low indicates that the Solution is expected to impact the KPI or mandatory PI.

3. An assessment result of N/A (Not Applicable) with confidence level N/A indicates that the Solution is not expected to impact at all the KPI or mandatory PI consistently with the Benefit Mechanism.

| KPI | Validation Targets – Network Level (ECAC Wide) | Performance Benefits at Network Level (ECAC Wide or Local depending on the KPI)[1] | Confidence in Results[2] |
|---|---|---|---|
| SAF1: Safety - Total number of estimated accidents with ATM Contribution per year | | | |
| FEFF1: Fuel Efficiency - Actual average fuel burn per flight | ***N/A*** | ***N/A*** | ***N/A*** |
| CAP1: TMA Airspace Capacity - TMA throughput, in challenging airspace, per unit time. | ***N/A*** | ***N/A*** | ***N/A*** |
| CAP2: En-Route Airspace Capacity - En-route throughput, in challenging airspace, per unit time | ***N/A*** | ***N/A*** | ***N/A*** |

[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

| | | | |
|---|---|---|---|
| CAP3: Airport Capacity – Peak Runway Throughput (Mixed mode). | ***N/A*** | ***N/A*** | ***N/A*** |
| TEFF1: Gate-to-gate flight time | ***N/A*** | ***N/A*** | ***N/A*** |
| PRD1: Predictability – Average of Difference in actual & Flight Plan or RBT durations | ***N/A*** | ***N/A*** | ***N/A*** |
| PUN1: Punctuality – Average departure delay per flight | ***N/A*** | ***N/A*** | ***N/A*** |
| CEF2: ATCO Productivity – Flights per ATCO - Hour on duty | ***…*** | ***+5%*** | ***Medium to high*** |
| CEF3: Technology Cost – Cost per flight | ***N/A*** | ***N/A*** | ***N/A*** |

**Table 1: KPI Assessment Results Summary**

| Mandatory PI | Performance Benefits Expectations at Network Level (ECAC Wide or Local depending on the KPI)[3] | Confidence in Results[4] |
|---|---|---|
| SAF1.X: Mid-air collision - En-Route | ***N/A*** | ***N/A*** |
| SAF2.X: Mid-air collision - TMA | ***N/A*** | ***N/A*** |
| SAF3.X: RWY-collision accident | ***N/A*** | ***N/A*** |
| SAF4.X: TWY-collision accident | ***N/A*** | ***N/A*** |
| SAF5.X: CFIT accident | ***N/A*** | ***N/A*** |
| SAF6.X: Wake related accident | ***N/A*** | ***N/A*** |
| SAF7.X: RWY-excursion accident | ***N/A*** | ***N/A*** |
| SAF8.X ...: Other SAF Risks | ***N/A*** | ***N/A*** |
| SEC1: A security risk assessment has been carried out | ***N/A*** | ***N/A*** |
| SEC2: Risk Treatment has been carried out | ***N/A*** | ***N/A*** |
| SEC3: Residual risk after treatment meets security objective. | ***N/A*** | ***N/A*** |
| ENV1: Actual Average CO2 Emission per flight | ***N/A*** | ***N/A*** |
| NOI1: Relative noise scale | ***N/A*** | ***N/A*** |
| NOI2: Size and location of noise contours | ***N/A*** | ***N/A*** |
| NOI4: Number of people exposed to noise levels exceeding a given threshold | ***N/A*** | ***N/A*** |
| LAQ1: Geographic distribution of pollutant concentrations | ***N/A*** | ***N/A*** |

[3] Negative impacts are indicated in red.

[4] 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

| | | |
|---|---|---|
| CAP3.1: Peak Departure throughput per hour (Segregated mode) | ***N/A*** | ***N/A*** |
| CAP3.2: Peak Arrival throughput per hour (segregated mode) | ***N/A*** | ***N/A*** |
| CAP4: Un-accommodated traffic reduction | ***N/A*** | ***N/A*** |
| RES1: Loss of Airport Capacity Avoided | ***N/A*** | ***N/A*** |
| RES1.1: Airport time to recover from non-nominal to nominal condition | ***N/A*** | ***N/A*** |
| RES2: Loss of Airspace Capacity Avoided. | ***N/A*** | ***N/A*** |
| RES2.1: Airspace time to recover from non-nominal to nominal condition. | ***N/A*** | ***N/A*** |
| RES4: Minutes of delays. | ***N/A*** | ***N/A*** |
| RES5: Number of cancellations. | ***N/A*** | ***N/A*** |
| TEFF2: Taxi in time | ***N/A*** | ***N/A*** |
| TEFF3: Taxi out time | ***N/A*** | ***N/A*** |
| TEFF4: TMA arrival time | ***N/A*** | ***N/A*** |
| TEFF5: TMA departure time | ***N/A*** | ***N/A*** |
| TEFF6: En-Route time | ***N/A*** | ***N/A*** |
| PRD2: Variance of Difference in actual & Flight Plan or RBT durations | ***N/A*** | ***N/A*** |
| PUN2: % Flights departing within +/- 3 minutes of scheduled departure time due to ATM and weather-related delay causes | ***N/A*** | ***N/A*** |
| CEF1: Direct ANS Gate-to-gate cost per flight | ***N/A*** | ***N/A*** |
| AUC3: Direct operating costs for an airspace user | ***N/A*** | ***N/A*** |
| AUC4: Indirect operating costs for an airspace user | ***N/A*** | ***N/A*** |
| AUC5: Overhead costs for an airspace user | ***N/A*** | ***N/A*** |

| | | |
|---|---|---|
| CMC1.1: Allocated vs. Requested ARES duration | ***N/A*** | ***N/A*** |
| CMC1.2: Allocated vs. Requested ARES dimension | ***N/A*** | ***N/A*** |
| CMC1.3: Deviation of Transit Time to/from airbase to ARES | ***N/A*** | ***N/A*** |
| CMC 1.3.1: Allocated ARES duration vs. total mission duration | ***N/A*** | ***N/A*** |
| CMC 1.3.2: Deviation of total mission duration by iOAT FPL validation | ***N/A*** | ***N/A*** |
| CMC 1.4.1: Rate of iOAT FPLs acceptance by NM systems | ***N/A*** | ***N/A*** |
| CMC 1.4.2: Rate of iOAT FPLs acceptance by ATC systems | ***N/A*** | ***N/A*** |
| CMC2.1: Fuel and Distance saved by GAT | ***N/A*** | ***N/A*** |
| HP1: Consistency of human role with respect to human capabilities and limitations | ***N/A*** | ***N/A*** |
| HP2: Suitability of technical system in supporting the tasks of human actors | ***N/A*** | ***N/A*** |
| HP3: Adequacy of team structure and team communication in supporting the human actors | ***N/A*** | ***N/A*** |
| HP4: Feasibility with regard to HP-related transition factors | ***N/A*** | ***N/A*** |
| FLX1: Average delay for scheduled civil/military flights with change request and non-scheduled or late flight plan request | ***N/A*** | ***N/A*** |

**Table 2 Mandatory PIs Assessment Summary**

**Additional Comments and Notes:**

**N/A**

# 2 Introduction

## 2.1 Purpose of the document

The Performance Assessment covers the Key Performance Areas (KPAs) defined in the SESAR2020 Performance Framework [3]. 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.

## 2.2 Intended readership

In general, this document provides the ATM stakeholders (e.g., airspace users, ANSPs, airspace industry) and SJU performance data for the Solution addressed.

Produced by the Solution project, the main recipient in the SESAR performance management process is PJ19, which will aggregate all the performance assessment results from the SESAR2020 solution projects PJ1-18 and provide the data to PJ20 for considering the performance data for the European ATM Master Plan. The aggregation will be done at higher levels suitable for use at Master Planning Level, such as deployment scenarios.

## 2.3 Inputs from other projects

The document includes information from the following SESAR 2020 Wave1 projects:

- PAGAR 2019 [4]: Performance Assessment and Gap Analysis Report (2019), where are collected the final benefits from SESAR 2020 Wave1.

PJ19 will manage and provide:

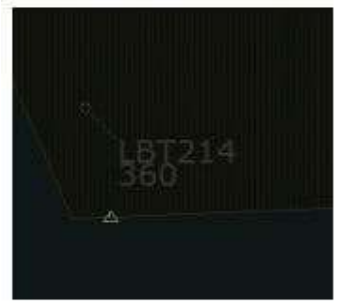
- SESAR Performance Framework (2019) [3], guidance on KPIs and Data collection supports.
- S2020 Common Assumptions[6], used to aggregate results obtained during validation exercises (and captured into validation reports) into KPIs at the ECAC level, which will in turn be captured in Performance Assessment Reports and used as inputs to the CBAs produced by the Solution projects. Where are also included performance aggregation assumptions, with traffic data items.

- For guidance and support PJ19 have put in place the Community of Practice (CoP)[5] within STELLAR, gathering experts and providing best practices.

[…]

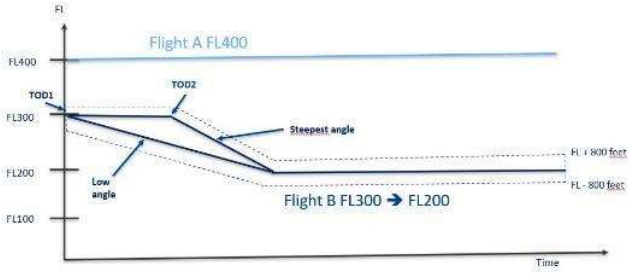
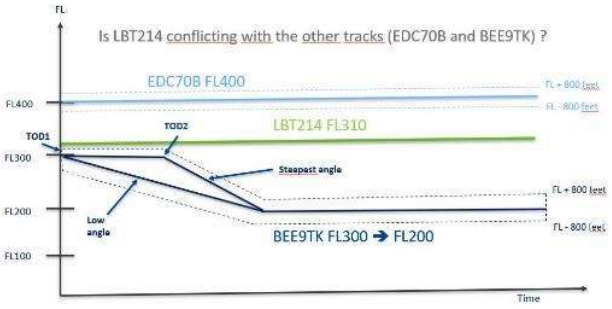
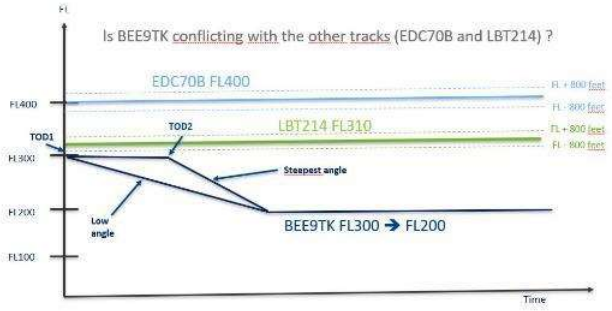
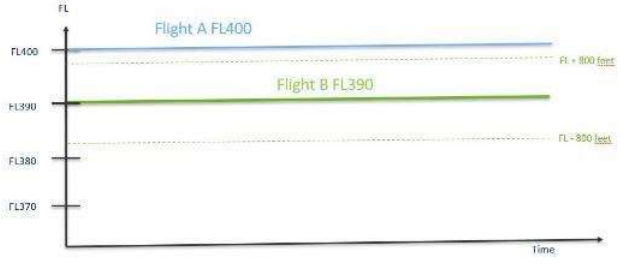
## 2.4 Glossary of terms

See the AIRM Glossary [1] [7] for a comprehensive glossary of terms.

| Term | Definition | Source of the definition |
|---|---|---|
| **Abnormal conditions** | Conditions that are not nominal. For instance, alerts (CLAM, EHS CLAM, etc) are considered in the solution as abnormal conditions. Emergency SSR code and emergency tracks also. | Sol. 96 AG |
| **Adjusted density** | The adjusted density is defined as the ratio between the hours of interactions and flight hours. | 2006 Complexity metrics report |
| **Area of Responsibility** | An airspace of defined dimensions within which an ATC unit provides air traffic services. | ATM Lexicon |
| **Attention Guidance** | The Attention Guidance system guides the attention of air traffic controllers to focus only on flights which will possibly need to interact with them during the navigation across their airspace. | Sol. 96 AG |
| **"Fade-out"** | Algorithm which will put in background traffic that presumably will not request interaction with ATCOs. | Sol. 96 AG |
| **"Fade-out" status** | Status of a flight for which no interaction with ATCOs will be needed. The flight is impacted by the fade-out algorithm.   | Sol. 96 AG |

[5] Go to "Advanced Portfolio Manager" on the left navigation menu, and select "Coordination Group – ATM Performance Assessment (APA)" in STELLAR:

| | | |
|---|---|---|
| **Horizontal Different Interacting Flows (HDIF)** | The HDIF is a measure of the complexity arising from the interactions between flights with different headings and is expressed as the duration of potential horizontal interactions (in hours) per flight hour. | 2006 Complexity metrics report |
| **"Intermediate Fade-out" status** | Flight impacted by the fade-out algorithm. The flight is candidate to be in "fade-out" status. To keep ATCO's situation awareness, the flight is turned to "intermediate fade-out" status. Then the ATCO can manually give his/her approbation. Once given, the flight turns to "fade-out" status.<br>  | Sol. 96 AG |
| **"Intermediate normal display" status** | Flight impacted by the fade-out algorithm.<br><br>When a flight in "fade-out" status is no longer Largely non-conflictual, it turns to "Intermediate normal display" status. To keep ATCO's situation awareness, this latter must manually give his/her approbation. Once given, the flight turns to "normal display" status.<br>  | Sol. 96 AG |

| | | |
|---|---|---|
| **Interaction** | An interaction is defined as the simultaneous presence of two aircraft in the same cell viewed for each aircrafts' perspective. | 2006 Complexity metrics report |
| **Largely non-conflictual** | A largely non-conflictual flight is a flight for which the minimum lateral distance is above 20 NM or the vertical profile is not intercepting with other flights.<br>  <br>  <br>  <br>  | Sol. 96 AG |

| | | |
|---|---|---|
| **"Normal display" status** | A flight in "normal display" status is a flight monitored and scanned by the ATCO who has the flight under its the Area of Responsibility. In other words, this is a flight not impacted by the fade-out algorithm.   | Sol. 96 AG |
| **Speed Different Interacting Flows (SDIF)** | The SDIF is a measure of the complexity arising from the interactions between flights in different speeds. It is expressed as the duration of potential speed interactions (in hours) per flight hour. | |
| **Speed line** | The speed line indicates the direction and x, y position of the track in x minutes. | Sol. 96 AG |
| **Structural index** | The structural index originates from horizontal (HDIF), vertical (VDIF), and speed (SDIF) interactions and is computed as the sum of the three indicators. | https://ansperformance.eu/reference/dataset/traffic-complexity-score/ |
| **Vertical Different Interacting Flows (HDIF)** | The VDIF is a measure of the complexity arising from the interactions between flights in different flight phases. It is expressed as the duration of potential vertical interactions (in hours) per flight hour. | 2006 Complexity metrics report |

**Table 3: Glossary**

## 2.5 Acronyms and Terminology

| Term | Definition |
|---|---|
| AG | Attention Guidance |
| Air G | Air Gestures |

| | |
|---|---|
| AI | Artificial Intelligence |
| ANSP | Air Navigation Service Provider |
| AR | Augmented Reality |
| ATC | Air Traffic Control |
| ATCO | Air Traffic Controller |
| ATM | Air Traffic Management |
| BIM | Benefit Impact Mechanism |
| CATC | Conflicting ATC Clearances |
| CBAT | Cost Benefit Analysis tailored for the Technological Solution |
| CC | Capability Configuration |
| CMAC | Conformance Monitoring Alerts for Controllers |
| CWP | Controller Working Position |
| EATMA | European ATM Architecture |
| E-ATMS | European Air Traffic Management System |
| EN | Enabler |
| E-OCVM | European Operational Concept Validation Methodology |
| ER | En-Route |
| FAA | Federal Aviation Administration |
| HMI | Human Machine Interface |
| HPAP | Human Performance Assessment Plan |
| IER | Information Exchange Requirement |
| INTEROP | Interoperability Requirements |
| IRS | Interface Requirements Specification |
| ISRM | Information Services Reference Model |
| ML | Machine Learning |
| NAF | NATO Architecture Framework |
| NFR | Non- Functional Requirements |

| | |
|---|---|
| NOV | NAF Operational View |
| NPV | Net Present Value |
| NSOV | NAF Service Oriented View |
| NSV | NAF System View |
| OE | Operating Environment |
| PAR | Performance Assessment Report |
| QoS | Quality of Service |
| RMCA | Runway Monitoring and Conflict Alerting |
| SDD | Service Description Document |
| SecAP | Security Assessment Plan |
| SESAR | Single European Sky ATM Research Programme |
| SJU | SESAR Joint Undertaking (Agency of the European Commission) |
| SoaML | Service Oriented Architecture Modelling Language |
| SPR | Safety and Performance Requirements |
| SUT | System Under Test |
| TRL | Technology Readiness Level |
| TS | Technical Specification |
| TS/IRS | Technical Specification/Interface Requirements Specification |
| TSAP | Technical Safety Assessment Plan |
| TVALP | Technological Validation Plan |
| TVALR | Technological Validation Report |
| TWR | Tower |
| V&V | Validation and Verification |
| VALS | Validation Strategy |
| VCS | Voice Communication System |
| V/AR | Virtual/Augmented Reality |

**Table 4: Acronyms and terminology**

The following is a list of the concepts, terms or definitions introduced or commonly referred to in this document.

| Term | Definition | Source |
|---|---|---|
| Airport Capacity Focus Area | Capture the peak runway throughput in the most challenging (or constrained) environments at busy hours, i.e., the capacity at a "maximum observed throughput" airport. | PAGAR |
| Airspace Capacity Focus Area | Capture the capability of a challenging volume of airspace to handle an increasing number of movements per unit time – through changes to the operational concept and technology. | PAGAR |
| Airspace Reservation/ Restriction (ARES) | Airspace Reservation means a defined volume of airspace temporarily reserved for exclusive or specific use by categories of users (Temporary Segregated Area (TSA), Temporary Reserved Area (TRA), and Cross-Border Area (CBA)) whereas Airspace Restriction designates Danger, Restricted and Prohibited Areas. | EC Regulation No 2150/2005 |
| Airspace User Cost-Efficiency Focus Area | Cost-Efficiency obtained by Airspace Users other than direct gate-to-gate ATS costs (CEF1) or AU cost improvements assessed through other KPIs: Fuel Efficiency, Punctuality, etc.<br>Note: Benefits assessed through other KPIs should not be included in this focus area to avoid double counting of benefits. AU Cost-Efficiency includes reduction of direct (AUC3) and indirect (AUC4) operational costs of the AU, as well as overhead costs (AUC5). In addition, there are two specific PIs, Strategic Delay (AUC1) and Sequence Optimisation Benefit (AUC2). | PAGAR |
| ARES Capacity | The ability of an ATM system to accommodate specific training events which require airspace reservations and/or restrictions during a specific period of time, taking into account the duration of the training events, ATM inefficiency, planning inefficiency and weather impact on training and operations. | Performance Framework 2017 |

| Term | Definition | Source |
|---|---|---|
| ATM Master Plan | The European ATM Master Plan is the agreed roadmap to bring ATM R&I to the deployment phase, introducing the agreed vision for the future European ATM system. It provides the main direction and principles for SESAR R&I, as well as the deployment planning and an implementation view with agreed deployment objectives. Through the SESAR Key Features, the ATM Master Plan identifies the Essential Operational Changes (both Essential Operational Changes featured in the Pilot Common Project and New Essential Operational Changes) and key R&I activities that support the identified performance ambition. The ATM Master Plan is updated on a regular basis in collaboration and consultation with the entire ATM community. Amendments are submitted to the SJU Administrative Board for adoption.<br>The content of the European ATM Master Plan is structured in three levels (Level 1 – Executive View, Level 2 – Planning and Architecture View, and Level 3 – Implementation View) to allow stakeholders to access the information at the level of detail that is most relevant to their area of interest. The intended readership for Level 1 is executive-level stakeholders. Levels 2 and 3 of the ATM Master Plan provide more detail on the operational changes and related elements and therefore the target audience is expert-level stakeholders. | SESAR2020 Project Handbook, European ATM Master Plan (9 Edition) |
| Civil-military coordination and cooperation | The coordination between the civil and military parties authorised to make decisions and agree a course of action. | Performance Framework 2017 |
| Cost-Benefit Analysis | A Cost-Benefit Analysis is a process for quantifying in economic terms the costs and benefits of a project or a programme over a certain period, and those of its alternatives (within the same period), in order to have a single scale of comparison for unbiased evaluation.<br>This process helps decision-makers to compare an investment with other possible investments and/or to make a choice between different options / scenarios and to select the one that offers the best value for money while considering all the key criteria affecting the decision. | PAGAR |
| Deployment Scenario | Set of SESAR Solutions selected to satisfy the specific Performance Needs of operating environments in the European ATM System and based on the timescales in which their performance contribution is needed in the respective operating environments. | PAGAR |
| Flexibility KPA | The ability of the ATM System and airports to respond to changes in planned flights and missions.<br>It covers late trajectory modification requests as well as ATFCM measures and departure slot swapping and it is applicable to military and civil airspace users covering both scheduled and unscheduled flights. In terms of specific military requirements, it also covers the ability of the ATM System to address military requirements related to the use of airspace and reaction to short-notice changes. | Performance Framework 2017 |

| Term | Definition | Source |
|---|---|---|
| Focus Area | Within each KPA, a number of more specific "Focus Areas" are identified in which there are potential intentions to establish performance management. Focus Areas are typically needed where performance issues have been identified. | ICAO Doc 9883 |
| Fuel Efficiency Focus Area | The SESAR performance Focus Area concerned with fuel efficiency.<br><br>How much fuel is used by aviation or by extension "Fuel efficiency" (how much fuel can be saved?) is one of the performance aspects.<br><br>Note: Policy places considerable focus on this. Fuel efficiency contributes to 3 of the 11 KPAs defined by ICAO: Cost-efficiency, Efficiency, and Environment. | PAGAR |
| Gap Analysis | Difference between the validation targets and the performance assessment.<br><br>It is used to:<br>1. Anticipate any deviation from the design performance targets.<br>2. Identify the underlying reasons.<br>3. Derive the appropriate recommendations to be taken on board to redirect the R&D activities within the Programme towards the ultimate achievement of SESAR2020's performance ambitions. | PAGAR |
| G2G ANS Cost-Efficiency Focus Area | One of the SESAR performance Focus Areas concerned with Cost Efficiency.<br><br>Direct G2G ANS costs are those costs that are charged to Airspace Users via unit rates, including ATM/CNS costs, regulatory costs, Met costs and EUROCONTROL Agency costs. | Performance Framework new |
| Human Performance (HP) | Human capabilities and limitations which have an impact on the safety, security and efficiency of aeronautical operations. | EUROCONTROL ATM Lexicon |
| Key Performance Area | A way of categorising performance subjects related to high level ambitions and expectations. ICAO Global ATM Concept sets out these expectations in general terms for each of the 11 ICAO defined KPAs. | EUROCONTROL ATM Lexicon |

| Term | Definition | Source |
|---|---|---|
| Key Performance Indicator | Current/past performance expected future performance (estimated as part of forecasting and performance modelling), as well as actual progress in achieving performance objectives is quantitatively expressed by means of indicators (sometimes called Key Performance Indicators, or KPIs). To be relevant, indicators need to correctly express the intention of the associated performance objective. Since indicators support objectives, they should not be defined without having a specific performance objective in mind. Indicators are not often directly measured. They are calculated from supporting metrics according to clearly defined formulas, e.g., cost-per-flight-indicator = Sum (cost)/Sum (flights). Performance measurement is therefore carried out through the collection of data for the supporting metrics."<br><br>In SESAR2020 Performance Framework, Key Performance Indicators are those that have a validation target associated derived from the corresponding Performance Ambition. | ICAO Doc 9883<br>Performance Framework |
| Local Air Quality Focus Area | One of the SESAR performance Focus Areas concerned with Environment.<br><br>Local air quality is a term commonly used to designate the state of the ambient air to which humans and the ecosystem are typically exposed at a specific location. In the case of aviation, local air quality studies are generally conducted near airports. | PAGAR |
| Noise Focus Area | One of the SESAR performance Focus Areas concerned with Environment.<br><br>The term Noise is used in this document to designate noise pollution, which is defined as unwanted sound. The impact of unwanted sounds on the recipients (in this case, people living around airports) causes adverse effects. | PAGAR |
| Operational Environment (OE) | An environment with a consistent type of flight operations. | EUROCONTROL ATM Lexicon |
| Performance Ambitions | Performance capability that may be achieved if SESAR Solutions are made available through R&D activities, deployed in a timely and, when needed, synchronised way and used to their full potential. | EUROCONTROL ATM Lexicon |
| Performance assessment | This term relates to the quantitative estimate of the potential performance benefit of an operational improvement based on outputs from validation projects, collected and analysed by PJ19.04.02 | ICAO Doc 9883 updated in PAGAR |

| Term | Definition | Source |
|---|---|---|
| Performance Framework | 1) The overall performance-driven development approach that is applied within the SESAR development programme to ensure that the programme develops the operational concept and technology needed to meet long-term performance expectations.<br><br>2) The set of definitions and terminology describing the building blocks used by a group of ATM community members to collaborate on performance management activities.<br><br>This set of definitions includes the levels in the global ATM performance hierarchy, the eleven Key Performance Areas, a set of process capability areas, focus areas, performance objectives, indicators, targets, supporting metrics, lists of dimension objects, their aggregation hierarchies and classification schemes. | EUROCONTROL ATM Lexicon |
| Performance Indicator | PIs are defined in the SESAR performance framework and relate to performance benefits in specific KPAs. However, no validation targets are assigned to PIs. SESAR Solutions projects use the results of validation exercises to report performance assessment in terms of the PIs, reporting the expected positive and negative impacts. Certain PIs are mandatory for measurement and reporting by Solution projects. | SESAR2020 Project Handbook |
| Performance metrics | Sometimes proxies may be used in a validation exercise when it is not possible to measure an impact directly using the specified KPIs and PIs. In these cases, other metrics may be used provided the solution project later converts the results into the reporting KPIs and PIs. | SESAR2020 Project Handbook |
| Predictability Focus Area | Predictability is focused on in-flight (i.e. off-block to on-block) variability of flight duration compared to the planned duration.<br>It is expected that this area will be extended in the future to reflect the improvement derived from better planning in pre-tactical phase. | Performance Framework 2019 |
| Punctuality Focus Area | Refers to “ATM Punctuality”. It captures ATM issues as well as events related to ATM that cause a temporal perturbation to airspace user schedules. | PAGAR |
| Resilience Focus Area | Resilience focuses on the ability to withstand and recover from planned and unplanned events and conditions which cause a loss of nominal performance. | Performance Framework updated |
| Safety | The state to which the possibility of harm to persons or damage to property is reduced, and maintained at or below, an acceptable level through a continuing process of hazard identification and risk management. | EUROCONTROL ATM Lexicon |

| Term | Definition | Source |
|---|---|---|
| Security | (aviation) Safeguarding civil aviation against acts of unlawful interference. This objective is achieved by a combination of measures and human and material resources.<br>Note: ATM Security is concerned with those threats that are aimed at the ATM System directly, such as attacks on ATM assets, or where ATM plays a key role in the prevention of or response to threats aimed at other parts of the aviation system (or national and international assets of high value). ATM security aims to limit the effects of a threats on the overall ATM Network. ATM Security is a subset of Aviation Security (as defined by ICAO in Annex 17). | EUROCONTROL ATM Lexicon,<br>Note are from PAGAR |
| SESAR2020 | The Programme for SESAR2020 was created with a clear and agreed need for continuing research and innovation in ATM beyond the SESAR 1 development phase. SESAR2020 is structured into three main research phases, starting with Exploratory Research, which is then further expanded within a Public-Private-Partnership (PPP) to conduct Industrial Research and Validation. Finally, it further exploits the benefits of the PPP in Demonstrating at Large Scale the concepts and technologies in representative environments to firmly establish the performance benefits and risks. | Performance Framework 2017 |
| SESAR Programme | The programme which defines the Research and Development activities and Projects for the SJU. | EUROCONTROL ATM Lexicon |
| SESAR Solution | A term used when referring to both SESAR ATM Solution and SESAR Technological Solution. SESAR Solutions relate to either an Operational Improvement (OI) step or a group of OI steps with associated Enablers (technical system, procedure or human), which have been designed, developed and validated in response to specific Validation Targets and that are expected deliver operational and/or performance improvements to European ATM, when translated into their effective realisation. | SESAR2020 Project Handbook |
| SESAR Technological Solution | SESAR Technological Solutions relate to verified technologies proven to be feasible and profitable, which may therefore be considered to enable future SESAR Solutions. | SESAR2020 Project Handbook |
| Single European Sky High Level Goals | The SES High Level Goals are political targets set by the European Commission. Their scope is the full ATM performance outcome resulting from the combined implementation of the SES pillars and instruments, as well as industry developments not driven directly by the EU. | SESAR2020 Project Handbook |
| Sub-OE | A subcategory of an Operating environment, classified according to its complexity (e.g., high complexity TMA, medium complexity TMA, low complexity TMA). | EUROCONTROL ATM Lexicon |
| Validation targets | Validation targets are the targets that focus on the development of enhanced capabilities by the SESAR Solutions. They aim to secure from R&D the required performance capability to contribute to the achievement of the Performance Ambitions and, thus, to the SES high-level goals.<br>In SESAR2020 validation targets are associated with a KPI. | EUROCONTROL ATM Lexicon |

**Table 5: Terminology**

# 3 Solution Scope

## 3.1 Detailed Description of the Solution

ATCOs in air traffic control (ATC) centres rely on the human machine interface (HMI) of their controller working position (CWP) to manage the airspace. This is especially true for the CWP's situation data display (SDD) with regard to safely supervising current air traffic. Situational awareness and attention are two important skills that controllers need to keep at a high level when controlling aircraft at a radar screen.

For safety and efficiency reasons most CWPs issue a series of action indicators - such as information, warning, alert and finally alarm – if an assistance system detects a potentially dangerous traffic situation in the near or medium future. Because in high complexity En-Route environment Controllers are subject to a huge traffic to be controlled, SESAR research is examining a solution to reduce this workload, guiding the attention of the ATCOs to focus only on flights which will possibly interact with each other during their flights across the controlled airspace.

Reducing workload will increase the throughput of these sectors and the Solution will reach this goal by means of the implementation of a new algorithm, a "fade-out" algorithm that will put in background color traffic that presumably will not request any ATCO's instruction for spacing.

In an high complexity En-Route environment for the first time the CWP will take decisions about the priority of flights with regards to the attention needed by ATCOs. The solution reduces controller workload and stress levels as awareness is enhanced and actions are executed close to the optimum times. Furthermore, controllers are 'ahead of the situation' and can handle high complexity traffic flows more easily.

## 3.2 Detailed Description of relationship with other Solutions

| Solution Number | Solution Title | Relation ship | Rational for Justification | Impacted KPA; Relationship coefficient [6] |
|---|---|---|---|---|
| PJ.08-01 | Management of Dynamic Airspace configurations | Cross Effect | PJ.16-04-CWPV perspective:<br><br>Other Solutions are potentially candidates as the Solution is linked to the definition of a | ***CEF 2*** (Cost Efficiency optimization for ANSP due to technological Enablers that will increase the efficiency in ATC.);<br><br>***CAP 2*** increased (Medium impact) due to general |

[6] For any question on how to fulfil this section please contact us through "STELLAR - Slideboard ()" or directly by email:Irisa Chiu irisa.chiu.ext@eurocontrol.int and Didier Dohy didier.dohy.ext@eurocontrol.int [7] Reactionary delay out of the scope since they could be due to many different reasons other than capacity degradation, in addition the cause of reactionary delay are not recorded in detail.

| | | | | |
|---|---|---|---|---|
| | | | new architecture of the CWP HMI.<br><br>These Solutions might be identified using the link to CHMI functional block in EATMA/MEGA.<br><br>Interaction magnitude should be low. | expectation to improve complexity management through new algorithm that allow to manage less critical flight. |
| PJ.10-01b | Flight-Centric ATC | Cross Effect | PJ.16-04-CWPV perspective:<br><br>Other Solutions are potentially candidates as the Solution is linked to the definition of a new architecture of the CWP HMI.<br><br>These Solutions might be identified using the link to CHMI functional block in EATMA/MEGA.<br><br>Interaction magnitude should be medium. | |
| PJ.10-01c | Collaborative Control | Cross Effect | PJ.16-04-CWPV perspcetive:<br>Other Solutions are potentially candidates as the Solution is linked to the definition of a new architecture of the CWP HMI.<br>These Solutions might be identified using the link to CHMI functional block in EATMA/MEGA.<br>Interaction magnitude should be medium. | |
| PJ.10-05 | IFR RPAS Integration | Cross Effect | PJ.16-04-CWPV perspective:<br>Other Solutions are potentially candidates as the Solution is linked to the definition of a | |

| | | | | |
|---|---|---|---|---|
| | | | new architecture of the CWP HMI.<br>These Solutions might be identified using the link to CHMI functional block in EATMA/MEGA.<br>Interaction magnitude should be high.<br>PJ.10-05 perspective: Confirm a potential interaction that has to be confirmed and evaluated in Wave 2.<br>Positive effect on HP. | |
| PJ.11-G1 | Enhanced Short Term Conflict Alert (STCA) and Non Transgression Zone (NTZ) Ground Based Safety Nets making use of DAPs information. | Cross Effect | PJ.16-04-CWPV perspective:<br>Other Solutions are potentially candidates as the Solution is linked to the definition of a new architecture of the CWP HMI.<br>These Solutions might be identified using the link to CHMI functional block in EATMA/MEGA.<br>Interaction magnitude should be low. | |
| PJ.15-02 | E-AMAN Service | Cross Effect | PJ.16-04-CWPV perspective:<br>Other Solutions are potentially candidates as the Solution is linked to the definition of a new architecture of the CWP HMI.<br>These Solutions might be identified using the link to CHMI functional block in EATMA/MEGA.<br>Interaction magnitude should be low. | |
| W2. PJ10.96 AG with | Improving ATCO productivity | Compatible / Indepen | W2. PJ10.96 AG prefers / is compatible with W2.PJ10.96.ASR as the | |

| | | | | |
|---|---|---|---|---|
| W2.PJ10.96 ASR | by ASR in EnRoute OE (improving Situation awareness and ATCO workload) | tent / No Cross Effect | Speech Recognition module might support ATCOs on duty and both SOLs are compatible in the same OE | |
| W2. PJ10.96 ASR with W2.PJ10.96 AG | Improving ATCO productivity by AG in EnRoute OE (improving Situation awareness and ATCO workload) | Compatible / Independent / No Cross Effect | W2. PJ10.96 ASR prefers / is compatible with W2.PJ10.96.AG as the Attention Guidance module might support ATCOs on duty and both SOLs are compatible in the same OE | |

**Table 6: Relationships of Sol 97.1 with other Solutions**

The possible relationships that PJ10-W2 -SOL 96 AG might have, looking at the other W2 Solutions in EnRoute Operational Environment, is with SOL 96 ASR and vice versa, judged as "***Compatible/Independent/No cross effect***". Thus, these relationships are not mentioned except for the above, due to being part of the same project.

# 4 Solution Performance Assessment

## 4.1 Assessment Sources and Summary of Validation Exercise Performance Results

SESAR Validation Exercises of this Solution (completed ones and planned ones) are listed below.

| Exercise ID | Exercise Title | Release | Maturity | Status |
|---|---|---|---|---|
| EXE–PJ.10-96-AG-TRL6-01 | | Q2 2022 | TRL6 | Completed |

**Table 7: SESAR2020 Validation Exercises**

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

| Exercise | OI Step | Exercise scenario & scope | Performance Results | Notes |
|---|---|---|---|---|
| EXE–PJ.10-96-AG-TRL6-01 | POI-0053-SDM | Real-time simulation addressing the improvement of controller productivity by Attention Guidance (AG) at the ER CWP/HMI | ***N/A*** | ***N/A*** |

**Table 8: Summary of Validation Results.**

## 4.2 Conditions / Assumptions for Applicability

The following **Error! Reference source not found.** summarises the applicable operating environments.

| OE | Applicable sub-OE | Special characteristics |
|---|---|---|
| En-Route | Very high complexity | Above FL355 |

**Table 9: Applicable Operating Environments.**

## 4.3 Safety

This safety assessment is conducted as per the SESAR Safety Reference Material (SRM) which itself is based on a twofold approach:

- ✓ a success approach which is concerned with the safety of the Solution operations in the absence of failure within the end-to-end Solution functional system, encompassing both Normal operation and Abnormal conditions,
- ✓ a conventional failure approach which is concerned with the safety of the Solution operations in the event of failures within the end-to-end Solution functional system.

These two approaches are applied to the derivation of safety properties at each of the successive lifecycle stages of the Solution development (Technical Safety Requirements at service level and at design level).

### 4.3.1 Safety Design drivers and Performance Mechanism

The PJ.10-W2-96 Attention Guidance deals with new methods of controller interaction with Human Machine Interface (HMI), implementing a fade-out algorithm in a very high complexity environment. The fade-out algorithm supports the ATCO by putting the “largely non-conflictual” flights in “fade-out” status which means they are displayed in a way it does not attract the user’s attention. Implementing a fade-out algorithm allows the ATCO to visualize the flights for which attention is required and a manual input may be necessary.

The aim of the application is to release ATCOs from the monitoring and the scanning of “largely non-conflictual” flights and to increase the ability to focus on relevant flights by reducing the amount of information to analyse on HMI.

Currently, there is no SESAR operational solution for which the Attention Guidance technology, as covered by the PJ10-W2-96 Technological solution, is an enabler. Therefore, its intended use within SESAR is limited to the use cases identified in Chapter 3.3.1 in PJ10-W2-96 AG Technical Safety Assessment Report.

Figure 1 and 2 shows the expected impacts and benefits in terms of safety.

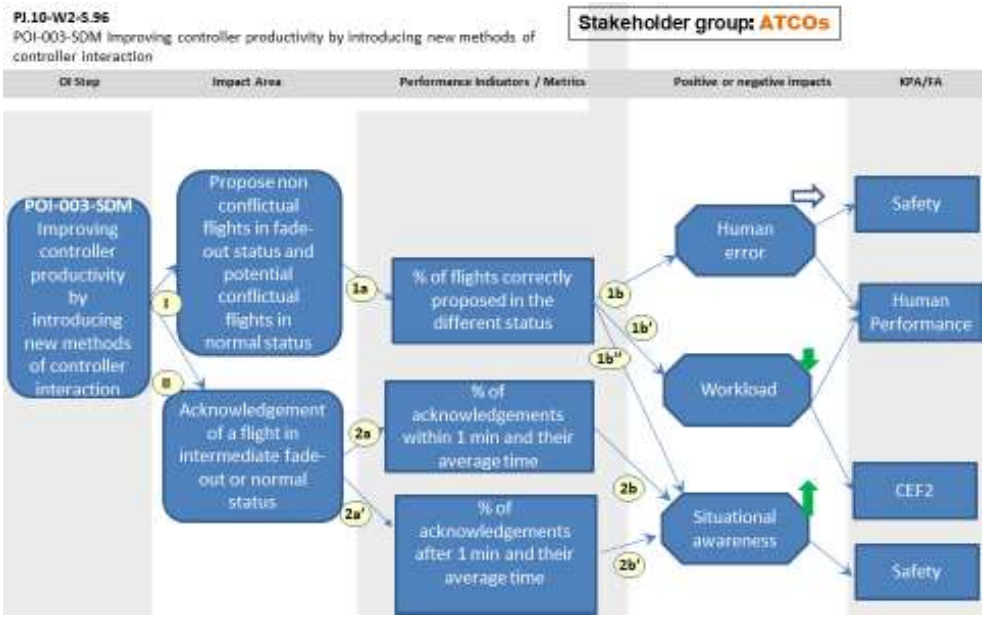



**Figure 3 BIM ATCOs**

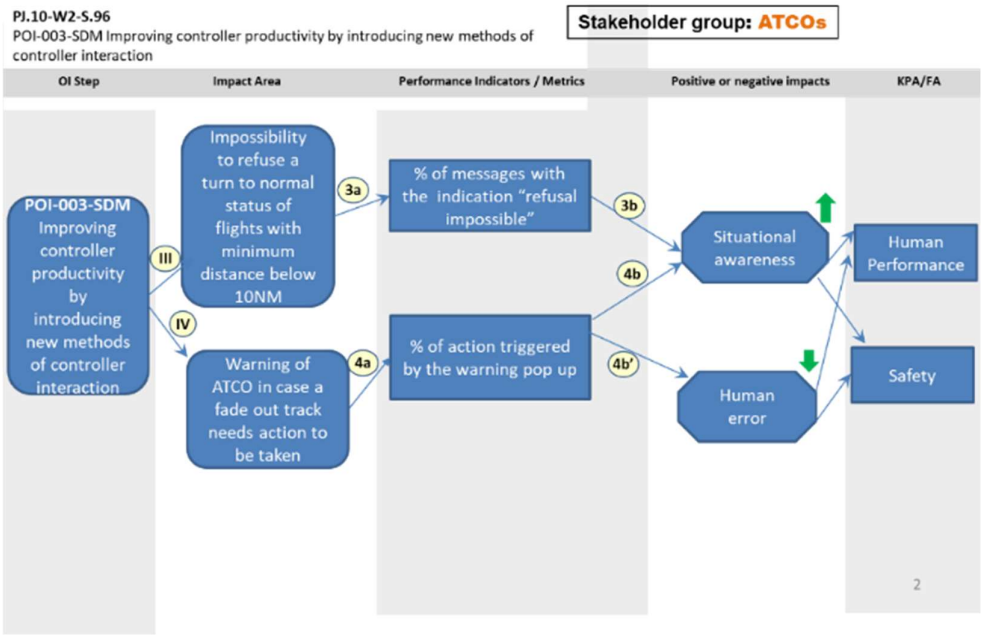



**Figure 4 BIM ATCOs**

## 4.3.2 Data collection and Assessment

Following the SRM process, Safety Requirements at Service level (SRS) and Operational Hazards have been developed and identified. The achievability of the intended use of safety application has been demonstrated through the satisfaction of the success criteria of the safety validation objectives

defined in relation to the Solution planned validation exercises and other specific validation means (Safety and HP workshop).

The safety-related outcomes of the validation exercises (traced back to the safety validation objectives) bring an essential contribution to the demonstration of the intended use of safety application achievability by the Solution design. Decision for deriving (or not) additional Safety Requirements might be taken from these results. Indeed, an TSSR functionality & performance addressing human factors or procedures might be covered by a validation exercise but the validation outcome might be that it can be satisfied only partially or even not satisfied, in which case the design should ensure adequate risk mitigation.

The safety-relevant results of the validation exercises and of any other specific validation means (Safety and HP workshop) are summarized in SESAR Solution 96 AG TVALR.

Safety data collection and then safety assessment have been developed and built on safety workshops conducted with various operational and validation experts, e.g. ATCOs from Skyguide and HungaroControl. The assessment based also on the results obtained from validation phase during Real Time Simulation (RTS) at Skyguide in Geneva through questionnaires and debriefings conducted among the participants.

Results are provided in the following documents:

- SESAR Solution 96 AG TVALR
- SESAR Solution 10.96 TS/IRS for TRL6 - Part II - Safety Assessment Report**Error! Reference source not found.**

### 4.3.3 Extrapolation to ECAC wide

An extrapolation is not possible based on the nature of the results, but it can be concluded that subjective feedback and objective measures indicate that safety is maintained.

### 4.3.4 Discussion of Assessment Result

Results and conclusions were mainly based on the results of the Post Exercise Questionnaires and the Post Simulation Questionnaire. The analysis shows that safety level can be maintained after implementation of the Solution. The results of the simulation along with experts' judgment can be a formal confirmation of this statement. Quantifiable indicators such as numbers of ATC detection of safety critical events and the timeliness of conflict resolution by controllers, can show a trend of maintaining safety which corroborates the subjective feedback given by controllers.

A significant factor that would change the safety level while using Attention Guidance in day-to-day operations is the increased trust in the system. After getting used to the function ATCO intervention is expected to be slower in case of a possible failure of the Attention Guidance.

### 4.3.5 Additional Comments and Notes

No additional comments or notes.

## 4.4 Environment: Fuel Efficiency / CO2 emissions

Does the Solution impact this KPA? ***NO***

### 4.4.1 Performance Mechanism

***N/A***

### 4.4.2 Assessment Data (Exercises and Expectations)

***N/A***

### 4.4.3 Extrapolation to ECAC wide

***N/A***

| *KPIs / PIs* | Unit | Calculation | Mandatory | Absolute expected performance benefit in SESAR2020 | % expected performance benefit in SESAR2020 |
|---|---|---|---|---|---|
| **FEFF1** Actual Average fuel burn per flight | Kg fuel per movement | Total amount of actual fuel burn divided by the number of movements | YES | *N/A* | *N/A* |
| **ENV1** Actual Average CO2 Emission per flight | Kg CO2 per flight | Amount of fuel burnt x 3.15 (CO2 emission index) divided by the number of flights | *N/A* | *N/A* | *N/A* |

**Table 10: Fuel burn and CO2 emissions saving for Mandatory KPIs /PIs**

| | Taxi out | TMA departure | En-route | TMA arrival | Taxi in |
|---|---|---|---|---|---|
| **FEFF1** Actual Average fuel burn per flight | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** |
| **ENV1** Actual Average CO2 Emission per flight | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** |

**Table 11: Fuel burn and CO2 emissions saving per flight phase.**

Were there any benefits obtained in SESAR2020 Wave1 for this Solution? ***NO***.

### 4.4.4 Discussion of Assessment Result

***N/A***

### 4.4.5 Additional Comments and Notes

***N/A***

## 4.5 Environment / Emissions, Noise and Local Air Quality

Does the Solution impact this KPA? ***NO***

### 4.5.1 Performance Mechanism

Is there a Benefit Mechanism available? ***NO***

### 4.5.2 Assessment Data (Exercises and Expectations)

| PIs | Unit | Calculation | Mandatory | Absolute expected performance benefit in SESAR2020 | % expected performance benefit in SESAR2020 |
|---|---|---|---|---|---|
| **NOI1** Relative noise scale | -2 to +2 | It is a qualitative scale based on expert judgment. -2 very negative effect or benefit, 0 neutral and +2 very positive effects or benefit. The objective of this metric is to provide a global assessment of the noise impact. This metric is built upon the other quantitative noise PIs (NOI2, NOI3, NOI4, NOI5) | ***N/A*** | ***N/A*** | ***N/A*** |
| **NOI2** Size and location of noise contours | Contours of noise level thresholds (e.g. LDEN 55 see ERM document for the list of recommended PIs). Surface of these contours($Km^2$) | Noise contours to be calculated according to the ECAC Doc.29 methodology. Surface of the noise contours calculated using a GIS tool or modules. Suggest the use of IMPACT tool. | ***N/A*** | ***N/A*** | ***N/A*** |
| **(NOI4)** Number of people exposed to noise levels exceeding a given threshold | Number of people inside noise contours. | Population count inside the contours calculated above. Need the availability of population census data. Calculated using a GIS tool or modules. IMPACT tool includes this functionality, using the EEA population database. | ***N/A*** | ***N/A*** | ***N/A*** |

| PIs | Unit | Calculation | Mandatory | Absolute expected performance benefit in SESAR2020 | % expected performance benefit in SESAR2020 |
|---|---|---|---|---|---|
| **LAQ1**<br>Geographic distribution of pollutant concentrations | Airport Local Air Quality Studies (ALAQS) inventory method generally uses mg/m$^3$ for each pollutant | Measurement to be performed within LTO cycle.<br>• NOx: Nitrogen oxides, including nitrogen dioxide (NO2) and nitrogen oxide (NO);<br>• VOC: Volatile organic compounds (including non-methane hydrocarbons (NMHC));<br>• CO: Carbon monoxide;<br>• PM: Particulate matter (fraction size PM2.5 and PM10);<br>• SOx: Sulphur oxides.<br>• Recommended tools: Open-ALAQS | ***N/A*** | ***N/A*** | ***N/A*** |

**Table 12: Noise and Local Air Quality benefit for Mandatory PIs**

Were there any benefits obtained in SESAR2020 Wave1 for this Solution? ***NO***

### 4.5.3 Extrapolation to ECAC wide

***N/A***

### 4.5.4 Discussion of Assessment Result

***N/A***

### 4.5.5 Additional Comments and Notes

***N/A***

## 4.6 Airspace Capacity (Throughput / Airspace Volume & Time)

Does the Solution impact this KPA? ***NO***

### 4.6.1 Performance Mechanism

Is there a Benefit Mechanism available? ***NO***

### 4.6.2 Assessment Data (Exercises and Expectations)

| Exercise ID or Expert judgement | Benefits contribution to CAP1 | Benefits contribution to CAP2 |
|---|---|---|
| EXE-xx | ***N/A*** | ***N/A*** |
| | | |

**Table 13: Airspace Capacity benefits per Exercise**

| OI step | Relative benefits contribution to CAP1 | Relative benefits contribution to CAP2 |
|---|---|---|
| XX-XXXX | ***N/A*** | ***N/A*** |
| | | |
| TOTAL | 100% | 100% |

**Table 14: Airspace Capacity relative benefits per OI step**

| KPIs / PIs | Unit | Calculation | Mandatory | Absolute expected performance benefit in SESAR2020 | % expected performance benefit in SESAR2020 |
|---|---|---|---|---|---|
| **CAP1** TMA throughput, in challenging airspace, per unit time | Relative change of movements (% and number of movement) | % and also total number of movements per volume of TMA airspace per hour for specific traffic mix and density, for High and Medium Complexity TMAs. TMA at peak demand hours. | YES | ***N/A*** | ***N/A*** |
| **CAP2** En-route throughput, in challenging | Relative change of movements (% and | % and also total number of movements, per volume of En-Route airspace per hour for specific traffic mix and | YES | ***N/A*** | ***N/A*** |

| KPIs / PIs | Unit | Calculation | Mandatory | Absolute expected performance benefit in SESAR2020 | % expected performance benefit in SESAR2020 |
|---|---|---|---|---|---|
| airspace, per unit time | number of movement) | density, for High and Medium Complexity TMAs. airspace at peak demand hours. | | | |

**Table 15: Airspace benefits for Mandatory KPIs /PIs**

Were there any benefits obtained in SESAR2020 Wave1 for this Solution? **NO**.

### 4.6.3 Extrapolation to ECAC wide

***N/A***

### 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)

Does the Solution impact this KPA? ***NO***

### 4.7.1 Performance Mechanism

Is there a Benefit Mechanism available? ***NO***

### 4.7.2 Assessment Data (Exercises and Expectations)

| Exercise ID or Expert judgement | Benefits contribution to CAP3 | Benefits contribution to CAP3.1 | Benefits contribution to CAP3.2 | Benefits contribution to CAP4 |
|---|---|---|---|---|
| EXE-xx | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** |
| | | | | |

**Table 16: Airport Capacity benefits per Exercise**

| OI step | Relative benefits contribution to CAP3 | Relative benefits contribution to CAP3.1 | Relative benefits contribution to CAP3.2 | Relative benefits contribution to CAP4 |
|---|---|---|---|---|
| XX-XXXX | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** |
| | | | | |
| TOTAL | 100% | 100% | 100% | 100% |

**Table 17: Airport Capacity relative benefits per OI step**

| KPIs / PIs | Unit | Calculation | Mandatory | Absolute expected performance benefit in SESAR2020 | % expected performance benefit in SESAR2020 |
|---|---|---|---|---|---|
| **CAP3** Peak Runway Throughput (Mixed mode) | % and Flight per hour | % and also total number of movements per one runway per one hour for specific traffic mix and density (in mixed mode RWY operations). The percentage change is measured against the maximum observed throughput during peak demand hours in the mixed-mode RWY operations airports group. | YES | ***N/A*** | ***N/A*** |

| KPIs / PIs | Unit | Calculation | Mandatory | Absolute expected performance benefit in SESAR2020 | % expected performance benefit in SESAR2020 |
|---|---|---|---|---|---|
| **CAP3.1** Peak Departure throughput per hour (Segregated mode) | % and Flight per hour | % and also total number of departures per one runway per one hour for specific traffic mix and density (in segregated mode of operations). The percentage change is measured against the maximum observed throughput during peak demand hours in the segregated-mode RWY operations airports group. | YES | ***N/A*** | ***N/A*** |
| **CAP3.2** Peak Arrival throughput per hour (Segregated mode) | % and Flight per hour | % and also total number of arrivals per one runway per one hour for specific traffic mix and density (in segregated mode of operations). The percentage change is measured against the maximum observed throughput during peak demand hours in the segregated-mode RWY operations airports group. | YES | ***N/A*** | ***N/A*** |
| **CAP4** Un-accommodated traffic reduction | Flights/year | Reduction in the number of un-accommodated flights i.e. a flight that would have been scheduled if there were available slots at the origin/destination airports.<br>NB: Supports CBA Inputs.<br>NB: Relates to Airport Capacity because this is STATFOR computation. CBA calculate this based on the assessment of the runway throughput we provide with and without the solutions and STATFOR data. | YES<br>For CBA. | ***N/A*** | ***N/A*** |

**Table 18: Airport Capacity for Mandatory KPIs /PIs**

Were there any benefits obtained in SESAR2020 Wave1 for this Solution? ***NO***

### 4.7.3 Extrapolation to ECAC wide

***N/A***

### 4.7.4 Discussion of Assessment Result

***N/A***

### 4.7.5 Additional Comments and Notes

***N/A***

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

Does the Solution impact this KPA? ***NO***

Is there a Benefit Mechanism available? ***NO***

See paragraph 4.14

### 4.8.1 Assessment Data (Exercises and Expectations)

| Exercise ID or Expert judgement | Benefits contribution to RES1 | Benefits contribution to RES1.1 | Benefits contribution to RES2 | Benefits contribution to RES2.1 | Benefits contribution to RES4 | Benefits contribution to RES5 |
|---|---|---|---|---|---|---|
| EXE-xx | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** |
| | | | | | | |

**Table 19: Resilience benefits per Exercise**

| OI step | Relative benefits contribution to RES1 | Relative benefits contribution to RES1.1 | Relative benefits contribution to RES2 | Relative benefits contribution to RES2.1 | Relative benefits contribution to RES4 | Relative benefits contribution to RES5 |
|---|---|---|---|---|---|---|
| POI-0053 | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** |
| | | | | | | |
| TOTAL | | | 100% | | | |

**Table 20: Resilience relative benefits per OI step**

| PIs | Unit | Calculation | Mandatory | Absolute expected performance benefit in SESAR2020 | % expected performance benefit in SESAR2020 |
|---|---|---|---|---|---|
| **RES1** Loss of Airport Capacity Avoided | % and Movements per hour | Loss of Airport Capacity with the concept divided by the loss of Airport Capacity without the concept. | NO | ***N/A*** | ***N/A*** |
| **RES 1.1** Airport time to recover from non-nominal to nominal condition | Minutes | Duration of Airport lost capacity from non-nominal to nominal condition. | NO | ***N/A*** | ***N/A*** |

| PIs | Unit | Calculation | Mandatory | Absolute expected performance benefit in SESAR2020 | % expected performance benefit in SESAR2020 |
|---|---|---|---|---|---|
| **RES2**<br>Loss of Airspace Capacity Avoided | % and Movements per hour | Loss of Airspace Capacity with the concept divided by the loss of Airspace Capacity without the concept | YES | | |
| **RES2.1**<br>Airspace time to recover from non-nominal to nominal condition | Minutes | Duration of Airspace lost capacity compared to non-nominal to nominal condition. | | ***N/A*** | ***N/A*** |
| **RES4**<br>Minutes of delays | Minutes | Impact on AUs measured through delays resulting from capacity degradation[7].<br>RES1 and RES2 KPIs drive this PI, though the PI may need to be measured on a condition-by-condition basis (e.g. fog, wind, system outage). | | ***N/A*** | ***N/A*** |
| **RES5**<br>Number of cancellations | No flights | Impact on AUs measured through Cancellations resulting from capacity degradation[8].<br>RES1 and RES2 KPIs drive this PI, though the PI may need to be measured on a condition-by-condition basis (e.g., fog, wind, system outage). | | ***N/A*** | ***N/A*** |

**Table 21: Resilience for Mandatory PIs**

Were there any benefits obtained in SESAR2020 Wave1 for this Solution? ***NO***

### 4.8.2 Extrapolation to ECAC wide

The output value of RES PI, obtained by analyzing the HP results, is not possible to be extrapolated at ECAC level due to the particular operational Scenario/situation that has determined the characteristic of the Validation Exercise.

[7] Reactionary delay out of the scope since they could be due to many different reasons other than capacity degradation, in addition the cause of reactionary delay are not recorded in detail.

[8] Reactionary delay out of the scope since they could be due to many different reasons other than capacity degradation, in addition the cause of reactionary delay are not recorded in detail.

So the output results will remain valid, for the RES PI, at local level only (see details at the *PJ19.4 – Performance Framework*).

### 4.8.3 Discussion of Assessment Result

***N/A***

### 4.8.4 Additional Comments and Notes

***N/A***

## 4.9 Flight Times

Does the Solution impact this KPA? ***NO***

### 4.9.1 Performance Mechanism

Is there a Benefit Mechanism available? ***NO***

### 4.9.2 Assessment Data (Exercises and Expectations)

| Exercise ID or Expert judgement | Benefits contribution to TEFF1 | Benefits contribution to TEFF2 | Benefits contribution to TEFF3 | Benefits contribution to TEFF4 | Benefits contribution to TEFF5 | Benefits contribution to TEFF6 |
|---|---|---|---|---|---|---|
| EXE-xx | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** |
| | | | | | | |

**Table 22: Flight Times benefits per Exercise**

| OI step | Relative benefits contribution to TEFF1 | Relative benefits contribution to TEFF2 | Relative benefits contribution to TEFF3 | Relative benefits contribution to TEFF4 | Relative benefits contribution to TEFF5 | Relative benefits contribution to TEFF6 |
|---|---|---|---|---|---|---|
| XX-XXXX | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** |
| | | | | | | |
| TOTAL | 100% | 100% | 100% | 100% | 100% | 100% |

**Table 23: Flight Times relative benefits per OI step**

### 4.9.3 Extrapolation to ECAC wide

| KPIs / PIs | Unit | Calculation | Mandatory | Absolute expected performance benefit in SESAR2020 | % expected performance benefit in SESAR2020 |
|---|---|---|---|---|---|
| **TEFF1** Gate-to gate flight time | Min/flight | Average of the distribution of actual gate-to-gate flight durations | YES | *N/A* | *N/A* |
| **TEFF2** Taxi in time | Min/flight | Average of the distribution of actual taxi-in (including ground queuing during taxi-in) durations | When relevant | *N/A* | *N/A* |
| **TEFF3** Taxi out time | Min/flight | Average of the distribution of actual taxi-out (including ground queuing during taxi-out) durations | When relevant | *N/A* | *N/A* |
| **TEFF4** TMA arrival time | Min/flight | Average of the distribution of actual TMA arrival (including holdings) durations | When relevant | *N/A* | *N/A* |
| **TEFF5**[9] TMA departure time | Min/flight | Average of the distribution of actual TMA departure durations | When relevant | *N/A* | *N/A* |
| **TEFF6** En-Route time | Min/flight | Average of the distribution of actual en-route durations | When relevant | *N/A* | *N/A* |

**Table 24: Flight Times benefits for Mandatory KPIs /PIs**

[9] Although no major time inefficiencies occur during climb, this phase has been included for consistency.

Table 25 is showing the impact on flight phases (provided when it is possible).

| | Taxi out | TMA departure | En-route | TMA arrival | Taxi in |
|---|---|---|---|---|---|
| **TEFF1** Gate-to gate flight time | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** |
| **TEFF2** Taxi in time | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** |
| **TEFF3** Taxi out time | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** |
| **TEFF4** TMA arrival time | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** |
| **TEFF5** TMA departure time | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** |
| **TEFF6** En-Route time | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** |

**Table 25: Flight times benefit per flight phase.**

Were there any benefits obtained in SESAR2020 Wave1 for this Solution? ***NO***

### 4.9.4 Discussion of Assessment Result

***N/A***

### 4.9.5 Additional Comments and Notes

***N/A***

## 4.10Predictability

Does the Solution impact this KPA? ***NO***

### 4.10.1Performance Mechanism

Is there a Benefit Mechanism available? ***NO***

### 4.10.2Assessment Data (Exercises and Expectations)

| Exercise ID or Expert judgement | Benefits contribution to PRD1 | Benefits contribution to PRD2 |
|---|---|---|
| EXE-xx | ***N/A*** | ***N/A*** |
| | | |

**Table 26: Predictability benefits per Exercise**

| OI step | Relative benefits contribution to PRD1 | Relative benefits contribution to PRD2 |
|---|---|---|
| XX-XXXX | ***N/A*** | ***N/A*** |
| | | |
| TOTAL | 100% | 100% |

**Table 27: Predictability relative benefits per OI step**

### 4.10.3Extrapolation to ECAC wide

| KPIs / PIs | Unit | Calculation | Mandatory | Absolute expected performance benefit in SESAR2020 | % expected performance benefit in SESAR2020 |
|---|---|---|---|---|---|
| **PRD1** Average of Difference in actual & Flight Plan or RBT durations | Minutes | Average of the distribution of the differences between flown trajectories & Flight Plans or RBT durations | YES | ***N/A*** | ***N/A*** |

| KPIs / PIs | Unit | Calculation | Mandatory | Absolute expected performance benefit in SESAR2020 | % expected performance benefit in SESAR2020 |
|---|---|---|---|---|---|
| **PRD2** Variance[10] of Difference in actual & Flight Plan or RBT durations | Minutes[2] | Variance of the distribution of the differences between flown trajectories & Flight Plans or RBT durations | YES | *N/A* | *N/A* |

**Table 28: Predictability benefits for Mandatory KPIs /PIs**

Table 29 is showing the impact on flight phases (provided when it is possible).

| | Taxi out | TMA departure | En-route | TMA arrival | Taxi in |
|---|---|---|---|---|---|
| **PRD1** Average of Difference in actual & Flight Plan or RBT durations | N/A | N/A | N/A | N/A | N/A |
| **PRD2** Variance of Difference in actual & Flight Plan or RBT durations | N/A | N/A | N/A | N/A | N/A |

**Table 29: Predictability benefit per flight phase**

Were there any benefits obtained in SESAR2020 Wave1 for this Solution? ***NO***

## 4.10.4Discussion of Assessment Result

***N/A***

## 4.10.5Additional Comments and Notes

***N/A***

[10] Standard Deviation is also accepted (in minutes).

## 4.11 Punctuality (% Departures < +/- 3 mins vs. schedule due to ATM causes)

Does the Solution impact this KPA? ***NO***

### 4.11.1 Performance Mechanism

Is there a Benefit Mechanism available? ***NO***

### 4.11.2 Assessment Data (Exercises and Expectations)

| Exercise ID or Expert judgement | Benefits contribution to PUN1 | Benefits contribution to PUN2 |
|---|---|---|
| EXE-xx | ***N/A*** | ***N/A*** |
| | | |

**Table 30: Punctuality benefit per Exercise**

| OI step | Relative benefits contribution to PUN1 | Relative benefits contribution to PUN2 |
|---|---|---|
| XX-XXXX | ***N/A*** | ***N/A*** |
| | | |
| TOTAL | 100% | 100% |

**Table 31: Punctuality relative benefit per OI step**

### 4.11.3 Extrapolation to ECAC wide

| KPIs / PIs | Unit | Calculation | Mandatory | Absolute expected performance benefit in SESAR2020 | % expected performance benefit in SESAR2020 |
|---|---|---|---|---|---|
| **PUN1** Average departure delay per flight | min/flight | Average delay (AOBT – SOBT) per flight due to reactionary delays, ATM and weather related delay causes. | YES | ***N/A*** | ***N/A*** |
| **PUN2** % Flights departing within +/- 3 minutes of scheduled departure time due to ATM and weather related delay causes | % | % Departures so that \|AOBT – SOBT\| < +/- 3 min. Difference in Actual Departure Time vs. Scheduled Time due to ATM and weather-related delay causes. | YES | ***N/A*** | ***N/A*** |

**Table 32: Punctuality benefit for Mandatory KPIs /PIs**

Table 33 is showing the impact on flight phases (provided when it is possible).

| | Taxi out | TMA departure | En-route | TMA arrival | Taxi in |
|---|---|---|---|---|---|
| **PUN1** Average departure delay per flight | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** |
| **PUN2** % Flights departing within +/- 3 minutes of scheduled departure time due to ATM and weather related delay causes | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** |

**Table 33: Punctuality benefit per flight phase.**

Were there any benefits obtained in SESAR2020 Wave1 for this Solution? ***No***.

## 4.11.4Discussion of Assessment Result

***N/A***

## 4.11.5Additional Comments and Notes

***N/A***

## 4.12Civil-Military Cooperation and Coordination (Distance and Fuel)

Does the Solution impact this KPA? ***NO***

### 4.12.1Performance Mechanism

Is there a Benefit Mechanism available? ***NO***

### 4.12.2Assessment Data (Exercises and Expectations)

| Exercise ID or Expert judgement | Benefits contribution to CMC1.1 | Benefits contribution to CMC1.2 | Benefits contribution to CMC1.3 | Benefits contribution to CMC1.3.1 | Benefits contribution to CMC1.3.2 | Benefits contribution to CMC1.4.1 | Benefits contribution to CMC1.4.2 | Benefits contribution to CMC2.1 |
|---|---|---|---|---|---|---|---|---|
| EXE-xx | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** |
| | | | | | | | | |

**Table 34: Civil-Military Cooperation and Coordination benefit per Exercise**

| OI step | Relative benefits contribution to CMC1.1 | Relative benefits contribution to CMC1.2 | Relative benefits contribution to CMC1.3 | Relative benefits contribution to CMC1.3.1 | Relative benefits contribution to CMC1.3.2 | Relative benefits contribution to CMC1.4.1 | Relative benefits contribution to CMC1.4.2 | Relative benefits contribution to CMC2.1 |
|---|---|---|---|---|---|---|---|---|
| XX-XXXX | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** |
| | | | | | | | | |
| TOTAL | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |

**Table 35: Civil-Military Cooperation and Coordination relative benefit per OI step**

### 4.12.3Extrapolation to ECAC wide

| Category | PIs | Unit | Calculation | Mandatory | Absolute expected performance benefit in SESAR2020 | % expected performance benefit in SESAR2020 |
|---|---|---|---|---|---|---|
| Impact of ATM Solutions on the effectiveness of military mission | **CMC1.1** Allocated vs. Requested ARES duration | % | It is calculated as proportion between the time allocated for ARES after completing the ASM planning phase (including the civil-military CDM process for airspace configuration) and the time initially requested by the user: Time allocated / time requested for airspace reservation/restriction.<br>It could be calculated for an individual ARES or for a group of ARES depending on the validation scenario objectives and specifications.<br>It is applicable to Variable Profile Area (VPA), Dynamic Mobile Area (DMA), and modular types of design for ARES.<br>The indicator supports the assessment of the impact of ASM planning and civil-military decision-making processes on the training time for military mission inside ARES. | When relevant | ***N/A*** | ***N/A*** |
| | **CMC1.2** Allocated vs. Requested ARES dimension | % | It is calculated as the proportion between the volume of the ARES allocated after completing the ASM planning phase (including the civil-military CDM process for airspace configuration) and the volume initially requested by the user: (Allocated ARES surface/ Requested ARES Surface) x (Allocated FL band/Requested FL band).<br>It could be calculated for an individual ARES or for a group of ARES depending on the validation scenario objectives and specifications.<br>It is applicable to VPA, DMA, and modular types of design for ARES.<br>It provides an indication on how closely the allocated ARES conforms to the required airspace dimensions for the execution of the training inside ARES. | When relevant | ***N/A*** | ***N/A*** |

| Category | PIs | Unit | Calculation | Mandatory | Absolute expected performance benefit in SESAR2020 | % expected performance benefit in SESAR2020 |
|---|---|---|---|---|---|---|
| | **CMC1.3** Deviation of Transit Time to/from airbase to ARES | +/- Minutes | It represents the difference between the transit time in the initial request of the military Airspace User and the transit time resulting from the airspace configuration processes (including the civil-military CDM for ASM).<br>Transit time is defined as the time to be flown from the airbase of departure to the entry point in ARES or from a reference point specified by the military user to the entry point in ARES.<br>It is applicable in situations where a time/distance constraint is defined by the military airspace user for the location of ARES.<br>It could be calculated for individual ARES and then the results could be summed up to provide a global figure for the entire military airspace use plan.<br>It is applicable to VPA, DMA type 1, and modular types of design for ARES.<br>It provides an indication on the effectiveness of ARES location. | When relevant | ***N/A*** | ***N/A*** |
| | **CMC 1.3.1** Allocated ARES duration vs. total mission duration | % | It is calculated as the difference in mean values of the ratios between time spent in DMA(s) versus total mission time (based on mid-speed) before (initial military request) and after the completion of airspace configuration (ARES allocation throughout civil-military CDM) processes.<br>It could be calculated for individual ARES or a group of ARES depending on the missions defined in the exercise scenarios.<br>It is applicable to VPA, DMA, and modular types of design for ARES.<br>It supports the assessment of the achievement of military training objectives inside ARES. | When relevant | ***N/A*** | ***N/A*** |
| | **CMC 1.3.2** Deviation of total mission duration by iOAT FPL validation | +/- Minutes | It is calculated as the difference between the duration of the mission in the validated iOAT FPL (Reference Mission Trajectory RMT) and the duration of the mission in the submitted iOAT FPL (Shared Mission Trajectory SMT).<br>It could be calculated for a single or the total FPLs submitted by WOC to the Network Manager (NM).<br>It supports the assessment of the impact of NM flight plan validation processes on the effectiveness of military Mission Trajectory planning, especially for cross border flights. | When relevant | ***N/A*** | ***N/A*** |

| Category | PIs | Unit | Calculation | Mandatory | Absolute expected performance benefit in SESAR2020 | % expected performance benefit in SESAR2020 |
|---|---|---|---|---|---|---|
| | **CMC 1.4.1** Rate of iOAT FPLs acceptance by NM systems | % | The indicator it is calculated as a proportion between the number of FPLs submitted by WOC to NM and the number of FPLs validated by NM systems against the flight planning and ATM route network rules.<br>The measurements could include both of the validation and tactical flow management systems of NM or could be limited to one of them.<br>It supports the assessment of the acceptability of military requirements and exemptions by NM systems. | When relevant | ***N/A*** | ***N/A*** |
| | **CMC 1.4.2** Rate of iOAT FPLs acceptance by ATC systems | % | The indicator is calculated as a proportion between the number of FPLs distributed after processing by NM to ATC systems and the number of FPLs accepted by the ATC systems.<br>It supports the assessment of the viability of IOAT FPL to ATC as well as of the ability of ATC systems to provide services to OAT flights. | When relevant | ***N/A*** | ***N/A*** |
| Contribution of CMCC to ATM performance gains | **CMC2.1** Fuel and Distance saved by GAT | Kg and NM | Kg of fuel and distance saved by GAT due optimisation of the ATM network through Demand Capacity balancing and to the new ARES design and management | When relevant | ***N/A*** | ***N/A*** |

**Table 36: Civil-Military cooperation and coordination benefit for Mandatory KPIs /PIs**

Table 37 is showing the impact on flight phases (provided when it is possible).

| | Taxi out | TMA departure | En-route | TMA arrival | Taxi in |
|---|---|---|---|---|---|
| **CMC1.1** Allocated vs. Requested ARES duration | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** |
| **CMC1.2** Allocated vs. Requested ARES dimension | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** |
| **CMC1.3** Deviation of Transit Time to/from airbase to ARES | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** |
| **CMC 1.3.1** Allocated ARES duration vs. total mission duration | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** |
| **CMC 1.3.2** Deviation of total mission duration by iOAT FPL validation | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** |

| | | | | | |
|---|---|---|---|---|---|
| **CMC 1.4.1** Rate of iOAT FPLs acceptance by NM systems | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** |
| **CMC 1.4.2** Rate of iOAT FPLs acceptance by ATC systems | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** |
| **CMC2.1** Fuel and Distance saved by GAT | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** |

**Table 37: Civil-Military cooperation and coordination benefit per flight phase.**

Were there any benefits obtained in SESAR2020 Wave1 for this Solution? ***NO***

## 4.12.4Discussion of Assessment Result

***N/A***

## 4.12.5Additional Comments and Notes

***N/A***

## 4.13Flexibility

Does the Solution impact this KPA? ***NO***

### 4.13.1Performance Mechanism

Is there a Benefit Mechanism available? ***NO***

### 4.13.2Assessment Data (Exercises and Expectations)

| Exercise ID or Expert judgement | Benefits contribution to FLX1 |
|---|---|
| EXE-xx | ***N/A*** |
| Add additional rows for all the Exercises from your Solution | |

**Table 38: Flexibility benefit per Exercise**

| OI step | Relative benefits contribution to FLX1 |
|---|---|
| XX-XXXX | ***N/A*** |
| Add additional rows for all the OIs from your Solution | |
| TOTAL | 100% |

**Table 39: Flexibility relative benefit per OI step**

## 4.13.3Extrapolation to ECAC wide

| PIs | Unit | Calculation | Mandatory | Absolute expected performance benefit in SESAR2020 | % expected performance benefit in SESAR2020 |
|---|---|---|---|---|---|
| **FLX1** Average delay for scheduled civil/military flights with change request and non-scheduled or late flight plan request | Minutes | Total delay for scheduled flights with change request and non-scheduled or late filling flights \|AOBT – SOBT\|, divided by number of movements | YES | **N/A** | **N/A** |

**Table 40: Flexibility benefit for Mandatory KPIs /PIs**

Table 41 is showing the impact on flight phases (provided when it is possible).

| | Taxi out | TMA departure | En-route | TMA arrival | Taxi in |
|---|---|---|---|---|---|
| **FLX1** Average delay for scheduled civil/military flights with change request and non-scheduled or late flight plan request | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** | ***N/A*** |

**Table 41: Flexibility benefit per flight phase.**

Were there any benefits obtained in SESAR2020 Wave1 for this Solution? ***NO***

## 4.13.4Discussion of Assessment Result

***N/A***

## 4.13.5Additional Comments and Notes

***N/A***

## 4.14Cost Efficiency

Does the Solution impact this KPA? ***YES***

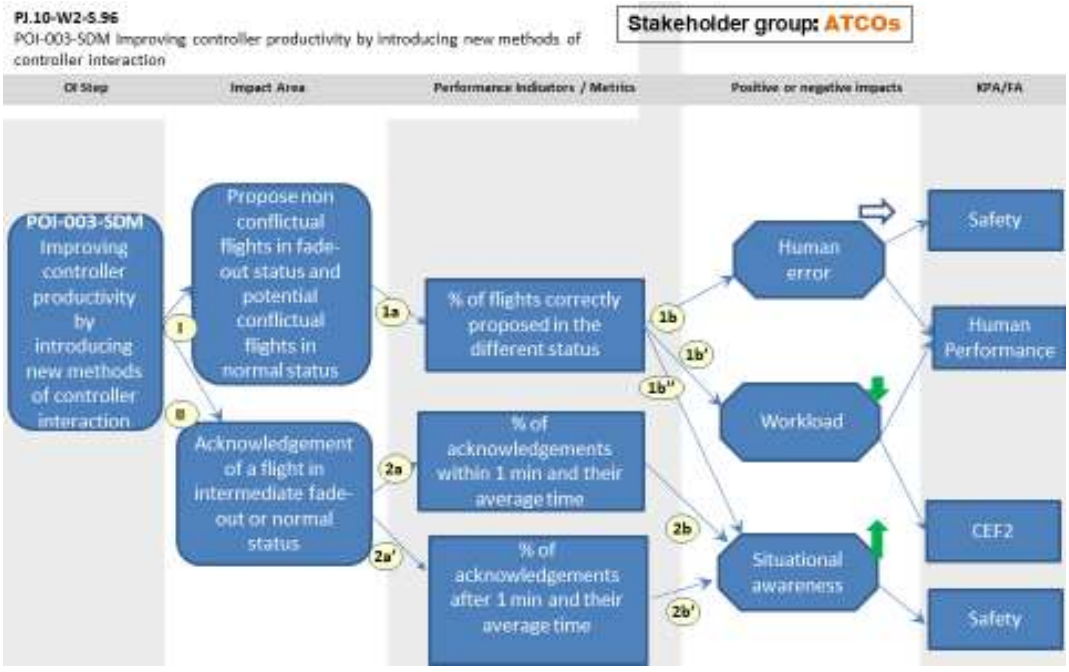
The Cost Efficiency performance metric is the direct gate-to-gate ANS cost per flight. It is being assessed by means of the following two KPIs:

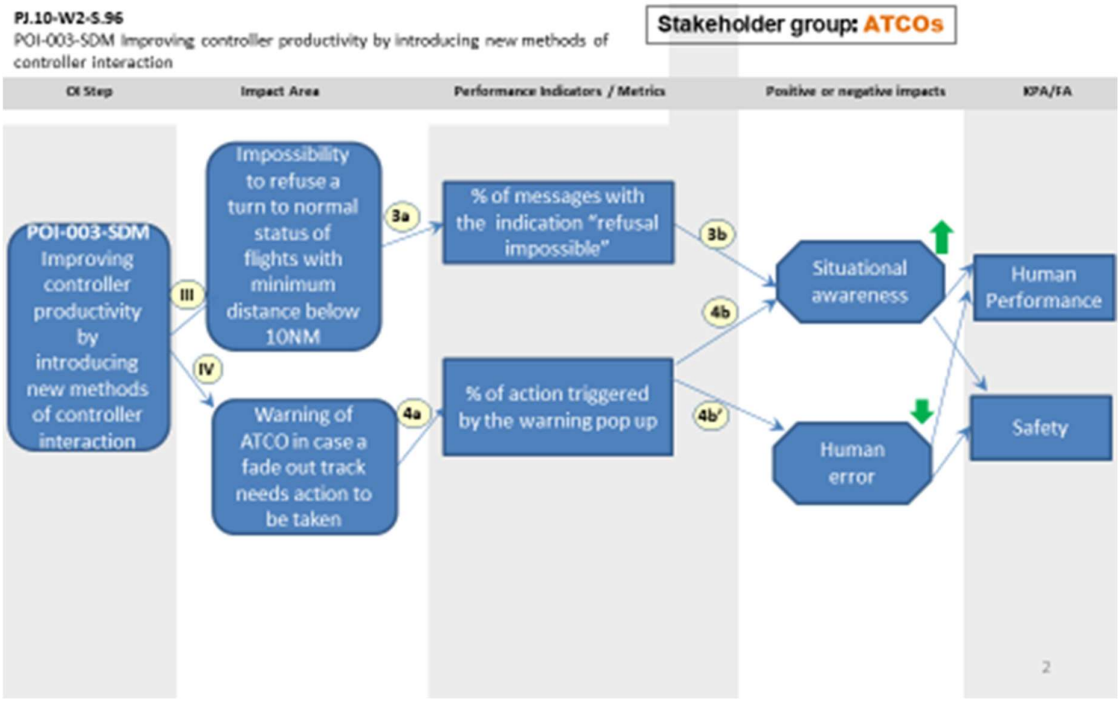
- ATCO Productivity improvement (%) – En-Route or TWR/APP, assessing the reduction of workload per controlled flight hour.
- Technology Related Cost-Efficiency Improvement (%) – by assessing the contributions of the technology enablers to a change in asset costs and/or operating costs (maintenance, etc), including support costs improvements (support personnel productivity).

### 4.14.1.1 Performance Mechanism

Is there a Benefit Mechanism available? ***YES***

The Benefit and Impact Mechanisms (BIMs) for each operational improvement are presented here below, following.






| Distribution to ATC | Stakeholder group: AUs |
|---|---|
| **OI:** | |
| (I) | The Attention Guidance as new controller interaction method will propose non conflictual flights in fade out status and potential conflictual flights in normal status |
| (II) | The Attention Guidance as new controller interaction method will allow the acknowledgement of a flight in intermediate fade out or normal status |
| (1a) | The percentage of flights correctly proposed in the different status will determine if this new controller interaction method is useful |
| (2a) | The percentage of acknowledgements within 1 min and their average time will determine if this new controller interaction method is useful |
| (2a') | The percentage of acknowledgements after 1 min and their average time will determine if this new controller interaction method is useful |
| (1b) | A high percentage of flights correctly proposed will possibly have a positive impact on human error increasing safety the controller's situational awareness increasing safety and human performance. |
| (1b') | A high percentage of flights correctly proposed will decrease workload increasing human performance. |
| (1b'') | A high percentage of flights correctly proposed will increase situational awareness increasing safety. |

| | |
|---|---|
| (2b) | A high percentage of acknowledgements within 1 min will increase situational awareness increasing safety. |
| (2b') | A high percentage of acknowledgements after 1 min will increase situational awareness increasing safety. |

| Distribution to ATC | | Stakeholder group: AUs |
|---|---|---|
| OI: | | |
| (III) | The Attention Guidance as new controller interaction method will not allow to refuse a turn to normal status of flights with minimum distance below 10NM. | |
| (IV) | The Attention Guidance as new controller interaction method will warn ATCOs in case a fade out track needs action to be taken. | |
| (3a) | The percentage of messages with the indication "refusal impossible" will determine if this new controller interaction method is useful. | |
| (4a) | The percentage of actions triggered by the warning pop up will determine if this new controller interaction method is useful. | |
| (3b) | A high percentage of messages with the indication "refusal impossible" will increase situational awareness and therefore increase safety and human performance. | |
| (4b) | A high percentage of actions triggered by the warning pop up will increase situational awareness and therefore increase safety and human performance. | |
| (4b') | A high percentage of actions triggered by the warning pop up will decrease human error and therefore increase safety and human performance. | |

## 4.14.2Assessment Data (Exercises and Expectations)

| Exercise ID or Expert judgement | Benefits contribution to CEF2 | Benefits contribution to CEF3 | Benefits contribution to CEF1 |
|---|---|---|---|
| EXE-PJ.10-96-AG-TRL-01xx | | ***N/A*** | ***N/A*** |
| | | | |

**Table 42: Cost Efficiency benefit per Exercise**

| OI step | Relative benefits contribution to CEF2 | Relative benefits contribution to CEF3 | Relative benefits contribution to CEF1 |
|---|---|---|---|
| XX-XXXX | | ***N/A*** | ***N/A*** |
| | | | |
| TOTAL | | | |

**Table 43: Cost Efficiency relative benefit per OI step**

### 4.14.3Extrapolation to ECAC wide

| KPIs / PIs | Unit | Calculation | Mandatory | Absolute expected performance benefit in SESAR2020 | % expected performance benefit in SESAR2020 |
|---|---|---|---|---|---|
| **CEF2**[11] Flights per ATCO-Hour on duty | No | Count of Flights handled divided by the number of ATCO-Hours applied by ATCOs on duty. | YES | | |
| **CEF3** Technology cost per flight | EUR / flight | G2G ANS cost changes related to technology and equipment. | YES | *N/A* | *N/A* |
| **CEF1** Direct ANS Gate-to-gate cost per flight | EUR / flight | Derived by PJ19, taking into account results for the other two KPIs as contributing factors. | Yes but derived from the other two KPIs below | *N/A* | *N/A* |

**Table 44: Cost Efficiency benefit for Mandatory KPIs /PIs**

Were there any benefits obtained in SESAR2020 Wave1 for this Solution? ***NO***

For the assessment, the ATCCO workload has been collected through questionnaires.

From a Human Factor aspect, the ATCO has been asked to indicate how much effort certain tasks took from “none” (score of 1) up to “extreme” (score of 7). This shows that, during the reference scenarios, ATCOs reached 38.3% of the highest possible workload score. During the solution scenarios ATCOs reached 34.9% of the highest possible workload score. This means that the workload was 3.4% lower in the solution than the reference runs.

This is a very small reduction which does not reflect the controllers’ subjective reports in the debriefings. Also considering that the gain on cognitive capacity will be taken on other/more tasks, it would therefore be reasonable to say that the workload reduction could reach a minimum of 5%. This workload reduction applies for Swiss ACC above level 355.

As the average traffic sample amounts to 32.5% above level 355 on Swiss ACC, it means that the workload reduction amount to more than 15% for the whole Swiss ACC.

Therefore, the increase on productivity will be **1.91%** when using the following formula:

[11] The benefits are determined by converting workload reduction to a productivity improvement, and then scale it to peak traffic in the applicable sub-OE category. It has to be peak traffic because there must be demand for the additional capacity (note that in this case the assumption is that the additional capacity is used for additional traffic).

Increase in productivity (%) = (1/ (1-0.75*workload reduction[12]/2) -1) x100

### 4.14.4Discussion of Assessment Result

By analyzing the assessment of the post analysis reported within the TVALR, following the conclusion of the Validation EXEs planned and executed for the scope of the SOLution 96 AG, and

- ✓ Although it was not possible to obtain a direct benefit from the post analysis for the KPA CEF2
- ✓ Thanks to the optimization of traffic management and therefore to the increase in capacity
- ✓ assuming that the reduction was due to the contingent situation (RESilience PI)
- ✓ taking the benefit of the reverse engineering mechanism,

it was possible to define and then quantify a positive effect in terms of ATCO Workload reduction which made it possible to obtain a benefit for the ATCO Productivity, exportable at ECAC Level (the RES always remains a value not expendable for PAGAR and therefore not "exportable" at a level higher than the scenario where the operating performance was measured).

The *Confidence in the Result* can be considered as ***HIGH***, thanks to the solidness of the data collected.

### 4.14.5Additional Comments and Notes

***N/A***

[12] Where the workload reduction is expressed as a decimal fraction (i.e. 10% = 0.1)

## 4.15Airspace User Cost Efficiency

Does the Solution impact this KPA? ***NO***

The Airspace User Cost Efficiency metrics capture monetized operational and non-operational airspace user benefits that are not already assessed through the other KPIs, meaning, benefits other than ANS cost improvements, fuel efficiency improvements, etc.

### 4.15.1Performance Mechanism

Is there a Benefit Mechanism available? ***NO***

### 4.15.2Assessment Data (Exercises and Expectations)

| Exercise ID or Expert judgement | Benefits contribution to AU3 | Benefits contribution to AU4 | Benefits contribution to AU5 |
|---|---|---|---|
| EXE-xx | ***N/A*** | ***N/A*** | ***N/A*** |
| | | | |

**Table 45: Airspace User Cost Efficiency benefit per Exercise**

| OI step | Relative benefits contribution to AU3 | Relative benefits contribution to AU4 | Relative benefits contribution to AU5 |
|---|---|---|---|
| XX-XXXX | ***N/A*** | ***N/A*** | ***N/A*** |
| | | | |
| TOTAL | 100% | 100% | 100% |

**Table 46: Airspace User Cost Efficiency relative benefit per OI step**

### 4.15.3Extrapolation to ECAC wide

| PIs | Unit | Calculation | Mandatory | Absolute expected performance benefit in SESAR2020 | % expected performance benefit in SESAR2020 |
|---|---|---|---|---|---|
| **AUC3** Direct operating costs for an airspace user | EUR | Impact on direct costs related to the aeroplane and passengers. Examples: fuel, staff expenses, passenger service costs, maintenance and repairs, navigation charges, strategic delay, landing fees, catering. | Yes, where an impact is foreseen on AU cost efficiency | ***N/A*** | ***N/A*** |

| PIs | Unit | Calculation | Mandatory | Absolute expected performance benefit in SESAR2020 | % expected performance benefit in SESAR2020 |
|---|---|---|---|---|---|
| **AUC4** Indirect operating costs for an airspace user | EUR | Impact on operating costs that don't relate to a specific flight. Examples: parking charges, crew and cabin salary, handling prices at Base Stations. | Yes, where an impact is foreseen on AU cost efficiency | ***N/A*** | ***N/A*** |
| **AUC5** Overhead costs for an airspace user | EUR | Impact on overhead costs. Examples: dispatchers, training, IT infrastructure, sales. | Yes, where an impact is foreseen on AU cost efficiency | ***N/A*** | ***N/A*** |

**Table 47: Airspace User Cost Efficiency benefit for Mandatory KPIs /PIs**

Were there any benefits obtained in SESAR2020 Wave1 for this Solution? ***NO***

## 4.15.4Discussion of Assessment Result

***N/A***

## 4.15.5Additional Comments and Notes

***N/A***

## 4.16Security

### 4.16.1The SecRAM 2.0 methodology and the Security Performance Mechanism

The main cyber-security objective of Solution 96 AG is to define an acceptable level of residual risk for primary operational assets. Primary ATM operational assets are listed within the foreseen operational scope for all the sub-solutions, also defining supporting assets, which are related to IT and technical infrastructure.

Security risk assessment activities resulted that no further recommended security controls need to be implemented and applied to reduce the impact of a successful attackto the ones already performed by the system also without the implementation of the fade-out algorithm.

After controls are in place, the level of residual risk is finally assessed. Attacks can also be mitigated by means of contingency measures, but the preferred course of action is through security controls, which are aimed at prevention rather than mitigation. According to the SESAR Cyber-security Strategy and the SecRAM 2.0 methodology, Security Objectives for all SESAR Solutions have been set at Programme level, i.e., all the Primary Assets of Solutions should have a “Low” residual risk level, that is 1 on a scale of 5. The EATMA architecture was also utilized throughout security assessment, in order to make use of an enterprise view of ATM.

### 4.16.2Security Assessment Data Collection

The collection of data for the security assessment has been mainly of a qualitative nature, with an initial scoping, limited to

| | |
|---|---|
| SC#1 | Controller Working Position |
| SC#2 | ATC Datacenter |
| SC#3 | Information Exchange |

Subsequently Primary assets were identified, based on both SecRAM and EATMA methodologies, resulting in the following list

| |
|---|
| Surveillance Infrastructure |
| Communication Management |

The resulting list of supporting assets was then generated:

| | |
|---|---|
| SA#1 | ATC sectors executive controller |
| SA#2 | ATC sectors planning controler |

| | |
|---|---|
| SA#3 | Network management |
| SA#4 | Control over input/output data |
| SA#5 | Systems for identification and authentication |
| SA#6 | User rights not reviewed regularly |

Based on the lists of primary and supporting assets, an analysis of the impact on ATM services was carried out, based on scenarios whose result in turn would entail a generalized reduction in terms of the usual parameters such as performance, economics, branding, regulatory and environmental. Such scenarios had previously been designed and assessed.

Impact on supporting assets was analysed, with inherited values never above 3

Finally, an appraisal of threats and their combinations, vulnerabilities was carried out, followed by risk evaluation and treatment. As it turned out, no special risks were identified and therefore no new risk treatment measures were singled out. A list of control actions is shown in the following table

| *ID* | *Control* | *Supporting asset* | *Primary asset* | *Baseline / new* | *Reduce impact / likelihood* | *Rationale* |
|---|---|---|---|---|---|---|
| *C1* | *Data backup, classification, protection in sw dev., test and dep.* | *SA1-4* | *PA4* | *B* | *L* | *Reduction in access to data limiting opportunities for tampering* |
| *C2* | *Network protection/segregation policies* | *SA1-4* | *PA2-4* | *B* | *L* | *Reduction of risk associated with network use and unauthorized network access* |
| *C3* | *Secure information transfer through formal exchange policies and authentication* | *SA1-4* | *PA3-4* | *B* | *I* | *Security enhancement via reduction of entry points for tampering* |
| *C4* | *Extensive logging and monitoring of ATM, application and network traffic* | *SA1-9* | *PA1-4* | *B* | *I* | *Online/offline automated log checks to detect anomalies* |

| | | | | | | |
|---|---|---|---|---|---|---|
| *C5* | *Encryption of commands and orders, of packets on network to/from other applications* | *SA1-4* | *PA3-4* | *B* | *I* | *Security enhancement reducing entry points hardening data transfer* |
| *C6* | *Controlled and verified change management to configuration, OS, application* | *SA2,3,4* | *PA3-4* | *B* | *I* | *Strict version control and test to minimize likelihood of introducing vulnerabilities with new releases or updates* |
| *C7* | *Access control policy for ATM areas, data centre* | *SA7-9* | *PA1, PA2* | *B* | *L* | *Physical security enhancement for ATM operational areas* |

The residual risk values were always very low (1) or low (2) with a low likelihood.

| PIs | Unit | Calculation | Mandatory | Current value |
|---|---|---|---|---|
| **SEC1**<br>A security risk assessment has been carried out | Binary Vector – with maximum 7 components with Y/N (according to the prioritization and maturity level of the solution) | A security risk assessment has been carried out applying SecRAM 2.0, and the following steps have each been carried out :<br>The identification of Primary Assets, Supporting Assets, Threat Scenarios and Vulnerabilities;<br>The evaluation of Impacts, Likelihoods and Risks. | YES (different steps are strongly recommended for different maturity levels) | *Y, Y, Y, Y, Y, Y, Y* |
| **SEC2**<br>Risk Treatment has been carried out | Binary Vector – 2 components with Y/N | Following SecRAM 2.0, Security controls have been identified by Security Experts and implemented in the Solution. | YES<br>(implementation just at higher maturity levels – V4) | *Y, Y but in actual fact no extra measures were found to be necessary other than usual ATM systems security already in place* |

| PIs | Unit | Calculation | Mandatory | Current value |
|---|---|---|---|---|
| **SEC3**<br>Residual risk after treatment meets security objective. | Risk Level – 2 levels are possible: medium or low | After Security Controls have been implemented, the Risk Level achieved per Supporting Asset decreases (H → M, M→L, H→L). It is important to notice that according to SecRAM the Risk Level achieved should be "Low" otherwise justifications must be provided. | YES | *Treatment was not specially carried out as a result of a Security Assessment, but ordinary measures put in place in the ATM ICT environment were found to be sufficient* |

**Table 48 Security benefit for Mandatory PIs**

In terms of security the validation exercise is situated within the ATM system, and the flow of data always takes place internally, with unlikely exchange of data with the outside world. Other than physical security, which is not within the scope of the current document, there are no special precautions which were the outcome of the Security Assessment Report

### 4.16.3Extrapolation to ECAC wide

N.A.

### 4.16.4Discussion of Assessment Result

The resulting requirements apply to the exercise in the solution, since they are applicable equally to ICT systems, as per the following list:

- Network components segregation
- Backup data saving
- Anti-Malware

The exercise was equally liable to security threats and though no specific extra measures were put in place, residual risk was found to be low, given their setting, within closed ATM environments. Again, EATMA and SecRAM were used extensively, to find that OIs were unlikely to be affected by security threats which would not affect the main ATM infrastructure

### 4.16.5Additional Comments and Notes

None

# 4.17Human Performance

## 4.17.1HP arguments, activities and metrics

*A summary (max ~20-30 lines) of the Human Performance Assessment Report, containing the description of the HP arguments covered and related activities/ metrics used in the solution. The reader shall be referred to Part IV of the OSED (HP Assessment Report) for a detailed description of the HP results of the validation.*

*The 4 HP arguments are depicted in the table below in the form of HP performance indicators. In case at least one of the second level indicators have been covered per PI, that PI is considered to have been satisfied at the level of the solution. Please mark the "Covered" section with <<N/A>> in case the PIs were not covered intentionally and with <<open>> or <<closed>> depending on whether the mitigations were found and validated up to date.*

*Please fill the metrics column with the relevant activities (workshop, interviews etc.) and measurements taken during validation activities (e.g. usability, workload, SA etc).*

| PIs | Activities & Metrics | Second level indicators | Covered |
|---|---|---|---|
| **HP1**<br>Consistency of human role with respect to human capabilities and limitations | **Validation simulation, questionnaire, debrief** | **HP1.1**<br>Clarity and completeness of role and responsibilities of human actors | Closed |
| | | **HP1.2**<br>Adequacy of operating methods (procedures) in supporting human performance | Open |
| | | **HP1.3**<br>Capability of human actors to achieve their tasks in a timely manner, with limited error rate and acceptable workload level | Closed |
| **HP2**<br>Suitability of technical system in supporting the tasks of human actors | **Validation simulation, questionnaire, debrief, eye tracking** | **HP2.1**<br>Adequacy of allocation of tasks between the human and the machine (i.e. level of automation). | Open |
| | | **HP2.2**<br>Adequacy of technical systems in supporting Human Performance with respect to timeliness of system responses and accuracy of information provided | Open |
| | | **HP2.3**<br>Adequacy of the human machine interface in supporting the human in carrying out their tasks. | Closed |
| **HP3**<br>Adequacy of team structure and team communication in supporting the human actors | **Validation simulation, questionnaire, debrief** | **HP3.1**<br>Adequacy of team composition in terms of identified roles | N/A |
| | | **HP3.2**<br>Adequacy of task allocation among human actors | Open |
| | | **HP3.3**<br>Adequacy of team communication with regard to information type, technical enablers and impact on situation awareness/workload | Open |
| | **Validation simulation,** | **HP4.1**<br>User acceptability of the proposed solution | Closed |

| PIs | Activities & Metrics | Second level indicators | Covered |
|---|---|---|---|
| **HP4**<br>Feasibility with regard to HP-related transition factors | **questionnaire, debrief** | **HP4.2**<br>Feasibility in relation to changes in competence requirements | N/A |
| | | **HP4.3**<br>Feasibility in relation to changes in staffing levels, shift organization and workforce relocation. | N/A |
| | | **HP4.4**<br>Feasibility in relation to changes in recruitment and selection requirements . | N/A |
| | | **HP4.5**<br>Feasibility in terms of changes in training needs with regard to its contents, duration and modality. | N/A |

**Table 49: HP arguments, activities and metrics**

[…]

## 4.17.2Extrapolation to ECAC wide

*There is no ECAC wide extrapolation required for this KPI.*

## 4.17.3Open HP issues/ recommendations and requirements

*An indication of the number of HP issues that are still open and HP benefits identified following the Solution validation exercises, as well as the number of recommendations and requirements defined. For the detailed description, please consult the HP Plan/ HP Log and the HP Assessment Report.*

| PIs | Number of open issues/ benefits | Nr. of recommendations | Number of requirements |
|---|---|---|---|
| **HP1**<br>Consistency of human role with respect to human capabilities and limitations | **4** | **4** | **4** |
| **HP2**<br>Suitability of technical system in supporting the tasks of human actors | **3** | **3** | **2** |
| **HP3**<br>Adequacy of team structure and team communication in supporting the human actors | **2** | **2** | **0** |
| **HP4**<br>Feasibility with regard to HP-related transition factors | **N/A** | **N/A** | **N/A** |

**Table 50: Open HP issues/ recommendations and requirements**

## 4.17.4Concept interaction

*An enumeration/description of possible interactions with other SESAR2020 solutions. Where interactions are identified, please specify the level of concept interaction and enumerate below the issues that are considered to have a relevant impact on other solutions as well.*

*In case issues that impact other solutions are envisaged please list them here to facilitate the aggregation of data into deployment scenarios.*

## 4.17.5 Most important HP issues

Please list here any important issues that might have a major impact on the performance of the solution.

In case issues that impact other solutions are envisaged please list them here to facilitate the aggregation of data into deployment scenarios

| PIs | Most important issue of the solution | Most important issues due to solution interdependencies |
|---|---|---|
| **HP1** Consistency of human role with respect to human capabilities and limitations | Human capability and limitation concerning sudden re-integration of fade-out tracks into mental model. | N/A |
| **HP2** Suitability of technical system in supporting the tasks of human actors | Trust in automation remains a key are of interest for this solution. Results are promising but should be monitored during further development work. | **N/A** |
| **HP3** Adequacy of team structure and team communication in supporting the human actors | The role of the supervisor was not included as part of the work for this solution. It should be explored in further development work. | **N/A** |
| **HP4** Feasibility with regard to HP-related transition factors | N/A | N/A |

**Table 51: Most important HP issues**

## 4.17.6Additional Comments and Notes

*If needed, add comments and notes as free text and structure.*

[…]

## 4.18Other PIs

Further PIs from the Performance Framework update are assessed qualitatively, or, if possible, quantitatively, in Table 52

| KPA | PIs | Benefit mechanism (text only) | Qualitative Impact[13] |
|---|---|---|---|
| *N/A* | *N/A* | *N/A* | *N/A* |
| *N/A* | *N/A* | *N/A* | *N/A* |

**Table 52: Qualitative assessment of QoS KPIs**

Detailed descriptions of these PIs can be found in the Performance Framework [3].

NOTE: These PIs are preliminary, and the table currently serves as a placeholder!

### 4.18.1Performance Mechanism

*N/A*

### 4.18.2Assessment Data (Exercises and Expectations)

*N/A*

### 4.18.3Additional Comments and Notes

*N/A*

[13] --, -, 0, +, ++

## 4.19Gap Analysis

| KPI | Validation Targets – Network Level (ECAC Wide) | Performance Benefits at Network Level (ECAC Wide or Local depending on the KPI)[14] | Rationale[15] |
|---|---|---|---|
| SAF1: Safety - Total number of estimated accidents with ATM Contribution per year | | | |
| FEFF1: Fuel Efficiency - Actual average fuel burn per flight | ***N/A*** | ***N/A*** | ***N/A*** |
| CAP1: TMA Airspace Capacity - TMA throughput, in challenging airspace, per unit time. | ***N/A*** | ***N/A*** | ***N/A*** |
| CAP2: En-Route Airspace Capacity - En-route throughput, in challenging airspace, per unit time | ***N/A*** | ***N/A*** | ***N/A*** |
| CAP3: Airport Capacity – Peak Runway Throughput (Mixed mode). | ***N/A*** | ***N/A*** | ***N/A*** |
| TEFF1: Gate-to-gate flight time | ***N/A*** | ***N/A*** | ***N/A*** |

[14] Negative impacts are indicated in red.

[15] Discuss the outcome if the gap indicates a different understanding of the contribution of the Solution (for example, the Solution is enabling other Solutions and therefore is not contributing a direct benefit). **Please contact your PJ19.04 Solution Champion to clarify when the Gap Rational is needed.**

| | | | |
|---|---|---|---|
| PRD1: Predictability – Average of Difference in actual & Flight Plan or RBT durations | ***N/A*** | ***N/A*** | ***N/A*** |
| PUN1: Punctuality – Average departure delay per flight | ***N/A*** | ***N/A*** | ***N/A*** |
| CEF2: ATCO Productivity – Flights per ATCO -Hour on duty | | | ***Medium to High*** |
| CEF3: Technology Cost – Cost per flight | ***N/A*** | ***N/A*** | ***N/A*** |

**Table 53: Gap analysis Summary**

[…]

# 5 References


*[1]* 08.01.03 D47: AIRM v4.1.0

*[2]* B05 Performance Assessment Methodology for Step 1 PJ19.04.01 Methodology for Performance Assessment Results Consolidation (2020)[16]

*[3]* SESAR Performance Framework (2019), Edition 01.00.01, Dec 2019

https://stellar.sesarju.eu/?link=true&domainName=saas&redirectUrl=%2Fjsp%2Fproject%2Fproject.jsp%3FobjId%3Dxrn%3Adatabase%3Aondb%2Frecord%2F16414675

*[4]* Performance Assessment and Gap Analysis Report (2019), Edition 00.01.02, Dec 2019

*[5]* Methodology for the Performance Planning and Master Plan Maintenance, Edition 0.13, Dec 2017

*[6]* D4_0_30-PJ19-SESAR2020_Common_Assumptions_2019 (1.0), ed. 01.00.00, 16 Sep 2019

## Content Integration

*[7]* SESAR ATM Lexicon

## Performance Management

*[8]* PJ19.04 D4.1 Validation Targets - Wave 2 (2020)[17]

## Validation

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

*[10]* SESAR 2020 - PJ05-W2 Sol 97 D3.1.033 - Technical Validation Plan (TVALP) Final version

## Safety

*[11]* SESAR, Safety Reference Material, Edition 4.0, April 2016

https://stellar.sesarju.eu/jsp/project/qproject.jsp?objId=1795089.13&resetHistory=true&statInfo=Ogp&domainName=saas

*[12]* SESAR, Guidance to Apply the Safety Reference Material, Edition 3.0, April 2016


[16] At the time of the creation of the PAR template, the Methodology (PJ19.04 Internal Document) is foreseen to be update in 2020.

[17] At the time of the creation of the PAR template the Validation Target is foreseen to be delivered in June 2020

https://stellar.sesarju.eu/jsp/project/qproject.jsp?objId=1795102.13&resetHistory=true&statInfo=Ogp&domainName=saas

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

*[14]* Accident Incident Models – AIM, release 2017

https://stellar.sesarju.eu/servlet/dl/ShowDocumentContent?doc_id=3658775.13&att=attachment&statEvent=Download

### Human Performance

*[15]* 16.06.05 D 27 HP Reference Material D27

*[16]* 16.04.02 D04 e-HP Repository - Release note

### Environment Assessment

*[17]* SESAR, Environment Assessment Process (2019), PJ19.4.2, Deliverable D4.0.080, Sep 2019.

https://stellar.sesarju.eu/servlet/dl/DownloadServlet?downloadKey=xrn%3Adatabase%3Aondb%2Frecord%2F14665451&resuming=true&zip=true&disposition=attachment&domainName=saas&domainName=saas

*[18]* ICAO CAEP – "Guidance on Environmental Assessment of Proposed Air Traffic Management Operational Changes" document, Doc 10031.

https://www.icao.int/publications/pages/publication.aspx?docnum=10031

### Security

*[19]* 16.06.02 D103 SESAR Security Ref Material Level

*[20]* 16.06.02 D137 Minimum Set of Security Controls (MSSCs).

*[21]* 16.06.02 D131 Security Database Application (CTRL_S)

# Appendix A Detailed Description and Issues of the OI Steps

| OI Step ID | Title | Consistency with latest Dataset |
|---|---|---|
| *N/A* | *N/A* | *N/A* |
| *N/A* | *N/A* | *N/A* |
| *N/A* | *N/A* | *N/A* |

**Table 54: OI Steps allocated to the Solution**

[…]

# Appendix B Title of the appendix

## B.1 <Appendix section>

### B.1.1 <Appendix sub section>

Insert beneficiary's logos below, if required and remove this sentence