

# SESAR 2020 Solution PJ.09-W2-44 SPR- INTEROP/OSED for V3 - Part IV - Human Performance Assessment Report

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# DNMS

## DIGITAL NETWORK MANAGEMENT SERVICES

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### Abstract

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This document contains the Human Performance (HP) assessment report for the Solution PJ.09-W2-44 Dynamic Airspace Configuration 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

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This document contains the Human Performance (HP) assessment report for the Solution PJ.09-W2-44 Dynamic Airspace Configuration 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.

In particular, 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 Step 4 – Collate findings & conclude on transition to next V-phase.

This HPAR is based on the results of one operational workshop and six Human-In-The-Loop Real Time Simulations.

Overall, HP Arguments 1, 2 and 3 have been addressed and the required evidence at V3 has been provided. Argument 4 related issues/benefits still requires further assessment.

## 2 Introduction

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### 2.1 Purpose of the document

The purpose of this document is to describe the result of the activities conducted according to the Human Performance (HP) assessment process [1] in order to derive the HP assessment report for Solution PJ.09-W2-44 “Dynamic Airspace Configurations” including requirements and recommendations.

### 2.2 Intended readership

The intended audience for this document is the other team members of the Solution PJ.09-W2-44 under investigation.

HP practitioners at the level of the transversal areas are also expected to have an interest in this document.

Other stakeholders that may be interested in this document are to be found among:

- PJ.07-W2-39 and PJ.07-W2-40 solution members, which will be interested in the level of maturity of DAC per its dependency w
- SJU Program representatives, as the owner and final approver of the document
- SESAR Wave 2 Solution 93, which will be recipient of DAC principles, especially cross border operations.
- PJ.19 Content Integration.

## 2.3 Structure of the document

This section describes the content of the different chapters

- Section 1 contains an executive summary which gives information about the purpose, scope, and methods used.
- Section 2 describes the purpose and the scope of the document, introducing the intended readership and also a list of acronyms and terminology.
- Section 3 details the HP objectives and HP approach.
- Section 4, in line with the HP reference material, describes the results of the four steps defined in the HP Assessment Process: the understanding of the ATM concept, the improvement and validation of the concept, and the collating of findings and transition to the next maturity phase.
- Section 5 contains the references used along the document.
- Appendix A contains the recommendations register and Appendix C the requirements register

## 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 <i>focussing on the variables that determine Human Performance</i> .
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 <i>focussing on the observable result of human activity in a work context</i> . 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, OSD, 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.
P&P	Policies and Procedures

**Table 1: Acronyms and terminology**

## 3 The Human Performance Assessment Process: Objective and Approach

The purpose of the HP assessment process described in detail in Human Performance Guidance document [1] is to ensure that HP aspects related to SESAR Solution technical and operational developments are systematically identified and managed. The SESAR HP assessment process uses an ‘argument’ and ‘evidence’ approach. An HP argument is an ‘HP claim that needs to be proven’. The aim of the HP assessment is to provide the necessary ‘evidence’ to show that the HP arguments impacted have been considered and satisfied by the HP assessment process. This includes the identification of HP requirements and recommendations to support the design and development of the concept, which will be defined in the HP Assessment Report

The HP assessment process is a four-step process. Figure 1 provides an overview of these four steps with the tasks to be carried out and the two main outputs (i.e., HP plan and HP assessment report). In addition, an HP Log is recommended to be maintained throughout the lifecycle of the Solution in which all the data/ information obtained from all HP activities conducted as part of the HP assessment is documented. This HP Log is a living document and is continuously updated and / or added to as the SESAR Solution progresses.

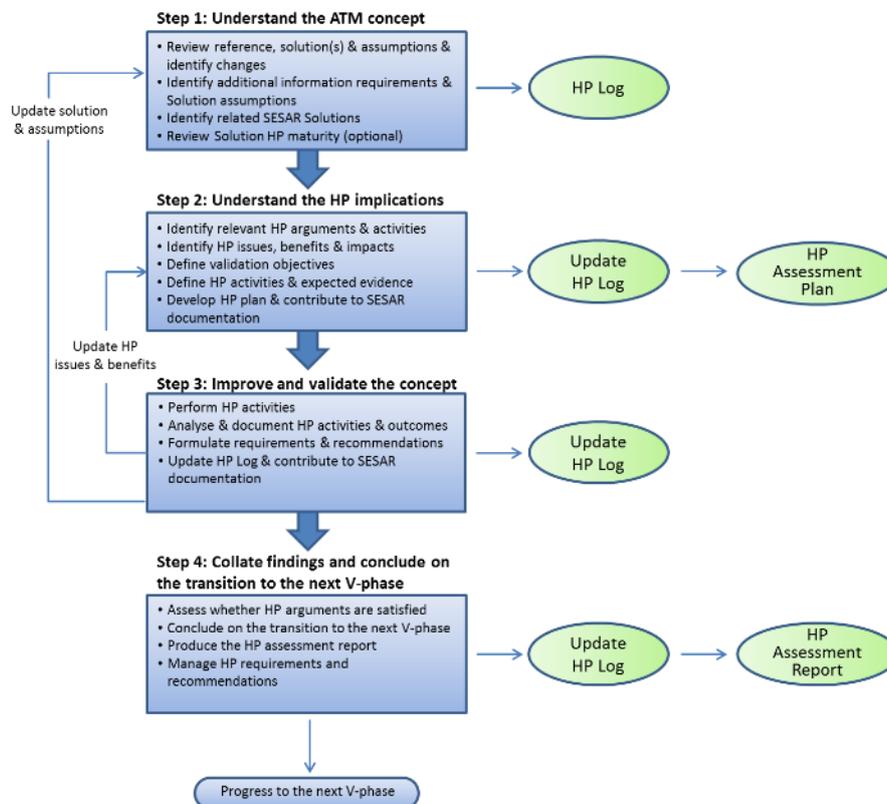


Figure 1. Steps of the HP Assessment Process

## 4 Human Performance Assessment

### 4.1 Step 1 Understand the ATM concept

#### 4.1.1 Description of reference scenario

As in PJ.09-W2-44: VALIDATION PLAN (VALP) for V3 – PART IV – HUMAN PERFORMANCE ASSESSMENT PLAN.

#### 4.1.2 Description of solution scenario

As in PJ.09-W2-44: VALIDATION PLAN (VALP) for V3 – PART IV – HUMAN PERFORMANCE ASSESSMENT PLAN.

#### 4.1.3 Consolidated list of assumptions

The list of consolidated assumptions applicable to the HP assessment are collected in Section 4.4 of PJ.09-W2-44 Validation Plan [3].

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

This section contains the ID and title of Solutions that are influenced by or have an impact on the HP assessment of the Solution under investigation. The following list of solutions have been identified:

- PJ.07-W2-39 “Collaborative framework managing delay constraints on arrivals” and PJ.07-W2-40: concept dependency
- PJ.10-W2-9 “Delegation of services amongst ATSU’s”: PJ.09-W2-44 is considered as concept basis;
- SESAR Wave 3 PJ.32 “Virtual Centre”: PJ.09-W2-44 is considered as concept basis.

#### 4.1.5 Identification of the nature of the change

HP argument branch	Change & affected actors
1. ROLES & RESPONSIBILITIES	
1.1 ROLES & RESPONSIBILITIES	<p>The LTM (Local Traffic Manager) will replace the FMP with additional responsibilities and tools, working in close collaboration with the EAP role introduced in SESAR 1.</p> <p>CWP will be also involved in the INAP process, notably the PC through new interactions with the EAP, extending the PC’s situation awareness beyond the scope of his area of interest.</p> <p>The role of the Supervisor might be also affected by new coordination processes derived from INAP processes.</p>

	<p>The Enhanced DCB Collaborative decision making concept introduce the opportunity for the different stakeholder to express their interests and performance needs.</p> <p>The INAP should support the collaborative decision-making under consideration of the different stakeholder perspectives. Resolution can be delegated from Local ATFCM actors to other actors depending on the type of imbalance and all Stakeholders will be able to make counterproposals in order to better fit their needs.</p>
<p>1.2 OPERATING METHODS</p>	<p>The new operating methods introduce:</p> <ul style="list-style-type: none"> <li>• New methodology of Traffic Demand Forecast is proposed to the INAP actors. This methodology is based on an earlier detection and more accurate identification of all the possible imbalances that can appear. It allows local ATFCM to improve the detection of imbalances by adding probabilistic information and uncertainties quantification.</li> <li>• New methodologies based on the Imbalance Prediction Service monitors current and assesses future network imbalances (hotspots)</li> <li>• New methodologies based on the Predicted Workload and metrics at different period of time before entering into a sector improve the operator confidence in the information provided and should help them in making a decision at different period of time. It provided to local ATFCM the identification of the flights contributing the most to complexity within a specific airspace volume and timeframe and a comparison of the predicted complexity value and the actual complexity value.</li> <li>• New methodologies based on a generic HMI "The predicted workload Local Visualization" which is both applied and used by the actors at local and regional levels to represent the imbalance information concerning (Local Complexity &amp; Network consolidated complexity Combination of several methodologies (density, complexity, interferences)</li> <li>• New methodologies should quantify the uncertainties of the Demand Prediction based on severity value and the confidence index which indicate the level of confidence that this prediction will occur.</li> <li>• New methodologies for imbalance prediction based on new complexity indicators and finer adjustments of the cognitive model for complexity and workload assessments, with their associated confidence indexes.</li> </ul>

	<ul style="list-style-type: none"> <li>• The INAP role (encompassing LTM and EAP) will work from the planning phase to the execution phase, closing the gap between the current FMP and the CWP considered in the previous operating method.</li> <li>• New Spots categories (Hotspot, Optislot), allowing the introduction of different levels of priority.</li> <li>• The standard STAM will be extended to Smart Traffic Adjustment Measures, by adding Very short Term ATFCM Measures (VTAMs - encompassing proposals for adjustment in all 4 dimensions -vertical, lateral, and longitudinal plans; they will consist in RBT revisions requests, as FL capping, horizontal rerouting, Target Time allocation, or a combination of all).</li> <li>• Decision-making for imbalance resolution will be performed within a Collaborative Framework. That involves taking into account the reactionary delays, the local imbalances and the Preferences &amp; Priorities for the different ATM Stakeholders with the help of different systems.</li> <li>• AUs P&amp;P consideration by INAP actors when there is not delegation from INAP to APOC for hotspot resolution.</li> <li>• New methodologies based on consideration by the INAP of the airport impact severity information, for a flight, to propose DCB measures (e.g. STAMs and/or Target Times) and or negotiate trajectories.</li> </ul>
<p>1.3 TASKS</p>	<p>The concept introduces new tasks derived from:</p> <ul style="list-style-type: none"> <li>• HMI tools and features (physical and cognitive tasks)</li> <li>• New imbalance prediction methodologies</li> <li>• New catalogue of DCB measures</li> <li>• INAP actors coordination processes</li> <li>• The variety of Collaborative mechanisms</li> </ul>
<p>2. HUMAN &amp; SYSTEM</p>	
<p>2.1 ALLOCATION OF TASKS (HUMAN &amp; SYSTEM)</p>	<p>The actors performing the tasks will be assisted by:</p> <ul style="list-style-type: none"> <li>• Automated support for imbalance prediction, encompassing several methodologies (Entry/Occupancy counts, Workload, Complexity)</li> <li>• Automated support for hotspot declaration (NOP), analysis and resolution</li> <li>• What-if functionalities for DCB measure impact assessment</li> <li>• What-else capabilities for DCB alternate SBT/RBT optimising targeted Performance Indicators</li> </ul>

	<p>(imbalances figures, reactionary delay ...measure solution)</p> <ul style="list-style-type: none"> <li>• Network Consolidated Constraint (NCC) provision, automated tools to assess DCB measures and monitor execution against the predicted impact on network performance.</li> <li>• Network consolidated imbalances figures supporting actors to perform a network impact assessment evaluation</li> <li>• AU Preferences &amp; Priorities and counterproposals : information continuously expressed is provided to INAP actors from the Collaborative NOP.</li> </ul>
<p>2.2 PERFORMANCE OF TECHNICAL SYSTEM</p>	<p>The new allocation of tasks between the human and the machine will require high levels of performance of the technical systems in terms of:</p> <ul style="list-style-type: none"> <li>• Relevance and accuracy of the information provided, so the INAP actors are able to trust the new concept</li> <li>• Timeliness of the information provided, especially when coordination processes are needed.</li> </ul>
<p>2.3 HUMAN – MACHINE INTERFACE</p>	<p>The new allocation of tasks between the human and the machine might affect the INAP HMI in terms of:</p> <ul style="list-style-type: none"> <li>• Imbalance Prediction methodologies</li> <li>• What – if functionality</li> <li>• Coordination process and Measure Management (different status (draft, proposed, for coordination, coordinated, for implementation implemented, abandoned).</li> </ul> <p>A HMI should be developed based on the expectations of the users, at local and regional scales in order to facilitate the identification of hotspots and the decision making process:</p> <ul style="list-style-type: none"> <li>• Demand Prediction HMI: The occupancy values define the severity of the traffic demand and should allow actors to judge the severity of the traffic demand.</li> </ul> <p>HMI tool and functionalities should improve the operator situational awareness:</p> <ul style="list-style-type: none"> <li>• The predicted workload Local Visualization to represent the imbalance information concerning (Local Complexity &amp; Network consolidated complexity Combination of several methodologies (density, complexity, interferences)</li> <li>• Predicted Workload tool should propose to INAP useful features in order to filter complexity information by traffic flows and individual flights</li> </ul>

	<p>and complexity settings and configuration parameters</p> <ul style="list-style-type: none"> <li>HMI tool and features must be compliant with usability criteria HF principle.</li> </ul>
<b>3. TEAMS &amp; COMMUNICATION</b>	
<b>3.1 TEAM COMPOSITION</b>	<p>The team composition might be modified if LTM and EAP are not collapsed into a same actor.</p> <p>Note that EAP role does not necessarily imply a dedicated actor, as it will depend on local management of staff needs.</p>
<b>3.2 ALLOCATION OF TASKS</b>	<p>The concept might affect the allocation of tasks between the INAP actors when LTM and EAP are not collapsed into a unique actor. This task allocation is impacted due to the overlapping between the INAP actors time horizon.</p>
<b>3.3 COMMUNICATION</b>	<p>The concept introduces additional communication needs:</p> <ul style="list-style-type: none"> <li>between INAP actors (including coordination/communication needs with SUP and PC);</li> <li>between INAP actors, NM and AUs;</li> <li>between INAP actors and APOC, especially when hotspot resolution has been delegated.</li> </ul>
<b>4. HP RELATED TRANSITION FACTORS</b>	
<b>4.1 ACCEPTANCE &amp; JOB SATISFACTION</b>	<p>The automation introduced by the concept might impact on INAP actors acceptance and job satisfaction.</p>
<b>4.2 COMPETENCE REQUIREMENTS</b>	<p>The introduction of the concept might require specific competences requirements.</p>
<b>4.3 STAFFING REQUIREMENTS &amp; STAFFING LEVELS</b>	<p>Not impacted.</p>
<b>4.4. RECRUITMENT AND SELECTION</b>	<p>Not impacted.</p>
<b>4.5. TRAINING NEEDS</b>	<p>The introduction of the concept might require specific training needs.</p> <ul style="list-style-type: none"> <li><u>Need for training (new skills) INAP actor on new procedures.</u></li> <li><u>Need for training (new skills) Atco</u></li> <li><u>Training on new tool and features</u></li> </ul>

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

Arg.	Issue ID	HP issue / Benefit	HP/Valid. Obj. ID	HP validation objective	Recommended activities
Arg. 1.1.2: The description of roles & responsibilities cover all tasks to be performed by a human actor.	HFI_ARG1.1.2-PJ.09-W2-44-V3-001	<b>HP Issue:</b> The role and responsibilities of the planner controller might require further assessment in high traffic demand situations.	OBJ-PJ.09-W2-44-V3-VALP-HP-001	To clearly define and validate the roles and responsibilities of all the human actors impacted by the concept.	Real Time Simulation
Arg. 1.1.2: The description of roles & responsibilities cover all tasks to be performed by a human actor.	HFI_ARG1.1.2-PJ.09-W2-44-V3-002	<b>HP Issue:</b> The role of the Supervisor in terms of assessing future sector configurations and making decisions might require further assessment.	OBJ-PJ.09-W2-44-V3-VALP-HP-001	To clearly define and validate the roles and responsibilities of all the human actors impacted by the concept.	Real Time Simulation
Arg. 1.2.4: The content of operating methods is clear and consistent (in V1: non-contradictory)	HFI_ARG1.2.4-PJ.09-W2-44-V3-001	<b>HP Issue:</b> The operating methods related to the coordination between LTM/EAP and SUP using the automated support tool for the management of sector configurations is not clear enough.	OBJ-PJ.09-W2-44-V3-VALP-HP-002	To validate the operating method derived from the integration of DAC within the DCB process.	Real Time Simulation
Arg. 1.2.4: The content of operating methods is clear and consistent (in V1: non-contradictory)	HFI_ARG1.2.4-PJ.09-W2-44-V3-002	<b>HP Issue:</b> The negotiation part of the CDM process concerning the optimisation of DMA parameters is not complexity assessed since the complexity of counterproposals	OBJ-PJ.09-W2-44-V3-VALP-HP-003	To validate the operating method related to the consideration of DMA requests.	Real Time Simulation

Arg.	Issue ID	HP issue / Benefit	HP/Valid. Obj. ID	HP validation objective	Recommended activities
		including short and very short-term notice DMA requests has not been considered.			
Arg. 1.2.4: The content of operating methods is clear and consistent (in V1: non-contradictory)	HFI_ARG1.2.4-PJ.09-W2-44-V3-003	<b>HP Issue:</b> The operating methods related to the CDM process between more than one ANSP and NM is not clearly defined.	OBJ-PJ.09-W2-44-V3-VALP-HP-002	To validate the operating method derived from the integration of DAC within the DCB process.	Real Time Simulation
Arg. 1.2.4: The content of operating methods is clear and consistent (in V1: non-contradictory)	HFI_ARG1.2.4-PJ.09-W2-44-V3-004	<b>HP Issue:</b> The operating methods related to the ATCo traffic handover during sector configuration changes might not consider the timing required for sector change.	OBJ-PJ.09-W2-44-V3-VALP-HP-002	To validate the operating method derived from the integration of DAC within the DCB process.	Real Time Simulation
Arg. 1.2.4: The content of operating methods is clear and consistent (in V1: non-contradictory)	HFI_ARG1.2.4-PJ.09-W2-44-V3-005	<b>HP Issue:</b> The Supervisor operating methods derived from INAP processes in a DAC environment are not clearly defined.	OBJ-PJ.09-W2-44-V3-VALP-HP-002	To validate the operating method derived from the integration of DAC within the DCB process.	Real Time Simulation
Arg. 1.2.5: Operating methods can be followed in an accurate, efficient and	HFB_ARG1.2.5-PJ.09-W2-44-V3-001	<b>HP Benefit:</b> The consideration of different Key Performance Indicators for the implementation of demand and capacity measures	OBJ-PJ.09-W2-44-V3-VALP-HP-004	To validate the benefits of integrating Key Performance Indicators in the DCB decision-	Real Time Simulation

Arg.	Issue ID	HP issue / Benefit	HP/Valid. Obj. ID	HP validation objective	Recommended activities
timely manner.		might increase the efficiency of the different actors decision-making process.		making process.	
Arg. 1.2.5: Operating methods can be followed in an accurate, efficient and timely manner.	HFB_ARG1.2.5-PJ.09-W2-44-V3-002	<b>HP Benefit:</b> The integration of complexity within the sector design and sector configuration optimisation process might increase the efficiency of the solutions adopted and thus reduce the ATCo workload.	OBJ-PJ.09-W2-44-V3-VALP-HP-005	To validate the benefits of integrating complexity as part of the sector design and sector optimisation process.	Real Time Simulation
Arg. 1.3.4: The level of trust in the new concept/the new procedures is appropriate.	HFI_ARG1.3.4-PJ.09-W2-44-V3-001	<b>HP Issue:</b> ATCo trust in the concept and procedures, as well as situational awareness, might be impaired if sector shape and timing of sector configuration change is not properly addressed by the solutions taken the LTM/EAP.	OBJ-PJ.09-W2-44-V3-VALP-HP-006	To validate the concept and procedures in terms of ATCo trust and situational awareness.	Real Time Simulation
Arg. 1.3.5: Human actors can maintain a sufficient level of situation awareness.	HFI_ARG1.3.5-PJ.09-W2-44-V3-001	<b>HP Issue:</b> In a DAC environment, the continuous change of sector configuration or sector boundaries might lead to a loss of pilots situational awareness with regards to the	OBJ-PJ.09-W2-44-V3-VALP-HP-007	To validate the concept acceptance from the pilot situational awareness perspective.	As this issue is referring to pilots, in order to be able to assess it in a realistic environment, a RTS with cockpit simulator is

Arg.	Issue ID	HP issue / Benefit	HP/Valid. Obj. ID	HP validation objective	Recommended activities
		frequency they are on.			recommended.
Arg. 2.1.2: Changes to the task allocation between human and machine support human performance.	HFI_ARG2.1.2-PJ.09-W2-44-V3-001	<b>HP Issue:</b> When NM sends targets to local DAC, and local DAC has its own targets, if these targets are conflicting, they might be overlooked.	OBJ-PJ.09-W2-44-V3-VALP-HP-008	To validate the human actors performance derived from the change in task allocation between human and machine.	Real Time Simulation
Arg. 2.1.4: The level of workload (induced by the allocation of tasks between the human and the machine) is acceptable.	HFI_ARG2.1.4-PJ.09-W2-44-V3-001	<b>HP Issue:</b> The DAC algorithm result and/or the quick change of sector configuration and the related coordination effort and loss of ATCo situational awareness might result in an increase of ATCo mental workload.	OBJ-PJ.09-W2-44-V3-VALP-HP-009	To validate the concept and procedures in terms of ATCo workload.	Real Time Simulation
Arg. 2.1.4: The level of workload (induced by the allocation of tasks between the human and the machine) is acceptable.	HFI_ARG2.1.4-PJ.09-W2-44-V3-002	<b>HP Issue:</b> The sector configuration transition phase might lead to unacceptable levels of ATCo workload.	OBJ-PJ.09-W2-44-V3-VALP-HP-009	To validate the concept and procedures in terms of ATCo workload.	Real Time Simulation
Arg. 2.1.5: Human actors can acquire an adequate mental model	HFI_ARG2.1.5-PJ.09-W2-44-V3-001	<b>HP Issue:</b> When the sector designer/optimiser tool produces sectors that result	OBJ-PJ.09-W2-44-V3-	To validate the concept and procedures in	Real Time Simulation

Arg.	Issue ID	HP issue / Benefit	HP/Valid. Obj. ID	HP validation objective	Recommended activities
of the machine and its automated functions.		in conflicts between sectors and trajectories (e.g. conflicts close to boundaries, very short sector entry/exits, etc.), ATCo workload and potential for human error might increase.	VALP-HP-009	terms of ATCo workload.	
Arg. 2.1.6: The level of trust in automated functions is appropriate.	HFI_ARG2.1.6-PJ.09-W2-44-V3-001	<b>HP Issue:</b> The ATCo trust in concept support tools might not bring the solution expected benefits.	OBJ-PJ.09-W2-44-V3-VALP-HP-010	To validate the support tools in terms of ATCo trust.	Real Time Simulation
Arg. 2.2.1: The accuracy and timeliness of information provided by the system is adequate for carrying out the task.	HFI_ARG2.2.1-PJ.09-W2-44-V3-001	<b>HP Issue:</b> The provision of different information to the actors involved could lead to an increase in task workload due to additional coordination or even human errors in the decision making process.	OBJ-PJ.09-W2-44-V3-VALP-HP-011	To validate accuracy and timeliness of the information provided by the system.	Real Time Simulation
Arg. 2.3.6: The usability of the user interface (input devices, visual displays/output devices, alarm& alerts) is acceptable. [V1: AIR only]	HFI_ARG2.3.6-PJ.09-W2-44-V3-001	<b>HP Issue:</b> The usability of the sector designer and sector configuration tool might not bring the solution expected benefits.	OBJ-PJ.09-W2-44-V3-VALP-HP-012	To validate the support tools usability.	Real Time Simulation

Arg.	Issue ID	HP issue / Benefit	HP/Valid. Obj. ID	HP validation objective	Recommended activities
Arg. 2.3.6: The usability of the user interface (input devices, visual displays/output devices, alarm& alerts) is acceptable. [V1: AIR only]	HFI_ARG2.3.6-PJ.09-W2-44-V3-002	<b>HP Issue:</b> The usability of the ATCo support screen for the pre-notification of new sector borders might not bring the solution expected benefits.	OBJ-PJ.09-W2-44-V3-VALP-HP-012	To validate the support tools usability.	Real Time Simulation
Arg. 3.1.1: Changes to existing roles in the team are identified (including roles that become obsolete).	HFI_ARG3.1.1-PJ.09-W2-44-V3-001	<b>HP Issue:</b> The roles and responsibilities impacted by the concept, and in particular by the integration of ATFM, DAC and ATC within INAP, might not be clearly defined.	OBJ-PJ.09-W2-44-V3-VALP-HP-001	To clearly define and validate the roles and responsibilities of all the human actors impacted by the concept.	Real Time Simulation
Arg. 3.2.1: Changes to the task allocation between human actors do not lead to adverse effects on human tasks.	HFB_ARG3.2.1-PJ.09-W2-44-V3-001	<b>HP Benefit:</b> The provision of the What-If functionality for demand and capacity measures decision making might reduce LTM/EAP workload and increase the efficiency of the measures taken.	OBJ-PJ.09-W2-44-V3-VALP-HP-013	To validate the benefits provided by the What-If functionalities.	Real Time Simulation
Arg. 3.2.1: Changes to the task allocation between human actors do not lead to adverse	HFB_ARG3.2.1-PJ.09-W2-44-V3-002	<b>HP Benefit:</b> The provision of the What-Else functionality for demand and capacity measures decision making might reduce	OBJ-PJ.09-W2-44-V3-VALP-HP-014	To validate the benefits provided by the What-Else functionalities.	Expert Judgment Workshops

Arg.	Issue ID	HP issue / Benefit	HP/Valid. Obj. ID	HP validation objective	Recommended activities
effects on human tasks.		LTM/EAP workload and increase the efficiency of the measures taken.			
Arg. 3.2.2: The proposed task allocation between human actors is supported by technical systems/the HMI.	HFI_ARG3.2.2-PJ.09-W2-44-V3-001	<b>HP Issue:</b> The implementation of What-If functionalities might lead to LTM/EAP human errors if the simulation and operational environment are not clearly distinguished.	OBJ-PJ.09-W2-44-V3-VALP-HP-013	To validate the benefits provided by the What-If functionalities.	Real Time Simulation
Arg. 3.2.2: The proposed task allocation between human actors is supported by technical systems/the HMI.	HFI_ARG3.2.2-PJ.09-W2-44-V3-002	<b>HP Issue:</b> The LTM/EAP situational awareness and workload might be negatively impacted when a DMA is located too close to sector boundaries if the system do not notify them.	OBJ-PJ.09-W2-44-V3-VALP-HP-006	To validate the concept and procedures in terms of ATCo trust and situational awareness.	Real Time Simulation
Arg. 3.3.3: Changes in communication means & modalities are identified and acceptable.	HFB_ARG3.3.3-PJ.09-W2-44-V3-001	<b>HP Benefit:</b> The implementation of digital communication between LTM/EAP/SUP and executive and planner controller (hotspot information, demand and capacity measures information) might	OBJ-PJ.09-W2-44-V3-VALP-HP-006	To validate the concept and procedures in terms of ATCo trust and situational awareness.	Real Time Simulation

Arg.	Issue ID	HP issue / Benefit	HP/Valid. Obj. ID	HP validation objective	Recommended activities
		lead to improved ATCo situational awareness and reduced ATCo workload, in particular for the implementation of short-term measures by the EC/PC.			
Arg. 3.3.4: The communication load of team members is acceptable in normal and abnormal conditions and degraded mode of operations.	HFI_ARG3.3.4-PJ.09-W2-44-V3-001	<b>HP Issue:</b> The dynamicity of the DAC concept might increase the communication load, resulting in unacceptable levels of ATCo workload.	OBJ-PJ.09-W2-44-V3-VALP-HP-009	To validate the concept and procedures in terms of ATCo workload.	Real Time Simulation
Arg. 3.3.5: Team members can maintain a sufficient level of shared situation awareness.	HFI_ARG3.3.5-PJ.09-W2-44-V3-001	<b>HP Issue:</b> The implementation of DAC concept might result in team members (LTM/EAP/SUP/ATCo) not being able to maintain a sufficient level of team situational awareness.	OBJ-PJ.09-W2-44-V3-VALP-HP-015	To validate the concept and procedures in terms of INAP and ATC actors situational awareness.	Real Time Simulation
Arg. 3.3.5: Team members can maintain a sufficient level of shared situation awareness.	HFB_ARG3.3.5-PJ.09-W2-44-V3-001	<b>HP Benefit:</b> The full concept integration within the Network Operations Plan via B2B services might increase the situational awareness of all the relevant actors	OBJ-PJ.09-W2-44-V3-VALP-HP-015	To validate the concept and procedures in terms of INAP and ATC actors situational awareness.	Real Time Simulation

Arg.	Issue ID	HP issue / Benefit	HP/Valid. Obj. ID	HP validation objective	Recommended activities
		involved in DCB processes.			
Arg. 3.3.5: Team members can maintain a sufficient level of shared situation awareness.	HFB_ARG3.3.5-PJ.09-W2-44-V3-002	<b>HP Benefit:</b> The provision of the Network Impacted Assessment for the solutions taken by the local LTM/EAP might increase the situational awareness of all the relevant actors and the efficiency of the measures taken.	OBJ-PJ.09-W2-44-V3-VALP-HP-015	To validate the concept and procedures in terms of INAP and ATC actors situational awareness.	Real Time Simulation
Arg. 4.1.2: The impact of changes on the job satisfaction of affected human actors has been considered.	HFI_ARG4.1.2-PJ.09-W2-44-V3-001	<b>HP Issue:</b> The proposed changes in the operating methods can have an impact on job satisfaction.	OBJ-PJ.09-W2-44-V3-VALP-HP-016	To identify the impact of the proposed changes in the operating methods on job satisfaction.	Real Time Simulation
Arg. 4.2.1: Knowledge, skill and experience requirements for human actors have been identified.	HFI_ARG4.2.1-PJ.09-W2-44-V3-001	<b>HP Issue:</b> Knowledge, skills and experience requirements for conducting the new operating methods might be underestimated (e.g. highly specialised vs. generic training).	OBJ-PJ.09-W2-44-V3-VALP-HP-017	To identify the knowledge, skill and experience requirements for all the impacted human actors.	Real Time Simulation
Arg. 4.5.1: The content of training for each actor group is	HFI_ARG4.5.1-PJ.09-W2-44-V3-001	<b>HP Issue:</b> If the ATCos are not sufficiently trained for the new sectors, their workload might increase and the benefit of the	OBJ-PJ.09-W2-44-V3-VALP-HP-018	To identify the content of the ATCo training for concept implementation.	Real Time Simulation

Arg.	Issue ID	HP issue / Benefit	HP/Valid. Obj. ID	HP validation objective	Recommended activities
specified. (V3 only)		concept might not be reached.			

### 4.3 Step 3 Improve and validate the concept

#### 4.3.1 Description of HP activities conducted

HP activity	By when
Initial Scoping and Change Assessment (HP/Safety)	October 2020
EXE-PJ.09-W2-44-V3-VALP-001 - Demand and capacity measures for tactical imbalance resolution based on complexity.	November – December 2021
EXE-PJ.09-W2-44-V3-VALP-002 - Extension of the DAC and DCB planning process from D-1 to D-Ops (-3 hours) at local and network level	October 2022
EXE-PJ.09-W2-44-V3-VALP-003 - Swim INAP Services 2020	April 2022
EXE-PJ.09-W2-44-V3-VALP-004 - Integrated DCB/DAC Planning within INAP timeframe using iACM (NATS/Indra)	March 2022
EXE-PJ.09-W2-44-V3-VALP-005 - DAC integration into DCB and ATC processes	September 2022
EXE-PJ.09-W2-44-V3-VALP-006 - Demand measures for tactical DCB imbalance resolution based on complexity assessment.	June 2021 – October 2022

**Table 3: Table of proposed HP activities and their priority**

ACTIVITY 1.	Initial Scoping and Change Assessment
Description	The objective of this initial stakeholder workshop is to conduct the scoping and change assessment of PJ.09-W2-44 and to set up the reference and solution scenario to capture essential information about the project from an HF

ACTIVITY 1.	Initial Scoping and Change Assessment
	<p>perspective. The ultimate goal is to identify the changes and impacts on Human Performance and Safety introduced by PJ.09-W2-44 concept.</p> <p>The workshop will address all the HP arguments defined in [1].</p> <p>The workshop will count with experts from the HP and Safety domain, concept experts, validation experts and operational experts.</p>
HP Objectives	<ul style="list-style-type: none"> <li>To set up the solution reference and solution scenario.</li> <li>To identify the changes and impact on Human Performance and Safety introduced by the PJ.09-W2-44 concept.</li> </ul>
Tool selected out of the HP repository	N/A
Planning and Approach	<p>The workshop will be divided into three different parts to cover: a) the common areas for Safety and HP; b) the HP area; and c) the Safety area. Each one of these parts will be led by the corresponding task leader.</p> <p>The workshop will be based on the completion of the Scoping and Change Assessment Template.</p>
Timeline	October 2020

Table 4: Description of Activity 1

ACTIVITY 2	EXE-PJ.09-W2-44-V3-VALP-001
Description	See Section 4.5 PJ.09-W2-44-V3 Final VALP [3].
HP objectives	OBJ-PJ09W2S44-V3-VALP.025: To investigate the impact on human performance of Dynamic Airspace Configurations integrated with INAP
Tool selected out of the HP repository	Bedford Scale, SASHA, SATI, Observation, Debriefing, Usability Scale
Planning and Approach	Human-In-The-Loop Real Time Simulation
Timeline	November – December 2022

Table 5: Description of Activity 2

ACTIVITY 3	EXE-PJ.09-W2-44-V3-VALP-002
Description	See Section 4.5 PJ.09-W2-44-V3 Final VALP [3].
HP objectives	OBJ-PJ09W2S44-V3-VALP.025: To investigate the impact on human performance of Dynamic Airspace Configurations integrated with INAP

Tool selected out of the HP repository	Bedford Scale, SASHA, SATI, Observation, Debriefing, Usability Scale
Planning and Approach	Human-In-The-Loop Real Time Simulation
Timeline	October 2022

**Table 6: Description of Activity 3**

<b>ACTIVITY 4</b>	<b>EXE-PJ.09-W2-44-V3-VALP-003</b>
Description	See Section 4.5 PJ.09-W2-44-V3 Final VALP [3].
HP objectives	OBJ-PJ09W2S44-V3-VALP.025: To investigate the impact on human performance of Dynamic Airspace Configurations integrated with INAP
Tool selected out of the HP repository	Bedford Scale, SASHA, SATI, Observation, Debriefing, Usability Scale
Planning and Approach	Human-In-The-Loop Real Time Simulation
Timeline	April 2022

**Table 7: Description of Activity 4**

<b>ACTIVITY 5</b>	<b>EXE-PJ.09-W2-44-V3-VALP-004</b>
Description	See Section 4.5 PJ.09-W2-44-V3 Final VALP [3].
HP objectives	OBJ-PJ09W2S44-V3-VALP.001 OBJ-PJ09W2S44-V3-VALP.003-011 OBJ-PJ09W2S44-V3-VALP.014-15
Tool selected out of the HP repository	Bedford Scale, SASHA, SATI, Observation, Debriefing, Usability Scale
Planning and Approach	Human-In-The-Loop Real Time Simulation
Timeline	March 2022

**Table 8: Description of Activity 5**

<b>ACTIVITY 6</b>	<b>EXE-PJ.09-W2-44-V3-VALP-005</b>
Description	See Section 4.5 PJ.09-W2-44-V3 Final VALP [3].

HP objectives	OBJ-PJ09W2S44-V3-VALP.025: To investigate the impact on human performance of Dynamic Airspace Configurations integrated with INAP
Tool selected out of the HP repository	Bedford Scale, SASHA, SATI, Observation, Debriefing, Usability Scale
Planning and Approach	Human-In-The-Loop Real Time Simulation
Timeline	September 2022

**Table 9: Description of Activity 6**

<b>ACTIVITY 7</b>	<b>EXE-PJ.09-W2-44-V3-VALP-006</b>
Description	See Section 4.5 PJ.09-W2-44-V3 Final VALP [3].
HP objectives	OBJ-PJ09W2S44-V3-VALP.025: To investigate the impact on human performance of Dynamic Airspace Configurations integrated with INAP
Tool selected out of the HP repository	Bedford Scale, SASHA, SATI, Observation, Debriefing, Usability Scale
Planning and Approach	Human-In-The-Loop Real Time Simulation
Timeline	June 2021 - October 2022

**Table 10: Description of Activity 7**

## 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
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Arg. 1.1.2: The description of roles & responsibilities cover all tasks to be performed by a human actor.

HFI_ARG1.1.2-PJ.09-W2-44-V3-001	HP Issue: The role and responsibilities of the planner controller might require further assessment in high traffic demand situations.	Open	OBJ-PJ.09-W2-44-V3-VALP-HP-001	RTS	The role of the planner controller is still to be further analysed. Many of the planner controller responsibilities were not simulated due to the lack of collateral sectors, towers and ACCs for coordination. The activity of the planner controller in very high demand and complexity	REC_PJ.09-W2-44-V3-001	
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Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
					scenarios is paramount.		
HFI_ARG1.1.2-PJ.09-W2-44-V3-002	HP Issue: The role of the Supervisor in terms of assessing future sector configurations and making decisions might require further assessment.	Closed	OBJ-PJ.09-W2-44-V3-VALP-HP-001	RTS	The role of the supervisor has been clearly defined and validated to the extent allowed by the simulations set up.		
Arg. 1.2.4: The content of operating methods is clear and consistent (in V1: non-contradictory).							
HFI_ARG1.2.4-PJ.09-W2-44-V3-001	HP Issue: The operating methods related to the coordination between LTM/EAP and SUP using the automated support tool for the management of	Open	OBJ-PJ.09-W2-44-V3-VALP-HP-002	RTS	This issue has been partially achieved. Even though the support tool for LTM/EAP and SUP was tested, the tool did not implement coordination mechanisms.	REC_PJ.09-W2-44-V3-002	

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
	sector configurations is not clear enough.						
HFI_ARG1.2.4-PJ.09-W2-44-V3-002	HP Issue: The negotiation part of the CDM process concerning the optimisation of DMA parameters is not complexity assessed since the complexity of counterproposals including short and very short-term notice DMA requests has not been considered.	Closed	OBJ-PJ.09-W2-44-V3-VALP-HP-003	RTS	The refined CDM procedures are considered as useful for all actors and allow them to perform their tasks. All actors consider that the roles and responsibilities relating to the DAC CDM process are clear and consistently defined. Future training needs should be taken into account.	REC_PJ.09-W2-44-V3-003	

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
HFI_ARG1.2.4-PJ.09-W2-44-V3-003	HP Issue: The operating methods related to the CDM process between more than one ANSP and NM is not clearly defined.	Open	OBJ-PJ.09-W2-44-V3-VALP-HP-002	RTS	The coordination between different ANSPs and NM has not been assessed, only between ACCs of the same ANSP.		
HFI_ARG1.2.4-PJ.09-W2-44-V3-004	HP Issue: The operating methods related to the ATCo traffic handover during sector configuration changes might not consider the timing required for sector change.	Closed	OBJ-PJ.09-W2-44-V3-VALP-HP-002	RTS	Traffic handover procedure was reported to be clear and efficient. No added issues were identified.		
HFI_ARG1.2.4-PJ.09-W2-44-V3-005	HP Issue: The Supervisor operating methods derived from INAP processes in a DAC environment	Open	OBJ-PJ.09-W2-44-V3-	RTS	The coordination aspects of the SUP operating method were not tested. Therefore, the		

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
	are not clearly defined.		VALP-HP-002		issue is partially addressed.		

Arg. 1.2.5: Operation methods can be followed in an accurate, efficient and timely manner

HFB_ARG1.2.5-PJ.09-W2-44-V3-001	HP Benefit: The consideration of different Key Performance Indicators for the implementation of demand and capacity measures might increase the efficiency of the different actors decision-making process.	Open	OBJ-PJ.09-W2-44-V3-VALP-HP-004	RTS	The inclusion of KPIs for LTM/EAP/SUP assessment in the implementation of demand and capacity measures was not tested.		
HFB_ARG1.2.5-PJ.09-W2-44-V3-002	HP Benefit: The integration of complexity within the sector design and sector configuration	Closed	OBJ-PJ.09-W2-44-V3-	RTS	The inclusion of complexity assessment in the sector design and optimisation		

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
	optimisation process might increase the efficiency of the solutions adopted and thus reduce the ATCo workload.		VALP-HP-005		process has been proven to increase the efficiency of the solutions adopted and to better distribute the ATCo workload.		
Arg. 1.3.4: The level of trust in the new concept/the new procedures is appropriate.							
HFI_ARG1.3.4-PJ.09-W2-44-V3-001	HP Issue: ATCo trust in the concept and procedures, as well as situational awareness, might be impaired if sector shape and timing of sector configuration change is not properly addressed by the solutions taken the LTM/EAP.	Closed	OBJ-PJ.09-W2-44-V3-VALP-HP-006	RTS	The level of trust experienced by the ATCos in terms of concept and procedures was judged as sufficient.		

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
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Arg. 1.3.5: Human actors can maintain a sufficient level of situation awareness.

HFI_ARG1.3.5-PJ.09-W2-44-V3-001	HP Issue: In a DAC environment, the continuous change of sector configuration or sector boundaries might lead to a loss of pilots situational awareness with regards to the frequency they are on.	Open	OBJ-PJ.09-W2-44-V3-VALP-HP-007	RTS	Even though pilots have not been tested in any of the exercises, pseudopilots feedback suggested that for the procedures put in place, frequency issues should not arise.	REC_PJ.09-W2-44-V3-004	
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Arg. 2.1.2: Changes to the task allocation between human and machine support human performance.

HFI_ARG2.1.2-PJ.09-W2-44-V3-001	HP Issue: When NM sends targets to local DAC, and local DAC has its own targets, if these targets are conflicting they might be overlooked.	Open	OBJ-PJ.09-W2-44-V3-VALP-HP-008	RTS	This part of the concept was not addressed.		
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Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
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Arg. 2.1.4: The level of workload (induced by the allocation of tasks between the human and the machine) is acceptable.

HFI_ARG2.1.4-PJ.09-W2-44-V3-001	HP Issue: The DAC algorithm result and/or the quick change of sector configuration and the related coordination effort and loss of ATCo situational awareness might result in an increase of ATCo mental workload.	Closed	OBJ-PJ.09-W2-44-V3-VALP-HP-009	RTS	The results obtained show that the level of workload remains within acceptable levels. Some improvements in the DAC algorithm have been identified.	REC_PJ.09-W2-44-V3-005	REQ_PJ.09-W2-44-V3-001
HFI_ARG2.1.4-PJ.09-W2-44-V3-002	HP Issue: The sector configuration transition phase might lead to unacceptable levels of ATCo workload.	Closed	OBJ-PJ.09-W2-44-V3-VALP-HP-009	RTS	The results obtained show that the level of workload remains within acceptable levels		

Arg. 2.1.5: Human actors can acquire an adequate mental model of the machine and its automated functions.

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
HFI_ARG2.1.5-PJ.09-W2-44-V3-001	HP Issue: When the sector designer/optimiser tool produces sectors that result in conflicts between sectors and trajectories (e.g. conflicts close to boundaries, very short sector entry/exits, etc.), ATCo workload and potential for human error might increase.	Closed	OBJ-PJ.09-W2-44-V3-VALP-HP-009	RTS	Results obtained show that these kind of issues should be taken into account in the designing phase of the DAC algorithm.		
Arg. 2.1.6: The level of trust in automated functions is appropriate.							
HFI_ARG2.1.6-PJ.09-W2-44-V3-001	HP Issue: The ATCo trust in concept support tools might not bring the solution expected benefits.	Closed	OBJ-PJ.09-W2-44-V3-VALP-HP-010	RTS	The level of trust in concept support tools has been demonstrated as acceptable.		

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
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Arg. 2.2.1: The accuracy and timeliness of information provided by the system is adequate for carrying out the task.

HFI_ARG2.2.1-PJ.09-W2-44-V3-001	HP Issue: The provision of different information to the actors involved could lead to an increase in task workload due to additional coordination or even human errors in the decision making process.	Closed	OBJ-PJ.09-W2-44-V3-VALP-HP-011	RTS	The timeliness and accuracy of the information provided to the involved actors has been demonstrated to be sufficient.		
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Arg. 2.3.6: The usability of the user interface (input devices, visual displays/output devices, alarm& alerts) is acceptable. [V1: AIR only]

HFI_ARG2.3.6-PJ.09-W2-44-V3-001	HP Issue: The usability of the sector designer and sector configuration tool might not bring the solution expected benefits.	Closed	OBJ-PJ.09-W2-44-V3-VALP-HP-012	RTS	The conclusions of the post-exercise questionnaires and debriefings showed that the tools were seen as suitable for supporting a		
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Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
					combined DAC/DCB process allowing for a smooth negotiation of counter proposals for optimizing the initial request among the actors.		
HFI_ARG2.3.6-PJ.09-W2-44-V3-002	HP Issue: The usability of the ATCo support screen for the pre-notification of new sector borders might not bring the solution expected benefits.	Closed	OBJ-PJ.09-W2-44-V3-VALP-HP-012	RTS	The usability of the tools has been proved as acceptable.		
Arg. 3.1.1: Changes to existing roles in the team are identified (including roles that become obsolete).							
HFI_ARG3.1.1-PJ.09-W2-44-V3-001	HP Issue: The roles and responsibilities impacted by the	Closed	OBJ-PJ.09-W2-44-	RTS	Roles and responsibilities have been clearly		

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
	concept, and in particular by the integration of ATFM, DAC and ATC within INAP, might not be clearly defined.		V3-VALP-HP-001		defined and documented.		

Arg. 3.2.1: Changes to the task allocation between human actors do not lead to adverse effects on human tasks.

HFB_ARG3.2.1-PJ.09-W2-44-V3-001	HP Benefit: The provision of the What-If functionality for demand and capacity measures decision making might reduce LTM/EAP workload and increase the efficiency of the measures taken.	Closed	OBJ-PJ.09-W2-44-V3-VALP-HP-013	RTS	What-if has been proven to be useful and efficient, allowing the exploration of several options before implementation.		
HFB_ARG3.2.1-PJ.09-W2-44-V3-002	HP Benefit: The provision of the What-Else	Open	OBJ-PJ.09-W2-44-	RTS	What-else functionalities not implemented.		

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
	functionality for demand and capacity measures decision making might reduce LTM/EAP workload and increase the efficiency of the measures taken.		V3-VALP-HP-014				
Arg. 3.2.2: The proposed task allocation between human actors is supported by technical systems/the HMI.							
HFI_ARG3.2.2-PJ.09-W2-44-V3-001	HP Issue: The implementation of What-If functionalities might lead to LTM/EAP human errors if the simulation and operational environment are not clearly distinguished.	Closed	OBJ-PJ.09-W2-44-V3-VALP-HP-013	RTS	What-if tools clearly differentiate between simulation and operational environments		

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
HFI_ARG3.2.2-PJ.09-W2-44-V3-002	HP Issue: The LTM/EAP situational awareness and workload might be negatively impacted when a DMA is located too close to sector boundaries if the system do not notify them.	Closed	OBJ-PJ.09-W2-44-V3-VALP-HP-006	RTS	No issues were reported on this matter. The concept and procedures in place have been demonstrated to be sufficient.		
Arg. 3.3.3: Changes in communication means & modalities are identified and acceptable.							
HFB_ARG3.3.3-PJ.09-W2-44-V3-001	HP Benefit: The implementation of digital communication between LTM/EAP/SUP and executive and planner controller (hotspot information, demand and capacity measures	Open	OBJ-PJ.09-W2-44-V3-VALP-HP-006	RTS	Communication between different actors has been partially addressed. Further analysis is required.		

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
	information) might lead to improved ATCo situational awareness and reduced ATCo workload, in particular for the implementation of short-term measures by the EC/PC.						

Arg. 3.3.4: The communication load of team members is acceptable in normal and abnormal conditions and degraded mode of operations.

HFI_ARG3.3.4-PJ.09-W2-44-V3-001	HP Issue: The dynamicity of the DAC concept might increase the communication load, resulting in unacceptable levels of ATCo workload.	Closed	OBJ-PJ.09-W2-44-V3-VALP-HP-009	RTS	Level of communication load has been demonstrated as acceptable.		
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Arg. 3.3.5: Team members can maintain a sufficient level of shared situation awareness.

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
HFI_ARG3.3.5-PJ.09-W2-44-V3-001	HP Issue: The implementation of DAC concept might result in team members (LTM/EAP/SUP/ATCo) not being able to maintain a sufficient level of team situational awareness.	Closed	OBJ-PJ.09-W2-44-V3-VALP-HP-015	RTS	System support has resulted in positive levels of team situational awareness.		
HFB_ARG3.3.5-PJ.09-W2-44-V3-001	HP Benefit: The full concept integration within the Network Operations Plan via B2B services might increase the situational awareness of all the relevant actors involved in DCB processes.	Open	OBJ-PJ.09-W2-44-V3-VALP-HP-015	RTS	Benefit partially demonstrated. No full integration of B2B services with regards to new sectorisation changes	REC_PJ.09-W2-44-V3-006	

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
HFB_ARG3.3.5-PJ.09-W2-44-V3-002	HP Benefit: The provision of the Network Impacted Assessment for the solutions taken by the local LTM/EAP might increase the situational awareness of all the relevant actors and the efficiency of the measures taken.	Open	OBJ-PJ.09-W2-44-V3-VALP-HP-015	RTS	Network Impact Assessment benefits not fully demonstrated; further analysis is required.	REC_PJ.09-W2-44-V3-007	
Arg. 4.1.2: The impact of changes on the job satisfaction of affected human actors has been considered.							
HFI_ARG4.1.2-PJ.09-W2-44-V3-001	HP Issue: The proposed changes in the operating methods can have an impact on job satisfaction.	Closed	OBJ-PJ.09-W2-44-V3-VALP-HP-016	RTS	Job satisfaction maintained.		
Arg. 4.2.1: Knowledge, skill and experience requirements for human actors have been identified.							

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
HFI_ARG4.2.1-PJ.09-W2-44-V3-001	HP Issue: Knowledge, skills and experience requirements for conducting the new operating methods might be underestimated (e.g. highly specialised vs. generic training).	Open	OBJ-PJ.09-W2-44-V3-VALP-HP-017	RTS	Not addressed		REQ_PJ.09-W2-44-V3-002
Arg. 4.5.1: The content of training for each actor group is specified. (V3 only)							
HFI_ARG4.5.1-PJ.09-W2-44-V3-001	HP Issue: If the ATCos are not sufficiently trained for the new sectors, their workload might increase and the benefit of the concept might not be reached.	Open	OBJ-PJ.09-W2-44-V3-VALP-HP-018	RTS	Not addressed		REQ_PJ.09-W2-44-V3-003

Table 11: Summary of the HP results and recommendations/ requirements for each identified issue & related argument

### 4.4.2 Maturity of the Solution

<b>Maturity checklist for finalising the V3 assessment</b>			
<b>ID</b>	<b>Question</b>	<b>Answer</b>	<b>Comments</b>
1	Has a Human Performance Assessment Report been completed? Have all relevant arguments been addressed and appropriately supported?	Yes	Refer to section 4.4.1
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)?	No	Lack of proper Argument 4 assessment
3	Have all the parts of the solution/concept been considered?	No	What-else and KPI integration into decision-making not addressed
4	Have potential interactions with related projects/concepts been considered and addressed?	Yes	Refer to section 2.2.
5	Is the level of human performance needed to achieve the desired system performance for the proposed solution consistent with human capabilities?	Yes	Refer to section 4.4.1
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 section 4.4.1
7	Has the proposed solution been tested with end-users and under sufficiently realistic conditions, including abnormal and degraded conditions?	No	Abnormal and degraded conditions not addressed.
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 section 4.4.1
9	Have all relevant SESAR documentation been updated according to the HP activities outcomes (OSED, SPR)?	Yes	See OSED and VALR.
10	Do the outcomes satisfy the HP issues/benefits in order to reach the expected KPA?	Yes	Refer to section 4.4.1

11	Have HP recommendations and HP requirements correctly been considered in HMI design, procedures/documentation and training?	Yes	Refer to section 4.4.1
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?	No	Lack of proper Arg. 4 assessment
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	Lack of proper Arg. 4 assessment
14	Has the next V-phase sufficiently been prepared (additional testing conditions, open HP issues to be addressed)?	Yes	Refer to Appendix A.

## 5 References

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### Human Performance

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- [1] SESAR Human Performance Assessment Process V1 to V3 – including VLD. Edition 00.03.00.

### PJ.09-W2-44

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- [2] SESAR Solution PJ.09-W2-44 SPR INTEROP OSED.
- [3] PJ.09-W2-44-V3 Final VALP – Part I.
- [4] PJ.09-W2-44-V3 Final VALP – Part IV Human Performance Assessment Plan.

## Appendix A – HP Recommendations Register

HP Recommendations Register									
Reference	Type of recommendation	Recommendation	Rationale	Assessment source + Reference report	Scope	Concept/solution involved	Recommendation status	Rationale in case of rejection	Comments
REC_PJ.09-W2-44-V3-001	New objective	It is recommended to further explore the role of the planner controller in high demand and complexity scenarios.	The role of the planner controller in high demand and complexity scenarios has not been fully analysed.	PJ.09-W2-44 V3 VALR	Ground	DCB	Accepted		
REC_PJ.09-W2-44-V3-002	New objective	It is recommended to further investigate the digital coordination between the different actors	The simulation set up did not allow to fully analyse the digital coordination between actors.	PJ.09-W2-44 V3 VALR	Ground	DCB	Accepted		

REC_PJ.09-W2-44-V3-003	New objective	It is recommended to further consider the training needs related to the CDM processes linked to the optimisation of DMAs.	The training needs have not been fully identified at the required level (V3)	PJ.09-W2-44 V3 VALR	Ground	DCB	Accepted		
REC_PJ.09-W2-44-V3-004	New objective	It is recommended to assess DAC environment in real operational context with pilots before deployment	Pilots have not been considered as part of the validation. Further analysis is recommended prior deployment.	PJ.09-W2-44 V3 VALR	Ground/Air	DCB	Accepted		
REC_PJ.09-W2-44-V3-005	New objective	It is recommended that the DAC algorithm could be further exploited with refinements better taking into account the operational criteria for the	Recommendation based on operational staff's feedback.	PJ.09-W2-44 V3 VALR	Ground	DCB	Accepted		

		new shapes calculation, allowing a better distribution of traffic load over the new sectors and better shapes, more beneficial from the point of view of the SA.							
REC_PJ.09-W2-44-V3-006	New objective	It is recommended to further explore the integration of NM B2B services for new sector configuration creation.	Not addressed.	PJ.09-W2-44 V3 VALR	Ground	DCB	Accepted		
REC_PJ.09-W2-44-V3-007	New objective	It is recommended to further explore the benefits of local actors performing Network Impact Assessment.	Not addressed.	PJ.09-W2-44 V3 VALR	Ground	DCB	Accepted		

Table 12: HP recommendations



## Appendix B – HP Requirements Register

HP Requirements Register									
Reference	Type of requirement	Requirement	Rationale	Assessment source + Reference report if available	Scope	Concept/solution involved	Requirement status	Rationale in case of rejection	Comments
REQ_PJ.09-W2-44-V3-001	System design	The DAC algorithm shall integrate operational criteria when defining new sector shapes.	Requirement based on operational staff's feedback.	PJ.09-W2-44 V3 VALR	Ground	DCB	To be analysed		
REQ_PJ.09-W2-44-V3-002	Other	Knowledge, skill and experience requirements shall be identified before the implementation of the concept.	Requirement based on deployment needs and HP reference material	PJ.09-W2-44 V3 VALR	Ground	DCB	To be analysed		

REQ_PJ.09-W2-44-V3-003	Training	Training requirements per actor group shall be identified before the implementation of the concept.	Requirement based on deployment needs and HP reference material	PJ.09-W2-44 V3 VALR	Ground	DCB	To be analysed		
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**Table 13: HP Requirements**

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