SESAR 2020 Solution 10-W2-93 SPR-INTEROP/OSED for V3 - Part IV - Human Performance Assessment Report

DeliverableID	D3.2.030
Dissemination Level:	PU
ProjectAcronym	PROSA
Grant:	874464
Call:	H2020-SESAR-2019-1
Topic:	PJ10-W2 Separation Management and Controllers Tools
Consortium coordinator:	DFS
Edition date:	26th May 2023
Edition:	01.00.01
Template Edition	02.00.05

Authoring & Approval

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Frequentis	10.02.2023
ENAV	10.02.2023
Naviair	13.02.2023
NATS	13.02.2023
DSNA	13.02.2023
Leonardo	13.02.2023
Hungarocontrol	13.02.2023

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Rejected By - Representatives of beneficiaries involved in the project

Beneficiary	Date
none	

Document History

Edition	Date	Status	Beneficiary	Justification
00.00.01	30/11/2021	Draft	ENAV	Creation of the document
00.00.02	24/01/2022	Draft	ENAV	Document update
00.00.03	02/02/2022	Draft	DFS ENAV	Document updated considering comments received after internal review
00.00.04	14/02/2022	Draft	ENAV	Document aligned with new template
00.00.05	18/02/2022	Version for delivery	ENAV	Document ready for delivery
00.00.06	21/12/2022	Updated Version	ENAV Skyguide PANSA	Document updated with exercises results
00.00.07	31/01/2023	Version for delivery	ENAV DFS	Document aligned with new template and comments
00.01.00	**06/02/2023**	**Final Version**	**ENAV**	**Sent out for approvals**
00.01.01	**13/02/2023**	**Final**	**ENAV**	**Final version for submission to the SJU**
01.00.00	**24.02.2023**	**Approved**	**DFS**	**Approved by the SJU**
01.00.01	**26.05.2023**	**Final**	**DFS**	**Final version for submission to SJU after Maturity Gate**

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PROSA

DELEGATION OF ATM SERVICES PROVISION AMONG ATSUS

Abstract

This document contains the Human Performance (HP) assessment report for the PJ.10-W2-93 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 V3-phase.

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Table of Contents

List of Tables

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List of Figures

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1 Executive Summary

This document provides the Human Performance Validation Plan for PJ.10-W2-93 "Delegation of ATM services provision among ATSUs" for V3 target maturity level in the context of SESAR2020 Wave 2. This V3 OSED Part IV describes the following operational use cases:

- Delegation of ATM services provision at night and

- Delegation of ATM services provision following abnormal conditions (ATSU contingency).

The concept elements (in terms of OI steps) that are intended to be validated within the scope of this validation plan are provided below:

> • SDM-0217 "Delegation of ATM services provision among ATSUs" (Initial maturity level: V2; Target maturity level: V3)

The HP Assessment Report ensures that V3 HP requirements, recommendations and V3 HP aspects have been identified and considered for the operational and technical development of the **SESAR Solution PJ.10-W2-Solution 93 Delegation of ATM services provision among ATSUs**, based on the HP Assessment Process methodology. The HP Assessment Report is built on the structure of the HP Arguments which are "HP claims that need to be proven", according to the HP Reference Material. In a first step – the scoping and change assessment- the arguments that are relevant for the concept were identified.

Following arguments were identified as being relevant for the concept:

- **Argument 1**: The role of the human is considered consistent with human capabilities and limitations.

- **Argument 2**: Technical systems support the human actors in performing their tasks.

- **Argument 3**: Team structures and team communication support the human actors in performing their tasks.

- **Argument 4**: Human Performance related transition factors are considered.

The solution PJ10.93 was focused on the delegation of ATM service provision between ATSUs and its operational concept PJ10.W2 Sol 93 ATM Solution OSED V3 suggested to validate the concept in difference traffic and airspace environments, through operational use cases detailed in the OSED Part I. Concerning the Operational concept tested (detailed in the PJ10.W2 Sol 93 ATM Solution OSED V3), a big majority of them were implemented in one or another validation exercise. Finally, the acceptance from the involved ATCO communities of the delegation procedures, is another argument for the maturity V3 of the solution PJ10.93.

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2 Introduction

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 in order to derive the HP assessment related to SESAR Solution PJ.10-W2-Solution 93 Delegation of ATM services provision among ATSUs including requirements and recommendations.

In the same time, the document will conclude on the level of HP maturity of the concept at this stage of the project, detailing requirements and recommendations based on the findings.

2.2 Intended readership

The intended audience for this document is the team members of PJ.10-W2-Solution 93, including other PJ.10-W2 Solutions, in particular:

- PJ.10-W2-Solution 73 IFAV

For the V3 phase, in particular input from the following SESAR Solutions is expected:

- PJ.09-W2-Solution 44 Dynamic Airspace Configuration

- PJ.32-W3 Virtual Centre

- PJ33-W3 FALCO - Flexible ATCO Endorsement and LDACS Complement

And following transverse and federating projects:

- PJ.19

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2.3 Structure of the document

The Human Performance Assessment Report contains 5 Chapters:

- Chapter 1 - contains an executive summary which gives information about the purpose and scope of the validation exercise.

- Chapter 2 - describes the purpose and the scope of the document, introducing the intended readership and entails a list of acronyms and terminology.

- Chapter 3 - provides information with regard to the HP Assessment Process.

- Chapter 4 - in line with the HP reference material, it describes the 4 steps defined in the HP Assessment Process:

  o Step 1: Understand the ATM Concept

  o Step 2: Understand the HP Implications

  o Step 3: Improve and validate the concept

  o Step 4: Collate findings & conclude on transition to the next V-phase.

- Chapter 5 - is intended to include all relevant reference material as well as additional information in the Appendixes:

  o Appendix A: Additional HP activities conducted

  o Appendix B: HP recommendations Register

  o Appendix C: HP Requirements Register

  o Appendix D: HP Log

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.

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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 1111: Acronyms and terminology

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3 The Human Performance Assessment Process: Objective and Approach

The purpose of the HP assessment process described in detail in **Error! Reference source not found.Error! Reference source not found.**SESAR Human Performance Assessment Process V1 to V3 including VLDs is to ensure that HP aspects related to SESAR 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.

The HP assessment process is a four-step process. Figure 1111: Steps of the HP assessment processFigure 11: Steps of the HP assessment processFigure 1: Steps of the HP assessment process 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 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.
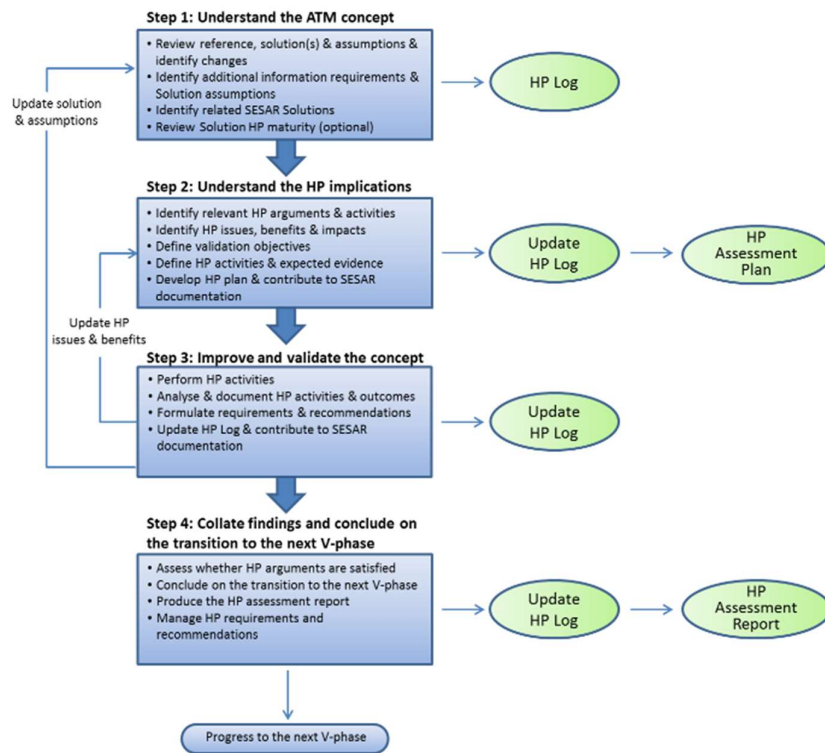

Figure 11111: Steps of the HP assessment process

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4 Human Performance Assessment

4.1 Step 1 Understand the ATM concept

4.1.1 Description of reference scenario

Refers to OSED Part I.

4.1.2 Description of solution scenario

Refers to OSED Part I.

4.1.3 Consolidated list of assumptions

Refers to OSED Part I.

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

Not applicable.

4.1.5 Identification of the nature of the change

The following tables are used to help systematically identify and capture the nature of the change that may result due to the introduction of the concept(s) under investigation in terms of the ATM actors impacted as well as the potential changes to their work.

Note that, for each real time simulation addressed there is a table that summarise the impact on ATM actors.

The HP argument branches of the table cover the second level of HP arguments in Appendix A of [2] and so it is not only used to help identify and capture changes to ATM actors work but can also be used to help screen and scope the HP assessment. Therefore, the table helps narrow down and focus the list of HP arguments that need to be investigated in the next step of the HP assessment. Furthermore, if there are no changes identified that relate to any of the HP argument branches in the table then no HP assessment is required on the Solution.

Note: the numbering of the argument branches in the table is in line with the numbering of the HP arguments in Appendix A of HP Reference Material.

SESAR **Solution PJ.10-W2-93** aimed at exploring operational concepts of the delegation of ATM services provision amongst ATSUs. Delegations can be done either in nominal operating conditions, in order to improve the overall efficiency of the ATM system or in abnormal conditions (i.e., contingency situations), in order to improve the resilience of the network and to minimise the impact of a system failure. In order to provide an overall view of changes and affected actors, for all simulation executed were gathered the data and summarise the use case tested for each. Follow the tables:

4.1.5.1 EXE-PJ.10-W2-93-V3-VALR-002 (ENAIRE)

The objective is to validate the operational aspects of the delegation of ATM services provision in nominal conditions. Use case :

- Delegation of ATM services provision at night

- Delegation of ATM services provision at fixed time

- Delegation of ATM services provision on-demand

HP argument branch	Change & affected actors
1. ROLES & RESPONSIBILITIES Left column	
1.1 ROLES & RESPONSIBILITIES	Roles and responsibilities during the delegation process are clearly defined. The role of Supervisor should be involved in the delegation, as recommended in the previous phase.
1.2 OPERATING METHODS	Concerning the operating methods, no changes are foreseen.
1.3 TASKS	No changes in the tasks.
2. HUMAN & SYSTEM	
2.1 ALLOCATION OF TASKS (HUMAN & SYSTEM)	No changes are foreseen regarding allocation of Tasks.
2.2 PERFORMANCE OF TECHNICAL SYSTEM	The level of trust in the system has been judged as sufficient.
2.3 HUMAN – MACHINE INTERFACE	The level of system support and related human performance has been judged as acceptable. As it was already mentioned, the only issue arises from the the undesired behaviour of the Conflict Detection and Resolution tool integrated into the CWP. The number of false alarms increased the air traffic controller workload and negatively impacted the situation awareness.
3. TEAMS & COMMUNICATION	
3.1 TEAM COMPOSITION	No changes are foreseen regarding team composition.
3.2 ALLOCATION OF TASKS	Concerning the allocation of tasks, they were clearly concluded that the ATC supervision has to be delegated together with the ATC service, i.e., the supervisor of the receiving ATSU should take care of the supervision activities for the delegated sector. It has been also highlighted that the supervisor shall be able to replace any of the air traffic controller on the

	shift in case of need, including the position of the receiving controller.
3.3 COMMUNICATION	The communication load has been considered as satisfactory except for the on-demand use case, where the number of exchanges between controllers significantly increased the radiofrequency and phone line occupation rate, as well as the overall workload, making it not acceptable for the ATFM scenarios.
4. HP RELATED TRANSITION FACTORS	
4.1 ACCEPTANCE & JOB SATISFACTION	Training needs were requested in order to improve acceptance & job satisfaction in the proposed concept.
4.2 COMPETENCE REQUIREMENTS	N/A
4.3 STAFFING REQUIREMENTS & STAFFING LEVELS	N/A
4.4. RECRUITMENT AND SELECTION	N/A
4.5. TRAINING NEEDS	Training needs were identified during the debriefing sessions. It was concluded that the level of training applied in the delegating ATSU, in terms of both content and hours, should be equally applied for the receiving ATSU.

4.1.5.2 EXE-PJ.10-W2-93-V3-VALR-003 (SKYGUIDE)

The objective is to validate the operational and technical aspects (including the validation of new services) of the delegation of ATM services provision.in nominal and abnormal conditions. Use cases:

- Delegation of ATM services provision at night

- Delegation of ATM services provision in case of contingency

HP argument branch	Change & affected actors
1. ROLES & RESPONSIBILITIES	
1.1 ROLES & RESPONSIBILITIES	At this stage, changes in roles and responsibility are not foreseen. The role of Supervisor should be involved in the delegation, as recommended in the previous phase.
1.2 OPERATING METHODS	No changes in Operating methods was observed during the simulation.
1.3 TASKS	No changes in the tasks.

2. HUMAN & SYSTEM	
2.1 ALLOCATION OF TASKS (HUMAN & SYSTEM)	No changes are foreseen regarding allocation of Tasks.
2.2 PERFORMANCE OF TECHNICAL SYSTEM	During the V3 phase, technical system has needed further refinements in order to increase the performance.
2.3 HUMAN – MACHINE INTERFACE	It is worth considering that there could be small potential changes regarding a specific used tool, leading, of course at the loss of small features of the HMI, based on, for example, the several different types of situations or countries.
3. TEAMS & COMMUNICATION	
3.1 TEAM COMPOSITION	No changes foreseen.
3.2 ALLOCATION OF TASKS	No changes foreseen.
3.3 COMMUNICATION	No changes foreseen.
4. HP RELATED TRANSITION FACTORS	
4.1 ACCEPTANCE & JOB SATISFACTION	Training needs were requested in order to improve acceptance & job satisfaction in the proposed concept.
4.2 COMPETENCE REQUIREMENTS	N/A
4.3 STAFFING REQUIREMENTS & STAFFING LEVELS	N/A
4.4. RECRUITMENT AND SELECTION	N/A
4.5. TRAINING NEEDS	In the first instance the delegation process concept is accepted. In order to provide more acceptance in the proposed concept it is necessary training for all involved actors.

4.1.5.3 EXE-PJ.10-W2-93-V3-VALR-004 (ENAV)

The objective is to validate the operational and technical aspects of the delegation of ATM services provision in nominal and abnormal conditions. Use cases:

- Delegation of ATM services provision at night
- Delegation of ATM services provision at fixed time
- Delegation of ATM services provision on-demand
- Delegation of ATM services provision in case of contingency
- Delegation of ATM services provision between Civil and Military ATSUs

HP argument branch	Change & affected actors
1. ROLES & RESPONSIBILITIES Left column	
1.1 ROLES & RESPONSIBILITIES	At this stage, changes in roles and responsibility are not foreseen. The role of Supervisor should be involved in the delegation, as recommended in the previous phase.
1.2 OPERATING METHODS	ATCOs involved in the validation exercise worked with different HMIs, and limited system support visibility of information was available.
1.3 TASKS	No changes in the tasks.
2. HUMAN & SYSTEM	
2.1 ALLOCATION OF TASKS (HUMAN & SYSTEM)	No changes in the allocation of tasks.
2.2 PERFORMANCE OF TECHNICAL SYSTEM	During the V3 phase, technical system has needed further refinements in order to increase the performance.
2.3 HUMAN – MACHINE INTERFACE	It is worth considering that there could be small potential changes regarding a specific used tool, leading, of course at the loss of small features of the HMI, based on, for example, the several different types of situations or countries.
3. TEAMS & COMMUNICATION	
3.1 TEAM COMPOSITION	No changes are foreseen regarding the team composition.
3.2 ALLOCATION OF TASKS	No changes are expected in the allocation of tasks.
3.3 COMMUNICATION	During the simulation, the communication load remains almost unchanged through the delegation phase.
4. HP RELATED TRANSITION FACTORS	
4.1 ACCEPTANCE & JOB SATISFACTION	The introduction of the delegation process should not negatively impact the acceptance and the job satisfaction of the ATCOs provided the system efficiently support them. However, to increase the level of trust in the new concept, it is suggested to carry out a lot of ATCOs training, considering contingencies as well.

4.2 COMPETENCE REQUIREMENTS	Training will be necessary to meet the expected competence requirements.
4.3 STAFFING REQUIREMENTS & STAFFING LEVELS	N/A
4.4. RECRUITMENT AND SELECTION	N/A
4.5. TRAINING NEEDS	Although the ATCOs' feedbacks show a global acceptance of the delegation process concept, extensive training to all the actors involved is necessary to consolidate this acceptance.

4.1.5.4 EXE-PJ.10-W2-93-V3-VALR-005 (COOPANS)

The objective is to validate the operational and technical aspects of the delegation of ATM services provision in nominal and abnormal conditions. Use cases:

- Delegation of ATM services provision in case of contingency

- Delegation of ATM services provision on-demand

HP argument branch	Change & affected actors
1. ROLES & RESPONSIBILITIES Left column	
1.1 ROLES & RESPONSIBILITIES	The role of Supervisor should be involved in the delegation, as recommended in the previous phase.
1.2 OPERATING METHODS	Concerning the operating methods, no changes are foreseen. But in this analysis, it is necessary to specify that the ATCOs involved work with different HMIs and limited system support.
1.3 TASKS	SUP role has an extended task, to coordinate delegation process with another FIR SUP.
2. HUMAN & SYSTEM	
2.1 ALLOCATION OF TASKS (HUMAN & SYSTEM)	No changes.
2.2 PERFORMANCE OF TECHNICAL SYSTEM	Technical system needs further refinements in order to increase the performance.
2.3 HUMAN – MACHINE INTERFACE	It is worth considering that there could be small potential changes regarding a specific used tool, like track highlight and preview mode
3. TEAMS & COMMUNICATION	

3.1 TEAM COMPOSITION	No changes are expected regarding team composition.
3.2 ALLOCATION OF TASKS	No changes are expected regarding allocation of tasks.
3.3 COMMUNICATION	No changes are expected regarding communication.
4. HP RELATED TRANSITION FACTORS	
4.1 ACCEPTANCE & JOB SATISFACTION	In the first instance the delegation process concept is accepted. In order to provide more acceptance in the proposed concept, training is necessary for all involved actors.
4.2 COMPETENCE REQUIREMENTS	See above.
4.3 STAFFING REQUIREMENTS & STAFFING LEVELS	See above.
4.4. RECRUITMENT AND SELECTION	See above.
4.5. TRAINING NEEDS	See above.

4.1.5.5 EXE-PJ.10-W2-93-V3-VALR-006 (PANSA)

The objective is to validate the operational aspects of the delegation of ATM services provision in nominal and abnormal conditions. Use cases:

- Delegation of ATM services provision at night
- Delegation of ATM services provision on-demand
- Delegation of ATM services provision in case of contingency

HP argument branch	Change & affected actors
1. ROLES & RESPONSIBILITIES Left column	
1.1 ROLES & RESPONSIBILITIES	At this stage, changes in roles and responsibility are not foreseen. The role of Supervisor should be involved in the delegation, as recommended in the previous phase.
1.2 OPERATING METHODS	No changes in operating methods are foreseen. However, the ATCOs involved in the validation exercise worked with different HMIs, and limited system support visibility of information was available.
1.3 TASKS	No changes in the tasks.
2. HUMAN & SYSTEM	

2.1 ALLOCATION OF TASKS (HUMAN & SYSTEM)	No changes are expected in the allocation of tasks.
2.2 PERFORMANCE OF TECHNICAL SYSTEM	During the V3 phase, technical system has needed further refinements in order to increase the performance.
2.3 HUMAN – MACHINE INTERFACE	It is worth considering that there could be small potential changes regarding a specific used tool, leading, of course at the loss of small features of the HMI, based on, for example, the several different types of situations or countries.
3. TEAMS & COMMUNICATION	
3.1 TEAM COMPOSITION	No changes are foreseen regarding the team composition.
3.2 ALLOCATION OF TASKS	No changes are expected in the allocation of tasks.
3.3 COMMUNICATION	No changes are expected in the communication.
4. HP RELATED TRANSITION FACTORS	
4.1 ACCEPTANCE & JOB SATISFACTION	The introduction of the delegation process should not negatively impact the acceptance and the job satisfaction of the ATCOs provided the system efficiently support them. However, to increase the level of trust in the new concept, it is suggested to carry out a lot of ATCOs training, considering contingencies as well.
4.2 COMPETENCE REQUIREMENTS	Training will be necessary to meet the expected competence requirements.
4.3 STAFFING REQUIREMENTS & STAFFING LEVELS	N/A
4.4. RECRUITMENT AND SELECTION	N/A
4.5. TRAINING NEEDS	Although the ATCOs' feedbacks show a global acceptance of the delegation process concept, extensive training to all the actors involved is necessary to consolidate this acceptance.

Table 22222: Description of the change for all exercises

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 activity/ies
Arg. 1.1.3: Roles and responsibilities are clear and consistent/non-contradictory	BEN1.1.3-PJ10-W2-93-001	Changes in roles and responsibility are not foreseen.	OBJ-PJ10-W2-93-001-HP	To assess if roles and responsibilities of human actors are clear and exhaustive.	Real Time Simulation
1.2.5: Operating methods (procedures) can be followed in an accurate, efficient and timely manner.	BEN1.1.5-PJ10-W2-93-002	All procedures and operating methods are followed in accurate manner.	OBJ-PJ10-W2-93-002-HP	To assess if procedures can be followed in accurate, efficient, and timely manner.	Real Time Simulation
Arg. 1.3.3: The level of workload (induced by cognitive and/or physical task demands) is acceptable.	ISS1.3.3 PJ10-W2-93-001	During the normal operating conditions, the level of workload might be maintained, but during the delegation the Workload could increase (e.g. if the occupancy is high in the delegated airspace).	OBJ-PJ10-W2-93-003-HP	To assess if the level of workload induced by the delegation of ATM services is acceptable for ATCOs.	Real Time Simulation
Arg. 1.3.4: The level of trust in the new concept/the new procedures is appropriate.	BEN1.3.4-PJ10-W2-93-003	During the delegation, in order to increase the level of trust, ATCOs training could be	OBJ-PJ10-W2-93-004-HP	To assess if the level of trust induced by the delegation is acceptable for ATCOs.	Real Time Simulation

Arg.	Issue ID	HP issue / Benefit	HP/Valid. Obj. ID	HP validation objective	recommended activity/ies
		potential positive impact (considering contingencies as well).			
Arg. 1.3.5: Human actors can maintain a sufficient level of situation awareness.	ISS1.3.5-PJ10-W2-93-002	During the normal operating conditions, the level of Situational Awareness is maintained, during the SA could decrease.	OBJ-PJ10-W2-93-005-HP	To assess if the level of situational awareness induced by the delegation is acceptable for ATCOs.	Real Time Simulation
Arg. 2.3.6: The usability of the user interface (including input devices, output devices/displays, and alarms & alerts) is acceptable.	ISS2.3.6-PJ10-W2-93-003	In order to supports the human in carrying out their tasks, should be small changes in HMI.	OBJ-PJ10-W2-93-006-HP	To assess the usability of the HMI with regards to the information.	Real Time Simulation
Arg. 3.3.1: Intra-team and inter-team communication supports the information requirements of team members.	ISS3.3.1-PJ10-W2-93-004	During the delegation procedures many actors communicate with each other, so a high level of information requirements is not always maintained.	OBJ-PJ10-W2-93-007-HP	To assess if the communication supports the information requirements of team members.	Real Time Simulation
Arg. 3.3.2: The phraseology supports communication	ISS3.3.2-PJ10-W2-93-005	In contingency procedures could be better define a	OBJ-PJ10-W2-	To assess if the standard phraseology used	Real Time Simulation

Arg.	Issue ID	HP issue / Benefit	HP/Valid. Obj. ID	HP validation objective	recommended activity/ies
in all operating conditions.		standard phraseology to applied.	93-008-HP	support the communication.	
Arg. 3.3.4: The communication load of team members is acceptable in normal and abnormal conditions and degraded mode of operations.	ISS3.3.4-PJ10-W2-93-006	During the delegation procedures many actors communicate with each other, so a high level of information requirements is not always maintained.	OBJ-PJ10-W2-93-009-HP	To assess if the communication supports in normal and abnormal conditions the information requirements of team members.	Real Time Simulation
Arg. 3.3.5: Team members can maintain a sufficient level of shared situation awareness.	ISS3.3.5-PJ10-W2-93-007	During the normal operating conditions, the level of Situational Awareness is maintained, during the SA could decrease.	OBJ-PJ10-W2-93-010-HP	To assess if the level of shared situation awareness is maintained by team members.	Real Time Simulation
Arg. 4.1.1: Changes in roles and responsibilities are acceptable to the affected human actors.	ISS4.1.1-PJ10-W2-93-008	Human Performance related aspects of the operational concept should be identified. These are crucial for the successful transition at a later stage.	OBJ-PJ10-W2-93-011-HP	To assess if the proposed solution is acceptable for human actors involved.	Real Time Simulation

Arg.	Issue ID	HP issue / Benefit	HP/Valid. Obj. ID	HP validation objective	recommended activity/ies
Arg. 4.2.1: Knowledge, skill and experience requirements for human actors have been identified.	ISS4.2.2-PJ10-W2-93-009	Negative impact on HP can occur when not maintain an appropriate level of skill on the delegated sector for the receiving ATCOs.	OBJ-PJ10-W2-93-012-HP	To consider the potential changes in knowledge, skill and experience requirements.	Real Time Simulation
Arg. 4.2.3: Potential interferences between existing and new knowledge & skills are identified.	ISS4.2.3-PJ10-W2-93-010	In the delegation process it could be possible identify an interference between existing and new knowledge & skills.	OBJ-PJ10-W2-93-013-HP	To consider the potential changes in knowledge, skill and experience requirements.	Real Time Simulation

4.3 Step 3 Improve and validate the concept

4.3.1 Description of HP activities conducted

ACTIVITY 1.	Real Time Simulation- EXE-PJ.10-W2-93-V3-VALR-002 (ENAIRE)
Description	HP support will be provided to Real Time Simulation. This will ensure that appropriate evidence can be generated through these simulations, such that HP arguments and claims can be supported.
HP OBJECTIVES	OBJ-PJ10-W2-93-001-HP To assess if roles and responsibilities of human actors are clear and exhaustive.

OBJ-PJ10-W2-93-002-HP To assess if procedures can be followed in accurate, efficient and timely manner.

OBJ-PJ10-W2-93-003-HP To assess if the level of workload induced by the delegation of ATM services is acceptable for ATCOs. |

	OBJ-PJ10-W2-93-004-HP To assess if the level of trust induced by the delegation is acceptable for ATCOs.
	OBJ-PJ10-W2-93-005-HP To assess if the level of situational awareness induced by the delegation is acceptable for ATCOs.
	OBJ-PJ10-W2-93-006-HP To assess the usability of the HMI with regards to the information.
	OBJ-PJ10-W2-93-007-HP To assess if the communication supports the information requirements of team members.
	OBJ-PJ10-W2-93-008-HP To assess if the standard phraseology used support the communication.
	OBJ-PJ10-W2-93-009-HP To assess if the communication supports in normal and abnormal conditions the information requirements of team members.
	OBJ-PJ10-W2-93-010-HP To assess if the level of shared situation awareness is maintained by team members.
	OBJ-PJ10-W2-93-011-HP To assess if the proposed solution is acceptable for human actors involved.
	OBJ-PJ10-W2-93-012-HP To consider the potential changes in knowledge, skill and experience requirements.
	OBJ-PJ10-W2-93-013-HP To consider the potential changes in knowledge, skill and experience requirements.
Tool selected out of the HP repository	Post Run Questionnaire, Post Simulation Questionnaire, Remote over the Shoulder Observation (with experts in situ), Debriefing Agenda Topics prepared ad hoc in order to address the specific exercise objectives and related success criteria.
Planning and Approach	The execution of the Real Time Simulation involves the following steps: • Validation planning, development of HP objectives and associated scenario and measurement recommendations. • Attendance at simulation exercises. • Post-exercise data analysis • Report contribution.
timeline	2022

Table 33333: Description of Activity EXE002

ACTIVITY 2.	**Real Time Simulation-** EXE-PJ.10-W2-93-V3-VALR-003 (SKYGUIDE)

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Description	HP support will be provided to Real Time Simulation. This will ensure that appropriate evidence can be generated through these simulations, such that HP arguments and claims can be supported.
HP OBJECTIVES	OBJ-PJ10-W2-93-001-HP To assess if roles and responsibilities of human actors are clear and exhaustive.
	OBJ-PJ10-W2-93-003-HP To assess if the level of workload induced by the delegation of ATM services is acceptable for ATCOs.
	OBJ-PJ10-W2-93-004-HP To assess if the level of trust induced by the delegation is acceptable for ATCOs.
	OBJ-PJ10-W2-93-005-HP To assess if the level of situational awareness induced by the delegation is acceptable for ATCOs.
	OBJ-PJ10-W2-93-006-HP To assess the usability of the HMI with regards to the information.
	OBJ-PJ10-W2-93-011-HP To assess if the proposed solution is acceptable for human actors involved.
	OBJ-PJ10-W2-93-012-HP To consider the potential changes in knowledge, skill and experience requirements.
Tool selected out of the HP repository	Post Run Questionnaire, Post Simulation Questionnaire, Remote over the Shoulder Observation (with experts in situ), Debriefing Agenda Topics prepared ad hoc in order to address the specific exercise objectives and related success criteria.
Planning and Approach	The execution of the Real Time Simulation involves the following steps: - Validation planning, development of HP objectives and associated scenario and measurement recommendations. - Attendance at simulation exercises. - Post-exercise data analysis - Report contribution.
timeline	2022

Table 44444: Description of Activity EXE003

ACTIVITY 3.	Real Time Simulation- EXE-PJ.10-W2-93-V3-VALR-004 (ENAV)
Description	HP support will be provided to Real Time Simulation. This will ensure that appropriate evidence can be generated through these simulations, such that HP arguments and claims can be supported.
HP OBJECTIVES	OBJ-PJ10-W2-93-001-HP To assess if roles and responsibilities of human actors are clear and exhaustive.

	OBJ-PJ10-W2-93-002-HP To assess if procedures can be followed in accurate, efficient and timely manner.
	OBJ-PJ10-W2-93-003-HP To assess if the level of workload induced by the delegation of ATM services is acceptable for ATCOs.
	OBJ-PJ10-W2-93-004-HP To assess if the level of trust induced by the delegation is acceptable for ATCOs.
	OBJ-PJ10-W2-93-005-HP To assess if the level of situational awareness induced by the delegation is acceptable for ATCOs.
	OBJ-PJ10-W2-93-006-HP To assess the usability of the HMI with regards to the information.
	OBJ-PJ10-W2-93-007-HP To assess if the communication supports the information requirements of team members.
	OBJ-PJ10-W2-93-008-HP To assess if the standard phraseology used support the communication.
	OBJ-PJ10-W2-93-009-HP To assess if the communication supports in normal and abnormal conditions the information requirements of team members.
	OBJ-PJ10-W2-93-010-HP To assess if the level of shared situation awareness is maintained by team members.
	OBJ-PJ10-W2-93-011-HP To assess if the proposed solution is acceptable for human actors involved.
	OBJ-PJ10-W2-93-012-HP To consider the potential changes in knowledge, skill and experience requirements.
	OBJ-PJ10-W2-93-013-HP To consider the potential changes in knowledge, skill and experience requirements.
Tool selected out of the HP repository	Post Run Questionnaire, Post Simulation Questionnaire, Remote over the Shoulder Observation (with experts in situ), Debriefing Agenda Topics prepared ad hoc in order to address the specific exercise objectives and related success criteria.
Planning and Approach	The execution of the Real Time Simulation involves the following steps: • Validation planning, development of HP objectives and associated scenario and measurement recommendations. • Attendance at simulation exercises. • Post-exercise data analysis • Report contribution.
timeline	2022

Table 55555: Description of activity EXE004

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ACTIVITY 4.	Real Time Simulation - EXE-PJ.10-W2-93-V3-VALR-005 (COOPANS)
Description	HP support will be provided to Real Time Simulation. This will ensure that appropriate evidence can be generated through these simulations, such that HP arguments and claims can be supported.
HP OBJECTIVES	OBJ-PJ10-W2-93-001-HP To assess if roles and responsibilities of human actors are clear and exhaustive. OBJ-PJ10-W2-93-003-HP To assess if the level of workload induced by the delegation of ATM services is acceptable for ATCOs. OBJ-PJ10-W2-93-004-HP To assess if the level of trust induced by the delegation is acceptable for ATCOs. OBJ-PJ10-W2-93-005-HP To assess if the level of situational awareness induced by the delegation is acceptable for ATCOs. OBJ-PJ10-W2-93-006-HP To assess the usability of the HMI with regards to the information. OBJ-PJ10-W2-93-012-HP To consider the potential changes in knowledge, skill and experience requirements.
Tool selected out of the HP repository	Post Run Questionnaire, Post Simulation Questionnaire, Remote over the Shoulder Observation (with experts in situ), Debriefing Agenda Topics prepared ad hoc in order to address the specific exercise objectives and related success criteria.
Planning and Approach	The execution of the Real Time Simulation involves the following steps: • Validation planning, development of HP objectives and associated scenario and measurement recommendations. • Attendance at simulation exercises. • Post-exercise data analysis • Report contribution.
timeline	2022

Table 66666: Description of activity EXE005

ACTIVITY 5.	Real Time Simulation - EXE-PJ.10-W2-93-V3-VALR-006 (PANSA)
Description	HP support will be provided to Real Time Simulation. This will ensure that appropriate evidence can be generated through these simulations, such that HP arguments and claims can be supported.
HP OBJECTIVES	OBJ-PJ10-W2-93-001-HP To assess if roles and responsibilities of human actors are clear and exhaustive.

	OBJ-PJ10-W2-93-003-HP To assess if the level of workload induced by the delegation of ATM services is acceptable for ATCOs.

OBJ-PJ10-W2-93-004-HP To assess if the level of trust induced by the delegation is acceptable for ATCOs.

OBJ-PJ10-W2-93-005-HP To assess if the level of situational awareness induced by the delegation is acceptable for ATCOs.

OBJ-PJ10-W2-93-006-HP To assess the usability of the HMI with regards to the information.

OBJ-PJ10-W2-93-012-HP To consider the potential changes in knowledge, skill and experience requirements.

OBJ-PJ10-W2-93-013-HP To consider the potential changes in knowledge, skill and experience requirements. |
| Tool selected out of the HP repository | Post Run Questionnaire, Post Simulation Questionnaire, Remote over the Shoulder Observation (with experts in situ), Debriefing Agenda Topics prepared ad hoc in order to address the specific exercise objectives and related success criteria. |
| Planning and Approach | The execution of the Real Time Simulation involves the following steps:

- Validation planning, development of HP objectives and associated scenario and measurement recommendations.
- Attendance at simulation exercises.
- Post-exercise data analysis
- Report contribution. |
| timeline | 2022 |

Table 77777: Description of activity EXE006

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

4.4.1 Summary of HP activities results & recommendations / requirements

 Due to a several number of exercises, all recommendations and requirements extrapolated during the Real Simulation were gathered in the HP_Log.
Living document embedded in this word file.

In addition, current status of an issue / benefit is 'closed': An issue is considered 'closed' when the issue had been sufficiently answered or no additional activities relating to that issue are foreseen as necessary. The HP recommendations and requirements fall into one of several categories:

System design

OPS (operating methods / procedures)

New objective

Training

Other

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
Arg. 1.1.3: Roles and responsibilities are clear and consistent							
BEN1.1.3-PJ10-W2-93-001	Changes in roles and responsibility are not foreseen.	Closed	OBJ-PJ10-W2-93-001-HP	Real Time Simulation	In accordance with questionnaires ratings, ATCOs quite agree that the roles are clearly defined, and the responsibilities remained unchanged during the delegation process, but all involved actors highlighted that a checklist is useful. Supervisor role is expanded to negotiation of cross border capacities and finding the best suitable solution for cross border delegation of ATS.	PJ10-93_01_HP OPS_Recom_1: ATSEP highlighted that chronological information of the services might be aligned according to the target of the architecture. Also, more complex environment might be considered for the different ADSP. PJ10-93_01_HP OPS_Recom_2: Supervisor and FMP role must be clearly defined considering sectorisation process is expanding over FIR boundaries.	PJ10-93_01_HP_OPS_Req_1: The delegating and receiving ATCOs shall be supported by appropriate automation and HMI functions to fully exchange relevant information and safely handover the responsibility.

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
					In general, roles and responsibilities were not impacted by delegation process and the quality of ATM services provision remained at an acceptable level.		

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

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
BEN1.1.5-PJ10-W2-93-002	All procedures and operating methods are followed in accurate manner.	Closed	OBJ-PJ10-W2-93-002-HP	Real Time Simulation	The results show that ATCOs roles were clear and quite exhaustive. Operating methods have been proven to be efficient and accurate. No issues reported derived from the delegation procedure itself. Workload remains under acceptable levels.	PJ10-93_01_HP OPS_Recom_3: ATCOs suggested to expand the collaboration from operational point of view and technical point of view in order to smooth the existing gaps between the two parties and make the platform easier to use and more suitable for controllers' working methods.	

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Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
					Only for the on-demand use case for ATFM reasons, a medium level of workload according to the Bedford scale (4/10) was reported during the delegation process.		

Arg. 1.3.3: The level of workload (induced by cognitive and/or physical task demands) is acceptable.

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
ISS1.3.3 PJ10-W2-93-001	During the normal operating conditions, the level of workload might be maintained, but during the delegation the Workload could	Closed	OBJ-PJ10-W2-93-003-HP	Real Time Simulation	The level of workload reported before, during and after the delegation process has been reported as acceptable. Only for the on-demand use case for ATFM reasons, a medium level of workload according to the Bedford scale (4/10)	PJ10-93_01_HP OPS_Recom_4: ATFCM tool for more precise complexity evaluation should be considered. PJ10-93_01_HP OPS_Recom_5: Further assessment should be performed regarding the Night delegation from ON to PANSA in order to investigate if and how ATCOs' workload could be alleviated.	

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
	increase (e.g. if the occupancy is high in the delegated airspace).				was reported during the delegation process. The level of Workload for Night Use Case remains at a low level during all phases of the delegation, which corresponds to a satisfactory level of workload. The level of workload appeared to be increasing during the delegation and after the delegation is completed, but it remains at an acceptable level. Contingency UC: The level of Workload for Contingency Use Cases remains at a low level during all phases		

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Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
					of the delegation, which corresponds to a satisfactory level of workload. The level of workload appeared to be increasing during the delegation, but it remains at an acceptable level and decreasing after the delegation is completed. The communication load was deemed satisfactory.		

Arg. 1.3.4: The level of trust in the new concept/the new procedures is appropriate.

| BEN1.3.4-PJ10-W2-93-003 | During the delegation, in order to increase the level of trust, ATCOs | Closed | OBJ-PJ10-W2-93-004-HP | Real Time Simulation | The robustness of the system used in the exercises was considered as not good enough. In fact, controllers felt that | | |

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
	training could be potential positive impact (considering contingencies as well).				the system provided them reliable information and helped them to perform their activity, but they were bothered when some information were not provided (e.g. STCA). Consequently, some refinements are needed to be able to use them in a real operational environment and this aspect impacted controllers' level of trust in the system. While supervisors had a good level of trust and confidence in the system as to allow them to properly handle the delegation		

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
					process. ATCOs proposed a list of improvements for HMI and platform. Supervisors had a good level of trust and confidence in the system as to allow them to properly handle the delegation process. Contingency UC: The level of trust and confidence was not deemed satisfactory as some technical issues occurred and the lack of certain tools controllers are used to work with were missing in the simulation.		

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Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
Arg. 1.3.5: Human actors can maintain a sufficient level of situation awareness.							
ISS1.3.5-PJ10-W2-93-002	During the normal operating conditions, the level of Situational Awareness is maintained, during the SA could decrease.	Closed	OBJ-PJ10-W2-93-005-HP	Real Time Simulation	The level of situational awareness has been considered as sufficient for the night and fix time use case. However, negative impacts have been identified for the on-demand use case (cross-border and ATFM). Night UC: The level of Situational Awareness varied throughout the phases of the delegation process but was assessed acceptable by controllers. On average, the SA decreased a little during the process of	PJ10-93_01_HP OPS_Recom_6: TCOs suggested to improve the preview mode phase by inserting colour codes or a video alarm to make the traffic situation clearer for the "receiving ATCOs"; this would greatly improve the situational awareness of the actors by speeding up the delegation process itself. PJ10-93_01_HP OPS_Recom_7: Harmonized LOA's, maintaining regular competence for overtaking airspace	

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
					delegation and after the delegation was completed but remained at an acceptable level. However, controllers expressed concerns in terms of ability to perform an efficient and safe work with the lack of information on the delegated sector. Contingency UC: the SA was found acceptable by most of the controllers during the simulation but not acceptable by one ATSU. Controllers expressed concerns in terms of ability to perform an efficient		

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
					and safe work. As the traffic load was not very high and the delegation took some cognitive capacity, swift/rapid re-configuration might cause degraded SA with respect to sector boundaries/floor/top. Step by step sectorisation, or all at once, must be carefully considered to avoid ATCO's overload.		

Arg. 2.3.6: The usability of the user interface (input devices, visual displays/output devices, alarm& alerts) is acceptable.

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
ISS2.3.6-PJ10-W2-93-003	In order to supports the human in carrying out their tasks,	Closed	OBJ-PJ10-W2-93-	Real Time Simulation	The level of trust in the system was not satisfactory. In fact, some problems raised during the validation	PJ10-93_01_HP_HMI_Recom_1: ATCOs suggested to have a clearer indication of the traffic status during the preview phase. At the time being they are all	PJ10-93_01_HP_HMI_Req_1: ATSUs involved in the delegation should identify a minimum equipment/ tools list for safe delegation of

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
	should be small changes in HMI.		006-HP		related to the fact that the simulation environment was not the operational system the controllers are used to. ATCOs proposed a list of improvements for HMI and platform. Some ATCOs expressed that they did not have enough information and knowledge on the delegated sector to make efficient decisions. They expressed concerns regarding their ability to maintain safe operations and perform their tasks efficiently. However,	displayed in grey colour, but the suggestion is to display the traffic assumed in green and the other in grey. PJ10-93_01_HP_HMI_Recom_2: In order for this concept to be acceptable in real life further ATM system improvements are necessary. PJ10-93_01_HP_HMI_Recom_3: Improvement of the system usability should be made to better support the ATCOs in achieving their tasks during night delegation procedure. PJ10-93_01_HP_HMI_Recom_4: Improvement of the System Usability should be made to support the ATCOs in achieving their tasks during on-demand delegation procedure.	airspace. The impact of the unavailability of any of the identified items should be included in the letter of agreement between the two ATSUs (e.g., unavailability of certain tools will not allow a delegation). PJ10-93_01_HP_OPS_Req_1: The delegating and receiving ATCOs shall be supported by appropriate automation and HMI functions to fully exchange relevant information and safely handover the responsibility.

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
					controllers were able to perform their tasks. Preview-mode was not integrated into the CWP, but all the information requirements were satisfied.		

Arg. 3.3.1: Intra-team and inter-team communication supports the information requirements of team members.

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
ISS3.3.1-PJ10-W2-93-004	During the delegation procedures many actors communicate with each other, so a high level of information requirements is not always maintained.	Closed	OBJ-PJ10-W2-93-007-HP	Real Time Simulation	Communications means have been proven as sufficient to carry out the tasks required by the concept. Communication load issues reported for the On-demand use case. The results show that the communication load remains almost		

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
					unchanged through the delegation phase. The communication load remains controlled to acceptable levels also during a contingency event.		

Arg. 3.3.2: The phraseology supports communication in all operating conditions.

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
ISS3.3.2-PJ10-W2-93-005	In contingency procedures could be better define a standard phraseology to applied.	Closed	OBJ-PJ10-W2-93-008-HP	Real Time Simulation	The results show that the phraseology doesn't not lead to errors related to perception & interpretation of auditory information.		

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

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
ISS3.3.4-PJ10-W2-93-006	During the delegation procedures many actors communicate with each other, so a high level of information requirements is not always maintained.	Closed	OBJ-PJ10-W2-93-009-HP	Real Time Simulation	The results show that the communication load remains almost unchanged through the delegation phase. The communication load remains controlled to acceptable levels also during a contingency event.		

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
ISS3.3.5-PJ10-W2-93-007	During the normal operating conditions, the level of Situational Awareness is maintained, during the SA	Closed	OBJ-PJ10-W2-93-010-HP	Real Time Simulation	Controllers experienced satisfactory levels of situational awareness before and after delegation with a clear decrease of the situational awareness during the delegation		

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
	could decrease.				process. This was attributable to the system and a basic implementation of the preview mode.		

Arg. 4.1.1: Changes in roles and responsibilities are acceptable to the affected human actors.

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
ISS4.1.1-PJ10-W2-93-008	Human Performance related aspects of the operational concept should be identified. These are crucial for the successful transition at a later stage.	Closed	OBJ-PJ10-W2-93-011-HP	Real Time Simulation	In general, no negative HP impact for the night and fix time use case. For the on-demand use case (ATFM and cross-border), negative impacts have been identified in terms of workload, SA, communication load, and potential for human error (high complexity and high demand scenarios).	PJ10-93_01_HP_TRAINING_Recom_1: ATCOs highlighted the importance of recurrent training in order to guarantee an optimal maintenance of competence by reinforcing and broadening the knowledge necessary to perform effectively in their role.	

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
					Delegation of ATM services provision in both Night UC and Contingency UC was deemed feasible in Low to Medium traffic densities as the workload of all involved ATCOs was manageable in all phases of the delegation. Moreover, the operational feasibility was assessed and found satisfactory by controllers. However, the ability to maintain safe operations was deemed as not entirely acceptable.		

Arg. 4.2.1: Knowledge, skill and experience requirements for human actors have been identified.

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Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
ISS4.2.2-PJ10-W2-93-009	Negative impact on HP can occur when not maintain an appropriate level of skill on the delegated sector for the receiving ATCOs.	Closed	OBJ-PJ10-W2-93-012-HP	Real Time Simulation	Knowledge, skill and experience requirements have been identified during the debriefing sessions. Some ATCOs expressed that they did not have enough information and knowledge on the delegated sector to make efficient decisions. They expressed concerns regarding their ability to maintain safe operations and perform their tasks efficiently. However, controllers were able to perform their tasks.	PJ10-93_01_HP_TRAINING_Recom_2: The delegation of ATM services provision among ATSUs should not be performed during high density traffic.	PJ10-93_01_HP_TRAINING_Req_1: They should be also trained to handle high traffic density in case of delegation of ATM services provision in both nominal and emergency situations. In the latter situation, controllers' situational awareness might be lost and the level of workload would increase therefore and it might get difficult to maintain the safety level".

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
Arg. 4.2.3: Potential interferences between existing and new knowledge & skills are identified.							
ISS4.2.3-PJ10-W2-93-010	In the delegation process it could be possible identify an interference between existing and new knowledge &skills.	Closed	OBJ-PJ10-W2-93-013-HP	Real Time Simulation	According to the controllers' feedback, gathered during the debriefing session, adequate training is needed. In addition, licensed and appropriately skilled ATCOs are needed in the receiving units.	PJ10-93_01_HP_TRAINING_Recom_3: Practical and theoretical training on delegated sector configuration should be provided to the ATCOs.	

Table 88888: Summary of the HP results and recommendations/ requirements for each identified issue & related argument

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4.4.2 Maturity of the Solution

The level of confidence in the results is satisfactory.

Results regarding the Human Performance can be considered as representative of the overall operational concepts thanks to the evidence given also from observation conducted during the exercise execution.

Due to the limited number of exercises runs, the findings are based on the comparison of a small number of exercises. Thus, no meaningful statistical analysis could be performed. The findings provided in this report should be considered with caution due to limited data sample.

The validation exercise successfully validated the delegation procedure. Nevertheless, there are still open points to be clarified on the conceptual level. For ATCOs the concept of delegation is useful at an operational level but needs some refinement and clarification especially in the usage of system supporting the execution of tasks to try to minimize the possibility of misunderstandings or overlapping.

ID	Question	Answer *Fill in 'yes' or 'no'.*	Comments *Please substantiate your answer.*
		Maturity checklist for finalising the V3 assessment	
1	Has a Human Performance Assessment Report been completed? Have all relevant arguments been addressed and appropriately supported?	Yes	The consolidated list of identified arguments, and associated evidence can be found in HP LOG **Error! Reference source not found.Error! Reference source not found.**Appendix D.
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	The consolidated list of identified issues and benefits can be found in HP LOG **Error! Reference source not found.Error! Reference source not found.**Appendix D.
3	Have all the parts of the solution/concept been considered?	Yes	VALP, OSED and annexes

4	Have potential interactions with related projects/concepts been considered and addressed?	Yes	PJ.10-W2-Solution 93, including other PJ.10-W2 Solutions, in particular:
			  • PJ.10-W2-Solution 73 IFAV
			
			For the V3 phase, in particular input from the following SESAR Solutions is expected:
			  • PJ.09-W2-Solution 44 Dynamic Airspace Configuration
			PJ.32-W3 Virtual Centre

5	Is the level of human performance needed to achieve the desired system performance for the proposed solution consistent with human capabilities?	Yes	The results can be found in the dedicated § **Error! Reference source not found.Error! Reference source not found.**4.4.1 of the HP Assessment Report.
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	Yes, the HP issues are addressed, and recommendations are formulated to reach anticipated targets. (HP LOG Appendix D)

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7	Has the proposed solution been tested with end-users and under sufficiently realistic conditions, including abnormal and degraded conditions?	Yes	Validation activities conducted during SESAR2**020 Wave 2 have been tested with end users.** **The assessment of** non-nominal scenarios for delegation process has been achieved within SESAR 2020 Wave2 exercise.
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 the Outcomes of the validation exercises
9	Have all relevant SESAR documentation been updated according to the HP activities outcomes (OSED, SPR)?	Yes	The HP recommendations are crosschecked with VALR.
10	Do the outcomes satisfy the HP issues/benefits in order to reach the expected KPA?	Yes	The outcome of the HP activities can be found in the dedicated § **Error! Reference source not found.Error! Reference source not found.**4.4.1 of the HP Assessment Report including open issues and benefits and in the Appendix A (Recommendations for concept implementation.
11	Have HP recommendations and HP requirements correctly been considered in HMI design, procedures/documentation and training?	Yes	The HP recommendations included in the Appendix A and HP LOG are under analysis for concept implementation.
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	

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)?	N/A	

5 References

Human Performance

[1] SESAR Human Performance Guidance Reference Material, 27/08/2020

[2] 16.06.05 D 27 HP Reference Material D27

[3] D3.1.070 Validation Plan Part IV for V2

Reference Documents

[4] SESAR 2020 Requirements and Validation Guidelines Wave 2, 08/06/2020

[5] D2.6 PJ19 Validation Strategy VALS (2019)

[6] D3.1.030 - PJ.10-W2-93-V2 Final SPR-INTEROP/OSED Part I

[7] D3.1.120 - PJ10-W2-93-V2 Final VALR for V2

[8] D3.1.030 SESAR Solution PJ.10-W2-93 SPR-INTEROP/OSED for V2 - Part II

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Appendix A   – Additional HP activities conducted

No additional HP activities conducted.

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Appendix B   – HP Recommendations Register

All recommendations were obtained by data gathering through questionnaires and debriefing sessions after each validation run. Finally, a focus group involving all experts identified refinements and improvements of the delegation procedure. Despite the positive feedback and overall operational acceptability of the proposed procedures with no major concerns related to Human Performance, some minor and general refinements or consideration have to be taken into account.

The Human Performance recommendations fall into one of several categories:

- System design

- OPS (operating methods / procedures)

- Training

From the focus groups, observations and questionnaires held during the exercise, the following recommendations resulted and categorised for HP Arguments:

Arg. 1.1.3: Roles and responsibilities are clear and consistent.

- **PJ10-93_01_HP OPS_Recom_1**: ATSEP highlighted that chronological information of the services might be aligned according to the target of the architecture. Also, more complex environment might be considered for the different ADSP.

- **PJ10-93_01_HP OPS_Recom_2**: Supervisor and FMP role must be clearly defined considering sectorisation process is expanding over FIR boundaries.

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

- **PJ10-93_01_HP OPS_Recom_3**: ATCOs suggested to expand the collaboration from operational point of view and technical point of view in order to smooth the existing gaps between the two parties and make the platform easier to use and more suitable for controllers' working methods.

Arg. 1.3.3: The level of workload (induced by cognitive and/or physical task demands) is acceptable.

- **PJ10-93_01_HP OPS_Recom_4**: ATFCM tool for more precise complexity evaluation should be considered.

- **PJ10-93_01_HP OPS_Recom_5**: Further assessment should be performed regarding the Night delegation from ON to PANSA in order to investigate if and how ATCOs' workload could be alleviated.

Arg. 1.3.5: Human actors can maintain a sufficient level of situation awareness.

- **PJ10-93_01_HP OPS_Recom_6**: TCOs suggested to improve the preview mode phase by inserting colour codes or a video alarm to make the traffic situation clearer for the "receiving ATCOs"; this would greatly improve the situational awareness of the actors by speeding up the delegation process itself.

- **PJ10-93_01_HP OPS_Recom_7**: Harmonized LOA's, maintaining regular competence for overtaking airspace.

Arg. 2.3.6: The usability of the user interface (input devices, visual displays/output devices, alarm& alerts) is acceptable.

- **PJ10-93_01_HP_HMI_Recom_1**: ATCOs suggested to have a clearer indication of the traffic status during the preview phase. At the time being they are all displayed in grey colour, but the suggestion is to display the traffic assumed in green and the other in grey.

- **PJ10-93_01_HP_HMI_Recom_2**: In order for this concept to be acceptable in real life further ATM system improvements are necessary.

- **PJ10-93_01_HP_HMI_Recom_3**: Improvement of the system usability should be made to better support the ATCOs in achieving their tasks during night delegation procedure.

- **PJ10-93_01_HP_HMI_Recom_4**: Improvement of the System Usability should be made to support the ATCOs in achieving their tasks during on-demand delegation procedure.

Arg. 4.1.1: Changes in roles and responsibilities are acceptable to the affected human actors.

- **PJ10-93_01_HP_TRAINING_Recom_1**: ATCOs highlighted the importance of recurrent training in order to guarantee an optimal maintenance of competence by reinforcing and broadening the knowledge necessary to perform effectively in their role.

Arg. 4.2.1: Knowledge, skill and experience requirements for human actors have been identified.

- **PJ10-93_01_HP_TRAINING_Recom_2**: The delegation of ATM services provision among ATSUs should not be performed during high density traffic.

Arg. 4.2.3: Potential interferences between existing and new knowledge & skills are identified.

- **PJ10-93_01_HP_TRAINING_Recom_3**: Practical and theoretical training on delegated sector configuration should be provided to the ATCOs.

For more details, please refers to HP_Log.

Appendix C   – HP Requirements Register

As recommendations also for the validated requirements below the list:

Arg. 1.1.3: Roles and responsibilities are clear and consistent.

- **PJ10-93_01_HP_OPS_Req_1**: The delegating and receiving ATCOs shall be supported by appropriate automation and HMI functions to fully exchange relevant information and safely handover the responsibility.

Arg. 2.3.6: The usability of the user interface (input devices, visual displays/output devices, alarm& alerts) is acceptable.

- **PJ10-93_01_HP_HMI_Req_1**: ATSUs involved in the delegation should identify a minimum equipment/ tools list for safe delegation of airspace. The impact of the unavailability of any of the identified items should be included in the letter of agreement between the two ATSUs (e.g., unavailability of certain tools will not allow a delegation).

- **PJ10-93_01_HP_OPS_Req_1**: The delegating and receiving ATCOs shall be supported by appropriate automation and HMI functions to fully exchange relevant information and safely handover the responsibility.

Arg. 4.2.1: Knowledge, skill and experience requirements for human actors have been identified.

- **PJ10-93_01_HP_TRAINING_Req_1**: They should be also trained to handle high traffic density in case of delegation of ATM services provision in both nominal and emergency situations. In the latter situation, controllers' situational awareness might be lost, and the level of workload would increase therefore and it might get difficult to maintain the safety level".

For more details, please refers to HP_Log.

Appendix D   – HP Log

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