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PJ02-W2-25-1 HPAR

PJ02 ENHANCED RUNWAY CONDITION AWARENESS FOR RUNWAY EXCURSION PREVENTION

This report is part of a project that has received funding from the SESAR3 Joint Undertaking under grant agreement No 874477 under European Union's Horizon 2020 research and innovation programme.

Abstract

This document contains the Human Performance (HP) assessment report for the PJ02-W2-25-1 which consists of the HP assessment plan, the results of the HP activities conducted according to the HP assessment process, newly identified issues and the HP recommendations & requirements. It corresponds to the completion of the four steps of the Human Performance assessment process, namely: Step 1 – Understand the concept: Baseline, Solution and Assumptions, Step 2 – Understand the Human Performance Implications, Step 3 – Improve and Validate the concept and Step4 – Collate findings & conclude on transition to next V-phase.

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1 Executive Summary

This document constitutes the Part IV of the OSED/SPR/INTEROP, collating findings on Human Performance (HPAP) activities performed in the project and described in the Human Performance Assessment Plan VALP Part IV.

The purpose of the HP assessment process is to provide assurance that HP issues related to the technical and operational developments of SESAR PJ.02-W2-25.1, are systematically identified, traced and resolved. This will provide the confidence that the introduction a product, a service or a system is compatible with human capabilities are conducted, i.e., no degradation in human performance will occur as a result of the implementation of the solution.

The overall aim of this HP assessment is to evaluate the impact of introducing the Operational Improvement (OI) steps linked to the solution SESAR PJ.02-W2-25.1:

- AO-0216 — Enhanced Runway Condition Awareness.

The Human Performance Assessment Report (HPAR) presents the outcomes of the Steps 1 to 4 of the Human Performance Assessment Process (HPAP):

- Step 1 – Understand the concept: Baseline, Solution and Assumptions;
- Step 2 – Understand the Human Performance Implications;
- Step 3 – Improve and Validate the concept; and
- Step 4 – Collate findings & conclude on transition to next V-phase.

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2 Introduction

2.1 Purpose of the document

The purpose of this document is to describe the results of the activities conducted according to the Human Performance (HP) assessment process [3] in order to derive the HP assessment report for Solution PJ.02-W2-25.1 including requirements and recommendations.

2.2 Intended readership

This document is mainly intended to be used by PJ.02-W2-25.1 “Enhanced runway condition awareness for runway excursion prevention” partners.

This SPR-INTEROP/OSED Part IV can provide useful information to the following audience:

- Project PJ.02-W2 AART – as the solution is contributing to the project.
- Project PJ.04-W2 TAM (Total Airport Management), as PJ.02-W2-25.1 developments can be interesting for this project
- Project PJ.19-W2 CI (Content Integration, Performance Management and Business Case Development) responsible for managing the content integration process to ensure the needed coherency (in terms of operational concept, architecture) between the different SESAR 2020 projects,
- Project PJ.20-W2 AMPLE (Master Planning) responsible for ATM Master Plan maintenance.

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2.3 Structure of the document

The HP report presents the outcomes of the Step 1 to Step 4 tasks related to the Human Performance assessment process.

Section 1 and 2 introduce this HP report document.

Section 3 summarises the Human Performance assessment process.

Section 4 constitutes the HP assessment report, with a sub-section for each step of the process.

Detailed information is available in appendices:

- Appendix A – Additional HP activities conducted
- Appendix B – HP recommendations issued from each exercise
- Appendix C – HP Requirements Register
- Appendix D – HP Log
- Appendix E – deleted OI AO-0107 (During concept development and validation it was decided that AO-0107 is obsolete)

2.4 Acronyms and Terminology

Term	Description
Human Factors (HF)	HF is used to denote aspects that influence a human's capability to accomplish tasks and meet job requirements. These can be external to the human (e.g. light & noise conditions at the work place) or internal (e.g. fatigue). In this way, "Human Factors" can be considered as *focussing on the variables that determine Human Performance*.
Human Performance (HP)	HP is used to denote the human capability to successfully accomplish tasks and meet job requirements. In this way, "Human Performance" can be considered *as focussing on the observable result of human activity in a work context*. Human Performance is a function of Human Factors (see above). It also depends on aspects related to Recruitment, Training, Competence, and Staffing (RTCS) as well as Social Factors and Change Management.
HP activity	An HP activity is an evidence-gathering activity carried out as part of Step 3 of the HP assessment process. An HP activity can relate to, among others, task analyses, cognitive walkthroughs, and experimental studies.
HP argument	An HP argument is an HP claim that needs to be proven through the HP Assessment Process.
HP assessment	An HP assessment is the documented result of applying the HP assessment process to the SESAR Solution-level. HP assessments provide the input for the HP case.

HP assessment process	The HP assessment process is the process by which HP aspects related to the proposed changes in SESAR are identified and addressed. The development of this process constitutes the scope of Project 16.04.01. It covers the conduct of HP assessments on the Solution-level as well as the HP case building over larger clusters of Solutions.
HP benefit	An HP benefit relates to those aspects of the proposed ATM concept that are likely to have a positive impact on human performance.
HP case	An HP case is the documented result of combining HP assessments from Solutions into larger clusters (SESAR Projects, deployment packages) in SESAR.
HP issue	An HP issue relates to those aspects in the ATM concept that need to be resolved before the proposed change can deliver the intended positive effects on Human Performance.
HP impact	An HP impact relates to the effect of the proposed solution on the human operator. Impacts can be positive (i.e. leading to an increase in Human Performance) or negative (leading to a decrease in Human Performance).
HP recommendations	HP recommendations propose means for mitigating HP issues related to a specific operational or technical change. HF recommendations are proposals that require additional analysis (i.e. refinement and validation). Once this additional analysis is performed, HF recommendations may be transformed into HF requirements.
HP requirements	HP requirements are statements that specify required characteristics of a solution from an HF point of view. HP requirements should be integrated into the DOD, OSED, SPR, or specifications. HF requirements can be seen as the stable result of the HF contribution to the Solution, leading to a redefinition of the operational concept or the specification of the technical solution.

Table 1: Acronyms and terminology

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3 The Human Performance Assessment Process: Objective and Approach

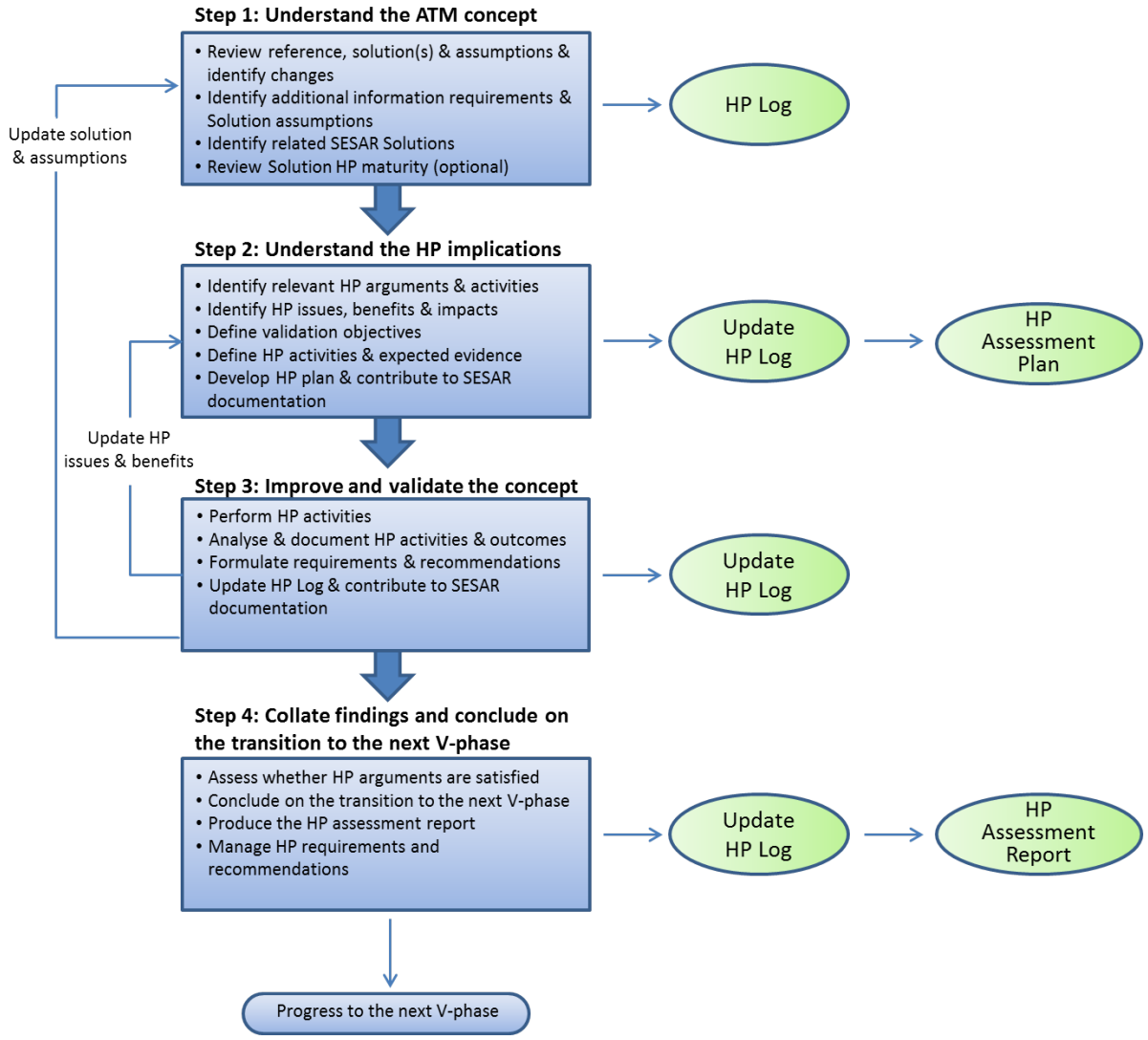

Figure 1: Steps of the HP assessment process

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4 Human Performance Assessment

4.1 Step 1 Understand the ATM concept

4.1.1 Description of reference scenario

The reference scenarios are reported elsewhere in the PJ.02-W2-25.1 VALP – Part 1 document, as part of section 5.1.4.1 [6]

4.1.2 Description of solution scenario

The solution scenarios are reported elsewhere in the PJ.02-W2-25.1 VALP – Part 1 document, as part of section 5.1.4.2 [6]

4.1.3 Consolidated list of assumptions

The assumptions are reported elsewhere in the PJ.02-W2-25.1 VALP – Part 1 document, as part of section 4.5 [6].

4.1.4 List of related SESAR Solutions to be considered in the HP assessment

Related solution to be considered in the HP assessment of the Solution is listed in Appendix D: HP LOG, Section “Solution&Concept Info”.

4.1.5 Identification of the nature of the change

The description of the human factors approach used to generate HP evidences is available as part of Validation Plan (VALP) - Part IV - Human Performance Assessment Plan, as part of section 4.1 [7].

HP argument branch	Change & affected actors
1. ROLES & RESPONSIBILITIES	
1.1 ROLES & RESPONSIBILITIES	AO: One new role is added in terms of RCAMS Admin with whom the AO must liaise in case of Degraded mode operations.
1.2 OPERATING METHODS	AO: Alert and notifications monitoring concerning changed RC from RWY sensors as well as OBACS data downloads from LND aircraft; Liaising with the RCAMS Admin in case of degraded mode operations.
1.3 TASKS	ATCO: Predicted RWYCC to be communicated to Flight Crew for take-off or landing preparation through appropriate mean (ATIS) using RCAMS provided information. AO/DO task migrates to one of supervision of the system in place and approval of generated reports; Fallback to R/T

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	procedures in case of degraded data-sources, to pursue GRF operations.
2. HUMAN & SYSTEM	
2.1 ALLOCATION OF TASKS (HUMAN & SYSTEM)	DO: Tool from AIRPORT-57 allows to assess in a continuously manner the runway surface condition, which affords better planning for on-demand AO runway inspections.
2.2 PERFORMANCE OF TECHNICAL SYSTEM	ATCO: Updates will be received as soon as AO/DO approves it; ATIS broadcast shall incorporate Predicted RC.
2.3 HUMAN – MACHINE INTERFACE	ATCO: AERODROME-ATC-31 to display runway surface condition status; ATC alert in case of RE risk in final approach on the radar approach display of the CWP; Human Error due to the AO and ATCO HMI is identified and reduced as far as possible. (NOTE: this EN is for AO-0107 that was eventually eliminated from solution scope) DO: new information on HMI (AIRPORT-57; AIRPORT-59) - RCAMS Alert integration - RCAMS RC Inspection (Manual Assessment) inputs on tablets,
3. TEAMS & COMMUNICATION	
3.1 TEAM COMPOSITION	DO: Integration of an RCAMS Administrator in degraded data-source environment.
3.2 ALLOCATION OF TASKS	DO: Fall-back to R/T procedures involve the intervention of an RCAMS Admin.
3.3 COMMUNICATION	ATCO: Communication between the ATCO and AO/DO shall focus on electronic sharing of information in nominal situations. Airport Operator - Control Tower: phone replaced by AIRPORT-57 - AERODROME-ATC-31 sharing of RWYCC information. (That was checked and validated, though AEORDROME-ATC-31 was eventually removed from solution scope)
4. HP RELATED TRANSITION FACTORS	
4.1 ACCEPTANCE & JOB SATISFACTION	ATCO: Acceptance of HMI and Predictive RC solutions and algorithms. Reliability of runway surface condition status assessed by AIRPORT-57
4.2 COMPETENCE REQUIREMENTS	Airport Operator and Control Tower: Predicted RWYCC introduction; AO- RCR system administrator

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4.3 STAFFING REQUIREMENTS & STAFFING LEVELS	N/A.

Table 2: Description of the change

4.2 Step 2 Understand the HP implications

4.2.1 Identification of relevant arguments, HP issues & benefits and HP activities

HP activities were conducted according to the planned activities in Validation Plan (VALP) - Part IV - Human Performance Assessment Plan, as part of section 4.3.1 [7].

4.3 Step 3 Improve and validate the concept

4.3.1 Description of HP activities conducted

The description of the HP activities conducted have been reported elsewhere in Validation Plan (VALP) - Part IV - Human Performance Assessment Plan, as part of section 4.3.2 [7].

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4.4 Step 4 Collate findings & conclude on transition to next V-phase

4.4.1 Summary of HP activities results & recommendations / requirements

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
Arg. 1.1.1: The description of roles & responsibilities cover all affected human actors.							
HFI_PJ02-25.1_RCAMS_AO-0216_Arg.1.1.1	AO-0216: AO/DO: Introduction of the RCAMS Admin (liaising with Data Supplier) role as part of the organisation should be clearly described to AO/DO for effective failover to take place.	OPEN	OBJ-PJ02-W2-25.1-V3-VALP-0006	Shadow-Mode Trials / LT	[Shadow] RCAMS Admin role is partly understood by DOs. Failover procedures were not formally identified although the software developer assumed a hotline role in case of technical failures and bug reporting with the system.	DO training should formally integrate the RCAMS admin roles and responsibilities in both normal and degraded operations.	RCAMs Admin role and procedures should be operational.
Arg. 1.2.5: Operating methods (procedures) can be followed in an accurate, efficient and timely manner							
HFI_PJ02-25.1_RCAMS_AO-0216_Arg.1.2.5	AO-0216: - AO/DO: Alert monitoring concerning	CLOSED	OBJ-PJ02-W2-25.1-V3-	Shadow-Mode Trials / LT	"With a standard situation corresponding to good weather conditions ATCO don't need a confirmation from DO about RCR, only		

	updated RC from sensors, - DO needs to signify system issues to a new role of RCAMS Admin.		VALP-0007 OBJ-PJ02-W2-25.1-V3-VALP-0008		with extreme unexpected situation he might request RCR confirmation from DO. RCAMS does not replace previous way of communication it rather supplements it and eliminates only unnecessary R/T calls. In case of any doubt or system failure ATCO easily go back to radio communication " "From DOs' questionnaires it results that the rate of RC update detection is acceptable. From DOs' questionnaires it results that the delay between RC updates and RC dissemination is acceptable. DO can use RCAMS system on tablets during or just		

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					after an inspection. SNOWTAM coding and dissemination is quicker. From DOs' questionnaires it results that the failover procedures have an acceptable impact on ongoing traffic operations. Failover procedure is feasible, the system has a possibility to alert about problems and failures but DO has no intention to take care of the system failures. The role of System Admin is required. From DOs' questionnaires it results that the restore procedures has an acceptable impact on ongoing traffic operations. "		

Arg. 1.3.2: Tasks can be achieved in a timely manner.							
HFI_PJ02-25.1_RCAMS_AO-0216_Arg.1.3.2	"AO-0216: - AO/DO: - New available information "	CLOSED	OBJ-PJ02-W2-25.1-V3-VALP-0009	Shadow-Mode Trials / LT	From DOs' questionnaires it results that the duration of failover to R/T is acceptable.		
Arg. 1.3.4: The level of trust in the new concept/the new procedures is appropriate.							
HFI_PJ02-25.1_RCAMS_AO-0216_Arg.1.3.4	AO-0216: AO task migrates to one of supervision of the system in place and the approval of generated reports, requiring trusting the algorithm based on accurate RWYCC and successful predictions.	CLOSED	OBJ-PJ02-W2-25.1-V3-VALP-0010 OBJ-PJ02-W2-25.1-V3-VALP-0010a	Shadow-Mode Trials / LT	ATCOs trust in RCAMS is sufficient. In case of any kind of doubt they easily can go back to radio communication and ask DO for confirmation. "PIREP was during Dassault flight tests February 17th and December 21st 02:57 UTC DO: yes DO's trust in RCAMS is sufficient. In case of any doubt, they can always go		

					for a manual inspection and double-check the situation. During flight test exercises in Gdansk, OBACS outputs (Ref to VAL OBJ 0012 results) provided consistent results with RCAMS Computed Current RWYCC. There was only a very minor deviation since Airport reported only RWYCC 5 whereas OBACS detected a bit less than RWYCC 5."		
Arg. 1.3.5: Human actors can maintain a sufficient level of situation awareness.							
HFI_PJ02-25.1_RCAMS_AO-0216_Arg.1.3.5	"AO-0216: + Airport Operator: Predicted RWYCC is not expected to degrade AO's situational awareness (knowing forcasts he can be prepared in advance for the action).	CLOSED	OBJ-PJ02-W2-25.1-V3-VALP-0002	Shadow-Mode Trials / LT	"No measures were conducted during the trial, although from questionnaires it results that RCAMS system improves DO's awareness Result assumption: there is no RCAMS system reference		

	DO/TWR will benefit from effortless availability of Predicted RWYCC"				scenario (during previous winter there was different reporting format used) – it means that all information displayed on HMI (see VAL OBJ 0011) contributes to better awareness of runway conditions (information from runway and MET sensors, warnings based on model for current runway condition and RWYCC and predicted RWYCC) During debriefing sessions with Duty Officers, they confirmed that their situational awareness is improved due to RCAMS introduction. They also stated they would need longer experience with system (they used it for one winter season) to skip any scheduled, regular runway inspection and use RCAMS outputs for runway		

					condition reporting without confirmation by runway inspection. They saw direct benefit in OBACS reports from aircrafts integrated into RCAMS system as independent verification of runway state with direct link to aircraft braking performance. The most important benefit for Duty Officers during validation exercise was the possibility to report runway condition directly during runway inspection via RCR Editor on mobile device (tablet). During workshops with Airport Operational Director, it was decided that Winter services are not a part of solution concept, and the CRT was wrongly formulated. Winter services are responsible for keeping		

					RWY clean and are not involved in RCR creation, so granting them an access to RCAMS system is not necessary, and even inadvisable not to interfere with responsibilities sharing between DO and winter services. "		
Arg. 2.2.2: The timeliness of information provided by the system is adequate for carrying out the task.							
HFI_PJ02-25.1_RCAMS_AO-0216_Arg.2.2.2	"AO-0216: OBACS data is provided for all equipped aircraft to AO."	CLOSED	OBJ-02-W2-25.1-V3-VALP-0012a	Shadow-Mode Trials / LT	Computed Braking Action from OBACS was considered by FC as consistent with deceleration felt during braking. During flight test exercises in Gdansk, Computed Braking Action information from OBACS was not directly accessible for AOC. Information was provided through PIREP to ATC. Hence, to assess accessibility of OBACS data for AOC, refer to VAL OBJ 0012a results.		

Arg. 2.3.6: The usability of the user interface (input devices, visual displays/output devices, alarm& alerts) is acceptable.							
HFI_PJ02-25.1_RCAMS_AO-0216_Arg.2.3.6	"AO-0216: - DO: new information on HMI (AIRPORT-57; AIRPORT-59) is usable. "	CLOSED	OBJ-PJ02-W2-25.1-V3-VALP-0004	Shadow-Mode Trials / LT	The way Current RWYCC and Predicted RWYCC is presented to ATCO is clear and well understood. The information was easily accessible for them (important especially in times of heavy workload). The same is with an alert about RWYCC update and/or system failure. The only thing that was problematic for ATCO was a need to introduce to already too busy workspace additional system and screen. To eliminate this problem controllers, suggest to integrate RCAMS system with one of already existing systems and HMI. ATIS seems to be the best option but solution 25.1 is not focusing on ATIS upgrade. "From DOs' questionnaires it results that the usability of		

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					the HMI is acceptable in all work environments. From DOs' questionnaires it results that the usability of notifications and alerts is mostly acceptable (including OBACS availability and validity). From DOs' questionnaires it results that the OBACS data usability is mostly acceptable. "		
Arg. 2.3.7: The user interface design reduces human error as far as possible							
HFI_PJ02-25.1_RCAMS_AO-0216_Arg.2.3.7	Human Error due to the AO and ATCO HMI is identified and reduced as far as possible.	CLOSED	OBJ-PJ02-W2-25.1-V3-VALP-	Shadow-Mode Trials / LT	DOs were able to correct any input mistakes, including the re-sending of an RCR in case there was an erroneous value in the previous report. Using mobile application		

			HP-0020		allows for faster coding of RCR/SNOWTAM		
Arg. 3.3.4: The communication load of team members is acceptable in normal and abnormal conditions and degraded mode of operations.							
HFI_PJ02-25.1_RCAMS_AO-0216_Arg.3.3.4	"AO-0216: - Change in communication between TWR and Airport Operator (RCR input instead of radio communication) may increase AO's workload"	CLOSED	OBJ-PJ02-W2-25.1-V3-VALP-HP-0021	Shadow-Mode Trials / LT	" RCR editor is an easy and quick tool for DO. Mobile version allows to code new RCR/SNOWTAM even at the inspection or directly after with no need for DO to go back to office to access the system. ATCOs is provided with readable and easily accessible information about RWYCC. Current RWYCC is accessible for ATCO on demand (visible on RCAMS HMI) When DO uses RCAMS system to code current RWYCC it is automatically supplemented with		

					Predicted RWYCC and transferred to ATCO. Each time ATCO is warned by the system about change of RWYCC. RTS proved that with a use of RCAMS ATCO was able to update ATIS with current RWYCC on regular basis ATCO questionnaires in VAL OBJ results in conclusion that the utmost benefit would be if RCAMS system integrates with ATIS system. That would eliminate effort needed to rewrite RWYCC from RCAMS to ATIS, thus making information available faster for Flight deck. "		
Arg. 4.1.2: The impact of changes on the job satisfaction of affected human actors has been considered.							

HFI_PJ02-25.1_RCAMS_AO-0216_Arg.4.1.2	"AO-0216: + Reliability of runway surface condition status assessed by AIRPORT-57"	CLOSED	OBJ-PJ02-W2-25.1-V3-VALP-HP-0024	Shadow-Mode Trials / LT	"[Shadow]: DO estimate generally that the RCAMS system did not reduce or increase the number of (weather related) runway inspections, for the following reasons: - RCAMS only informed decisions but was not used as a prescriptive means, - The duration over which the system was evaluated was relatively short and the appropriate weather conditions for estimating its use (snow events) lasted only a few days in December 2021 as well as a few icing instances in Jan and Feb 2022."		

Table 3: Summary of the HP results and recommendations/ requirements for each identified issue & related argument

4.4.2 Maturity of the Solution

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Maturity checklist for finalising the V3 assessment			
ID	**Question**	**Answer**	**Comments** *Please substantiate your answer.*
1	Has a Human Performance Assessment Report been completed? Have all relevant arguments been addressed and appropriately supported?	YES	*Refer to Tab "Change and Argument Identification" concerning AO-0216.*
2	Are the benefits and issues in terms of human performance and operability related to the proposed solution sufficiently assessed (i.e. on the level required for V3)?	YES	Refer to Tab "Issues-Objective-Outcome", Column D: "Issues and Benefits".
3	Have all the parts of the solution/concept been considered?	YES	Winter Services were considered at intermediate VALP step as additional stakeholders, although their role was finally evaluated as being out of project scope. TWR ATCO with a separate OI (AO-0107) was analysed as assessed within a concept. Finally it was decided that AO-0216 can be a stand alone development and more beneficial would be to integrate RCAMS with ATIS that to deploy AO-0107.

4	Have potential interactions with related projects/concepts been considered and addressed?	YES	Potential interactions has been investigated but none significant was finally identified. A recommendation has been formulated about benefits from potential (separate concept) RCAMS-ATIS integration Refer to Related SESAR Solution, Tab "Solution and Concept Info".
5	Is the level of human performance needed to achieve the desired system performance for the proposed solution consistent with human capabilities?	YES	Workload and Situational Awareness probes were used during debriefing, HMI and system functions/alerts were adjusted to users requirements during development phase, task efficiency has been assessed (e.g. Duty Officer is able to create SNOWTAM faster with a RCAMS usage)
6	Are the assessments results in line with what is targeted for that concept? If not, has the impact on the overall strategic performance objectives/targets been analysed?	YES	Refer to Actual Evidence in Column V
7	Has the proposed solution been tested with end-users and under sufficiently realistic conditions, including abnormal and degraded conditions?	YES	Validation period was long enough (4 months of shadow mode in winter conditions) to investigate different situations and user's reactions and
8	Do validation results confirm that the interactions between human and technology are operationally feasible, and consistent with agreed human performance requirements?	YES	Refer to VALR results and recommendations e.g. results show that RCAM's Admin role and procedures should be operational.

9	Have all relevant SESAR documentation been updated according to the HP activities outcomes (OSED, SPR)?	YES	All documents have been updated
10	Do the outcomes satisfy the HP issues/benefits in order to reach the expected KPA?	YES	General results proves that RCAMS supports work of Duty Officers, improves their situational awareness and general safety
11	Have HP recommendations and HP requirements correctly been considered in HMI design, procedures/documentation and training?	YES	During validation preparation period a multiple workshops with Duty Officers has been organized to adjust HMI, clarify data presentation (especially OBACS) and demonstrate system functionalities. The only thing that proved to be still confusing was a role of RCAMs Admin, which was simulated by system manufacturer, although not applied by DO
12	Have the major factors that can influence the transition feasibility (e.g. changes in competence requirements, recruitment and selection, training needs, staffing requirements, and relocation of the workforce) been addressed? Are there any ideas on how to overcome any issues?	YES	Training sessions was provided to DOs to correctly interpret available data, especially OBACS, which is new
13	Have any impacts been identified that may require changes to regulation in the area of HP/ATM? This includes changes in roles & responsibilities, competence requirements, or the task allocation between human & machine.	NO	

14	Has the next V-phase sufficiently been prepared (additional testing conditions, open HP issues to be addressed)?	YES	AO-0216 is mature enough to be deployed. A recommendations has been formulated to further investigate a concept of possible RCAMS-ATIS integration and a way to present Predicted RWYCC to other stakeholders.

5 References

Human Performance

[1] SESAR (2010). 16.06 Strawman Paper on Case Building in SESAR SWP 16.6 v0.8.

[2] SESAR (2013). HP assessment process for projects in V1, V2 and V3. D10-001 (ground based and airborne projects), 00.01.0 0, October 2013

[3] SESAR (2011). P06.09.03 D05.1 Single Remote Tower Validation Plan – Appendix: Human Performance Assessment Plan.

[4] SESAR (2021). SESAR Solution PJ.02-W2-25 SPR-INTEROP/OSED (interim) for V3 - Part I

[5] SESAR (2021). SESAR Solution PJ.02-W2-25: Validation Plan (VALP) - Part I

[6] SESAR (2021). SESAR Solution PJ.02-W2-25: Validation Plan (VALP) - Part IV - Human Performance Assessment Plan.

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Appendix A – Additional HP activities conducted

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Appendix B – HP Recommendations Register

HP Recommendations Register									
Reference	Type of recommendation	Recommendation	Rationale	Assessment source + Reference report	Scope (Air, Air/Ground, Ground)	Concept / solution Involved	Recommendation status	Rationale in case of rejection	Comments
HP_Recomm_1	OPS (operating methods / procedures)	DO training should formally integrate the RCAMS admin roles and responsibilities in both normal and degraded operations.	HFI_PJ02-25.1_RCAMS_AO-0216_Arg.1.1.1	Shadow-mode Trial	Ground	RCAMS	Accepted		
HP_Recomm_2	New objective	Enable workload measures as a means of determining impacts of the	"HFI_PJ02-25.1_RCAMS_AO-0216_Arg.1.3.3	Shadow-mode Trial	Ground	RCAMS	Accepted		

		concept on end users' activities.							
HP_Recomm_3	OPS (operating methods / procedures)	Re-evaluate ATCO performance with integrated RCAMS information in ATIS.	HFI_PJ02-25.1_RCAMS_AO-0107_Arg.1.3.3	Shadow-mode Trial/LT	Ground	RCAMS	Accepted		

Table 4: HP recommendations

Appendix C – HP Requirements Register

HP Requirements Register									
Reference	Type of requirement	Requirement	Rationale	Assessment source + Reference report if available	Scope (Air, Air/Ground, Ground)	Concept/ solution Involved	Requirement status	Rationale in case of rejection	Comments
HP_Req_1	OPS (operating methods / procedures)	RCAMs Admin role and procedures should be operational.	HP_Recomm_1	Shadow-mode Trial	Ground	RCAMS	Accepted		
HP_Req_2	Other	Workload measures for the next maturity phase should be included in the experimental protocol.	HP_Recomm_2	Shadow-mode Trial	Ground	RCAMS	Accepted		

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HP_Req_3	OPS (operating methods / procedures)	ATCO performance should be re-evaluated with RCAMS info integrated within ATIS.	HP_Recomm_3	Shadow-mode Trial/LT	Ground	RCAMS	Accepted		

Table 5: HP Requirements

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Appendix D – HP Log

Worksheet in E
_PANSA PJ_02-W2-2!

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Appendix E – deleted AO-0107 - Summary of HP activities results & recommendations / requirements

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
Arg. 1.2.5: Operating methods (procedures) can be followed in an accurate, efficient and timely manner							
HFI_PJ02-25.1_RCAMS_AO-0107_Arg.1.2.5	"AO-0107: - ATCOs have access to Current and Predictive RCR Information on their CWP (AERODROME-31). ATCOs are alerted of changes in Runway Condition Codes through the HMI, requiring monitoring and management."	CLOSED	OBJ-PJ02-W2-25.1-V3-VALP-0007	Shadow-Mode Trial/LT	"With a standard situation corresponding to good weather conditions ATCO don't need a confirmation from DO about RCR, only with extreme unexpected situation he might request RCR confirmation from DO. RCAMS does not replace previous way of communication it rather supplements it and eliminates only unnecessary R/T calls. In case of any doubt or system failure ATCO		

					easily go back to radio communication "		
Arg. 1.3.3: The level of workload (induced by cognitive and/or physical task demands) is acceptable.							
HFI_PJ02-25.1_RCAMS_AO-0107_Arg.1.3.3	"AO-0107: - The provision of Predicted RWY conditions to Flight Crews for TOF or LND preparation through ATIS should incur no workload increase for the ATCO, - RCR updates need to be regularly consulted by ATCOs to preserve SA of RWY conditions."	OPEN	OBJ-PJ02-W2-25.1-V3-VALP-HP-0007	Shadow-Mode Trial/LT	"TWR ATCO confirms the benefits only if RCAMS system would be integrated with already existing systems, RCAMS would update ATIS automatically, RCAMS system will allow DO to create RCR without inspection (less RWY occupation). "	Re-evaluate ATCO performance with integrated RCAMS information in ATIS.	ATCO performance should be re-evaluated with RCAMS info integrated within ATIS.
Arg. 1.3.4: The level of trust in the new concept/the new procedures is appropriate.							
HFI_PJ02-25.1_RCAMS_AO-0107_Arg.1.3.4	"AO-0107, AO-216: - ATCO: If the information regarding predicted runway condition is	OPEN	OBJ-PJ02-W2-25.1-V3-	Shadow-Mode Trial/LT	ATCOs trust in RCAMS is sufficient. In case of any kind of doubt they easily can go back to radio communication		

	not trustworthy enough, operators' adherence to the procedures and benefits of the change on human performance will be reduced."		VALP-0010		and ask DO for confirmation.		
Arg. 1.3.5: Human actors can maintain a sufficient level of situation awareness.							
HFI_PJ02-25.1_RCAMS_AO-0107_Arg.1.3.5	"AO-0107: + ATCO/Flight crew: Predicted RWYCC is expected to increase ATCO/Flight crew situational awareness about expected runway condition,"	OPEN	OBJ-PJ02-W2-25.1-V3-VALP-HP-0011	Shadow-Mode Trial/LT	N/A	Enable workload and SA measures as a means of determining impacts of the concept on end users' activities.	Workload and SA measures for the next maturity phase should be included in the experimental protocol.
Arg. 2.2.2: The timeliness of information provided by the system is adequate for carrying out the task.							
HFI_PJ02-25.1_RCAMS_AO-0107_Arg.2.2.2	"AO-0107: - RCR Updates will be received by ATCO as soon as AO/DO approves it. Timeliness will be dependent on the	OPEN	OBJ-PJ02-W2-25.1-V3-VALP-	Shadow-Mode Trial/LT	Computed Braking Action from OBACS was considered by FC as consistent with deceleration felt during braking.	Enable workload and SA measures as a means of determining impacts of the concept on end users' activities.	Workload and SA measures for the next maturity phase should be included in the

	ability for DO to effectively approve updates in the system, + ATIS broadcast shall incorporate Predicted RC."		HP-0015				experimental protocol.
Arg. 2.3.6: The usability of the user interface (input devices, visual displays/output devices, alarm& alerts) is acceptable.							
HFI_PJ02-25.1_RCAMS_AO-0216_Arg.2.3.6	"AO-0107: The HMI usability should allow ATCO to perform their tasks while not negatively impacting workload and task performance"	OPEN	OBJ-PJ02-W2-25.1-V3-VALP-HP-0017	Shadow-Mode Trial/LT	The way Current RWYCC and Predicted RWYCC is presented to ATCO is clear and well understood. The information was easily accessible for them (important especially in times of heavy workload). The same is with an alert about RWYCC update and/or system failure. The only thing that was problematic for ATCO was a need to introduce to already too busy workspace additional system and screen. To eliminate	Enable workload and SA measures as a means of determining impacts of the concept on end users' activities.	Workload and SA measures for the next maturity phase should be included in the experimental protocol.

					this problem controllers, suggest to integrate RCAMS system with one of already existing systems and HMI. ATIS seems to be the best option but solution 25.1 is not focusing on ATIS upgrade.		
Arg. 3.3.4: The communication load of team members is acceptable in normal and abnormal conditions and degraded mode of operations.							
HFI_PJ02-25.1_RCAMS_AO-0107_Arg.3.3.4	"AO-0107: +Communication load concerning RC should be reduced due to common RCAMS information."	OPEN	OBJ-PJ02-W2-25.1-V3-VALP-HP-0021	Shadow-Mode Trial/LT	ATCOs is provided with readable and easily accessible information about RWYCC. Current RWYCC is accessible for ATCO on demand (visible on RCAMS HMI) ATCO questionnaires in VAL OBJ results in conclusion that the utmost benefit would be if RCAMS system integrates with ATIS system. That would eliminate effort needed to rewrite	Re-evaluate ATCO performance with integrated RCAMS information in ATIS.	ATCO performance should be re-evaluated with RCAMS info integrated within ATIS.

					RWYCC from RCAMS to ATIS, thus making information available faster for Flight deck.		
Arg. 4.1.2: The impact of changes on the job satisfaction of affected human actors has been considered.							
HFI_PJ02-25.1_RCAMS_AO-0107_Arg.4.1.2	"AO-0107: + Provision of up-to-date Current RC and Predicted RC information to aid FC in TOF and LND procedures should benefit job satisfaction, + Accuracy of RWYCC algorithm and keeping PIREPs concerning deviations in braking performance at a low value."	OPEN	OBJ-PJ02-W2-25.1-V3-VALP-HP-0023	Shadow-Mode Trial/LT	- The duration over which the system was evaluated was relatively short and the appropriate weather conditions for estimating its use (snow events) lasted only a few days in December 2021 as well as a few icing instances in Jan and Feb 2022."	Re-evaluate ATCO performance with integrated RCAMS information in ATIS.	ATCO performance should be re-evaluated with RCAMS info integrated within ATIS.

-END OF DOCUMENT-

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