

# SESAR DEMO STAIRS report Part V - Performance Assessment Report (PAR)

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# 12 STAIRS

## 13 SESAR STAIRS VLD2

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16 This DEMO report is part of a project that has received funding from the SESAR Joint Undertaking under  
17 grant agreement No 874476 under European Union's Horizon 2020 research and innovation  
18 programme.



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## 21 **Abstract**

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22 This performance assessment report addresses STAIRS demonstration activities results related to main  
23 KPA focused performance and related definition from SESAR PJ03B-05 PAR conclusions.

24

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## 96 1 Executive Summary

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97 This document provides the Performance Assessment Report (PAR) for DEMO STAIRS report D1.4.

98 The PAR is consolidating DEMO performance validation results addressing KPIs/PIs and metrics from  
99 the SESAR2020 Performance Framework [3].

100 There have been demonstrated SESAR PJ03B-05 Solutions SURF-A and -ITA as an onboard safety  
101 solution for pilots developed within the SESAR Airport Safety Net technology. It aims at triggering  
102 cockpit alerts to inform the flight crew in case of risk of collision with any traffic equipped with ADS-B  
103 OUT transmitter. Following an alert, the flight crew can be ready to possibly undertake any action  
104 required to resolve the risk of collision during runway operations.

105 Main goals of the program were to demonstrate two exercises EXE-H and EXE-T with 4 high level  
106 objectives OB1 through OB4 including controlled entry into service with required system performance  
107 supported by in-service data fast time simulations, addressing qualitative assessments of ADS-B and  
108 interoperability with existing ATC architecture.

109 • Exercise EXE-VLD-02-001 (EXE-H)

110 • Exercise EXE-VLD-02-002 (EXE-T)

### 111 **Description:**

112 In the airport environment, there can be instances today where conflicting ATC clearances are given to  
113 aircraft or where flight crews do not comply with ATC clearances. These situations are generally  
114 identified and resolved but can result in last minute and urgent actions for the controllers and/or pilots.  
115 This Solution aims to provide the pilots with alerts detecting the risk of collision with another aircraft  
116 operating on the same area (runway). It deals with a pure safety net for pilots involving a reaction from  
117 pilots.

118 According to IATA Safety Report, runway incursions are identified as a major threat. Indeed, about one  
119 runway incursion event per day is reported.

120

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### 121 **Assessment Results Summary:**

122 The following tables summarises the assessment outcomes per KPI (Table 1-1) and mandatory PI (Table  
123 1-2) puts them side-by side against Validation Targets in case of KPI from PJ19 [7]. The impact of a  
124 Solution on the performances are described in Benefit Impact Mechanism. All the KPI and mandatory  
125 PI from the Benefit Mechanism were the Solution potentially impact have to be assessed via validation  
126 results, expert judgment etc.

127 There are three cases:

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



- 130 2. An assessment result (positive or negative) different than 0 with confidence level High,  
131 Medium or Low indicates that the Solution is expected to impact the KPI or mandatory PI.
- 132 3. An assessment result of N/A (Not Applicable) with confidence level N/A indicates that the  
133 Solution is not expected to impact at all the KPI or mandatory PI consistently with the Benefit  
134 Mechanism.
- 135

KPI	Validation Targets – Network Level (ECAC Wide)	Performance Benefits at Network Level (ECAC Wide or Local depending on the KPI) <sup>1</sup>	Confidence in Results <sup>2</sup>
SAF1: Safety - Total number of estimated accidents with ATM Contribution per year	Medium (-1.46%)	-7.5%	Medium
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	N/A	N/A	N/A

<sup>1</sup> Negative impacts are indicated in red.

<sup>2</sup> 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

(Mixed mode).			
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	N/A	N/A	N/A
CEF3: Technology Cost – Cost per flight	N/A	N/A	N/A

136

**Table 1-1: KPI Assessment Results Summary**

137

Mandatory PI	Performance Expectations at Network Level (ECAC Wide or Local depending on the KPI) <sup>3</sup>	Benefits at Network	Confidence Results <sup>4</sup>	in
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	-7.5%		Medium	
SAF4.X: TWY-collision accident	N/A		N/A	
SAF5.X: CFIT accident	N/A		N/A	

<sup>3</sup> Negative impacts are indicated in red.

<sup>4</sup> 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

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
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	40-70%	Medium
HP2: Suitability of technical system in supporting the tasks of human actors	40-70%	Medium
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

138

**Table 1-2 Mandatory PIs Assessment Summary**

139

140 **Additional Comments and Notes:**

141 There was no change impacted by the DEMO from the last PAR release of the SESAR PJ03B-05 PAR  
142 assessment.

## 143 2 Introduction

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### 144 2.1 Purpose of the document

145 The Performance Assessment covers the Key Performance Areas (KPAs) defined in the SESAR2020  
146 Performance Framework [3]. Assessed are at least the Key Performance Indicators (KPIs) and the  
147 mandatory Performance Indicators (PIs), but also additional PIs as needed to capture the performance  
148 impacts of the Demo. It considers the guidance document on KPIs/PIs [3] for practical considerations,  
149 for example on metrics.

150 The purpose of this document is to present the performance assessment results from the validation  
151 exercises at SESAR Demo level. The KPA performance results are used for the performance assessment  
152 at strategy level and provide inputs to the SESAR3 Joint Undertaking (S3JU) for decisions on the  
153 SESAR2020 Programme.

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

### 157 2.2 Intended readership

158 This document is mainly intended to be read by project PJ03b-05 partners concerned by “Traffic alerts  
159 for pilots for airport operations” and its validation. It is also of interest at the level of PJ03b “Safer  
160 Airports and Flights for Europe”, and also at the level of PJ03a “Integrated Surface Management”.

- 161 a) Internal to SESAR STAIRS program
- 162 b) Internal to SESAR 2020 and external to VLD2 STAIRS:
  - 163 a. The project members concerned by future function development and standardization,
  - 164 b. Involved PCIT and EPMB members
  - 165 c. PJ19 and PJ22 projects
- 166 c) External to SESAR
  - 167 a. Avionics systems and subsystems designers
  - 168 b. Avionics equipment suppliers
  - 169 c. Airlines, Business Aviation, Flight Crew
  - 170 d. Air Traffic Centre, ATM designers and controllers
  - 171

### 172 2.3 Inputs from other projects

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

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

176 PJ19 will manage and provide:

- 177 - SESAR Performance Framework (2019) [3], guidance on KPIs and Data collection supports.
- 178 - S2020 Common Assumptions, used to aggregate results obtained during validation exercises
- 179 (and captured into validation reports) into KPIs at the ECAC level, which will in turn be captured
- 180 in Performance Assessment Reports and used as inputs to the CBAs produced by the Solution
- 181 projects. Where are also included performance aggregation assumptions, with traffic data
- 182 items.
- 183 - For guidance and support PJ19 have put in place the Community of Practice (CoP)<sup>5</sup> within
- 184 STELLAR, gathering experts and providing best practices.

## 185 2.4 Glossary of terms

186 See the AIRM Glossary [1] [6] for a comprehensive glossary of terms.

## 187 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

<b>N/A</b>	Not Applicable
<b>OI</b>	Operational Improvement
<b>PAR</b>	Performance Assessment Report
<b>PI</b>	Performance Indicator
<b>PRU</b>	Performance Review Unit
<b>QoS</b>	Quality of Service
<b>RBT</b>	Reference Business / Mission Trajectory
<b>SESAR</b>	Single European Sky ATM Research Programme
<b>S3JU</b>	SESAR3 Joint Undertaking (Agency of the European Commission)
<b>SESAR2020 Programme</b>	The programme which defines the Research and Development activities and Projects for the S3JU.

188 **Table 2-1: Acronyms and terminology**

189

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

192

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



Term	Definition	Source
Airspace User Cost-Efficiency Focus Area	<p>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.</p> <p>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).</p>	PAGAR
ARES Capacity	<p>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.</p>	Performance Framework 2017
ATM Master Plan	<p>The European ATM Master Plan is the agreed roadmap to bring ATM R&amp;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&amp;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&amp;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 S3JU Administrative Board for adoption.</p> <p>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.</p>	SESAR2020 Project Handbook, European ATM Master Plan (9 Edition)
Civil-military coordination and cooperation	<p>The coordination between the civil and military parties authorised to make decisions and agree a course of action.</p>	Performance Framework 2017

Term	Definition	Source
Cost-Benefit Analysis	<p>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.</p> <p>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.</p>	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	<p>The ability of the ATM System and airports to respond to changes in planned flights and missions.</p> <p>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.</p>	Performance Framework 2017
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	<p>The SESAR performance Focus Area concerned with fuel efficiency.</p> <p>How much fuel is used by aviation or by extension "Fuel efficiency" (how much fuel can be saved?) is one of the performance aspects.</p> <p>Note: Policy places considerable focus on this. Fuel efficiency contributes to 3 of the 11 KPAs defined by ICAO: Cost-efficiency, Efficiency, and Environment.</p>	PAGAR
Gap Analysis	<p>Difference between the validation targets and the performance assessment.</p> <p>It is used to:</p> <ol style="list-style-type: none"> <li>1. Anticipate any deviation from the design performance targets.</li> <li>2. Identify the underlying reasons.</li> <li>3. Derive the appropriate recommendations to be taken on board to redirect the R&amp;D activities within the Programme towards the ultimate achievement of SESAR2020's performance ambitions.</li> </ol>	PAGAR

Term	Definition	Source
G2G ANS Cost-Efficiency Focus Area	One of the SESAR performance Focus Areas concerned with Cost Efficiency.  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
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.”  In SESAR2020 Performance Framework, Key Performance Indicators are those that have a validation target associated derived from the corresponding Performance Ambition.	ICAO Doc 9883 Performance Framework
Local Air Quality Focus Area	One of the SESAR performance Focus Areas concerned with Environment.  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.  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

Term	Definition	Source
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
Performance Framework	<p>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.</p> <p>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.</p> <p>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.</p>	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. 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

Term	Definition	Source
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 <a href="#">risk management</a> .	EUROCONTROL ATM Lexicon
Security	(aviation) Safeguarding civil aviation against <a href="#">acts of unlawful interference</a> . This objective is achieved by a combination of measures and human and material resources.  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, 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 S3JU.	EUROCONTROL ATM Lexicon
SESAR Solution	A term used when referring to both SESAR ATM Solution and SESAR Technological Solution.	SESAR2020 Project Handbook
SESAR ATM 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.  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

Term	Definition	Source
Validation targets	<p>Validation targets are the targets that focus on the development of enhanced capabilities by the SESAR Solutions. They aim to secure from R&amp;D the required performance capability to contribute to the achievement of the Performance Ambitions and, thus, to the SES high-level goals.</p> <p>In SESAR2020 validation targets are associated with a KPI.</p>	EUROCONTROL ATM Lexicon

193

**Table 2-2: Terminology**

194

## 195 **3 Demo Scope**

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### 196 **3.1 Detailed Description of the Demo**

197 This project is focused on demonstration TRL7 of the (previous) SESAR PJ03B-05 solutions and following  
198 from previous results of the SESAR PJ28 project. The Very Large Demonstration (VLD) report includes  
199 strategy with two main exercises and three main work packages WP2 (Interoperability), WP3 EXE-  
200 VLD02-001 (EXE-H) business aircraft and WP4 EXE-VLD02-002 (EXE-T) for mainline aircraft. Mainline  
201 and business aircraft demonstration is executed on international airports and in-service data replay  
202 aligned with interoperability aspects and data analysis. The main objectives of the VLD2 demonstration  
203 focuses on safety KPA with system performance, ADS-B qualitative assessment and Interoperability  
204 assessment.

### 205 **3.2 Detailed Description of relationship with other Solutions**

206 As identified in EATMA, PJ03B05 traffic alert solution for pilots there is no link to other solutions.

207 The VLD2 STAIRS with PJ03B-05 solution is supporting airborne safety nets, which can be deployed  
208 independently of any other ATM solutions without any change to current ground or cockpit procedures  
209 & responsibilities.

## 210 4 Demo Performance Assessment

### 211 4.1 Assessment Sources and Summary of Validation Exercise 212 Performance Results

213 Previous Validation Exercises (pre-SESAR2020 Wave 2) relevant for this assessment are listed below.

Organisation	Document Title	Publishing Date
Airbus lead/ Honeywell task	D4 1 191 - SESAR PJ30b - 05 V3 OSED - SPR - INTEROP part V -PAR final	15/11/2019
DLR lead/ Honeywell task	PJ28_D1_13_Demo_Report_00_03_00	19/12/2019

214 **Table 4-1: Pre-SESAR2020 Exercises**

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

Exercise ID	Exercise Title	Release	Maturity	Status
EXE-VLD-02-001	(EXE-H) – Exercise led by Honeywell	Final	V3+	Done
EXE-VLD-02-002	(EXE-T) – Exercise led by Thales	Final	V3+	Done

216 **Table 4-2: SESAR2020 Validation Exercises**

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

Exercise	OI Step	Exercise scenario & scope	Performance Results	Notes
EXE-VLD-02-001	AUO-0605	Demonstration on business aircraft (CDTI)	Acceptable	SURF-ITA
EXE-VLD-02-002	AUO-0605	Demonstration on mainline aircraft (no CDTI)	Acceptable	SURF-A

219 **Table 4-3: Summary of Validation Results.**

### 220 4.2 Conditions / Assumptions for Applicability

221 The following Table 4-4 summarises the applicable operating environments.



OE	Applicable sub-OE	Special characteristics
Airport surface	All airports	SURF-A/ITA complementary to ground safety net, regardless of the airport equipment

222

Table 4-4: Applicable Operating Environments.

223

224 **4.3 Safety**

225 **4.3.1 Safety Design drivers and Performance Mechanism**

226 SURF-A/ITA traffic alerts for pilots on runway is a SESAR solution addressing traffic threat on runway  
227 and improving overall safety.

228  
229 In reference to D4.1.191 - SESAR PJ03b-05 V3 OSED-SPR-INTEROP part II Safety Assessment Report is  
230 described in detail the assumptions and methodology supporting the safety criteria results. Here are  
231 the main outcomes for the VLD that has not changed the original assumptions and performance  
232 impacts:  
233

234 **SAC#1 : There shall be an improvement 7,5 % of barrier B1 (Pilot Runway Collision Avoidance)**  
235 **to reduce runway collisions per year due to the introduction of the SURF-A/ITA runway**  
236 **solution and demonstrated with VLD2 STAIRS, despite of the traffic increase till 2035.**

237 In this safety criterion, both implementations SURF-A/ITA are considered.

238 The number of demo flights with collision and runway incursion is very rare within the overall exercise  
239 to be physically verified the SAC#1 and following from objectives of the VLD.

240 For a single aircraft equipped with the technology, pending the traffic broadcast eligible ADS-B signal,  
241 the detection rate of runway collision risk is targeted to be above 95%.  
242

243 **4.3.2 Data collection and Assessment**

244 Below is provided table with DEMO result per KPA and KPI defined.

KPA	Objective	Description	KPI	Success criteria	Where & how	CTQ value	Results
Safety	OB1	Controlled Entry Into Service (CEIS)	Operational: Nuisance, false, missed alerts rate and human performance confirmation	Acceptable alert rates, System and HMI acceptance	Flight trial (US) F900EX, In-service FAA data replay Airbus fleet	Operational: Nuisance rate below 1E-05, false rate below 1E-05 Missed rate below 3E-02, Cockpit applications synchronized, Pilots confirmed expected V3 solution	Using flight trial of main scenarios with simulated traffic on-board and replay of cert in-service data package have confirmed acceptable KPI rates. HMI has been assessed acceptable with implementation and synced with other pilots'

						cockpit system applications.
OB2	Data replay in fast time	(Safety) Fast time simulations, replay: Nuisance, false alerts, certification	Acceptable alert rates, System acceptance	In-service FAA ADS-B data replay (significant sample)	ADS-B qualitative assessment and simulation with impact to algorithms	Analysis of ADS-B data with qualitative assessment and simulation has initiated development of additional defensive design layer with new ADS-B filter. Final results confirmed acceptable alert rates and system behaviour.
OB3	ADS-B quality assessment	(Interoperability): transverse analysis of ADS-B performance acceptability	Traffic detection rate of at least 70% Qualitative assessment / Navigation parameters accuracy	DSNA data	ADS-B accuracy and assessment in line with eligibility rules	Eurocontrol analysis and WP3 FAA ADS-B qualitative assessment have confirmed previous SESAR outcomes and provided inputs for design solution update.
OB4	Interoperability review	(Interoperability): ANSP operational expertise	Compatibility with ground safety net, alert timing, ATC procedures and phraseology	Operational experts, airspace users (ATC, Pilots, survivors experts)	Use cases with interoperability objectives confirmed	Supported by DSNA workshops and analysis of operational ATC procedures versus results of OB2 alerting algorithms performance has proved interoperability compliance in all aspects. Confirmed safety improvement as previous SESAR solution at V3 with not impacted /lower ATCo workload.

Table 4-5: Results per KPA

246 Runway incursion events from collected data have been compared to the overall number of operations  
247 using significant data sample (SC-186 ADS-B data) finally providing figures around 8E-05 of valid alerts  
248 rate with possible runway incursions impacting regular operations. Taking into account this specific  
249 sample of data it still provides significant benefit helping pilots to anticipate such events.

250 From system design perspective overall nuisance alert rate provides the figure below 1E-05 providing  
251 acceptable results for safety objectives within safety system requirements. False alert rate has been  
252 assessed with 0 alerts rate. Missing alerts rate is dependent on specific airport conditions and traffic  
253 equipage, but for final design of demonstrated solution the final traffic detection rate was over 95%  
254 for eligible traffic and over 70% for all ADS-B traffic MOPS version 1 and 2.

### 255 **4.3.3 Extrapolation to ECAC wide**

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

### 257 **4.3.4 Discussion of Assessment Result**

258 As mentioned within the DEMO STAIRS report part I these results of the critical KPIs with system  
259 performance including ADS-B qualitative issues can be extrapolated to specific airport conditions and  
260 traffic equipage. But still the ADS-B traffic eligibility and algorithm design solution will be applied  
261 globally on the same ADS-B technology no matter where the runway is located with different airport  
262 environmental and navigational conditions.

### 263 **4.3.5 Additional Comments and Notes**

264 Not applicable.

265

266 **4.4 Environment: Fuel Efficiency / CO2 emissions**

267 Not applicable.

268 **4.5 Environment / Emissions, Noise and Local Air Quality**

269 Not applicable.

270 **4.6 Airspace Capacity (Throughput / Airspace Volume & Time)**

271 Not applicable. **Resilience (% Loss of Airport & Airspace Capacity Avoided)**

272 Not applicable.

273 **4.8 Flight Times**

274 Not applicable.

275 **4.9 Predictability**

276 Not applicable.

277 **4.10 Punctuality**

278 Not applicable.

279 **4.11 Civil-Military Cooperation and Coordination (Distance and Fuel)**

280 Not applicable.

281 **4.12 Flexibility**

282 Not applicable.

## 283 **4.13 Cost Efficiency**

284 Some elements for cost efficiency are provided in SESAR D4.1.210\_CBA.

285 Here are some qualitative elements regarding the costs of the solution:

- 286 • Costs are mostly system development costs (non-recurring costs).
- 287 • SURF-A/ITA is a function that does not require specific hardware development.
- 288 • Only software development is needed.
- 289 • There is an overall ATCo and Pilots workload improvements related to SAC improvement with  
290 number of runway incursions prevented by the new SESAR solution.

## 291 **4.14 Airspace User Cost Efficiency**

292 Some qualitative elements for cost-benefits analysis are provided in SESAR D4.1.210\_CBA.

293 Here are some qualitative elements regarding the costs of the solution for airspace users:

- 294 • Implementation on aircraft is limited to software upload and limited wiring.
- 295 • This can be done in parallel with other updates in order to minimize the aircraft immobilization  
296 time.
- 297 • SURF-A/ITA is a safety net which does not change the current procedures or workload. Crews  
298 are not relying on it to operate, and the change in cockpit HMI is completely unchanged.
- 299 • The expected level of training is C, meaning the reading of operational documentation (Flight  
300 crew operating manual, flight crew technique manual) and a dedicated training support  
301 (PowerPoint, video). However, no specific training in simulator will be required. Hence, the  
302 costs for airlines will be minimal.
- 303 • There is no impact to ATCo cost efficiency within existing ATM model.

## 304 **4.15 Security**

### 305 **4.15.1 The SecRAM 2.0 methodology and the Security Performance** 306 **Mechanism**

307 Based on the SecRAM guidelines have been defined security assessments of the VLD2 with PJ03B-05  
308 solution and risks summarized in the security reports (see SESAR D4.1.190 - SESAR PJ03b-05 V3 OSED-  
309 SPR-INTEROP part IIIA/B).

310 In reference to the PMP, a document was produced by PCG32, Action Paper “Cybersecurity for  
311 S2020”[8] to analyse the how the SESAR 2020 projects would be potentially impacted by Security  
312 aspects. As a result of this analysis, a score was given to each solution to reflect this impact. The

313 solutions with a score higher than 2.5 are considered as potentially more impacted than the other  
 314 ones. As shown is the figure below, all PJ03b solutions have a score lower than 2,5.

PJ03b	Airport Safety Nets	
PJ.03b-01	Enhanced Airport Safety Nets for Controllers	2,2
PJ.03b-03	Conformance monitoring safety net for Pilots	1,6
PJ.03b-05	Traffic alerts for Pilots for airport operations	2
PJ.03b-06	Safety support tools for runway excursions	1,4

315  
 316 **Figure 1: Extract from PCG32 Action Paper**

317

### 318 4.15.2 Security Assessment Data Collection

319 There one OI steps within PJ03B-05 solution with security assessment for the VLD2 SESAR STAIRS  
 320 program:

- 321 • AUO-0605 “Traffic alerts for pilots during runway operations” for mainline and business  
 322 aircraft.

323 Runway function under AUO-605 is identified as the most critical solution in reference to safety and  
 324 security assessments.

325 The key elements of the PJ03B-05 solution for security assessment is other traffic ADS-B data  
 326 (Information – identified as a primary asset) provided to Aircraft (System) processing this data and  
 327 providing traffic alerts to the Flight Crew (Human) in case of collision threat. Based on pilot decision  
 328 the flight crew can take a resolution action that is communicated to ATC within standard phraseology  
 329 and operational procedures.

330

PIs	Unit	Calculation	Mandatory	Current value
<b>SEC1</b> 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)	2
<b>SEC2</b> 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)	1

PIs	Unit	Calculation	Mandatory	Current value
<b>SEC3</b> 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	Low
<b>SEC7</b> 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	Low
<b>SEC8</b> 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	Low
<b>SEC9</b> 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.	Low

331 Table 4-6: Risk assessment for OI AUO-0605

332 **4.15.3 The solution security assessment provides acceptable results with low**  
 333 **security impacts and existing system requirements. Extrapolation to**  
 334 **ECAC wide**

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

336 **4.15.4 Discussion of Assessment Result**

337 Reflect on the outcome, summarise main issues, and provide a confidence estimate for the assessment  
 338 result.

339 **4.15.5 Additional Comments and Notes**

340 Not applicable.

341 **4.16 Human Performance**

342 There were only two minor supporting objectives with Human performance assessment for  
 343 preparation phase DEMO1&3 and demonstration phase DEMO2&4.



344 Within preparation phase HP was demonstrated on Honeywell and Airbus bench and limited flight trial  
345 only to confirm reached V3 readiness for demonstration phase of DEMO2&4 for both exercises without  
346 Human Factors activities.

347 Activity under limited DEMO2&4 of this project focused on the observable result of human  
348 performance in the context of planned demonstration flights under work packages WP3 and 4 only.

349 For postponed flight campaigns that will be using simple form as questionnaires, to be completed by  
350 the pilots directly after flight during debrief in case of triggered alert or unexpected behaviour. All  
351 these events to be analysed for relevant, nuisance, false and missed alert detection.

352 With an assumption for VDL2-DEMO2&4 flights, it is likely that a very few aircraft trigger a SURF-A/ITA  
353 alert as an onboard alert barrier.

354 Therefore, no or limited sample of questionnaires are expected for limited statistics of human  
355 performance study only.

356 Airspace Users have been involved within ADS-B data replay and flight trials on both exercises resulting  
357 in an assessment of manual analysis of all alerting cases for proper timing and operational scenario  
358 with possibility to reproduce the scenario on the flight simulator.

359 Regarding interoperability aspects there were assessed feedbacks and questionnaires from AUs pilots  
360 and ATC operational experts in case the traffic alert was triggered in specific scenarios of airport-  
361 controlled area for specific ATC procedures and runway encounters. This was applied also as a post  
362 process analysis of ADS-B data replay or during an annual ATC workshop with ANSPs within VLD2  
363 project schedule.

364 Based on information above with limited human factors activities applied the HPAR report is not  
365 impacted from previous version under V3 phase.

#### 366 **4.16.1 HP arguments, activities and metrics**

367 Based on information above with limited human factors activities applied, the new HPAR report is not  
368 applicable.

369 Using the DEMO results, there is no change to previous HPAR results and metrics from previous SESAR  
370 phase under PJ03B-05 with below arguments.

HP argument branch	Change & affected actors
1. ROLES & RESPONSIBILITIES	
1.1 ROLES & RESPONSIBILITIES	There may be impact on pilots understanding of the situation and their reaction to the alerts if they receive contradictory resolution by ATC. Pilots may rely on ATC instruction while the alerts give another information. There is a need to clarify what will be the role of pilots when facing a conflicting situation between ATC and SURF-A/SURF-ITA.
1.2 OPERATING METHODS	<ul style="list-style-type: none"> <li>The flight crew may detect a traffic conflict not detected by ATC; therefore it implies that specific</li> </ul>

	<p>procedures need to be defined between air and ground to manage the operating methods towards ATC when the aircraft detects a conflict thanks to its new system and need to communicate it to ATC. This is valid for cases where the aircraft cannot avoid the conflict but just inform ATC about it, which bring an improvement compared to the current situation.</p>
1.3 TASKS	<ul style="list-style-type: none"> <li>No changes are foreseen</li> </ul>
2. HUMAN & SYSTEM	
2.1 ALLOCATION OF TASKS (HUMAN & SYSTEM)	<ul style="list-style-type: none"> <li>No changes are foreseen</li> </ul>
2.2 PERFORMANCE OF TECHNICAL SYSTEM	<ul style="list-style-type: none"> <li>No changes are foreseen</li> </ul>
2.3 HUMAN – MACHINE INTERFACE	<p>There will be an HMI for alerts but this one will be consistent with the design philosophy of the aircraft and in line with certification requirements (EASA regulation).</p>
3. TEAMS & COMMUNICATION	
3.1 TEAM COMPOSITION	No changes are foreseen.
3.2 ALLOCATION OF TASKS	No changes are foreseen.
3.3 COMMUNICATION	<p>To manage case where an alert triggers onboard but the aircraft is stopped and cannot avoid the conflict, there will be a need of communication between flight crew and ATC, or flight crew and other aircraft. As time critical situations, it is necessary to define a clear phraseology applied and understood by all actors.</p>
4. HP RELATED TRANSITION FACTORS	
4.1 ACCEPTANCE & JOB SATISFACTION	<ul style="list-style-type: none"> <li>No changes are foreseen</li> </ul>
4.2 COMPETENCE REQUIREMENTS	<p>No new competences are required to use the system as procedures needed in reaction to the alerts are already known by pilots. However, as the function needs to trigger reflex actions in the sense that when pilots will face such a warning alert (respective caution alert for [SURF-ITA] and [TWY-ITA]) the appropriate action is obvious to select. Therefore, pilots would have to learn, and train expected actions related to</p>

	each alert/use case to trigger quick decision and reaction.
4.3 STAFFING REQUIREMENTS & STAFFING LEVELS	No changes are foreseen.

371 **Table 4-7: HPAR argument from AUO-0605**

372 Below table provides results from VLD2 STAIRS with previous study and activities under SESAR PJ03B-  
373 05.

PIs	Activities & Metrics	Second level indicators	Covered
<b>HP1</b> Consistency of human role with respect to human capabilities and limitations	- <b>Real Time Simulations</b> (Observations, Questionnaires, Interviews): <ul style="list-style-type: none"> <li>Situational awareness</li> <li>Usability</li> <li>Workload</li> </ul> - <b>Workshop</b> <ul style="list-style-type: none"> <li>Tasks and responsibilities description</li> </ul>	<b>HP1.1</b> Clarity and completeness of role and responsibilities of human actors	CLOSED
		<b>HP1.2</b> Adequacy of operating methods (procedures) in supporting human performance	CLOSED
		<b>HP1.3</b> Capability of human actors to achieve their tasks in a timely manner, with limited error rate and acceptable workload level	CLOSED
<b>HP2</b> Suitability of technical system in supporting the tasks of human actors	- <b>Real Time Simulations</b> (Observations, Questionnaires, Interviews): <ul style="list-style-type: none"> <li>Suability (Timeliness of the alerts, time left to solve issues).</li> <li>Workload</li> <li>Trust</li> <li>Situational awareness</li> </ul>	<b>HP2.1</b> Adequacy of allocation of tasks between the human and the machine (i.e. level of automation).	N/A
		<b>HP2.2</b> Adequacy of technical systems in supporting Human Performance with respect to timeliness of system responses and accuracy of information provided	CLOSED
		<b>HP2.3</b> Adequacy of the human machine interface in supporting the human in carrying out their tasks.	CLOSED
<b>HP3</b> Adequacy of team structure and team communication in supporting the human actors	N/A	<b>HP3.1</b> Adequacy of team composition in terms of identified roles	N/A
		<b>HP3.2</b> Adequacy of task allocation among human actors	N/A
		<b>HP3.3</b> Adequacy of team communication with regard to information type, technical enablers and impact on situation awareness/workload	N/A

PIs	Activities & Metrics	Second level indicators	Covered
<b>HP4</b> Feasibility with regard to HP-related transition factors	N/A	<b>HP4.1</b> User acceptability of the proposed solution	N/A
		<b>HP4.2</b> Feasibility in relation to changes in competence requirements	N/A
		<b>HP4.3</b> Feasibility in relation to changes in staffing levels, shift organization and workforce relocation.	N/A
		<b>HP4.4</b> Feasibility in relation to changes in recruitment and selection requirements	N/A
		<b>HP4.5</b> Feasibility in terms of changes in training needs with regard to its contents, duration and modality.	N/A

374 **Table 4-8: HP arguments, activities and metrics**

375 **4.16.2 Extrapolation to ECAC wide**

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

377 **4.16.3 Open HP issues/ recommendations and requirements**

378 There is no new open HP issue with the DEMO activities from the previous assessment.

379 **4.16.4 Concept interaction**

380 No specific interactions with other SESAR VLD demonstrations have been identified from a Human  
 381 Performance perspective.

382 **4.16.5 Most important HP issues**

383 There have not been identified any change on important HP issues for the performance of the DEMO  
 384 from the previous definition under SESAR PJ03B-05 listed below.

PIs	Most important issue of the solution	Most important issues due to solution interdependencies
<b>HP1</b> Consistency of human role with respect to human	PJ03b-05_ISS_03: With or without alerts provided to ATCO through ATC tools, potential issues of contradictory resolution instructions may occur and may impact pilots understanding of the situation and their reaction to the alerts that may at the end impact safety of operations. Consistency between the two alerts (air and ground) as well as authority sharing should be further investigated.	No solution interdependencies identified regarding HP1

PIs	Most important issue of the solution	Most important issues due to solution interdependencies
capabilities and limitations	<p>ATC keeps usual authority for traffic de-confliction and pilots are able to decide if an avoidance maneuver is needed due to an issue onboard not perceptible by ATC (e.g. windshear, failure) but it has to be confirmed if onboard maneuvers in response to SURF-A alerts are in line with a decision ATC might make in parallel to solve the conflict (does not generate new conflicts, minimize impact on traffic management).</p> <p>PJ03b-05_ISS_04: Some conflicting situations generating alerts may let few manoeuvre possibilities to ownship aircraft and may require that pilots inform ATC or other aircraft of its presence or of a potential threat detected by aircraft systems. In a short timeline of safety net, if the phraseology between operators is not clear they may transmit confusing communication and reduce the possibility to solve the conflict in time.</p> <p>PJ03b-05_ISS_05: Depending on the use case and on the operational context (traffic density, low visibility conditions, equipment failure, etc.), traffic conflict situations understanding, and subsequent decision making may be complex to do upon alert triggering. It has to be ensured that workload induced by the alerts is acceptable to make a decision and perform the action in time.</p> <p>PJ03b-05_BEN_01: Depending on the use case and on the operational context (traffic density, low visibility conditions, equipment failure, etc.), traffic conflict situations understanding, and subsequent decision making may be complex to do upon alert triggering. It is expected that the alerting function support pilots' assessment of the situation and facilitate decision making in all situations and all contexts while enhancing safety.</p> <p>PJ03b-05_ISS_01: As a safety net, the alert system is designed to trigger in a last resort to cover ATC or pilots' error, it should not trigger in nominal operations (nominal aircraft separation and non-conflicting clearances), therefore triggering time is late and time to understand the situation and make a decision on the action to perform may be short in certain situations. Additionally, the decision making can depend on the context then delay the recovery action. It has to be ensured that pilots may respond to the alerts in time in all the cases and contexts.</p> <p>PJ03b-05_ISS_02: If alert information is not well understood by the crew, it can confuse pilots on the situation and lead to time-critical issues concerning expected actions to answer to the alert. Audio and textual messages have to be unambiguous and perceived by pilots in all operational contexts.</p>	
HP2 Suitability of technical system in supporting the tasks of human actors	<p>PJ03b-05_ISS_06: The CDTI is expected to support crew understanding of the SURF-ITA alerts (by providing surrounding traffic visualisation and providing additional information, monitored by the SURF-ITA function). Nevertheless, requiring the CDTI to allow the SURF-ITA functioning has strong impact on function KPA (costs, fleet equipment constraints, display information overload...).</p> <p>Then, is the CDTI information really required to ensure an efficient pilot's reaction when detecting a potential conflict?</p>	No solution interdependencies identified regarding HP2

PIs	Most important issue of the solution	Most important issues due to solution interdependencies
<b>HP3</b> Adequacy of team structure and team communication in supporting the human actors		No solution interdependencies identified regarding HP3
<b>HP4</b> Feasibility with regard to HP-related transition factors		No solution interdependencies identified regarding HP4

Table 4-9: Most important HP issues

385

386 **4.16.6 Additional Comments and Notes**

387 Not applicable.

388 **4.17 Other PIs**

389 Not applicable.

390 **4.18 Gap Analysis**

391 There is a limited data for performance assessment for comparison between validation target and  
 392 performance assessment within overall SAC criteria. The most important is the acceptable system  
 393 performance with safety objectives and requirements for nuisance/false/missed alert rates helping to  
 394 meet final validation targets.

395

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<sup>6</sup> At the time of the creation of the PAR template, the Methodology (PJ19.04 Internal Document) is foreseen to be update in 2020.

<sup>7</sup> At the time of the creation of the PAR template the Validation Target is foreseen to be delivered in June 2020

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438 **Appendix A Detailed Description and Issues of the OI**  
 439 **Steps**  
 440

441 No further issues have been identified with the latest DEMO dataset.

OI Step ID	Title	Consistency with latest Dataset
AUO-0605: SURF-A  Traffic Alerts for Pilots during Runway Operations (No CDTI display – mainline aircraft)	Traffic Alerts for pilots for airports operations refer to enhancing on-board systems in order to detect potential and actual risks of collision with other traffic during runway operations. In all cases the flight crew are provided with appropriate alerts.	Consistent with the latest DEMO dataset  Experimental flights
AUO-0605: SURF-ITA  Traffic Alerts for Pilots during Runway Operations (CDTI display – business aircraft)	Traffic Alerts for pilots for airports operations refer to enhancing on-board systems in order to detect potential and actual risks of collision with other traffic during runway operations. In all cases the flight crew are provided with appropriate alerts & indication.	Consistent with the latest DEMO dataset  Flight Trial and ADS-B SC-186 data replay

442 **Table 5-1: OI Steps allocated to the Demo**

443  
 444  
 445  
 446  
 447

**AIRBUS**



**Honeywell**

**THALES**



448

