INDUSTRIAL RESEARCH

SESAR Solution PJ.01-06 SPR/INTEROP-OSED V3 - Part V - Performance Assessment Report (PAR)

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PJ01 EAD

ENHANCED ARRIVALS AND DEPARTURES

This SPR-INTEROP OSED Part V is part of a project that has received funding from the SESAR Joint Undertaking under grant agreement No 731864 under European Union's Horizon 2020 research and innovation programme.

Abstract

This deliverable summarizes the performance results of the different exercises carried out in Solution PJ.01-06. The work performed was to assess and validate the benefit of integrating piloting supporting enhanced vision systems that can increase the safety and reliability of rotorcraft operations through dedicated symbology for specific rotorcraft operations, especially during arrival and departure operations including visual segments. The objective was to assess and validated the benefit of having SBAS based navigation for advanced Point-In-Space RNP approaches and departures to/from FATO by defining the corresponding rotorcraft specific contingency procedures in case of loss of communication. As the SBAS navigation, the corresponding contingency procedures will need to comply as much as possible with profiles adapted to exploit rotorcraft performances, reduce fuel consumption and noise emission. The pilot was supported during these operations by dedicated symbology presented on a Head Mounted Display system.

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1 Executive Summary

This document provides the Performance Assessment Report (PAR) for PJ.01-06 – Enhanced Rotorcraft and GA operations in the TMA.

The PAR is consolidating Solution performance validation results addressing KPIs/PIs and metrics from the SESAR2020 Performance Framework [23].

Description:

The work performed was to assess and validate the benefit of integrating piloting supporting enhanced vision systems that can increase the safety and reliability of rotorcraft operations through dedicated symbology for specific rotorcraft operations, especially during arrival and departure operations including visual segments. The objective was to assess and validated the benefit of having SBAS based navigation for advanced Point-In-Space RNP approaches and departures to/from FATO by defining the corresponding rotorcraft specific contingency procedures in case of loss of communication. As the SBAS navigation, the corresponding contingency procedures will need to comply as much as possible with profiles adapted to exploit rotorcraft performances, reduce fuel consumption and noise emission. The pilot was supported during these operations by dedicated symbology presented on a Head Mounted Display system.

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 [23]. The impact of a Solution on the performances are described in Benefit Impact Mechanism. All the KPI and mandatory PI from the Benefit Mechanism were the Solution potentially impact have to be assessed via 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 Expectations at Network Level (ECAC Wide or Local depending on the KPI)[1]	Confidence in Results[2]
FEFF1: Fuel Efficiency – Fuel burn per flight	N/A	5220 tonnes of fuel/year (ECAC Wide)	Medium
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	X N/A
CAP3: Airport Capacity – Peak Runway Throughput (Mixed mode).	N/A	N/A	N/A
PRD1: Predictability – Variance of Difference in actual & Flight Plan or RBT durations	N/A	N/A	N/A
PUN1: Punctuality – % Flights departing within +/- 3 minutes of scheduled departure time due to ATM and weather related delay	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

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causes			
CEF2: ATCO Productivity – Flights per ATCO -Hour on duty	N/A	N/A	N/A
CEF3: Technology Cost – Cost per flight	N/A	N/A	N/A
SAF1: Safety - Total number of fatal accidents and incidents with ATM Contribution per year	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: RWY-excursion accident	N/A	N/A
SAF5.X: TWY-collision accident	N/A	N/A
SAF6.X: CFIT accident	N/A	N/A
SAF7.X: Wake related accident	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

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
SEC7: Personnel (safety) risk after mitigation	N/A	N/A
SEC8: Capacity risk after mitigation	N/A	N/A
SEC9: Economic risk after mitigation	N/A	N/A
FEFF2: CO2 Emissions.	16440 t per year (ECAC wide)	Medium
FEFF3: Reduction in average flight duration.	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
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
RE5: Number of cancellations.	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	4,5M€/year	Medium
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: Available/Required training Duration within ARES	N/A	N/A
CMC1.2: Allocated/ Optimum ARES dimension	N/A	N/A
CMC1.3: Transit Time to/from airbase to ARES	N/A	N/A
CMC2.1: Fuel and Distance saved (for GAT operations)	N/A	N/A
CMC2.2: GAT planning efficiency of Available ARES	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:

No additional comments.

2 Introduction

2.1 Purpose of the document

The following text is not supposed to be changed!

The Performance Assessment covers the Key Performance Areas (KPAs) defined in the SESAR2020 Performance Framework [23]. 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 for practical considerations, for example on metrics.

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

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

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

2.2 Intended readership

In general, this document provides the ATM stakeholders (e.g. airspace users, ANSPs, airports, 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. Additionally, the consolidation process will be carried out annually, based on the SESAR Solution's available inputs.

- The members of solutions within PJ.01 EAD - Enhanced Arrival & Departures.
- The members of the following solutions within S2020:
    - PJ.02-05 Independent Rotorcraft operations at the airport

2.3 Inputs from other projects

The document includes information from the following SESAR 1 projects:

- B.05 D72: SESAR 1 Final Performance Assessment, where are described the principles used in SESAR1 for producing the performance assessment report.

PJ19 will manage and provide:

- PJ19.04.01 D4.1: Performance Framework (2018), guidance on KPIs and Data collection supports.
- PJ19.04.03 D4.0.1: S2020 Common assumptions, 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) within STELLAR, gathering experts and providing best practices.

2.4 Glossary of terms

See the AIRM Glossary for a comprehensive glossary of terms.

2.5 Acronyms and Terminology

Term	Definition
ANS	Air Navigation Service
ANSP	Air Navigation Service Provider
ATFM	Air Traffic Flow Management
ATM	Air Traffic Management
BAD	Benefits Assessment Date
BAER	Benefit Assessment Equipment Rate
CBA	Cost Benefit Analysis
DOD	Detailed Operational Description
E-ATMS	European Air Traffic Management System
ECAC	European Civil Aviation Conference
DB	Deployment Baseline
KPA	Key Performance Area
KPI	Key Performance Indicator
N/A	Not Applicable
OI	Operational Improvement

PAR	Performance Assessment Report
PI	Performance Indicator
PRU	Performance Review Unit
QoS	Quality of Service
RBT	Reference Business / Mission Trajectory
SESAR	Single European Sky ATM Research Programme
SJU	SESAR Joint Undertaking (Agency of the European Commission)
SESAR2020 Programme	The programme which defines the Research and Development activities and Projects for the SJU.

Table 3: Acronyms and terminology

3 Solution Scope

3.1 Detailed Description of the Solution

This Performance Assessment Plan covers the performance results as described in the VALR of the three Validation Exercises, briefly detailed in the following points:

- EXE-01.06-V3-VALP-001 – This real-time validation was set prior to the flight trials in Braunschweig. Therefore this exercise was needed to verify the functional setup and provided further test scenarios that cannot be conducted in the flight trials. This could be due to safety issues or weather conditions. Additionally the generic and safe environment of a simulator allows multivariate testing under controlled conditions what allows a better statistical analysis. The scenario layout in the means of the approach and departure path were the same as for the flight trials.
- EXE-01.06-V3-VALP-002 – This validation exercise included flight testing of IFR Advanced Point-in-Space (PinS) procedures on Braunschweig airport using an EC135 helicopter equipped with its standard avionics suite, completed with a TopEagle Head Mounted Display and real-time simulated Flight Management System and Navigation Display. The scenarios included assessment of the navigation performance, human factors, and workload under day and night conditions for a single pilot IFR configuration. During these validation activities, the traffic was considered, and in particular its impact on crew workload. The basis of the validation assessment was the crew's feedback in the form of test report. This validation exercise has covered the use case titled "Advanced PinS procedure using HMD" as defined in SESAR2020 PJ01-06 SPR-INTEROP/OSED document, in nominal and abnormal conditions, with the helicopter being flown manually (without autopilot coupling).
- EXE-01.06-V3-VALP-003 – Validation activities at Airbus Helicopters included flight testing of IFR Advanced Point-in-Space (PinS) approaches to Donauwörth heliport with either BK117 D-2 or EC135 helicopter equipped with a Helionix integrated avionics suite (Head Down Display). The scenarios included assessment of the navigation performance, human factors and crew workload under day, night and NVG conditions as well as single- and dual-pilot IFR configurations. The basis of the validation assessment was flight test data analysis and crew feedback in the form of post-flight test report. This validation exercise covered the use case titled "Advanced PinS procedure using HDD" as defined in SESAR2020 PJ01-06 SPR-INTEROP/OSED document, in nominal and abnormal conditions, with and without autopilot coupling.

3.2 Detailed Description of relationship with other Solutions

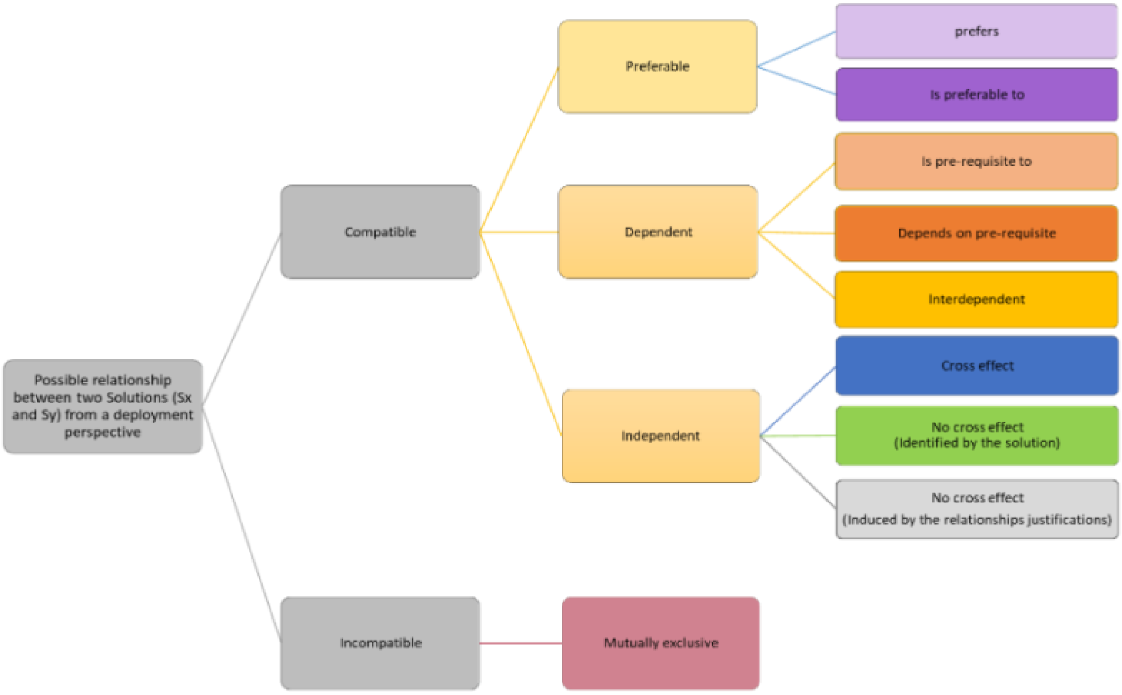

Figure 1: Solution dependencies

Solution Number	Solution Title	Relationship	Rational for the relationship
PJ.02-05	Independent Rotorcraft operations at the airport	Dependent	Advanced PinS is just an enabler for SNI approach

4 Solution Performance Assessment

4.1 Assessment Sources and Summary of Validation Exercise Performance Results

Previous Validation Exercises (pre-SESAR2020, etc.) relevant for this assessment are listed below.

Organisation	Document Title	Publishing Date
SESAR1 PJ.04-10	First Iteration validation activities - Validation Report	16/12/2015
SESAR1 PJ.04-10	Second Iteration validation activities - Validation Report	13/06/2016

Table 4: Pre-SESAR2020 Exercises

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

Exercise ID	Exercise Title	Release	Maturity	Status
EXE-01.06-V3-VALP-001	Advanced PinS procedures using HMD in real-time simulation		V3	OK
EXE-01.06-V3-VALP-002	Advanced PinS procedures using HMD in flight test		V3	OK
EXE-01.06-V3-VALP-003	Advanced PinS procedures using HDD		V3	OK

Table 5: 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-01.06-V3-VALP-001	AOM-0104-B	This real-time validation was set prior to the flight trials in Braunschweig. Therefor this exercise was needed to verify the functional setup and provide further test scenarios that cannot be conducted in flight trials. This can be due to safety issues or weather conditions. Additionally the generic and safe environment of a simulator allows multivariate	See V3 VALR	

		testing under controlled conditions what allows a better statistical analysis. The scenario layout in the means of the approach and departure path was the same as for the flight trials.		
EXE-01.06-V3-VALP-002	AOM-0104-B	This validation exercise included flight testing of IFR Advanced Point-in-Space (PinS) procedures on Braunschweig airport using an EC135 helicopter equipped with its standard avionics suite, completed with a TopEagle Head Mounted Display and real-time simulated Flight Management System and Navigation Display. The scenarios included assessment of the navigation performance, human factors, and workload under day and night conditions for a single pilot IFR configuration. During these validation activities, the traffic was considered, and in particular its impact on crew workload. The basis of the validation assessment was the crew's feedback in the form of test report. This validation exercise has covered the use case titled "Advanced PinS procedure using HMD" as defined in SESAR2020 PJ01-06 SPR-INTEROP/OSED document, in nominal and abnormal conditions, with the helicopter being flown manually (without autopilot coupling).	See V3 VALR	
EXE-01.06-V3-VALP-003	AOM-0104-B	Validation activities at Airbus Helicopters included flight testing of IFR Advanced Point-in-Space (PinS) approaches to Donauwörth heliport with either BK117 D-2 or EC135 helicopter equipped with a Helionix integrated avionics suite (Head Down Display). The scenarios included assessment of the navigation performance, human factors and crew workload under	See V3 VALR	

		day, night and NVG conditions as well as single- and dual-pilot IFR configurations. The basis of the validation assessment was flight test data analysis and crew feedback in the form of post-flight test report. This validation exercise covered the use case titled “Advanced PinS procedure using HDD” as defined in SESAR2020 PJ01-06 SPR-INTEROP/OSED document, in nominal and abnormal conditions, with and without autopilot coupling.		

Table 6: Summary of Validation Results.

4.2 Conditions / Assumptions for Applicability

The following Table 7 summarises the applicable operating environments.

OE	Applicable sub-OE	Special characteristics
TMA	Low and medium complexity	N/A
Airport	Low and medium complexity	N/A

Table 7: Applicable Operating Environments.

The following Table 8 summarises the essential deployment details.

BAD	Specific geographical and/or stakeholder deployment
2025	Normal rotorcraft
2025	GA and rotorcraft
2025	40% Advanced PinS equipage

Table 8: Deployment details.

Equipage details and how equipage influences benefits in the ramp-up phase is given in Table 9.

Min flight equipage rate	Opt flight equipage rate	BAER	AUs that need to equip	Start of flight equipage	End of flight equipage
40% Advanced PinS	100% Advanced PinS	40% Advanced PinS	All rotorcrafts		

capabilities	capabilities	capabilities			

Table 9: Influence of Equipage on benefits.

4.3 Safety

4.3.1 Safety Criteria and Performance Mechanism

Based on the Accident Incident Model Charts (AIM-Charts) for Controlled Flight into Terrain (CFIT) four Safety Criteria were defined to ensure that the new procedure increase Safety. **Table 10** shows the defined Safety Criteria and the corresponding Barriers

Safety Criteria	Description
SAC101	The number of Imminent CFIT (CF3) shall remain the same with the new concept.
SAC102	The number of Controlled Flight Towards Terrain (CF4) shall remain the same with the new concept.
SAC103	The number of Flight Towards Terrain Commanded by Pilot (CF5) shall be reduced by the new concept due to the use of an HMD.
SAC104	The number of Flight Towards Terrain Commanded by System (CF6) shall remain the same with the new concept.

Table 10: Safety Criteria

4.3.2 Data collection and Assessment

Table 11 lists the defined Safety Objectives (Functionality and Performance) for normal and abnormal conditions.

ID	Description
SO-0001	The ATM system (MSAW) shall detect when the trajectory of an aircraft will penetrate terrain.
SO-0002	The Controller shall receive a warning if the rotorcraft intend to flight into terrain.
SO-0003	The monitoring information displayed to the pilots shall be always adequate.
SO-0004	All flight relevant information shall always displayed to the pilot
SO-0005	The Status of the system shall be always visible to the pilots.
SO-0006	The HMD shall always display all relevant information.
SO-0007	The HMD shall support manoeuver which combine longitudinal, lateral and vertical movements, in particular on the curved part of the departure procedure.
SO-0008	The HMD shall support manoeuver which combine longitudinal, lateral and vertical movements, in particular on the curved part of the arrival procedure.

SO-0009	The HMD shall support the pilot when approaching the MAPt (Missed Approach Point), to decide whether to continue or abort the approach.
SO-0010	The flight crew shall always have the possibility to perform the departure/approach procedure without SBAS (vertical guidance).
SO-0011	The flight crew shall have the possibility to perform the departure/approach procedure without HMD.
SO-0012	The ATCOs shall make clearances available to the Flight Data Processor.
SO-0013	The ATM System shall self-monitor its integrity.
SO-0014	The A/C System shall self-monitor its integrity.
SO-0015	The Flight Crew shall make cleared flight trajectory available to the Flight Management System.
SO-0016	The ATCO shall be able to check for terrain conflicts on his own.

Table 11: Safety Objectives (Functionality and Performance) for normal and abnormal conditions

Table 12 lists the Safety Objectives (Integrity) for failure approach.

ID	Description
SO-0101	The Loss of GNSS signal during the PinS operation shall lead to a conflict less than $2*10^{-7}$ times per flight.
SO-0102	The HMD failure during the PinS operation shall lead to a conflict less than $2*10^{-7}$ times per flight.
SO-0103	The MSAW System fail to detect a conflict less than $1*10^{-7}$ times per flight.

Table 12: Safety Objectives (Integrity) for failure approach

Table 13 lists the defined Safety Requirements (Functionality and Performance) for normal and abnormal conditions.

ID	Description
SR-0001	The Air Traffic Controller shall input any clearance given to an rotorcraft on a dedicated interface
SR-0002	The MSAW shall receive all clearance information.
SR-0003	The MSAW shall receive all terrain/obstacle information from the database.
SR-0004	The MSAW shall regularly calculate minimum distance between rotorcraft trajectory based on clearance data and terrain/obstacle data based on current database.

SR-0005	The MSAW shall provide warning to the ATCO who is responsible for the rotorcraft which trajectory will penetrate terrain/obstacle on a dedicated interface.
SR-0006	The FMS shall receive all relevant data form the NAVAID.
SR-0007	The FMS shall provide all relevant data including flight trajectory to the HMD.
SR-0008	The HMD shall visually provide all relevant data including flight trajectory to the Flight Crew.
SR-0009	The Flight Crew shall check adherence of selected navaids to given clearances.
SR-0010	An alive-check system shall monitor the FMS.
SR-0011	An alive-check system shall monitor the HMD.
SR-0012	An alive-check system shall monitor the GNSS.
SR-0013	The Flight Crew shall check adherence of flight trajectories to given clearances.
SR-0014	The Air Traffic Controller shall have access to a Terrain Database independent of the MSAW.
SR-0015	The Air Traffic Controller shall check adherence of flight trajectories to given clearances.
SR-0016	A monitoring aid shall warn of any discrepancy between cleared trajectory and actual trajectory.
SR-0017	An alive-check system shall monitor the Flight Data Processor.
SR-0018	An alive-check system shall monitor the Terrain Database.
SR-0019	An alive-check system shall monitor the MSAW.

Table 13: Safety Requirements (Functionality and Performance) for normal and abnormal conditions

Table 14lists the Safety Requirements (Integrity) for failure approach.

ID	Description
SR-0101	FMS data corruption shall occur less than $6*10^{-8}$.
SR-0102	HMD data corruption shall occur less than $6*10^{-8}$
SR-0103	GNSS shall fail to show data less than $6*10^{-8}$
SR-0104	Flight Data Processor data corruption shall occur less than $3*10^{-8}$
SR-0105	Terrain Database data corruption shall occur less than $3*10^{-8}$

SR-0106	MSAW shall miss a conflict less than $3*10^{-8}$.

Table 14: Safety Requirements (Integrity) for failure approach

4.3.3 Extrapolation to ECAC wide

Taking into account the defined Safety Objectives and Safety Requirements described above, it can be assumed that the new concept has no negative impact on Safety. As no measurements on Safety were carried out in the simulator trials and live trials no data on extrapolation can be provided.

4.3.4 Discussion of Assessment Result

The new concept is not expected to have any negative or positive safety impact. As no measurements on Safety were carried out in the simulator trials and live trials this assessment is based only on the theoretical safety analysis in the Safety Assessment Report.

4.3.5 Additional Comments and Notes

No additional comments.

4.4 Environment / Fuel Efficiency

Often fuel efficiency is improved through a reduction of flight or taxi time. This time benefit is also assessed, in this section, as it is additional input for the business case.

4.4.1 Performance Mechanism

The aim of the solution is to decrease the fuel consumption by reducing the length of the approaches.

4.4.2 Assessment Data (Exercises and Expectations)

The reference scenarios are based on 3 current approach studies in order to estimate the saving per approach and some hypothesis are taken about the deployment in Europe to estimate the global saving (*data taken from Eurocontrol).

The main figures of the reference scenario are:

- Percentage of rotorcraft equipped with Advanced PinS capabilities today: 40% on 2900* (from twin engine IFR medium and heavy only) registered rotorcraft in Europe
- Number of Airport using Advanced PinS : 300 regarding the 2000* European airports (15%)
- Deployment from 2022 to 2032Flight performed with a standard twin engine rotorcraft like an AH135
- Traffic Growth assumptions 1,9%/year

<u>**Solution Scenario**</u>

Three different solution scenarios were performed in PJ.01-06.

<u>**Scenario 1: Approach/departures to EDEV (Braunschweig)**</u>

This scenario take into account the saving regarding the length of the approach compare the classical T approach.

Standard LPV approach	Advanced PinS	Saving
13.4 NM	11.1 NM	~2 NM

<u>**Scenario 2: Approach/departures to EDPR (Donauwörth)**</u>

This scenario take into account the saving regarding the length of the approach compare the classical Y approach.

Standard LPV approach	Advanced PinS	Saving
14 NM	11.5 NM	~2.5 NM

Scenario3: Approach to LFBO (Toulouse)

This scenario take into account the saving regarding the length of the approach compare the classical ILS approach.

Standard LPV approach	Advanced PinS	Saving
12 NM	9 NM	~3 NM

Conclusion: The average saving is 2.5 NM (~20%).

Assumptions

For all scenarios the time horizon of the CBA is 21 years following the V3 of the each enabler. No change in the regulation is expected.

Other assumptions included in the numbers hereafter:

- Traffic evolution
- Number of movements on secondary airports
- Number of aircrafts equipped with advanced PinS capabilities

Name	Reference
Cost of fuel [EUR/kg]	0.9 €/kg
Fuel consumption [kg/min]	2.5 Kg/min
Velocity in approach (kt)	80 Kts
Average distance saving (NM)	2.5 NM
No. of flights per rotorcraft per year (BA/RA/MA)	500 flight
Average duration of flight (BA/RA/MA)	1 hour

4.4.3 Extrapolation to ECAC wide

Scenario feature		Year 2027	Source
Applicability: Number of locations where Solution is deployed (# ROEs)	AOM-0104-B	300	Consortium estimation

Impacted traffic, i.e. experiencing the benefits from the Solution(s)	IFR flights per year	40% of 2900*500 = 580 000 approaches + 580 000 departures	Consortium estimation

With the consortium estimations above a saving of 4640 tonnes of fuel/year is expected.

KPIs / PIs	Unit	Calculation	Mandatory	Benefit in SESAR1 (if applicable)	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	N/A
FEFF2 Actual Average CO_2 Emission per flight	Kg CO_2 per flight	Amount of fuel burn x 3.15 (CO_2 emission index) divided by the number of flights	YES	N/A	N/A	N/A
FEFF3 Reduction in average flight duration	Minutes per flight	Average actual flight duration measured in the Reference Scenario – Average flight duration measured in the Solution Scenario	YES	N/A	N/A	N/A

Table 15 is showing the impact on flight phases (provided when it is possible).

	Taxi out	TMA departure	En-route	TMA arrival	Taxi in
FEFF1 Actual Average fuel burn per flight	N/A	4,5 kg	N/A	4,5 kg	N/A

FEFF2 Actual Average CO_2 Emission per flight	N/A	14,2 kg	N/A	14,2 kg	N/A
FEFF3 Reduction in average flight duration	N/A	N/A	N/A	N/A	N/A

Table 15: Fuel burn reduction per flight phase.

4.4.4 Discussion of Assessment Result

Due to the new concept, it is possible to reduce the miles flown per arrival, depending on the current standard approach/departure, between 2 NM and 3 NM. This results in an average saving of 9 kg fuel per flight (approach/departure). In addition, an average of 28,35 kg of CO2 is saved per flight (approach/departure).

4.4.5 Additional Comments and Notes

No additional comments.

4.5 Environment / Noise and Local Air Quality

4.5.1 Performance Mechanism

In PJ.01-06, no analyses were carried out, but with a reduction in the number of miles flown, a reduction in noise and local air quality is expected.

4.5.2 Assessment Data (Exercises and Expectations)

PIs	Unit	Calculation	Mandatory	Benefit in SESAR1 (if applicable)	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)	YES for Airport OE Solutions	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(Km2)	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.	YES for Airport OE Solutions	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.	YES for Airport OE Solutions	N/A	N/A	N/A

PIs	Unit	Calculation	Mandatory	Benefit in SESAR1 (if applicable)	Absolute expected performance benefit in SESAR2020	% expected performance benefit in SESAR2020
LAQ1 Geographic distribution of pollutant concentrations	Airport Local Air Quality Studies (ALAQS) inventory method generally uses mg/m3 for each pollutant	Measurement to be performed within LTO cycle. NOx: Nitrogen oxides, including nitrogen dioxide (NO2) and nitrogen oxide (NO); VOC: Volatile organic compounds (including non-methane hydrocarbons (NMHC)); CO: Carbon monoxide; PM: Particulate matter (fraction size PM2.5 and PM10); SOx: Sulphur oxides. Recommended tools: Open-ALAQS	YES for Airport OE Solutions relative to LTO (=>below 3000ft)	N/A	N/A	N/A

4.5.3 Extrapolation to ECAC wide

There is no ECAC wide extrapolation required for this KPI.

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)

4.6.1 Performance Mechanism

For a detailed analyse please refer to the PJ 02-05 because Advanced PinS is a just enabler for SNI approach. The improvement of the capacity is performed at a higher level by implementing SNI approach. **Note from PJ 02-05:** Even if the expected improvements are mild, it should be considered a positive trend for the TMA Capacity (and Flight Efficiency with tailored rotorcraft procedures) due to the fact that today the rotorcraft AUs are not allowed to fly to/from a busy airport unless in respecting the VFR/VMC conditions. This means that rotorcrafts are not considered in the current airport capacity evaluation. After implementing the operational solution proposed in the context of PJ.02-05 they can fly under IFR rules to/from a busy airport towards contributing in the airport capacity increase (RWYs movements + FATOs movements).

4.6.2 Assessment Data (Exercises and Expectations)

KPIs / PIs	Unit	Calculation	Mandatory	Benefit in SESAR1 (if applicable)	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	N/A
CAP2 En-route throughput, in challenging airspace, per unit time	Relative change of movements (% and number of movement)	% and also total number of movements, per volume of En-Route airspace per hour for specific traffic mix and density, for High and Medium Complexity TMAs.airspace at peak demand hours.	YES	N/A		

4.6.3 Extrapolation to ECAC wide

N/A

4.6.4 Discussion of Assessment Result

Stakeholder	KPA	R&D Needs
TMA Operator	EFF	Increasing efficiency during approach reducing the traffic conflict between Aircraft and Rotorcraft.
TMA Operator	HP	Increasing human performance of the control during approach through the implementation of the traffic separation.
TMA Operator	SAF	Increasing safety during approach, better situational awareness through the implementation of the traffic separation avoiding human error.

4.6.5 Additional Comments and Notes

No additional comments.

4.7 Airport Capacity (Runway Throughput Flights/Hour)

4.7.1 Performance Mechanism

For a detailed analyse please refer to the PJ 02-05 because Advanced PinS is a just enabler for SNI approach. The improvement of the capacity is performed at a higher level by implementing SNI approach. **Note from PJ 02-05:** Even if the expected improvements are mild, it should be considered a positive trend for the airport Capacity (and Flight Efficiency with tailored rotorcraft procedures) due to the fact that today the rotorcraft AUs are not allowed to fly to/from a busy airport unless in respecting the VFR/VMC conditions. This means that rotorcrafts are not considered in the current airport capacity evaluation. After implementing the operational solution proposed in the context of PJ.02-05 they can fly under IFR rules to/from a busy airport towards contributing in the airport capacity increase (RWYs movements + FATOs movements).

4.7.2 Assessment Data (Exercises and Expectations)

KPIs / PIs	Unit	Calculation	Mandatory	Benefit in SESAR1 (if applicable)	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**	**N/A**
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	YES	**N/A**	**N/A**	**N/A**

KPIs / PIs	Unit	Calculation	Mandatory	Benefit in SESAR1 (if applicable)	Absolute expected performance benefit in SESAR2020	% expected performance benefit in SESAR2020
		hours in the segregated-mode RWY operations airports group.				
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	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. NB: Supports CBA Inputs. 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 For CBA.	N/A	N/A	N/A

4.7.3 Extrapolation to ECAC wide

N/A

4.7.4 Discussion of Assessment Result

Stakeholder	KPA	R&D Needs
Airport Operator	EFF	Increasing efficiency during approach reducing the traffic conflict between Aircraft and Rotorcraft. Specific holding zone for rotorcraft, capacity for rotor craft to land in airport FATO independently of the aircraft traffic. Reducing the risk of delay.
Airport Operator	HP	Increasing human performance of the control during final approach through the implementation of the traffic separation.
Airport Operator	SAF	Increasing safety during approach, better situational awareness through the implementation of the traffic separation avoiding human error.

4.7.5 Additional Comments and Notes

No additional comments.

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

4.8.1 Performance Mechanism

Resilience is not an expected benefit for solution PJ.01-06 in SESAR2020. Therefore, no analysis for resilience was performed during the V3 phase of the solution.

4.8.2 Assessment Data (Exercises and Expectations)

PIs	Unit	Calculation	Mandatory	Benefit in SESAR1 (if applicable)	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.	YES	N/A	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.	YES for Airport OE Solutions	N/A	N/A	N/A
RES2 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	N/A	N/A	N/A
RES2.1 Airspace time to recover from non-nominal to nominal condition	Minutes	Duration of Airspace lost capacity compared to non-nominal to nominal condition.	YES for Airspace OE Solutions	N/A	N/A	N/A

PIs	Unit	Calculation	Mandatory	Benefit in SESAR1 (if applicable)	Absolute expected performance benefit in SESAR2020	% expected performance benefit in SESAR2020
RES4 Minutes of delays	Minutes	Impact on AUs measured through delays resulting from capacity degradation[5]. 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).	YES	N/A	N/A	N/A
RES5 Number of cancellations	Nb flights	Impact on AUs measured through Cancellations resulting from capacity degradation[6]. 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).	YES	N/A	N/A	N/A

4.8.3 Extrapolation to ECAC wide

N/A

4.8.4 Discussion of Assessment Result

N/A

4.8.5 Additional Comments and Notes

N/A

[5] 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.

[6] 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.

4.9 Predictability (Flight Duration Variability, against RBT)

4.9.1 Performance Mechanism

For a detailed analyse please refer to the PJ 02-05 because Advanced PinS is a just enabler for SNI approach. The improvement of the capacity is performed at a higher level by implementing SNI approach.

4.9.2 Assessment Data (Exercises and Expectations)

Please refer to PJ.02-05 for assessment data.

4.9.3 Extrapolation to ECAC wide

KPIs / PIs	Unit	Calculation	Mandatory	Benefit in SESAR1 (if applicable)	Absolute expected performance benefit in SESAR2020	% expected performance benefit in SESAR2020
PRD1 Variance[7] of Difference in actual & Flight Plan or RBT durations	$Minutes^2$	Variance of Difference in actual & Flight Plan or RBT durations	YES	**N/A**	**N/A**	**N/(A**

Table 16 is showing the impact on flight phases (provided when it is possible).

	Taxi out	TMA departure	En-route	TMA arrival	Taxi in
PRD1 Variance[8] of Difference in actual & Flight Plan or RBT durations	N/A	N/A	N/A	N/A	N/A

Table 16: Predictability benefit per flight phase, standard deviation improvement.

4.9.4 Discussion of Assessment Result

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[7] Standard Deviation is also accepted.

[8] Standard Deviation is also accepted.

Stakeholder	KPA	R&D Needs
Airport/TMA Operators	EFF	Increasing efficiency during approach reducing the traffic conflict between Aircraft and Rotorcraft. Air Traffic management is equivalent to 2 independent Airports or TMA using SNI and in this case it's easier to predict the traffic congestion, only a same range of speed have to be managed by controllers.

4.9.5 Additional Comments and Notes

No additional comments.

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

4.10.1Performance Mechanism

For a detailed analyse please refer to the PJ 02-05 because Advanced PinS is a just enabler for SNI approach. The improvement of the capacity is performed at a higher level by implementing SNI approach.

4.10.2Assessment Data (Exercises and Expectations)

Please refer to PJ.02-05 for assessment data (Exercise and Expectations)

4.10.3Extrapolation to ECAC wide

KPIs / PIs	Unit	Calculation	Mandatory	Benefit in SESAR1 (if applicable)	Absolute expected performance benefit in SESAR2020	% expected performance benefit in SESAR2020
PUN1 % Flights departing within +/- 3 minutes of scheduled departure time due to ATM and weather related delay causes	%	% Departures so that |AOBT – SOBT[9]| < +/- 3 min. Difference in Actual Departure Time vs. Scheduled Time due to ATM and weather related delay causes.	YES	**N/A**	**N/A**	**N/A**

Table 17 is showing the impact on flight phases (provided when it is possible).

	Taxi out	TMA departure	En-route	TMA arrival	Taxi in
PUN1 % Flights departing within +/- 3 minutes of scheduled	N/A	N/A	N/A	N/A	N/A

[9] Taking into account those SESAR concepts working on the planning phase, it is possible for different Stakeholders to request departure changes (outside the tolerance window of +/- 3 minutes) subject to approval by all actors involved before the flight execution. If accepted by all concerned actors, the reference plan against which the departure punctuality is measured will be this updated RBT instead of SBT.

departure time due to ATM and weather related delay causes						

Table 17: Punctuality benefit per flight phase.

4.10.4Discussion of Assessment Result

Stakeholder	KPA	R&D Needs
Airport/TMA Operators	EFF	Increasing efficiency during approach reducing the traffic conflict between Aircraft and Rotorcraft and then reducing the risk of delay. Specific holding zone for rotorcraft, capacity for rotor craft to land in airport FATO independently of the aircraft traffic allowing controllers to reduce the amount of delay in case of congestion.

4.10.5Additional Comments and Notes

No additional comments.

4.11 Civil-Military Cooperation and Coordination (Distance and Fuel)

4.11.1 Performance Mechanism

Civil-Military Cooperation and Coordination is not an expected benefit for solution PJ.01-06 in SESAR2020. Therefore, no analysis for the PI's CMC1.1, CMC1.2, CMC1.3, CMC2.1 and CMC2.2 were performed during the V3 phase of the solution

4.11.2 Assessment Data (Exercises and Expectations)

No measurements during V3 phase as not one of the expected benefits.

4.11.3 Extrapolation to ECAC wide

PIs	Unit	Calculation	Mandatory	Benefit in SESAR1 (if applicable)	Absolute expected performance benefit in SESAR2020	% expected performance benefit in SESAR2020
CMC1.1 Available/Required training Duration within ARES	%	Available training duration / Required training duration. It provides an indication on an available training duration within ARES in regard to the individual training event. The existing ATM system does not generate required data. SESAR WP11.1 WOC offers a solution to use the available training duration within ARES as a leading indicator. It is applicable for a performance assessment of pre-tactical ASM process. It could be used as leading PI.	YES	N/A	N/A	N/A
CMC1.2 Allocated/ Optimum ARES dimension	%	(Allocated ARES surface/ Optimum ARES Surface) x (Allocated FL/Optimum FL) It provides an indication of how closely the allocated ARES conforms to the optimum airspace dimensions. Due to different operational requirements among the states, performance monitoring and target setting is applicable at national level. It is applicable for a performance assessment of pre-tactical ASM and could be used as leading and/or lagging PI.	YES	N/A	N/A	N/A

PIs	Unit	Calculation	Mandatory	Benefit in SESAR1 (if applicable)	Absolute expected performance benefit in SESAR2020	% expected performance benefit in SESAR2020
CMC1.3 Transit Time to/from airbase to ARES	Minutes	It provides an indication of the transit time for aircraft which participated in an individual sortie. If it is calculated passed of a flight plan data it could be used as leading PI. If it is calculated based on an actual the flight time from airbase to ARES and back , it could be used as a lagging PI.. Flight time between ARESs could be calculated as the transit time. The existing ATM system does not generate required data. SESAR WP11.1 WOC offers a solution to use the transit time a leading indicator. It is applicable for a performance assessment of pre-tactical ASM.	YES/NO	N/A	N/A	N/A
CMC2.1 Fuel and Distance saved (for GAT operations)	Kg and NM	Kg of fuel and distance flown for GAT due optimisation of the ATM network through Demand Capacity balancing and to the new ARES design and management	YES	N/A	N/A	N/A
CMC2.2 GAT planning efficiency of Available ARES (% GAT flights planning to use ARES / GAT flights for which ARES is available)	%	GAT planning effectiveness use ARES could be captured using the following indicator: % (GAT flights planning to use ARES / GAT flights for which ARES is available). It could be number and time based measure.	YES	N/A	N/A	N/A

Table 18 is showing the impact on flight phases (provided when it is possible).

	Taxi out	TMA departure	En-route	TMA arrival	Taxi in
CMC1.1 Available/Required training Duration within ARES	No measurements as no expected	N/A	N/A	N/A	No measurements as no expected

	benefits				benefits
CMC1.2 Allocated/ Optimum ARES dimension	No measurements as no expected benefits	N/A	N/A	N/A	No measurements as no expected benefits
CMC1.3 Transit Time to/from airbase to ARES	No measurements as no expected benefits	N/A	N/A	N/A	No measurements as no expected benefits
CMC2.1 Fuel and Distance saved (for GAT operations)	No measurements as no expected benefits	N/A	N/A	N/A	No measurements as no expected benefits
CMC2.2 GAT planning efficiency of Available ARES (% GAT flights planning to use ARES / GAT flights for which ARES is available)	No measurements as no expected benefits	N/A	N/A	N/A	No measurements as no expected benefits

Table 18: Civil-Military cooperation and coordination benefit per flight phase

4.11.4 Discussion of Assessment Result

N/A

4.11.5 Additional Comments and Notes

N/A

4.12 Flexibility

Flexibility means the ability to react to late flight plan changes and requests. The main PI / metric, FLX1, is "Average delay for scheduled civil/military flights with change request and non-scheduled / late flight plan request."

4.12.1 Performance Mechanism

Flexibility is not an expected benefit for solution PJ.01-06 in SESAR2020. Therefore no analyses were performed during the V3 phase of the solution.

4.12.2 Assessment Data (Exercises and Expectations)

N/A

4.12.3 Extrapolation to ECAC wide

PIs	Unit	Calculation	Mandatory	Benefit in SESAR1 (if applicable)	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	N/A

Table 19 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	No measurements as no expected benefits	N/A	N/A	N/A	No measurements as no expected benefits

Table 19: Flexibility benefit per flight phase.

4.12.4 Discussion of Assessment Result

N/A

4.12.5 Additional Comments and Notes

N/A

4.13 Cost Efficiency

4.13.1 Performance Mechanism

N/A

4.13.2 Assessment Data (Exercises and Expectations)

N/A

4.13.3 Extrapolation to ECAC wide

KPIs / PIs	Unit	Calculation	Mandatory	Benefit in SESAR1 (if applicable)	Absolute expected performance benefit in SESAR2020	% expected performance benefit in SESAR2020
CEF2[10] Flights per ATCO-Hour on duty	Nb	Count of Flights handled divided by the number of ATCO-Hours applied by ATCOs on duty.	YES	N/A	N/A	N/A
CEF3 Technology cost per flight	EUR / flight	G2G ANS cost changes related to technology and equipment.	YES	N/A	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	N/A

4.13.4 Discussion of Assessment Result

N/A

4.13.5 Additional Comments and Notes

[10] 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).

N/A

4.14Airspace User Cost Efficiency

4.14.1Performance Mechanism

The aim of the solution is to decrease fuel by reducing the length of the approaches. A reduction of fuel always results in a reduction auf airspace user costs.

4.14.2Assessment Data (Exercises and Expectations)

As descript in Chapter 4.4 an average fuel reduction of 2.5 kg per approach is expected with the new concept.

Assumptions

For all scenarios the time horizon of the CBA is 10 years following the V3 of the each enabler. No change in the regulation is expected.

Other assumptions included in the numbers hereafter:

- Traffic evolution
- Number of movements on secondary airports
- Number of aircrafts equipped with advanced PinS capabilities

Name	Reference
Cost of fuel [EUR/kg]	0.9 €/kg
Fuel consumption [kg/min]	2.5 Kg/min
Velocity in approach (kt)	80 Kts
Average distance saving (NM)	2.5 NM
Average delay – flight (min)	15 min [PJ 02-05]
Average delay – ground (min)	20 min [PJ 02-05]
No. of flights per rotorcraft per year (BA/RA/MA)	500 flight
Average duration of flight (BA/RA/MA)	1 hour

This results in an average airspace user cost saving of 4.22€ per flight.

4.14.3Extrapolation to ECAC wide

Scenario feature		Year 2030	Source
Applicability: Number of locations where Solution is deployed (# ROEs)	AOM-0104-B	300	Consortium estimation

Impacted traffic, i.e. experiencing the benefits from the Solution(s)	IFR flights per year	40% of 2900*500 = 580 000 flights	Consortium estimation

With the consortium estimations above a saving of 2400000€/year is expected.

PIs	Unit	Calculation	Mandatory	Benefit in SESAR1 (if applicable)	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	N/A
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	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	N/A

4.14.4 Discussion of Assessment Result

The fuel saving per flight is very low at € 4.22. The savings are most interesting for companies with a large fleet of rotorcraft.

4.14.5 Additional Comments and Notes

No additional comments.

4.15Security

4.15.1The SecRAM 2.0 methodology and the Security Performance Mechanism

The impact on personal security risks and the impact on operational security were not assessed during the V3 activities of PJ.01-06. As long as no guidance on how to analyse security is available, this topic can not be analysed. Furthermore the template for the Security Assessment (former SPR-INTEROP/OSED Part III) is no longer available on Stellar.

4.15.2Security Assessment Data Collection

PIs	Unit	Calculation	Mandatory	Current value
SEC1 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 : The identification of Primary Assets, Supporting Assets, Threat Scenarios and Vulnerabilities; The evaluation of Impacts, Likelihoods and Risks.	YES (different steps are mandatory for different prioritization and maturity levels)	N/A
SEC2 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 (implementation just at higher maturity levels – V4)	N/A
SEC3 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	N/A
SEC7 Personnel (safety) risk after mitigation	Risk 3 levels are possible: high, medium or low	Qualitative assessments are derived from application of the SESAR2020 Security Risk Assessment Methodology (SecRAM 2.0). The PI is the maximum risk evaluated for the SESAR Solution after application of the recommended controls and considering the Personnel Impact Area only.	According to the SESAR Solution prioritization list and to the maturity level of the solutions	N/A
SEC8 Capacity risk after mitigation	Risk – 3 levels are possible: high, medium or low	Qualitative assessments are derived from application of SecRAM 2.0. The PI is the maximum risk evaluated for the SESAR Solution after application of the recommended controls and considering the Capacity Impact Area only.	According to the SESAR Solution prioritization list and to the maturity level of the solutions	N/A

PIs	Unit	Calculation	Mandatory	Current value
SEC9 Economic risk after mitigation	Risk – 3 levels are possible: high, medium or low	Qualitative assessments are derived from application of SecRAM 2.The PI is the maximum risk evaluated for the SESAR Solution after application of the recommended controls and considering the Economic Impact Area only.	According to the SESAR Solution prioritization list and to the maturity level of the solutions.	N/A

4.15.3Extrapolation to ECAC wide

There is no ECAC wide extrapolation required for this KPI.

4.15.4Discussion of Assessment Result

The following high level security requirements were defined:

[REQ]

Identifier	REQ-PJ.01.06-SEC-MSSC-C8.3-0001
Title	Software design - Detection, prevention and recovery controls
Requirement	Software design and operation shall provide detection, prevention, and recovery controls to protect A/C software against malicious code.
Status	<validated>
Rationale	High level cyber security requirement based on a self-assessment of the project members of Solution PJ.01-06.
Category	<Security>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.01-06
<ALLOCATED_TO>	<Sub-Operating Environment>	Airport TMA

[REQ]

Identifier	REQ-PJ.01.06-SEC-MSSC-C8.3-0002

Title	Loss of software function or the unauthorised replay.
Requirement	The loss of software function or the unauthorised replay of sensitive data has a potentially high impact on Operational Safety, Performance (Delay, Environment) and/or Cost of Operation. Malicious software may stop operations, manipulate data to the detriment of operations, or provide unauthorized access to data or operations. Malicious software may be introduced in design or production coding, via operational updates or through the use of viruses.
Status	<validated>
Rationale	High level cyber security requirement based on a self-assessment of the project members of Solution PJ.01-06.
Category	<Security>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.01-06
<ALLOCATED_TO>	<Sub-Operating Environment>	Airport TMA

[REQ]

Identifier	REQ-PJ.01.06-SEC-PR1-C8.3-0001
Title	Detection and removement of malicious software
Requirement	The software development and production process shall detect and remove malicious software prior to the in-service date.
Status	<validated>
Rationale	High level cyber security requirement based on a self-assessment of the project members of Solution PJ.01-06.
Category	<Security>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.01-06
<ALLOCATED_TO>	<Sub-Operating Environment>	Airport TMA

[REQ]

Identifier	REQ-PJ.01-06-SEC-PR2-C8.3-0002
Title	Software management process - removed on detection.
Requirement	The software management process shall ensure that all detected malicious software is removed on detection.
Status	<validated>
Rationale	High level cyber security requirement based on a self-assessment of the project members of Solution PJ.01-06.
Category	<Security>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.01-06
<ALLOCATED_TO>	<Sub-Operating Environment>	Airport TMA

[REQ]

Identifier	REQ-PJ.01-06-SEC-PR3-C8.3-0003
Title	Immediate user information
Requirement	Once detected users shall be immediately informed of the event and as soon as possible provided with detailed of any effects.
Status	<validated>
Rationale	High level cyber security requirement based on a self-assessment of the project members of Solution PJ.01-06.

Category	<Security>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.01-06
<ALLOCATED_TO>	<Sub-Operating Environment>	Airport TMA

[REQ]

Identifier	REQ-PJ.01-06-SEC-PR4-C8.3-0004
Title	Software Installation
Requirement	The software shall only be installed from verified media.
Status	<validated>
Rationale	High level cyber security requirement based on a self-assessment of the project members of Solution PJ.01-06.
Category	<Security>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.01-06
<ALLOCATED_TO>	<Sub-Operating Environment>	Airport TMA

[REQ]

Identifier	REQ-PJ.01-06-SEC-PR5-C8.3-0005
Title	Validated and verificated software installation
Requirement	Only software which has been the subject of documented validation and verification testing shall be installed.

Status	<validated>
Rationale	High level cyber security requirement based on a self-assessment of the project members of Solution PJ.01-06.
Category	<Security>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.01-06
<ALLOCATED_TO>	<Sub-Operating Environment>	Airport TMA

[REQ]

Identifier	REQ-PJ.01-06-SEC-PR7-C8.3-0006
Title	Software development, operations, maintenance and management staff
Requirement	Software development, operations, maintenance and management staff shall be proved with periodic training on type of malicious software.
Status	<validated>
Rationale	High level cyber security requirement based on a self-assessment of the project members of Solution PJ.01-06.
Category	<Security>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.01-06
<ALLOCATED_TO>	<Sub-Operating Environment>	Airport TMA

[REQ]

Identifier	REQ-PJ.01-06-SEC-TR1-C8.3-0001
Title	Detection and removal system - periodical scan
Requirement	The detection and removal system shall scan all software before installation, all data items that are input to the system, all data and software on access and scan all system software in every 28 day period.
Status	<validated>
Rationale	High level cyber security requirement based on a self-assessment of the project members of Solution PJ.01-06.
Category	<Security>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.01-06
<ALLOCATED_TO>	<Sub-Operating Environment>	Airport TMA

[REQ]

Identifier	REQ-PJ.01-06-SEC-TR2-C8.3-0002
Title	Protection against detected malicious software achievement
Requirement	For operational systems, protection against detected malicious software shall be achieved within 10 minutes of detection. If cessation of operations is necessary, this shall be done as soon as operationally safe to do so.
Status	<validated>
Rationale	High level cyber security requirement based on a self-assessment of the project members of Solution PJ.01-06.
Category	<Security>

[REQ Trace]

Relationship	Linked Element Type	Identifier

<ALLOCATED_TO>	<SESAR Solution>	PJ.01-06
<ALLOCATED_TO>	<Sub-Operating Environment>	Airport TMA

[REQ]

Identifier	REQ-PJ.01-06-SEC-TR3-C8.3-0003
Title	Signature databases
Requirement	In response to information about a new form of malicious software development and operation software shall be reviewed for presence. The detection software shall utilise signature databases from a reputable security source; systems connected to the Internet shall update their detection databases within 12 hours of the availability of new signatures, or within 72 hours if the system has no Internet connection.
Status	<validated>
Rationale	High level cyber security requirement based on a self-assessment of the project members of Solution PJ.01-06.
Category	<Security>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.01-06
<ALLOCATED_TO>	<Sub-Operating Environment>	Airport TMA

[REQ]

Identifier	REQ-PJ.01-06-SEC-TR5-C8.3-0004
Title	Security and Software Management processes alert
Requirement	The System shall alert the Security and Software Management processes within 5 minutes of detecting malicious software.
Status	<validated>

Rationale	High level cyber security requirement based on a self-assessment of the project members of Solution PJ.01-06.
Category	<Security>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.01-06
<ALLOCATED_TO>	<Sub-Operating Environment>	Airport TMA

[REQ]

Identifier	REQ-PJ.01-06-SEC-TR6-C8.3-0005
Title	Verified media definition
Requirement	Verified media shall be defined within the Software Management process
Status	<validated>
Rationale	High level cyber security requirement based on a self-assessment of the project members of Solution PJ.01-06.
Category	<Security>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.01-06
<ALLOCATED_TO>	<Sub-Operating Environment>	Airport TMA

[REQ]

Identifier	REQ-PJ.01-06-SEC-TR7-C8.3-0006
Title	Validation and verification processes - industry standards

Requirement	Validation and verification processes to be used shall be based on industry standards e.g. ISO or Def Standards and industry best practices.
Status	<validated>
Rationale	High level cyber security requirement based on a self-assessment of the project members of Solution PJ.01-06.
Category	<Security>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.01-06
<ALLOCATED_TO>	<Sub-Operating Environment>	Airport TMA

[REQ]

Identifier	REQ-PJ.01-06-SEC-TR8-C8.3-0007
Title	Staff training
Requirement	Training to staff shall ensure that all users understand and practice processes for handling media, are aware of the risks resulting from malicious software and the mechanisms by which such software may be inadvertently introduced into the system, and understand general security requirements and good practice for the protection of security tokens such as passwords and access controls. Users shall demonstrate current knowledge of these issues at intervals of no less than 1 year.
Status	<validated>
Rationale	High level cyber security requirement based on a self-assessment of the project members of Solution PJ.01-06.
Category	<Security>

[REQ Trace]

Relationship	Linked Element Type	Identifier

<ALLOCATED_TO>	<SESAR Solution>	PJ.01-06
<ALLOCATED_TO>	<Sub-Operating Environment>	Airport TMA

[REQ]

Identifier	REQ-PJ.01-06-SEC-TR9-C8.3-0008
Title	Security and Software management processes - up to date listing of trained staff
Requirement	The Security and Software management processes shall maintain an up to date listing of those who have been trained and shall restrict access to operational software to those who have been trained and are current.
Status	<validated>
Rationale	High level cyber security requirement based on a self-assessment of the project members of Solution PJ.01-06.
Category	<Security>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.01-06
<ALLOCATED_TO>	<Sub-Operating Environment>	Airport TMA

4.15.5Additional Comments and Notes

No additional comments

4.16Human Performance

4.16.1HP arguments, activities and metrics

Level of maturity of the concept at the start of the HP assessment is considered to be V3. As an on board technical solution, it has been stated that no changes on ATM actors or procedures would result from the introduction of the advanced PinS procedure concept. Five HP arguments that needed to be considered and satisfied in the HP assessment were identified in HP assessment plan.

Specific HP issues and benefits relating to the advanced PinS procedure concept for each of the relevant arguments have been identified by performing HP issue and benefit brainstorming sessions / interviews with relevant stakeholders including pilots, engineers, safety and HF experts.

Based on the HP arguments and issues / benefits identified, three HP activities were recommended and realised:

- Advanced PinS flight simulator trials (EXE-01.06-V3-VALP-001)
- Advanced PinS real flight trials (EXE-01.06-V3-VALP-002)
- Advanced PinS real flight trials (EXE-01.06-V3-VALP-003)

The results from these three exercises were satisfying for the HP assessment and allowed to obtained evidences relating to all the issues / benefits identified end to close it all.

Four recommendations and two requirements were derived from the HP assessment process.

PIs	Activities & Metrics	Second level indicators	Covered
HP1 Consistency of human role with respect to human capabilities and limitations	Simulator flight trials of two different specifically designed PinS procedures with curved segments and Real flight trials of a specifically designed PinS procedures with curved segments	**HP1.1** Clarity and completeness of role and responsibilities of human actors	Not covered as no changes
		HP1.2 Adequacy of operating methods (procedures) in supporting human performance	Yes
		HP1.3 Capability of human actors to achieve their tasks in a timely manner, with limited error rate and acceptable workload level	Not covered as no changes
HP2	Simulator flight trials of two different specifically	**HP2.1** Adequacy of allocation of tasks between the human and the machine (i.e. level of automation).	Not covered as no changes
		HP2.2	Not covered as

PIs	Activities & Metrics	Second level indicators	Covered
Suitability of technical system in supporting the tasks of human actors	designed PinS procedures with curved segments and Real flight trials of a specifically designed PinS procedures with curved segments	Adequacy of technical systems in supporting Human Performance with respect to timeliness of system responses and accuracy of information provided	no changes
		HP2.3 Adequacy of the human machine interface in supporting the human in carrying out their tasks.	Yes
HP3 Adequacy of team structure and team communication in supporting the human actors	N/A	**HP3.1** Adequacy of team composition in terms of identified roles	Not covered as no changes
		HP3.2 Adequacy of task allocation among human actors	Not covered as no changes
		HP3.3 Adequacy of team communication with regard to information type, technical enablers and impact on situation awareness/workload	Not covered as no changes
HP4 Feasibility with regard to HP-related transition factors	N/A	**HP4.1** User acceptability of the proposed solution	Not covered as no changes
		HP4.2 Feasibility in relation to changes in competence requirements	Not covered as no changes
		HP4.3 Feasibility in relation to changes in staffing levels, shift organization and workforce relocation.	Not covered as no changes
		HP4.4 Feasibility in relation to changes in recruitment and selection requirements .	Not covered as no changes
		HP4.5 Feasibility in terms of changes in training needs with regard to its contents, duration and modality.	Not covered as no changes

4.16.2 Extrapolation to ECAC wide

There is no ECAC wide extrapolation required for this KPI.**Open HP issues/ recommendations and requirements**

PIs	Number of open issues/ benefits	Nr. of recommendations	Number of requirements
HP1 Consistency of human role with respect to human capabilities and limitations	0	3	2
HP2 Suitability of technical system in supporting the tasks of human actors	0	1	0
HP3 Adequacy of team structure and team communication in supporting the human actors	0	0	0
HP4 Feasibility with regard to HP-related transition factors	0	0	0

4.16.4Concept interaction

No concept interaction was performed on HP level.

4.16.5 Most important HP issues

Important issues that might have a major impact on the performance of the solution are listed below.

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	An RF leg ending at the start of LPV combines the interception of localizer and glideslope at the same location. Departure and approach segment can be designed much shorter. For pilots this could introduce a higher workload and time pressure, especially in manual flight.	N/A
	An RF leg ending at the start of LPV combines the interception of localizer and glideslope at the same location. Departure and approach segment can be designed much shorter. For pilots this could introduce a higher workload and time pressure in	N/A

PIs	Most important issue of the solution	Most important issues due to solution interdependencies
	automated flight.	
	Advanced PinS procedures introduce RF legs with a low position error margin, vertically as well as laterally. For pilots, this could introduce a high workload in manual flight.	N/A
HP2 Suitability of technical system in supporting the tasks of human actors	In manual flight with high precision needs pilot ought to plan their actions accurately. Advanced display formats can assist this process and therefore serve as enable for manual flight.	N/A
	In automated flight with high precision needs, pilot ought to anticipate the systems actions ahead of time. The complexity of an advanced PinS procedure can interfere with the pilots' ability to anticipate system reactions and impact situational awareness.	N/A
	The Helmet Mounted Display might bring discomfort for the pilot after several minutes of use.	N/A
HP3 Adequacy of team structure and team communication in supporting the human actors	N/A	N/A
	N/A	N/A
	N/A	N/A
HP4 Feasibility with regard to HP-related transition factors	N/A	N/A
	N/A	N/A
	N/A	N/A
	N/A	N/A
	N/A	N/A

4.16.6 Additional Comments and Notes

All three exercises have demonstrated the operability and technical feasibility for rotorcraft to fly advanced PinS RNP approach procedures using SBAS and IFR equipment. The use of autopilot and enhanced vision system showed positive impact on pilot workload and situational awareness.

Exercise 1 and 2 show that the SVS system has a positive impact on the pilot workload and situation awareness. Further, advanced flight director solution has a slight advantage on the situational awareness level compared to the 3D route display solution.

4.17 Other PIs

Further PIs from the Performance Framework update are assessed qualitatively, or, if possible, quantitatively, in Table 20.

KPA	PIs	Benefit mechanism (text only)	Qualitative Impact[11]
N/A	N/A	N/A	N/A

Table 20: Qualitative assessment of QoS KPIs

4.17.1 Performance Mechanism

N/A

4.17.2 Assessment Data (Exercises and Expectations)

N/A

4.17.3 Additional Comments and Notes

N/A

4.18 Gap Analysis

The objective of the gap analysis is a comparison between the validation targets and the performance assessment. As no Validation Targets are listed for Solution PJ.01-06 in the PJ.19 Validation Targets (2019) document [17], a gap analysis is not possible.

KPI	Validation Targets – Network Level (ECAC Wide)	Performance Benefits Expectations at Network Level (ECAC Wide or Local depending on the KPI)[12]	Rationale[13]

[11] --, -, 0, +, ++

[12] Negative impacts are indicated in red.

FEFF1: Fuel Efficiency – Fuel burn per flight	N/A	5220 tonnes of fuel/year (ECAC Wide)	Medium
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
PRD1: Predictability – Variance of Difference in actual & Flight Plan or RBT durations	N/A	N/A	N/A
PUN1: Punctuality – % Flights departing within +/- 3 minutes of scheduled departure time due to ATM and weather related delay causes	N/A	N/A	N/A
CEF2: ATCO Productivity – Flights per ATCO -Hour on duty	N/A	N/A	N/A
CEF3: Technology Cost – Cost per flight	N/A	N/A	N/A

[13] Discuss the outcome if, and only 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).

SAF1: Safety - Total number of fatal accidents and incidents with ATM Contribution per year	N/A	N/A	N/A

Table 21: Gap analysis Summary

5 References

Content Integration

[1] EATMA – Version 8 Delivery Report

[2] EATMA Guidance Material and Report (2017), 01.01.00

[3] SESAR ATM Lexicon

[4] Cost Benefit Analysis Methods and Practices Cost-Benefit Analysis – Model and Methods – Part 1, 00.01.01

[5] Cost-Benefit Analysis – Model and Methods Part 2, 00.01.01

[6] Cost-Benefit Analysis – Method to assess costs

[7] SESAR 1 Business Case – 2016, 00.01.01

[8] 04 Guidelines for Producing Benefit and Impact Mechanisms

[9] 08 ATM CBA Quality Checklist

[10] Methods to Assess Costs and Monetise Benefits – Supporting Template

[11] Cost-Benefit Analysis – Standard Input, 01.00.00

Environmental Methodology and Assessment Practices

[12] ENV – Guidance Reference Material, 03.00.00

Human Performance

[13] Human Performance – Guidance Reference Material, 00.01.00

Maturity Assessment

[14] Introduction to SESAR Maturity Criteria, 01.01.02

[15] Maturity Criteria, 01.05.00

[16] Maturity Gate Guidance, 01.00.01

Performance Management

[17] Validation Targets (2019 Edition), 01.00.00

[18] Performance Management – Deployment Planning and Reporting, 00.01.01

[19] SESAR 1 Performance Assessment Report and Gap Analysis, 00.02.00

[20] SESAR2020 Wave 1 Performance Assessment Report and Gap Analysis, 01.00.00

[21]Performance Dashboard, 01.00.00

[22]Common Assumptions

[23]Performance Framework, 01.00.00

Safety Methodology and Assessment Practices

[24] Safety – Guidance Reference Material, Edition 4.0

[25] Safety - Guidance to Apply the Safety Reference Material, Edition 3.0

[26] Safety – Guidance to Resilience Engineering

Security

[27]Cyber Security Strategy, 01.00.00

[28]Prioritisation Questionnaire

[29]SecRAM catalogues, 02.00.00

[30]SecRAM, 02.00.00

[31]Security Prioritisation CST, 01.00.01

Solution Validation

[32] SESAR2020 Requirements and Validation Guidelines, 00.01.00

[33] System Engineering – Methodology for the V & VP, V & VI and Demonstration Platform development

[34]Validation Strategy, 01.00.01

System and Service Development

[35]Common Services – Processing Methodology, 00.02.01

[36]ISRM – Modelling Guidelines, 00.08.00

[37]ISRM- Primer, 00.08.00

[38]Service – Guidance Development Method, 00.01.02

[39]ISRM – Foundation Rulebook

[40]SWIM – Compliance Framework Criteria, 01.00.00

[41]SWIM – Compliance Report Template, 00.01.01

[42]ATM Information Reference Model, 00.01.01

[43]SWIM Foundation, 00.02.01

[44]Service Roadmap, 00.01.00

[45]Action Plan Service Part B, 01.00.00

[46]B04.04 Scoping Specification of CWP, 01.00.00

[47]Business Model Services part B, 01.00.00

[48]Common Services Foundation Method, 01.00.00

[49]Evaluation Report, 01.00.00

[50]High Level Technical Architecture Service Part B, 01.00.00

[51]Conclusion Report, 01.00.00

5.1 Reference Documents

[52]ED-78A GUIDELINES FOR APPROVAL OF THE PROVISION AND USE OF AIR TRAFFIC SERVICES SUPPORTED BY DATA COMMUNICATIONS.

[53]SESAR Solution PJ.01-06 SPR-INTEROP/OSED for V3 - Part I (D5.1.010)

[54]SESAR Solution PJ.01-06 SPR-INTEROP/OSED for V3 - Part II (D5.1.010)

[55]SESAR Solution PJ.01-06 SPR-INTEROP/OSED for V3 - Part IV (D5.1.010)

[56]SESAR Solution PJ.01-06 Validation Plan (VALP) for V3 – Part I (D5.1.020)

[57] SESAR Solution PJ.01-06 Validation Plan (VALP) for V3 – Part II (D5.1.020)

[58]SESAR Solution PJ.01-06 Validation Plan (VALP) for V3 – Part IV (D5.1.020)

[59]SESAR Solution PJ.01-06 Validation Report (VALR) for V3 – (D5.1.050)

[60]SESAR SOLUTION 02-05: COST BENEFIT ANALYSIS (CBA) FOR V3 – Rev 00.01.00

Appendix A Detailed Description and Issues of the OI Steps

OI Step ID	Title	Consistency with latest Dataset
AOM-0104-B	Advanced Point-in-Space RNP approaches and departures	Dataset 19

Table 22: OI Steps allocated to the Solution

AOM-0104-B

Rotorcraft procedures are designed to allow easier IFR access to VFR FATOs, in particular when weather conditions are adverse. Advanced (e.g. curved) SBAS/GBAS guided Point-in-Space RNP approaches towards landing locations and Point-in-Space departures from landing locations are created with connections to/from Low Level IFR route network. The curved segment of the advanced PinS can be placed in the initial, intermediate or missed approach segment.

The following Change Requests related to required and optional enablers have been initiated:

- A/C-04 Flight management and guidance for improved lateral navigation in approach via RNP → removed
- A/C-04a Flight management and guidance for Advanced RNP → removed
- A/C-05a APV Barometric VNAV → changed to a required enabler
- PRO-251 ATC Procedure to handle SNI IFR rotorcraft operations using PinS → new required enabler