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Abstract

This document contains the Human Performance (HP) Assessment report for the SESAR Solution PJ07-W2-39 “Collaborative framework for managing arrival delay within an ATFM regulation” 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 Step 4 – Collate findings and conclude on transition to next V-phase.

Initially the Human Performance (HP) Assessment covered two Operational Improvement steps addressed by this PJ07 Solution, addressing the Collaborative Arrival Management for Local DCB constraints (AUO-0110) and for Airport constraints (AUO-0109). However, **this last OI Step (AUO-0109), originally associated with Solution 39 has been unlinked from the Solution on the grounds of insufficient maturity.**

Nevertheless, even if the AUO-0109 is no longer in the Solution, the analysis of AUO-0109 is still included in this report so as not to lose the data and analysis. **The content for AUO-0110 can easily be identified because it relates to exercise EXE-01** (AUO-0109 relates to EXE-02 and EXE-04).

This report consolidates the results of the different HP activities conducted by means of documents review and validation exercises:

- Stakeholders’ workshops
- Dry run and gaming exercise session
- Validation Exercises: Real-time simulations

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1 Executive Summary

This document describes the results of the activities conducted according to the Human Performance Assessment Plan for the PJ07-W2-39. **Error! Reference source not found..**

This Human Performance Assessment Report collects the results of the four steps of the Human Performance Assessment process, namely: Step 1 – Understand the ATM concept, Step 2 – Understand the HP implications, Step 3 – Improve and validate the concept, and Step 4 – Collate findings and conclude on the transition to the next V-phase.

According to the PJ07 Human Performance Assessment Plan **Error! Reference source not found.**, the following HP activities have been conducted and the results collected described in the present document:

- **Stakeholder workshops.** Two stakeholder workshops were conducted (September 2020 and June 2021) in collaboration with the PJ07 Solution Safety experts to identify the nature of the change (issues and benefits) and impacts on Human Performance in terms of roles and responsibilities, operating methods, system, and human-machine interface.
- **PJ07 activities.** Three shadow Mode activities were conducted with three sets of end-users' actors, including L-DCB actors (FMPs and Airport operator), AUs (Airlines) and NMOC structured around 3 Use cases to validate benefits and issues in terms of human performance and operability related to the proposed solution.

The Exercise EXE#1 was the real-time shadow-mode exercise, structured around Use Case 1 and focused on Zurich Airport (LSZH) arrivals. The exercise was undertaken between 4th and 15th October 2021, with the main stakeholders being: Skyguide as FMP (L-DCB), Swiss International Airlines (SWISS) as the main AU participating in the UDPP process, Zurich Airport (participating to a subset of scenarios only) and NMOC Operator (Eurocontrol) interacted during the exercise in a set of validation scenarios. The Exercise EXE#2 was the real-time shadow-mode exercise, structured around Use Case 2 and focused on Alicante Airport (LEAL) arrivals. The exercise was undertaken between 15th and 23rd March 2022, with the main stakeholders being Ryanair (RYP) as the main AU participating in the UDPP process, Alicante Airport and NMOC Operator (Eurocontrol) interacted during the exercise in a set of validation scenarios. The Exercise EXE#4 was the real-time shadow-mode exercise, structured around Use Cases 2 and 2bis and focused on Paris Charles de Gaulle airport (LFPG) arrivals. The exercise was undertaken between 27th and 1st July 2022, with the main stakeholders being FMP(s) (L-DCB) from Paris ACC, Air France (AFR) as the main AU participating in the UDPP process, interacted during the exercise in a set of validation scenarios.

The HP activities have been conducted with all the relevant end-users, including L-DCB actors (FMPs and Airport operator), AUs (Airlines) and NMOC. Firstly, due to insufficient exposure to the proposed process (APT operator, EXE#1) the qualitative feedback and quantitative results were implicitly restricted to a small sample. Secondly, there was no NM Operator present in EXE#4 or FMP in EXE#2. Despite participants remaining at their places of work and that the tools and the platform were connected via the internet (occasionally there were some technical issues), this setup and its simulation scenarios were judged by participants to be adequate to assess the impacts on human performance.

Through collection of findings included output from Stakeholder's workshop, feedback issue from qualitative questionnaire and debriefing and observation during validation exercises, all the parts of the UDPP concept have been considered and validated. The relevant outputs or evidence collected from each of these HP activities are summarised in this report together with recommendations to mitigate each of the potential HP issues identified. HP Arguments 1,2 and 3 have been addressed and the required evidence at V3 level has been provided. Recommendations and suggestion for further clarity on role and responsibilities (HP argument 1) and requirement made for certain HMI and functionality improvements had reported and listed (HP Argument 2). HP Arguments 3, regarding the task achievement had in collaborative way been highlighted that some automation functions should be added to avoid unnecessary workload for users. Recommendation and requirement had been investigated. There was not any issue identified for Argument 4.

The overall results obtained in terms of workload, situational awareness, task efficiency was consistent with human capabilities, and considered at an acceptable level or show a positive increase comparing the Solution Scenario against the Reference Scenario.

The HP recommendations and HP requirements developed based on the results of the validation activities, regarding the HMI design and usability, the clarification of concept in terms of roles, responsibilities and the operating procedures had been considered at each step of the process and listed. Additionally, the identification of training on new HMI automation feature, also new process, and operating methods (MOPS) were identified during the outputs of qualitative questionnaire and debriefing session. However, relevant issues were identified and analysed, and recommendations and requirements consequently developed for Operating methods clarification, training needs, HMI usability and task allocation between human and machine. Human performance aspects were also confirmed to be consistent with the V3 requirements. To prepare the next V-phase, based on the HP activities conducted and results obtained, some recommendations for further research have been developed based on the open issues

Overall, it can be concluded that the use of the different applications of the UDPP concept is viable in an operational environment. **Given the validation results of Solution 39 activities, it is suggested that the maturity of the collaborative process around the UDPP concept, as designed by Solution 39 and supported by AUO-0110 OI Step, is declared to be at the V3 level.** There are certain elements of the concept that require further collection of evidence and further assessment. However, the validation undertaken within this Solution show that the concept has the potential to deliver significant benefits to the AUs, without compromising the objectives of other ATM stakeholders and without a significant workload increase for these stakeholders. In some cases, it was investigated that the use of automation could reduce or maintain an acceptable level of workload.

The main HP issues were identified for which recommendations and requirements must be considered to avoid becoming an impediment to concept implementation. The results therefore suggest that further clarity on Roles and responsibilities and process must be established on the L-DCB stakeholder side prior to deployment of the concept. (Produce guidelines for AUs; Produce guidelines or a procedure for FMPs; Modify the concept; Monitor the use of the concept in operations).

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 report for Project PJ07, Solution 39 and Solution 37 including requirements and recommendations.

2.2 Intended readership

The intended audience for this document is primarily all the Partners involved in the SESAR Solution PJ07-W2-39 “Collaborative framework for managing arrival delay within an ATFM regulation”.

PJ07 Solution Managers, to allow definition of the way the human performance assessment activities will be embedded into the Design and Validation aspects,

Human Performance (HP) assessment experts allocated to this Project, to allow relevant implication approach, planning and performance of the Human performance assessment activities,

Safety assessment expert(s) allocated to this Project, to allow proper coordination of the safety assessment with the Human Performance assessment activities,

PJ07 Validation Exercises actors responsible for the preparation and conduct of the Validation exercises, to consider in the Validation, Plan the safety-related validation needs expressed in this Safety Plan, and ultimately the integration of the collected safety evidence into the Validation Report,

Stakeholders involved in the S39 concept definition, responsible to produce the OSED/SPR/INTEROP and TS/IRS documents, to ensure alignment with the outcomes of the Human Performance assessment (HP Objectives and HP Requirements),

PJ04 “Total Airport Management” experts for their consideration in the Network Performance Management and Monitoring and further in Solution “Collaborative Network Management Functions”.

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

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

- Affected employee unions
- ANS providers
- Airport owners / providers
- Airspace users
- CFSPs

2.3 Structure of the document

This document is structured into the following chapters:

- Chapter 1 is the executive summary and contains the key information of the Human Performance Assessment Report.
- Chapter 2 is the introduction and describes the purpose of the document, the intended readership, the scope of the document, the human performance work schedule, the structure of the document, and the acronyms and terminology used through it.
- Chapter 3 details the Human Performance Assessment Process followed.
- Chapter 4 constitutes the core of the document and includes the ATM concept addressed, the Human Performance implications, and the description of the Human Performance activities conducted and the consolidation of the Human Performance results, recommendations, requirements. It also includes the maturity assessment of PJ07 Solution 39 from the Human Performance perspective.
- Chapter 5 contains the list of references used in the document.
- Appendix A describes the additional Human Performance activities conducted.
- Appendix B constitutes the Human Performance Recommendations Register.
- Appendix C constitutes the Requirements Register.
- Appendix D consolidates the Human Performance Assessment Log.
- Appendix F constitutes the Human Performance Objectives Assessment

2.4 Acronyms and Terminology

Acronym	Definition
ADES	Airport Destination
ALC	Alicante Airport
ANS	Air Navigation Service
ANSP	Air Navigation Service Provider
AOC	Airline Operations Centre
AOP	Airport Operation Plan
API	Arrival Planning Information (message)
APOC	Airport operation Centre
APT	Airport
ATC	Air Traffic Control
ATFCM	Air Traffic Flow and Capacity Management
ATM	Air Traffic Management

ATSU	Air Traffic Control Units
AU	Airspace User
CASA	Computer-Assisted Slot Allocation (Network Manager slot allocation for regulations)
CCS	Capacity Constrained Situation
CDG	Charles de Gaulle
CDM	Collaborative Decision Making
CFSPs	Computerised Flight Plan Service Providers
CTOT	Calculated Take-Off Time
DCB	Demand and Capacity Balancing
EAP	Extended ATC Planning
EXE	Exercise
(P- or Reactive) FDCI	(Proactive- or Reactive) Flight Delay Criticality Indicator
FDR	Fleet Delay Reordering
FF-ICE	Flight & Flow Information for a Collaborative Environment
FMP	Flow Management Position
FOC	Flight Operations Centre
FPFS	First-Planned First-Served
FPL	Flight Plan
L-DCB	Flight Management Position
LTM	Local Traffic Manager
MCP	Mandatory Cherry-Pick
MPR	Most Penalizing Regulation
MOPS	Manual of Operating ProceSs
NCP	Network Cherry-Pick
NM	Network Manager
NMf	Network Manager function
NOP	Network Operation Portal/Plan

OBJ	Objective
RBT	Reference Business Trajectory
SBT	Share Business Trajectory
SFP	Selective Flight Protection
STAM	Short-Term ATFCM Measures
TMA	Terminal Manoeuvring Area
TTA	Target Time of Arrival for measure initiated in the SBT Elaboration phase
TTO	Target Time Over for measure initiated in the SBT Elaboration phase
UDPP	User Driven Prioritization Process (UDPP)
ZRH	Zurich Airport
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.
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 SESAR Solutions into larger clusters (e.g., SESAR Projects, deployment packages) in SESAR.
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 workplace) or internal (e.g., fatigue). In this way, "Human Factors" can be considered as <i>focussing on the variables that determine Human Performance</i> .
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 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.
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 <i>as 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 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 SPR-INTEROP/OSED, or TS/IRS. HF requirements can be seen as the stable result of the HF contribution to the Solution, leading to a redefinition of the operational concept or the specification of the technical solution.

Table 1: Acronyms and terminology

3 The Human Performance Assessment Process: Objective and Approach

The purpose of the HP assessment process described in detail in Human Performance Guidance document (see latest version in Program Library) 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 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.

4 Human Performance Assessment

4.1 Step 1 Understand the ATM concept

4.1.1 Description of reference scenario

This section contains a brief description of the reference scenario as described in the OSED.

As described in PJ07-W2 S39 OSED **Error! Reference source not found.** the reference scenario is characterized by:

- **With regards to Network and Local Flow management processes:**
 - In the current operating environment, Network and Local Flow management is performed by means of ATFM regulations and slot-delay in case of overload situations.
 - All the actions put in place to solve capacity problems are based on avoiding Safety issues generated by overloading a scarce resource and the human being activities in charge of this resource. Planning and sequencing are performed on a First-Planned First-Served basis (CASA) applied on flights within the overloaded capacity element including recovery period.
 - This delay management concept (CASA) is not considering the impact of the delay on the AUs. It does not consider the impact of each flight and the fleet rotational impact therein, nor the overall costs associated to this line of flying, nor Airport/Crew/Aircraft limitations and constraints, nor schedule integrity nor of the impacts to passenger experience. In summary, each flight is specific and carries the fleet AU organisation behind and the passenger flow.
- **With regards to imbalance resolution**
 - Investigate the Decision-making mechanism for imbalance between capacity and demand imposing delays, or other measures on certain flights before departure at Airports or En-route.
 - The resolution for imbalance resolution is performed by NMf based on FPFS integrating side effect generated by the Most Penalizing Constraint.
 - All of the actions to reduce the flight delay over the Network are not taking into account the impact of the delay on the AUs.
 - The tools used to solve imbalance: a CASA Regulations or STAM measures do not take into account Airspace Users' impact.
- **With regards to Constraint Reconciliation:**
 - The current NM system can only manage multiple target time constraints issued by the CASA regulation. This reconciliation is based on the Most Penalizing Regulation

(MPR). However, it cannot handle multiple target time constraints when issued by different local systems (No CASA regulation). This prevents mixing the assignment of Target Time from different local sources.

- **With regards to Airspace Users Preference & Priority Management**
 - Extended Slot Swapping for departure offers a very limited local solution for airlines at a collaborative decision-making airport to identify slot swapping opportunities in an easy and user-friendly way.
 - AUs inputs is very limited, and the ATM system allows little flexibility to Airspace Users: planning and sequencing are performed on a First-Plan-First-Served basis (CASA), both under normal and abnormal conditions. In general, the current operating method, planning, sequencing, and flow management use only time-dimensional control to balance capacity and demand without Airspace Users' interventions.
- **With regards to Local Airport roles and processes:**
 - Any airport needing Regulation (CDM and non-CDM airports)
 - Sub-OE: VL Airports + Large Airports
 - Manage the ground side of the Airport (stands ...)
 - In coordination with L-DCB for all Network operations related action (TTA, API ...)
- **With regards to Local DCB roles and processes:**
 - In planning phase (D-1) and on the day of operations, L-DCB monitors the traffic, detects the imbalances in coordination with NM, can put in place an ATFCM regulation and analyses the situation.
 - In current situation, L-DCB proposes ATFCM measures in order to cope with real time traffic situation by monitoring traffic counts or by proposing short-term planning measures in order to improve traffic smoothness.
 - L-DCB works closely with the ATSU Supervisor and the Network Management Operation Centre (NMOC) in order to adjust the available capacity to the demand and when necessary, to define & implement adequate ATFCM measures.
- **With regards to Collaborative Network Management Functions (NMf):**
 - The current NM system supports advanced capabilities to support the collaborative framework providing services to disseminate imbalance information, collect and disseminate hotspot and DCB Measures information and support the coordination and implementation of DCB measures amongst NM, L-DCB, APT and AU.
 - The current NM system keeps applying CASA: FPFS principle and MPR rules to integrate the traffic and the different constraints within the Network.
- **With regards of ATM & ANS systems**

- L-DCB tools (dedicated to Airport or to Airport plus the TMA)
- APOC tools
- FOC for AUs
- UDPP Service maintains the UDPP measure

Further details on the Reference scenario addressed by Solution PJ07 could be found in Sections 3.3.1, of OSED Part I.

4.1.2 Description of solution scenario

This section contains a brief description of the solution scenario as described in the OSED sections 3.3.2.

The Baseline for the Human Performance assessment will be considered by the current operating methods in managed Airspace as per the end of SESAR 1. Solution PJ07-W2-39 addresses the integration of the User Driven Prioritisation Process (UDPP) during planning phase, to decrease the impact on AU's fleet in case of a Local constraint and/or Network imbalances and performance.

Solution PJ07-W2-39 addresses the integration of UDPP mechanisms into the arrival constraint resolution processes. The integration of the UDPP concept in the ATM collaborative framework is based on new operating methods and new active role of AUs in resolving DCB situation:

- New operating method based on the integration of different processes used to manage the arrival traffic at an Airport. It builds on existing ones for resolving capacity constraint situations and incorporates additional features:
 - Collaborative resolution of the Capacity Constraint Situation: all key stakeholders are involved in the resolution of DCB imbalance problem on arrivals to an ADES
 - Integration of UDPP into the CCS resolution process: the central part of resolving the DCB imbalance problem on arrivals at ADES is the inclusion and consideration of AU flight prioritisation in the process
- New role of AUs for better performance: AUs become active in resolving DCB situations
- New functional systems

The new operating methods and roles consideration lead to adapt tools to change new features and new functionality automation level are required.

- UDPP service (part of the NM system and hosting the algorithm), taking input and producing sequence. The change concerns the integration of the UDPP algorithms in the CASA function to be able to deal with AUs prioritisation inputs that it receives.

Inputs: The Airport constraints (CCS), the baseline sequence (FPFS solution), the Airspace User prioritisation, and the Network impact of changes.

Outputs: the prioritized sequence provided to APOC/L-DCB through NM for final check and implementation

- L-DCB tools (dedicated to Airport or to the airport with TMA) with new functions (or not)
- APOC tools with new functions (or not)

- CHMI could be needed in relation to the B2B functions (as today)
- FOC for AUs: New FOC expected to include functions for setting the UDPP inputs, run the What-if with the UDPP inputs selected and submit the UDPP inputs to NM for possible implementation and publication.

The Operational Improvements steps originally addressed by this PJ07 Solution were:

- AUO-0110: Collaborative Arrival Management for Local DCB constraints.
- AUO-0109: Collaborative Arrival Management for Airport constraints. **AUO-0109 was originally associated with Solution 39, however this OI Step has since been unlinked from the Solution on the grounds of insufficient maturity.**

4.1.3 Consolidated list of assumptions

Solution PJ07 list of assumptions impacting HP assessments could be found in Section, 4.4

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

- PJ04-W2-28.3: Connected large airports (AOP/ NOP integration – (One of the elements is TTA from airport perspective)
- PJ07-W2-38: Enhanced integration of AU trajectory definition and network management processes (P-FDCI complementarity)

4.1.5 Identification of the nature of the change

HP argument branch	Change & affected actors
1. ROLES & RESPONSIBILITIES	
1.1 ROLES & RESPONSIBILITIES	Potentially affected actors: (Roles and responsibilities should not change, except operating methods and tasks). AU: Responsibility and role reinforced with a new active participation in the DCB problem resolution (In the measure participate & participation strategy). In case of a capacity imbalance, AU ensure UDPP Prioritisation information to decrease impact on fleet and AU will be able to re-order their flights or set prioritisation via FDR, SFP or Margins feature. AU will publish new trajectories if needed. L-DCB: No change in roles or responsibilities from L-DCB side. By default, all ATFM regulations can be UDPP-enabled. At the beginning (initiation phase), following the case, the L-DCB may decide in coordination with NM, to involve the AU in the process for the mitigation of the delay by setting a UDPP measure NM. (It is a choice and not every time when an ATFM regulation is set in place). (Phase 1: Initiation). The fact that AU inputs their priorities will be transparent for the L-DCB and will not have any safety impact. APOC/APT: No change in roles or responsibilities from AOP side. NM: No change in roles or responsibilities from NM side.
1.2 OPERATING METHODS	The new operating methods introduce: Changes in coordination and possibly delegation of responsibilities between all actors including NM, APT and local

DCB. The degree of impact on HP will depend on the level of automation and performance of the system to support actors, however in general the HP element of the new modus operandi is expected to be neutral.

AU: The AU will be notified by NMF about the UDPP service being open if a UDPP measure concerns the flight of given AU. AU decides to participate in the process or not.

AU can set predefined priority if available (according to the FF-ICE implementation). (*Phase 1: Initialisation*)

Using the What If tool, each AU will be able to assess the impact of a prioritisation on their own flights to check the new times, generated by the UDPP service, and to reduce the impact of the delay on their fleet. AU can test any possible optimisation by applying on the flight in the UDPP measure the following features: SFP, FDR or Margins or combination of those.

Each AU can use (or not) the UDPP Service to mitigate the impact of the delay. AU not using UDPP will not be negatively impacted by the other AUs (equity rules are automatically applied on slot generation) (*Phase 2A: Prioritisation- Step 5A*).

AU could send their flights prioritisation using the What-if capability to UDPP services. When new delays are considered acceptable, the AU will be able to Submit the prioritisation to the UDPP service that will automatically become effective in the NM (*Phase 2A: Prioritisation- Step 6A*).

AUs may use UDPP service for internal what-if. AUs could send new Submit (containing flight prioritisation) to NM, which are recalculated by the UDPP service which update and consolidate proposal from AUs. The new TTA and CTOT slots will become active and public (*Phase 2A: Prioritisation- Step 7A*))

NOTA: 'Reactive FDCI' and Slot Swapping need to be considered in the hierarchy of action in the full arrival management process. UDPP measure is applicable earlier in the planning phase than the Reactive FDCI and Slot Swapping. Reactive FDCI and Slot Swapping could be use after the UDPP service release the flight to optimisation (*Phase 3: Optimization*)

L-DCB: No change. Given that all ATFM regulation can be UDPP enabled by default and then there is no need for the L-DCB to choose for UDPP instead of a classical ATFM regulation (if no AU is participating, the result is the same as a classical ATFM regulation). It may be considered that for L-DCB is the same and no change. (*Phase 1: Initialisation*).

L-DCB (as Network representative) can assess the UDPP arrival times, given by the Submission of the new prioritisation from AUs, by using the NOP. L-DCB can initiate UDPP measure based on ATFCM regulation to allow an equitable solution for AUs. L-DCB can monitor and update arrival measure according to the evolution of the traffic though a NM function. L-DCB can optimise Flight(s) using the NMOC eHelpDesk (*Phase 2A: Prioritisation- Step 5A to 7A*))

Another operating method is to use TTA as the initial solution to solve arrival constraint by initiating an ATFCM (NCP) measure by the Local DCB (L-DCB). L-DCB actor inputs the TTA initial solution, integrates flight constraints from AUs (Margins prioritisation) to his "Network Cherry-Pick" (NCP) measure. In other words, the priority instructs the most important flight time constraint

	to be managed first, thus avoiding large impact on AU fleet organisation and passengers. (<i>Phase 2B: Prioritisation- Step 5B to 7B</i>) L-DCB shares with AUs the intermediate solution for refinement if necessary and sets the final TTA solution in the NM system. The local solution can be achieved through an automated mechanism using a specific local algorithm, or through a manual flight selection process by a human operator; L-DCB actor. L-DCB can look different KPIs to prepare optimization phase (Phase 3: Optimization). L-DCB can update UDPP solution by modifying TTA on Flights released by the UDPP measure and update the sequence in coordination with NM as today if necessary (Phase 3: Optimization). APOC/APT: APOC/APT can look different KPIs to prepare optimization phase. APOC/APT can update UDPP solution or modify TTA on Flights released by the UDPP measure and update the sequence through the L-DCB in coordination with NM as today if necessary. (<i>Phase 3: Optimization</i>) NM: Accommodate the CASA/UDPP service final proposal, or update if necessary. NOTA: Phase 3 would be done by exception, and it should be not considered as daily process in the workflow
1.3 TASKS	The concept introduces new tasks derived from: • NM, AUs, APT and local DCB actors' coordination processes • HMI tools and features (physical and cognitive tasks) • New problem resolution methodologies and actor involved • The variety of Collaborative mechanisms AU: The relevant AU staff will identify the flights to prioritise and apply the UDPP mechanisms (FDR and/or SFP and/or Margins), according to AU need (<i>Phase 1: Initialisation</i>). The AU can set predefined priority taking on board if available (according to FF-ICE implementation), the first UDPP solution will integrate this predefined priority without AU intervention (<i>Phase 1: Initialisation</i>). AU will use UDPP Service define their prioritisation and generate internal What-if solution; AU will analyse the What-if solution and the impact on their fleet and organisation; When AU is satisfied by the What-If solution, AUs can Submit to the network its UDPP flights. AU will be always informed and have an up-to-date status of the UDPP measure and flights over the Network link (<i>Phase 2A: Prioritisation</i>). Workload: The Workload is slightly to increase, for AU actors but should stay acceptable. The rationale is that the AUs may need more time to assess different what-if options and different priority inputs during non-nominal situation Mitigation: It must be noticed that workload depends on the level of tools automation which should compensate for this increase. The what-if assessment task will be on global scenario, not for each flight which reduce the taskload impact. Another rationale is that even the several what-if request and analyse should increase the taskload, at the same time, the Collaborative Management Process should replace or light some heavy and complexity current task

which request to the Human actors to deals with a lot of information to reduce delays

Mitigation: It means also that the evaluation of level of workload should include the notion of weight of task (not the number of tasks to perform) (heavy and complexity which could involve a high mental charge) and the position of the task in the sequence (in what time the task is performed (close or not to deadline). The level of workload should be investigated as cost saving task in that way. It should also consider that a proactive way instead of reactive way allow to actors to better anticipate and reduce the negative impact of **workload**.

L-DCB: The relevant L-DCB staff will be able to perform current task and new added tasks related to NCP solution (UC2):

Current continuous today's task based on current process: L-DCB verifies the network impact of the updates in sequence (L-DCB can adapt CCS in coordination with NM in face to situation/traffic changes and can optimize by issuing TTA when flights are released from the UDPP measure in coordination with NM as today. *(Phase 2A&B to 8A&8B: Prioritisation)* L-DCB builds the NCP solution integrating AU Flight Prioritisation to smooth the traffic. L-DCB creates/updates solution with AU Constraints. And can compute the solution integrating AU prioritisation. This task can be achieved with both option: The local solution can be achieved through an automated mechanism using a specific local algorithm, or through a manual flight selection process by a human operator. *(Phase 6B)*

L-DCBL There won't be any major new task for the L-DCB regarding the use of UDPP; only concerning the UC2 – NCP: the fact of requesting UDPP measure based on NCP Network Cherry-Pick measure instead of CASA). The relevant L-DCB staff will be able to generate and analyse KPIs Local Impact assessment to prepare optimization phase with NM data. L-DCB can modify TTA or through eHelpdesk on flights released by UDPP measure and update the sequence, if necessary, in coordination with NM as today. *(Phase 3: Optimization)*

Workload: The workload impact should be neutral for L-DCB relevant actor.

The workload for L-DCB will slightly increase in the case of NCP solution (UC2) only. During the validation process (phase 6B), LDCB should be in total control of the solution but without any tools or automation the execution of the process would be extremely difficult. A manual Cherry pick is a task which needs mental calculations by the L-DCB, the task to assess the effectiveness of the UDPP NCP measure manually and without automation tool may lead increase cognitive workload.

Nevertheless, workload will decrease slightly. The rationale is that: in the previous process, the AU could not give their flight prioritisation and request to L-DCB some change about flight lately to decrease the impact of the regulation in their fleet. With the Collaborative Management Process, solution should be more anticipate and reduce the number of change request to execute for the L-CDB.

Mitigation: A lot depends on the level of automation, even for the initial cherry pick selection.

The number of AUs involved in the UDPP measure, number of AUs request and the wish to accommodate all AUs request may potentially increase

	workload and pressure (it may lead pressure due to not satisfied all request or to try). It may lead potential impact on the human error and job satisfaction. APOC/APT: Continuous task as today based on current process: The relevant APOC staff publishes a capacity constraint; can update the Airport organisation (API for runways, taxiing etc.) and updates and sends APIs and DPs to NMF (In coordination with L-DCB and NM) (<i>Phase 2: Prioritisation</i>). The relevant APOC staff will be able: To generate and analyse KPIs Airport Impact assessment; prepare optimization (<i>Phase 3: Optimization</i>): update UDPP solution (update the sequence, if necessary, in coordination with L-DCB and NM), modify TTA on flights released by UDDP measure; APOC/APT send TTAs if needed to NM/UDPP service to generate finale TTA/CTOT solution and publish the revised sequence. Workload The workload will increase slightly for APT relevant actor. The rationale is that the workload is generated by the level of uncertainty of the situation and performed actions (checking tasks linked to the accuracy & timeliness of information provided) to set up put regulation. In the new process, The UDPP priority will be used instead of Regulation, so it will be a question of considering the level of uncertainty of the situation and the use of the UDPP. NM: The workload will increase slightly for NM relevant actor. The rationale is that NM may need to verify proposed solutions which may lead a possible increase in workload.
2. HUMAN & SYSTEM	
2.1 ALLOCATION OF TASKS (HUMAN & SYSTEM)	The actors performing the tasks will be assisted by: Additional HMIs are expected, on the AUs side to manage the UDPP inputs and to submit their inputs to UDPP service. UDPP service (expected to be within NM) will also mean new interfaces. Automation for different parts of the process is envisaged as mitigation to prevent negative impacts on workload. Validation exercise may come out with requirements for automation. AU: The AU operator will identify which flights to prioritise and set a predefined priority (Phase 1: Initialisation) (manually or with automated support tool). The AU operator defines priorities for flights subject to the UDPP measure and uses the UDPP service to execute a what-if request (Phase 2: Prioritisation) (manually or with automated support tool) The AU operator evaluates the returned what-if scenario for the impact on the flight operation (Phase 2: Prioritisation) (manually or with automated support tool) The AU operator submits the UDPP proposal to UDPP service (UDPP commit) (Phase 2: Prioritisation) (manually or with automated support tool) The AU operator have an up-to-date vision and the last up to date UDPP measure solution (Current CTOT, proposed TTA) (<i>Phase 3: Optimization</i>) (manually or with automated support tool).

	L-DCB: L-DCB will request, activate a UDPP measure (<i>Phase 1: Initialisation</i>) (UDPP services, What-if features), send and update CCS to UDPP service (<i>Phase 1: Initialisation</i>). (Manually or with automated support tool). L-DCB will use a set of several Local Impact assessment KPIs to analyse and check whether the UDPP proposal is still acceptable with the situation (manually or with automated support tool / What-if feature) (<i>Phase 3: Optimization</i>). L-DCB can update UDPP solution by modifying TTA on Flights released by the UDPP measure and update the sequence in coordination with NM as today if necessary (<i>Phase 3: Optimization</i>) (manually or with automated support tool). L-DCB have always informed and have an up-to-date vision to the last up-to-date UDPP measure solution (Current CTOT, proposed TTA) (<i>Phase 3: Optimization</i>) (manually or with automated support tool). APOC/APT: The human operator will still publish the capacity constraint (<i>Phase 1: Initialisation</i>) and the Airport organisation: API for runways, taxiing etc... (In coordination with L-DCB and NM) (<i>Phase 2: Prioritisation</i>) (Manually or with automated support tool). APOC/APT execute a set of Local Impact assessment KPIs to prepare optimization (<i>Phase 3: Optimization</i>); update the sequence, if necessary, in coordination with L-DCB and NM), modify TTA on flights released by UDPP measure; APOC/APT send TTAs if needed to NM/UDPP service to generate finale TTA/CTOT solution and publish the revised sequence. (Manually or with automated support tool) APOC/APT have always informed and have an up-to-date vision to the last up-to-date UDPP measure solution (Current CTOT, proposed TTA). (<i>Phase 3: Optimization</i>) (manually or with automated support tool) NM: Accommodate the CASA/UDPP service final proposal, or update if necessary. (<i>Phase 3: Optimization</i>) (Manually or with automated support tool).
2.2 PERFORMANCE OF TECHNICAL SYSTEM	The new allocation of tasks between the human and the machine will require high levels of performance of the technical systems in terms of: • Relevance and accuracy of the information provided, so all actors involved in the process can trust the new concept • Timeliness of the information provided, especially when coordination processes are needed. • Recovery process in easy way especially when what-if scenario request is done • The performance of the system allows actors to keep acceptable level of workload and impact the feasibility and the acceptance of the concept by users. AU: The UDPP service is expected to provide the service with an instantaneous update of the delays and cost in <i>what if mode</i>, and near instantaneous update (to be defined) when published the final sequence. L-DCB: The UDPP service within NMF is expected to provide the service with near instantaneous delay when recalculating new sequence. The same level

		of service is expected when verifying the impact of the new sequence on network or recalculating the new sequence. APOC/APT: The UDPP service is expected to provide the service with near instantaneous delay to recalculate new sequence. NM/UDPP Services: (via B2B services) The UDPP service is expected to maintain The UDPP measure. (Flights are progressively released from the UDPP measure when they reach their cut-off time. NM/UDPP service is expected to consolidate data from AU inputs to generate final TTA/CTOT solution and always publish an up-to-date solution of the UDPP measure. NM System is expected to keep applying FPFS principle (and other CASA rules: MPR) to integrate the traffic and the different constraints within the Network. NM System is expected to deliver Network Impact Assessment (NIA) in a continuous process. NM/UDPP service is expected to share UDPP proposal with all through the Network.
2.3	HUMAN – MACHINE INTERFACE	Situational Awareness (HMI induces): HMI and coordination process should improve transparency between partners involved in the decision-making process. It might increase the level of SA. Workload (HMI induced): Level of Trust in the information (accuracy and timeliness) provided lead increase workload. A gap between what-if and the real outcome may be a potential field for reduced acceptance. AU: The UDPP features could either be incorporated into existing AU OCC tools or perhaps as a stand-alone system by providing additional information on the cost and impacts of any delays resulting from a CCS. The output of reordering will be display by adding the additional information depending on local AUs implementation: impact on the time or the cost. L-DCB: The NMF display will incorporate the view of the baseline delay and UDPP prioritised delay per flight in the hotspot. This display may not be required if the solution is equitable and ATFM delay is not increased APOC/APT: The APOC display will show the impact view of the UDPP prioritisation and the up-to-date-vision of UDPP solution. The APOC tool should provide a predefine set of KPIs for Airport Impact Assessment The APOC tool should provide a what-if or set of predefine what-if scenario to help Human actor in checking if the solution is still more acceptable The APOC display will show the impact of update action (TTA on flights released by the UDPP measure, the updated sequence) NM: not yet identified.
3. TEAMS & COMMUNICATION		
3.1	TEAM COMPOSITION	No changes foreseen.

3.2 ALLOCATION OF TASKS	The new concept should not impact the allocation of task between actors. But this will mean changes in coordination and possibly delegation of responsibilities between all actors including NM, APT and local DCB and, new operating methods, new HMIS and automation level to support actors could have an impact of the task load. Coordination tasks could lead new task dispatched between actors. Staff dedicated to this task should be investigate. AU: The relevant AU staff (dispatcher, duty manager) might be given the extended authority based on analysis of operational impact of the delays L-DCB: No changes foreseen. APOC/APT: No changes foreseen. NM: No changes foreseen.
3.3 COMMUNICATION	Changes to roles, responsibilities and operating methods are expected mainly through the inclusion of the AU actor in the DCB imbalance resolution process. This will mean changes in coordination and possibly delegation of responsibilities between all actors including NM, APT and local DCB. Changes due to UDPP only look minimal but difficult to assess accurately at the moment. If coordination is in one-to-one with AUs then the process would be heavier and lead the level of workload. The concept introduces additional communication needs: AU: New automated messages between AUs and UDPP servers. L-DCB: New automated messages between UDPP server and L-DCB local server in case of NCP-UDPP solution. During the collaboration phase, if coordination is in one-to-one with AUs then the process would be heavier for the L-DCB and impact the level of workload and pressure. Some process should be built to prevent potential issue APOC/APT: New automated messages between AUs and UDPP servers. NM: New automated messages between AUs and UDPP servers. <i>(Replace phone call)</i>
4. HP RELATED TRANSITION FACTORS	
4.1 ACCEPTANCE & JOB SATISFACTION	The automation feature and HMIs should support actors in the decision-making process. The HMI assessment will be a high impact on the acceptance of the project. The AUs consideration in the participation of the DCB problem resolution (delegation process) might impact on all actors' acceptance and job satisfaction. AU: Relevant AU staff job satisfaction could improve due to the improved service provided to AU, the decision-making ability, and the improvements in AU situation awareness. Additionally, the nature and the number of task (due to Collaborative Management Process) which may improve in AU workload level L-DCB: Relevant L-DCB staff job satisfaction could improve due to the knowledge that they are improving their service to AUs. Nevertheless, in the case of NCP-UDPP solution if the human actors would like to accommodate all AUs request may potentially increase workload and

	pressure (it may lead pressure due to not satisfy all request or to try). It may lead potential impact on the human error and job satisfaction APOC: Relevant APOC staff job satisfaction could improve due to the knowledge that they are improving their service to AUs. But relevant APOC staff may be reluctant to allow changing the working methods and allowing the AU to change the sequence close to the departure times.
4.2 COMPETENCE REQUIREMENTS	No changes foreseen
4.3 STAFFING REQUIREMENTS & STAFFING LEVELS	No changes foreseen. Due to the maturity of the HP assessment, analysis on staffing requirements and staffing levels are not needed to be performed.
4.4. RECRUITMENT AND SELECTION	No changes foreseen
4.5. TRAINING NEEDS	Training not expected to change in a major way either (additional tasks maybe to be included in the training but no major impact). New tools mean that users would need to be trained. Acceptance potentially linked to workload -> may lead to old methods. <i>The introduction of the concept might require specific training needs:</i> • Need for training (new HMIs and automation feature) for actor on new procedures. • Need for training (new process and operating methods)

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 PJ07-S39

The identification of relevant arguments, Human Performance issues and Human Performance benefits for SESAR PJ07 Solution 39 and Solution 37 can be found in Section 4.2 of the PJ09 Human Performance Assessment Plan. **Error! Reference source not found..**

4.3 Step 3 Improve and validate the concept

4.3.1 Description of HP activities conducted

HP activity	By when
Stakeholder Workshop: (HP/Safety HAZARD and nature of change)	25 th September 2020
Stakeholder Workshop: (HP/Safety HAZID and Issue analysis & mitigations)	29 June 2021
Human-in-the-Loop: Real-Time Gaming Simulation Zurich exercise (EXE#1) (SKYGUIDE, SWISS, ZRH Airport, NMOC, L-DCB)	4 th October -15 th October 2021
Human-in-the-Loop: Shadow Mode Simulation Alicante exercise (EXE#2) (ENAI, ALC Airport, NMOC, L-DCB)	15 TH March – 25 th March 2022
Human-in-the-Loop: Real-Time Gaming Simulation CDG exercise (EXE#4) (EUROCONTROL, CDG Airport, DSNA)	27th June – 1st July 2022

Table 3: Table of proposed HP activities and their priority

4.3.1.1 ACTIVITY 1: Stakeholder workshop (HP/SAF Hazard & nature of change)

ACTIVITY 1.	STAKEHOLDER WORKSHOP – (HP/SAFETY HAZARD AND NATURE OF CHANGE)
Description	The objective of the initial stakeholder process is to set up the reference scenario, to capture essential information about the project from an HF perspective to identify the changes and impacts on Human Performance and Safety introduced by PJ07 concept. The aims are to define who is impacted concerning the changes in existing roles (AUs, L-DCB/L-DCB, APOC,) and responsibilities to identify on how they might be impacted (operating methods, change in tasks, tools.). This first step analysis can allow us to identify and prioritise some HF issues and their impacts. Participants in the workshop will be HP experts, safety experts, solution experts, stakeholders, and operational experts.
HP OBJECTIVES	• To determine the expectations and issues from the Solution Stakeholders (Airspace Users, ANSP (L-DCB/L-DCB), Airport (APOC), NMOC) • To ensure a common understanding of the Operational Concept • To set up the reference scenario (baseline) and the solution scenario • To identify the changes and impacts on Human Performance introduced by the concept addressed by PJ07: ○ To identify the actors affected with the introduction of UDPP. ○ To identify the changes to the roles and responsibilities, operating methods (procedure task and practices) of the impacted actors and validate that they are clear and consistent. ○ To determine whether the role of human actors is consistent with human capabilities and limitation regarding level of workload and situation awareness

	○ To determine whether the technical systems support the human actors in performing their tasks ○ To determine whether the concept impact the team composition and communication between human actors. ○ To determine the impact of the job satisfaction and the level of acceptance of the new concept by the users.
Tool selected out of the HP repository	Facilitation
Planning and Approach	The combined HP and Safety workshop will be conducted on 25th of September 2020 in WebEx mod. This workshop approach utilising the expertise of involved in several project areas will help to identify as many HF issues as possible, and gain commitment of these HF Issues by all member of project. The workshop will be conducted based on the Safety and Performance scoping and change assessment template previously filled and General Coordination Workflow diagram (OSED) involving all actors as document support annex.
Timeline	25 September 2020

Table 4: HP Activity STAKEHOLDER WORKSHOP 1

4.3.1.2 ACTIVITY 2. Stakeholder workshop (HP/SAF HAZID and Issue analysis & mitigations)

ACTIVITY 2.	STAKEHOLDER WORKSHOP – (HP/SAFETY HAZID AND ISSUE ANALYSIS & MITIGATIONS)
Description	The objective of second stakeholder process will be focused on refine HP issue and list of possible mitigation issues. Participants in the workshop will be HP experts, safety experts, solution experts, stakeholders, and operational experts.
HP objectives	• To refine the identification of the changes and impacts on Human Performance introduced by the concept addressed by PJ07. • To identify and propose some mitigations aspect
Tool selected out of the HP repository	Facilitation
Planning and Approach	The review should be based on the EATMA model outlined in the OSED
timeline	29 June 2021

Table 5: HP Activity STAKEHOLDER WORKSHOP 2

4.3.1.3 ACTIVITY 3. Human in the loop - Real- time gaming simulation - (EXE#1)

ACTIVITY 3.	Zurich Exercise (EXE#1)- SKYGUIDE+SWISS+ZRH – Human in the loop
Description	A real-time gaming simulation (Shadow mode exercise) is a validation exercise providing the possibility to end users and operational experts to validate the concept and the developed HMI support in an environment that simulates the real operations but is not “online” yet. It is conducted in a controlled experimental condition to be able to manipulate and simulate different scenarios without having an impact on real operations.
HP objectives	HP1-Consistency of human role with respect to human capabilities and limitations: • OBJ-07-W2.39-V3-VALP-HP1-001 • OBJ-07-W2.39-V3-VALP-HP1-002 • OBJ-07-W2.39-V3-VALP-HP2-002 • OBJ-07-W2.39-V3-VALP-HP2-006 • OBJ-07-W2.39-V3-VALP-HP2-010 • OBJ-07-W2.39-V3-VALP-HP2-008 • OBJ-07-W2.39-V3-VALP-HP2-009 • OBJ-07-W2.39-V3-VALP-HP3-001 HP2-Suitability of technical system in supporting the tasks of human actors: • OBJ-07-W2.39-V3-VALP-HP2-004 • OBJ-07-W2.39-V3-VALP-HP2-007 • OBJ-07-W2.39-V3-VALP-HP2-008 • OBJ-07-W2.39-V3-VALP-HP6-001 • OBJ-07-W2.39-V3-VALP-HP6-002 • OBJ-07-W2.39-V3-VALP-HP6-003 • OBJ-07-W2.39-V3-VALP-HP3-002 HP3-Adequacy of team structure and team communication in supporting the human actors: • OBJ-07-W2.39-V3-VALP-HP2-001 • OBJ-07-W2.39-V3-VALP-HP2-005 • OBJ-07-W2.39-V3-VALP-HP2-006 HP4-Feasibility regarding to HP-related transition factors: • OBJ-07-W2.39-V3-VALP-HP6-004 • OBJ-07-W2.39-V3-HP4-001 • OBJ-07-W2.39-V3-HP4-002
Tool selected out of the HP repository	PROCEDURES: qualitative questionnaire, observations, and debriefing. PERCEIVED WORKLOAD: Individual questionnaires, observations debriefing SITUATIONAL AWARENESS: Individual questionnaires, debriefing LEVEL OF TRUST: Individual questionnaires, observations debriefing. HMI / SUPPORTING TOOLS: Usability tests, observations questionnaires and debriefings.
Planning and Approach	The validation exercise “EXE#1 SKYGUIDE+SWISS+ZRH” will validate the Operational and technical benefit of the integrated L-DCB/UDPP/(APOC) process for managing arrivals at ZRH (AU-DCB tools solve locally the problem (ATFCM regulation) in cooperation with the Network Manager) - UDPP commit to be performed - L-DCB involvement - AUs + ZRH Airport as actors
timeline	4th October -15th October 2021

Table 6: Human in the loop - EXE#1

4.3.1.4 ACTIVITY 4. Human in the loop - Shadow Mode simulation - (EXE#2)

ACTIVITY 4.	Alicante exercise (EXE#2)– Human in the loop
Description	A Human-In-The-Loop Shadow Mode simulation is a validation exercise providing the possibility to end users and operational experts to validate the concept and the developed HMI support in an environment that simulates the real operations but is not “online” yet. It is conducted in a controlled experimental condition to be able to manipulate and simulate different scenarios without having an impact on real operations.
HP objectives	HP1-Consistency of human role with respect to human capabilities and limitations: • OBJ-07-W2.39-V3-VALP-HP1-001 • OBJ-07-W2.39-V3-VALP-HP1-002 • OBJ-07-W2.39-V3-VALP-HP2-001 • OBJ-07-W2.39-V3-VALP-HP2-002 • OBJ-07-W2.39-V3-VALP-HP2-006 • OBJ-07-W2.39-V3-VALP-HP2-008 • OBJ-07-W2.39-V3-VALP-HP3-001 HP2-Suitability of technical system in supporting the tasks of human actors: • OBJ-07-W2.39-V3-VALP-HP3-002 • OBJ-07-W2.39-V3-VALP-HP5-002 HP3-Adequacy of team structure and team communication in supporting the human actors: • OBJ-07-W2.39-V3-VALP-HP2-005
Tool selected out of the HP repository	Bedford Scale, SASHA, SATI, Usability Score, Debriefing, Observation
Planning and Approach	The validation exercise “EXE#2 ENAIRE” will validate the Operational and technical benefit of the integrated APOC/AUs/UDPP/(L-DCB) process for managing arrivals at ALC (AU-DCB tools solve locally the problem (ATFCM regulation) in cooperation with the Network Manager NMOC)
Timeline	15TH March – 25th March 2022

Table 7: Human in the loop - EXE#2

4.3.1.5 ACTIVITY 5. Human in the loop - Real- time gaming simulation - (EXE#4)

ACTIVITY 5.	CDG exercise (EXE#4)– Human in the loop
Description	A real-time gaming simulation (Shadow mode exercise) is a validation exercise providing the possibility to end users and operational experts to validate the concept and the developed HMI support in an environment that simulates the real operations but is not “online” yet. It is conducted in a controlled experimental condition to be able to manipulate and simulate different scenarios without having an impact on real operations.
HP objectives	HP1-Consistency of human role with respect to human capabilities and limitations: • OBJ-07-W2.39-V3-VALP-HP1-001 • OBJ-07-W2.39-V3-VALP-HP1-002 • OBJ-07-W2.39-V3-VALP-HP2-002 • OBJ-07-W2.39-V3-VALP-HP2-006 • OBJ-07-W2.39-V3-VALP-HP2-010 • OBJ-07-W2.39-V3-VALP-HP2-008 • OBJ-07-W2.39-V3-VALP-HP2-009 • OBJ-07-W2.39-V3-VALP-HP3-001 HP2-Suitability of technical system in supporting the tasks of human actors: • OBJ-07-W2.39-V3-VALP-HP2-007 • OBJ-07-W2.39-V3-VALP-HP3-001 • OBJ-07-W2.39-V3-VALP-HP3-002 • OBJ-07-W2.39-V3-VALP-HP5-001 HP3-Adequacy of team structure and team communication in supporting the human actors: • OBJ-07-W2-39-V3-VALP-HP2-001 • OBJ-07-W2.39-V3-VALP-HP2-005 • OBJ-07-W2.39-V3-VALP-HP2-006 HP4-Feasibility regarding HP-related transition factors: • OBJ-07-W2.39-V3-VALP-HP2-006 • OBJ-07-W2-39-V3-HP4-001
Tool selected out of the HP repository	PROCEDURES: qualitative questionnaire, observations, and debriefing. PERCEIVED WORKLOAD: Individual questionnaires, observations debriefing SITUATIONAL AWARENESS: Individual questionnaires, debriefing LEVEL OF TRUST: Individual questionnaires, observations debriefing. HMI / SUPPORTING TOOLS: Usability tests, observations questionnaires and debriefings.
Planning and Approach	EXE#4 EUROCONTROL: CDG (Wave 3), - DSN expressed interest after W2 was defined - Expected use case: UDPP to be integrated with E-AMAN processes in planning phase, details TBD
Timeline	27th June – 1st July 2022

Table 8: Human in the loop - EXE#4

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

4.4.1 Summary of HP activities results & recommendations / requirements

4.4.1.1 EXE1# Collaborative management of constraints on arrivals at Zurich Airport (ZRH)

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Obj. ID	Valid. activity conducted	results / evidence	recommendations	requirements
Arg. 1.1.1: Operating methods cover operations in normal operating conditions.							
HFI- ARG1.1.1- ZRH-07-V3- 001	HP Issue: The description of roles & responsibilities for each human actors likely to be affected by the change with the introduction of Collaborative Management Process in the resolution solution might not be fully described.	Closed	OBJ-07- W2.39-V3- VALP-HP1- 001	Stakeholder Workshop	The description of roles & responsibilities for potentially affected actors (L-DCB, AUs & NM Operator) are fully described during Stakeholders Workshop.		
HFI- ARG1.1.2- ZRH-07-V3- 001	HP Issue: The description of roles and responsibilities is not complete and all the tasks to be performed by the human operators have not been considered and described. This includes the new tasks and modified tasks that may result from the proposed project changes, as well as the former existing tasks that remain unchanged.	Closed	OBJ-07- W2.39-V3- VALP-HP1- 001	Workshop Stakeholders (with safety and operational expert) Real-Time Gaming Simulation (EXE01 ZUR)	The description of roles & responsibilities for potentially affected actors (L-DCB, AUs & NM Operator) and all the tasks to be performed by the actors have been considered during Stakeholders Workshop. The outputs of the debriefing sessions during Real-Time Gaming Simulation the regarding the role and responsibility have not highlighted that Flight Prioritization substantially changes (in a way that is likely to have a strong effect in decision making process) the role and responsibility of the L-DCB actor.		
HFB- ARG1.1.3- ZRH-07-V3- 001	HP Benefit: The description of roles & responsibilities which allows to AUs participation via setting a UDPP measure (Phase 1: Initiation) is clear and consistent for all human actors involved in the Collaborative Management Process.	Closed	OBJ-07- W2.39-V3- VALP-HP1- 001	Stakeholder Workshop	The clarity and the consistency regarding the description of roles & responsibilities which allows to AUs participation via setting a UDPP measure during the initialisation process has been validated. The outputs of the qualitative questionnaire regarding description of roles & responsibilities which allows to AUs participation via creating and		

					activating a UDPP measure showed positive feedback. They agreed clearly understand their role and responsibility during all phases of the process.		
HFI-ARG1.1.3-ZRH-07-V3-001	HP Issue: The description of roles & responsibilities during the Initialisation of the process, Flight prioritisation and Optimisation phase is not clear and not consistent with their daily work, for all actors (L-DCB, AUs, and NMOC) involved in the Collaborative Management Process. An ambiguous definition of roles and responsibilities could lead to inefficient operating methods and in turn impair the overall concept acceptability.	Closed	OBJ-07-W2.39-V3-VALP-HP1-001	Stakeholder Workshop	The clear understanding regarding the description of roles & responsibilities during the Initialisation of the process, Flight prioritisation and Optimisation phases for all actors (L-DCB, AUs, and NMOC) involved in the Collaborative Management Process has been validated. The outputs of the qualitative questionnaire showed mixed feedback. All actors estimated that description of roles & responsibilities consistent with their daily work during all phase of the process. description of roles & responsibilities	PJ07-ZUR-HP-RECOM-07	
HFI-ARG1.1.3-ZRH-07-V3-002	HP Issue: The role of NM functions to automatically integrate the AU prioritization to calculate the flight delays might be not clear and inconsistent with current role and responsibility. An ambiguous definition of roles and responsibilities could lead to inefficient operating methods and in turn impair the overall concept acceptability.	Closed	OBJ-07-W2.39-V3-VALP-HP1-001	Stakeholder Workshop	The outputs of the qualitative questionnaire showed positive feedback regarding the role of NM functions to automatically integrate the AU prioritization to calculate the flight delays. All actors (L-DCB, AUs, and NMOC) involved in the Collaborative Management Process have estimated that the role of NM functions clear and consistent with current role and responsibility		
HFI-ARG1.1.3-ZRH-07-V3-003	HP Issue: In case of a capacity imbalance, the description of roles & responsibilities which allows AUs to re-order their flights or set prioritisation via FDR, SFP or Margins feature is not clear and not consistent for all human actors involved in the Collaborative Management.	Closed	OBJ-07-W2.39-V3-VALP-HP1-001	Stakeholder Workshop	The description of roles & responsibilities for potentially affected actors (L-DCB, AUs & NM Operator) which allows AUs to re-order their flights or set prioritisation via FDR, SFP or Margins feature have been considered during Stakeholders Workshop. The outputs of the debriefing sessions during Real-Time Gaming Simulation the regarding the role and responsibility have not highlighted specific issue.		
Operating methods are exhaustive and support human performance.							

Arg. 1.2.1: Operating methods cover operations in normal operating conditions.							
HFB- ARG1.2.1- ZRH-07-V3- 001	HP Benefit: The operating methods related to the consideration of the AUs UDPP prioritisation by the L-DCB actors in operating conditions are fully defined for all human actors involved in the Collaborative Management Process.	Closed	OBJ-07- W2.39-V3- VALP-HP1- 002	Workshop Stakeholders (with safety and operational expert) Real-Time Gaming Simulation (EXE01 ZUR)	The outputs of the qualitative questionnaire showed positive feedback regarding the consideration of the AUs UDPP prioritisation by the L-DCB actors in operating conditions. The AUs considered that their Flight prioritisation is considering by L-DCB.		
Arg. 1.2.2: Operating methods cover operations in abnormal operating conditions.							
HFI- ARG1.2.2- ZRH-07-V3- 001	HP Issue: The Prioritisation operating methods developed are not fully defined for the AUs actors and do not cover operations in operational issue conditions. Using the What If tool, the AU will not be able to assess the impact of a prioritisation on its fleet and will not test any possible optimisation by applying on the flight in the UDPP measure the following features: SFP, FDR or Margins or combination of those. It could lead to inefficient operating methods and in turn impair the overall concept acceptability.	Open	OBJ-07- W2.39-V3- VALP-HP1- 002	Workshop Stakeholders (with safety and operational expert) Real-Time Gaming Simulation (EXE01 ZUR)	The operational acceptance issue regarding the fully definition of the different phases of the new process has been partially validated. The outputs of the qualitative questionnaire showed mixed feedback regarding the clarity and the consistency of the different phases of the new process. Although that the operating methods considering the optimisation phase (Optimise arrival sequence) is considered clear for actors involved in the process, during the debriefing session, the Optimisation appeared not to be clear for AUs and L-DCB (Airport operator) actors. Some aspect of the phase 3 may affect the resulting AU benefits or potentially even produce disbenefits for AUs. It is recommended to clarified concept with local framework between AUs and Airports that would establish guide for use the specifically the optimisation phase. They highlighted that this phase was not relevant for this exercise. It is recommended to re-assess acceptance of the Optimisation phase in use case 2 from other validation exercise (EXE2 an EX4).	PJ07-ZUR-HP- RECOM-01 PJ07-ZUR-HP- RECOM-08	PJ07-ZUR-HP- REQ-13

HFI- ARG1.2.2- ZRH- 07-V3- 002	HP Issue: The operating methods related to the collaborative CCS resolution process are not fully defined and do not cover daily operations. The rationale is that the timeframes between the flights' SIT1 milestones and UDPP cut-off times provided, are not sufficiently large enough to allow AUs to submit UDPP input on their flights. (E.g.: the notion of UDPP cut-off-time. At what time the different actors could make an action or not)	Closed	OBJ-07- W2.39-V3- VALP-HP1- 002	Workshop Stakeholders (with safety and operational expert) Real-Time Gaming Simulation (EXE01 ZUR)	The issue regarding the full definition of operating methods related to the collaborative CCS resolution process has been validated. The outputs of the qualitative questionnaire showed positive feedback regarding the timeframes between the flights' SIT1 milestones and UDPP cut-off times provided. The AUs considered that the process provides sufficiently large timeframes between the flights' SIT1 milestones and UDPP cut-off times, during which UDPP inputs can be submitted on my flights.	
HFI- ARG1.2.2- ZRH- 07-V3- 004	HP Issue: The operating methods related to the consideration of AUs Flight prioritisation are not fully defined and not cover daily operations. The rationale is that the new slots allocation producing delay on flights might not be considering the AU Flight prioritisation.	Closed	OBJ-07- W2.39-V3- VALP-HP1- 002	Workshop Stakeholders (with safety and operational expert) Real-Time Gaming Simulation (EXE01 ZUR)	The issue regarding the full definition of operating methods related to the consideration of AUs Flight prioritisation has been validated. The outputs of the qualitative questionnaire showed positive feedback regarding the consideration of the AU Flight prioritisation when the new slots allocation producing delay on flights. The AUs considered that the new slots allocation producing delay on flights are considering the AU Flight prioritisation.	
HFB- ARG1.2.2 ZRH-- 07- V3-001	HP Benefit: The operating methods developed are fully defined to cover daily operations. (Phase 2: Prioritisation). As the UDPP measure is applicable earlier in the planning phase than the Reactive FDCI and Slot Swapping. Reactive FDCI and Slot Swapping could be use after the UDPP service release the flight to optimisation.	Closed	OBJ-07- W2.39-V3- VALP-HP1- 002	Workshop Stakeholders (with safety and operational expert) Real-Time Gaming Simulation (EXE01 ZUR)	The operational acceptance issue regarding the fully definition of the Prioritisation phase of the new process has been validated. The outputs of the qualitative questionnaire showed positive feedback regarding the clarity and the consistency of the AU prioritisation & commit. All actors considered that the Prioritisation phase is clear. In addition, the AUs considered that it had a high added value to decrease the impact of the delays and the overall process to set up UDPP prioritisation.	

Arg. 1.2.4: The content of operating methods is clear and consistent (in V1: non-contradictory).

HFI-ARG1.2.4-ZRH-07-V3-001	HP Issue: The new process introduces the notion of cut-off-time which determine boundaries' intervention for actors involved in the process. This absolute time defined when the "UDPP Measure" is initiated and specify until when AUs can set priorities/Margins on their flights. Over this time, the last prioritisation given by AUs on their flights are taken as "final UDPP prioritisation" to elaborate final UDPP solution. This process should be clear and consistent for all actors involved.	Closed	OBJ-07-W2.39-V3-VALP-HP1-002	Workshop Stakeholders (with safety and operational expert) Real-Time Gaming Simulation (EXE01 ZUR)	The issue regarding the and the consistency of the different phases of the new process has been validated. The outputs of the qualitative questionnaire showed positive feedback regarding the clarity and the consistency of the different phases of the new process. Nevertheless, debriefing sessions highlighted that depends on what the constraints issue are, the number of affected flights, this process could be complex it could be taken more than 30 minutes to manage.		
HFI-ARG1.2.4-ZRH-07-V3-002	HP Issue: The operating methods related to the interaction process between all actors (AUs, L-DCB (FMP & Airport operator), NMOC) involved in the collaborative UDPP Management process might be not clear and inconsistent with their daily work. An ambiguous process for all actors involved may lead to negative impact on actor's performance.	Closed	OBJ-07-W2.39-V3-VALP-HP1-002	Workshop Stakeholders (with safety and operational expert) Real-Time Gaming Simulation (EXE01 ZUR)	The issue regarding the clarity and the consistency between the operating methods related to the interaction process between all actors (AUs, L-DCB, NMOC) involved in the collaborative UDPP Management process and their daily work has been validated. The outputs of the qualitative questionnaire showed mixed feedback regarding the operating methods related to the interaction process between all actors (AUs, L-DCB, NMOC) involved in the collaborative UDPP Management process. The interaction process between actors introduced in the operating methods is considered as consistent with their daily work. In addition, during the debriefing session, AUS confirmed that the new concept is compatible with their tasks and highlighted that UDPP should be integrate to all system to have a full vision of all airlines. Nevertheless, the exercise highlighted that the Airport operator (L-DCB) was more likely intervene on UDPP solution than FMP whose intervene only in safety aspect was compromised.	PJ07-ZUR-HP-RECOM-07	PJ07-ZUR-HP-REQ-13

					It is recommended a concept clarification for the phase 3 (optimisation)		
Arg. 1.2.5: Operating methods can be followed in an accurate, efficient, and timely manner.							
HFI-ARG1.2.5-ZRH-07-V3-001	HP Issue: The UDPP operating methods cannot be followed in an accurate, efficient, and timely manner. Operating methods for normal operating conditions of operation cannot be applied by the end users without significant errors and respecting the sequence and timing of actions.	Closed	OBJ-07-W2.39-V3-VALP-HP2-010	Workshop Stakeholders (with safety and operational expert) Real-Time Gaming Simulation (EXE01 ZUR)	The issue regarding the accuracy, efficiency and timeliness of the UDPP operating methods has been validated. The outputs of the qualitative questionnaire showed positive feedback regarding the operating methods related to consideration of UDPP mechanism. All actors (AUs, L-DCB, NMOC) considered that the initialisation of the process (measure creation & activation), the Flight prioritisation (AU prioritisation & commit) and Optimisation phase (Optimise arrival sequence) can be followed in an accurate, relevant, and timely manner. Moreover, L-DCB, NMOC estimated that the collaborative CCS resolution inclusion can be achieved without compromising their work objectives each time the process is trigger.		
1.3	Human actors can achieve their tasks (in normal & abnormal conditions of the operational environment and degraded modes of operation).						
Arg. 1.3.1: The potential for human error is reduced as far as possible.							
HFB-ARG1.3.1-ZRH-07-V3-001	HP Benefit: The potential for human error is reduced to a tolerable level. Are Potential human errors and mitigations to bring them to an acceptable level identified?	Cancelled	OBJ-07-W2.39-V3-VALP-HP2-002	Real-Time Gaming Simulation (EXE01 ZUR)	The issue regarding the potential of human error had been validated. The outputs of the qualitative feedback (questionnaire and debriefing) showed positive feedback from FMP. The FMP actors clearly confirmed that the safety aspect of UDPP measure based on UC1 is not an issue because CASA is still the function responsible for computation of slots and allocation of flights to those slots		
Arg. 1.3.2: Tasks can be achieved in a timely manner.							
HFB-ARG1.3.2-	HP Benefit: The Human actors can achieve their tasks in a timely manner (Phase 2). The Collaborative Management Process	Closed	OBJ-07-W2.39-V3-	Real-Time Gaming Simulation (EXE01 ZUR)	The issue regarding the timely manner of tasks achievement by the Human actors involved in the Collaborative Management Process (Phase 2) has	PJ07-ZUR-HP-RECOM-02	PJ07-ZUR-HP-REQ- 03

ZRH-07-V3-001	allows the AU relevant actor to generate different what-if options and different priority inputs during non-nominal situations (due to use of one, mix or full UDPP mechanism). It should improve timeliness of task-related analysing and decision-making flights prioritisation actions.		VALP-HP2-006		been validated. The outputs of the qualitative questionnaire showed positive feedback regarding the achievement of their tasks in a timely manner during the Flight prioritisation (AU prioritisation & commit). The AUs actors considered that they clearly identified Flights concerned by a UDPP measure. In addition, they estimated that the overall process to set up UDPP prioritisation of their fights on their fleet and all actions to mitigate impact of delay with the new process are easy. Nevertheless, they highlighted, during the debriefing's session that even it's a daily business, there was a lot of information and data needed to support the decision-making process (sequence to apply, margins, priority,) this process could be complex. They also highlighted that this information should be treated in automation way and the operator should not do that. It is recommended to set up training and tools automation improvement to mitigate a possible increase of workload.	PJ07-ZUR-HP-RECOM-03
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Arg. 1.3.3: The level of workload (induced by cognitive and/or physical task demands) is acceptable.

HFB-ARG1.3.3-ZRH-07-V3-001	HP Benefit: The Collaborative Closed Management Process allows a better anticipation of the resolution of the problems decreasing the last-minute request for both actors AUs and L-DCB. The level of workload should be investigated as cost saving task in that way.	OBJ-07-W2.39-V3-VALP-HP3-001	Prototyping session Real-Time Gaming Simulation (EXE01 ZUR)	The issue regarding the level of subjective workload as consideration of as cost saving task in that way has been validated. The outputs of the qualitative questionnaire showed that the level of subjective workload due to the consideration of the new process is considered as acceptable. Even if, during Flights' prioritisation before submitting, the number of actions could be very high and requires additional workload to consider numerous What-If options. However, they estimated the benefit outweighs the additional workload. During the debriefing session, the AUs explained even if in operational process,
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HFB- ARG1.3.3- ZRH- 07-V3- 002	HP Benefit: The level of workload will decrease slightly for L-DCB relevant actor. The rationale is that: in the previous process, the AU could not give their flight prioritisation and request to L-DCB some change about flight lately to decrease the impact of the regulation in their fleet. With the Collaborative Management Process, solution should be more anticipate and reduce the number of change request to execute for the L-DCB.	Closed	OBJ-07- W2.39-V3- VALP-HP3- 001	Real-Time Gaming Simulation (EXE01 ZUR)	Prioritisation need more workload, at the end of the day, the prioritisation is well managed, and the workload impact is decrease. There is no more change in the flight, so at the end of day there is less thing to do. The new process allows them the flexibility to distribute workload along the day. Moreover, even if the number of actions to perform the task is the same, the both actors AUs and L-DCB estimated that the new process reduces complexity of current tasks. The issue regarding the level of subjective workload due to the consideration of the better anticipation of the number of change request to execute for the L-DCB has been validated. The outputs of the qualitative questionnaire showed that the L-DCB actors estimated that there is not really change to plan organize their work as expected. In addition, during the debriefing session they considered that there is no impact of the subjective workload.
HFB- ARG1.3.3- ZRH- 07-V3- 003	HP Benefit: The level of workload will increase slightly for APT relevant actor. The rationale is that the level of workload is generated by the level of uncertainty of the situation and performed actions (checking tasks linked to the accuracy & timeliness of information provided) to set up put regulation. In the new process, the UDPP measure will be used instead of Regulation, so it will be a question of considering the level of uncertainty of the situation and the use of the UDPP.	Open	OBJ-07- W2.39-V3- VALP-HP3- 001	Real-Time Gaming Simulation (EXE01 ZUR)	The issue regarding the level of subjective workload due to the consideration of the checking tasks linked to the accuracy & timeliness of information to set up put a regulation has been partially validated. Even, if the level of subjective workload has not been assessed, the outputs of the qualitative questionnaire showed that the APT actors estimated that the investigation of the collaborative CCS resolution process has no negative impact on the detection of the DCB imbalance/CCS in my area of responsibility. Moreover, they estimated that the information provided is useful to supports them in the decision-

making process. Nevertheless, the APT workload remains an open question, due to limited participation of the APT actor in the scenario runs and thus insufficient exposure to the proposed process.

HFI- ARG1.3.3- ZRH-07-V3- 001	HP Issue: The level of workload could be increase slightly for NM actor. The rationale is that NM may need to verify proposed UDPP solutions which may lead to a possible increase of the level of workload.	Closed	OBJ-07- W2.39-V3- VALP-HP3- 001	Real-Time Gaming Simulation (EXE01 ZUR)	The issue regarding the level of subjective workload due to the consideration of the checking tasks linked to the accuracy & timeliness of information to set up put a regulation has been validated. Even, if the level of subjective workload has not been assessed, he outputs of the qualitative questionnaire showed that the NMOC actor considered that the collaborative CCS resolution inclusion can be achieved without compromising their work objectives each time the process is trigger.
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Arg. 1.3.4: The level of trust in the new concept/the new procedures is appropriate.

HFI- ARG1.3.4- ZRH-07-V3- 001	HP Issue: The tools should support the human actors in the decision-making process. A not accurate and timeliness information provided to actors may not allow them to select the most convenient TTA to solve the imbalance. It will lead to a too low level of trust and may reduce acceptance in the new concept and operating methods by actors involved in the Collaborative Management Process.	Closed	OBJ-07- W2.39-V3- VALP-HP2- 008	Real-Time Gaming Simulation (EXE01 ZUR)	The operational acceptance issue regarding the appropriate level of trust in the collaborative CCS resolution process to select the most convenient TTA to solve the imbalance by the AUs actors has been validated. The outputs of the qualitative questionnaire showed that AUs were confident about in the information provided by the tool to prioritise their fleet. Moreover, when incorporates the UDPP inputs, they considered that their UDPP inputs are correctly reflected in the CCS resolution. Also, when one or more parameters of the measure change (start/end times, duration, rate), they estimated that their constraints and/or UDPP inputs were correctly reflected in the updated measure. Nevertheless, they highlighted that there is sometimes a discrepancy between What-If and	PJ07-ZUR-HP- RECOM-04	PJ07-ZUR-HP- REQ- 04
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					Submit information. Although this is explained in the concept, it could result in lower confidence.		
Arg. 1.3.5: Human actors can maintain a sufficient level of situation awareness.							
HFB-ARG1.3.5-ZRH-07-V3-001	HP Benefit: During the UDPP NCP measure resolution process, all human actors should always be able to obtain the up-to-date status of the situation which allow them a better understanding of the global situation and the elaboration of the solution. It allows them to maintain a sufficient level of awareness of the operational situation which might impact positively the ability to make appropriate decision.	Closed	OBJ-07-W2.39-V3-VALP-HP2-009	Real-Time Gaming session Debriefing session (EXE01 Zurich)	The operational acceptance issue regarding level of all human actor's situation awareness during the UDPP NCP measure resolution process has been validated. The outputs of the qualitative questionnaire showed that the new collaborative framework allows all actors (AUs, L-DCB, NMOC) to better understand the situation and in which phase of the process, they must act [initialisation of the process (measure creation & activation), the Flight prioritisation (AU prioritisation & commit) and Optimisation phase (Optimise arrival sequence)].identify the impact of a proposed solution in their area of responsibility. Nevertheless, during the debriefing session, AUs highlighted that collaboration between AU and Airport must be clarified during the optimisation phase.	PJ07-ZUR-HP-RECOM-05	
2.1	Is there an appropriate allocation of tasks between the human and machine (i.e., level of automation)?						
Arg. 2.1.1: The task allocation between the human and the machine is consistent with automation principles							
HFB-ARG2.1.1-ZRH-07-V3-001	HP Benefit: There is an appropriate allocation of tasks between the human actors and machine. The new concept considers that the actors performing the tasks will be assisted by additional HMIs. On the AUs side to manage the UDPP inputs and to submit their inputs to UDPP service. UDPP service (expected to be within NM) will also mean new interfaces. Automation for different parts of the process is envisaged as mitigation to prevent negative	Closed	OBJ-07-W2.39-V3-VALP-HP2-007	Real-Time Gaming Simulation (EXE01 ZUR)	The operational acceptance issue regarding the appropriate allocation of tasks between the human actors and machine has been validated. The outputs of the qualitative questionnaire showed that all actors (AUs, L-DCB, NMOC) considered that the distribution between the system automation and human action is well balanced for performing their tasks. In particular, the AUs considered that the level of automation for the what-if tool is acceptable to carry out my tasks effectively. During the debriefing session, actors	PJ07-ZUR-HP-RECOM-03	PJ07-ZUR-HP-REQ- 03

	impacts on workload level. The level of automation/distribution of tasks between the human and machine must be consistent with HF automation principles.				considered that user interface had a lot of information and they highlighted that some automation improvement should be necessary to mitigate the level of workload in operational situation.		
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Arg. 2.1.2: Changes to the task allocation between human and machine support human performance.

HFI-ARG2.1.2-ZRH-07-V3-001	HP Issue: All during phases of Collaborative Management Process, all human actor's cognitive and task demands could be not acceptable. The impact of the changes in the task on situational awareness, workload, human error/ performance must be considered.	Closed	OBJ-07-W2.39-V3-VALP-HP2-007	Real-Time Gaming Simulation (EXE01 ZUR)	The acceptance issue regarding an appropriate allocation of tasks between the human actors and machine has been validated. The outputs of the qualitative questionnaire showed that all actors (AUs, L-DCB, NMOC) considered that information provided by the tool is useful and supports them in the decision-making process. In particularity, the AUs considered that the systems help them in comparing and analysing different information items and with the What-if features, it allows them to generate decision options, and to select the most appropriate decisions and actions to be performed. Also, in particularity, the L-DCB considered that the accuracy and the timeliness of the information/ data provided allows them to easily create UDPP Measure with regulation.		
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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.

HFB-ARG2.1.4-ZRH-07-V3-001	HP Benefit: The level of workload should be acceptable by relevant AUs actors. Even if the level of workload is likely to increase slightly due to additional tasks, the rationale is that the Collaborative Management Process should replace or light some heavy and complex tasks which request to the Human actors to deals with	Closed	OBJ-07-W2.39-V3-VALP-HP3-002	Real-Time Gaming Simulation (EXE01 ZUR)	The issue regarding an acceptable level of subjective workload due to additional tasks with the Collaborative Management Process consideration has been validated. The outputs of the qualitative questionnaire showed that the AUs estimated the new process reduces complexity of current tasks without increase the number of actions to perform.	PJ07-ZUR-HP-RECOM-03	PJ07-ZUR-HP-REQ- 06
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	a lot of information to reduce delays and their impact.				Moreover, they also considered even if the level of workload is slightly increased due to the necessary prioritisation, that was not taking place before, but can be easily managed due to the flexibility on the time at which inputs have to be given. To mitigate the impact of the workload, it is recommended to improve tools usability. (E.g: limitation of the submit task (click), better task automation of task, better feature to deal with lot of information and data provided to the users.		
HFB-ARG2.1.4-ZRH-07-V3-002	HP Benefit: The level of workload should be acceptable by relevant L-DCB actors. Even if the level of workload is increase slightly due to additional tasks, the rationale is in the previous process, the AU could not give their flight prioritisation and request to L-DCB some change about flight lately to decrease the impact of the regulation in their fleet. With the Collaborative Management Process, solution should be more anticipate and reduce the number of change request to execute for the L-CDB.	Closed	OBJ-07-W2.39-V3-VALP-HP3-002	Real-Time Gaming Simulation (EXE01 ZUR)	The issue regarding the level of subjective workload due to the consideration of the better anticipation of the number of change request to execute for the L-DCB has been validated. The outputs of the qualitative questionnaire showed that the level of subjective workload due to the consideration of the new process is considered as acceptable. Even if the number of actions to perform the task is the same, L-DCB estimated that the new process reduces complexity of current tasks.		
HFB-ARG2.1.4-ZRH-07-V3-003	HP Benefit: The level of workload for the L-DCB is acceptable as the current tasks do not change for the L-DCB actors.	Closed	OBJ-07-W2.39-V3-VALP-HP3-002	Real-Time Gaming Simulation (EXE01 ZUR)	The issue regarding the level of subjective workload due to the consideration of the better anticipation of the number of change request to execute for the L-DCB has been validated. The outputs of the qualitative questionnaire showed that the L-DCB actors estimated that there is not really change to plan organize their work as expected.		
HFB-ARG2.1.4-ZRH-07-V3-004	HP Benefit: The level of workload should be acceptable by relevant NM actors. Workload for NM actors likely to increase slightly but should stay acceptable.	Closed	OBJ-07-W2.39-V3-VALP-HP3-002	Real-Time Gaming Simulation (EXE01 ZUR)	The issue regarding an acceptable level of subjective workload due to additional tasks with the Collaborative Management Process consideration has been validated.		

					The outputs of the qualitative questionnaire showed that the NMOC estimated with the new process they can always plan and organise their work and complexity will not be changing and still the same as current.		
Arg. 2.1.5: Human actors can acquire an adequate mental model of the machine and its automated functions.							
HFB-ARG2.1.5-ZRH-07-V3-001	HP Benefit: Human actors have an appropriate picture of the automation process and the aim of the automated process.	Closed	OBJ-07-W2.39-V3-VALP-HP2-004	Real-Time Gaming Simulation (EXE01 ZUR)	The issue regarding an appropriate picture of the automation process and the aim of the automated process has been validated. The outputs of the qualitative questionnaire showed that the level of the level of automation for the what-if tool is acceptable to carry out my tasks effectively. In addition, some tool functionality improvement might be considered as to somehow display previous state with the improved state of the prioritization to be able to see at a glance the improvement and improve the decision-making process.	PJ07-ZUR-HP-RECOM-03	PJ07-ZUR-HP-REQ-07
Arg. 2.1.6: The level of trust in automated functions is appropriate.							
HFI-ARG2.1.6-ZRH-07-V3-001	HP Issue: The AUs actors' level of confidence in what-if information passed from UDPP service to assess the situation could be not appropriate. A gap between what-if and the real outcome may negatively impact the confidence of the result. It might lead to a low level of trust in the process and may be a potential field for reduced acceptance.	Closed	OBJ-07-W2.39-V3-VALP-HP2-008	Real-Time Gaming session Debriefing session (EXE01 Zurich)	The operational acceptance issue regarding the appropriate level of trust in what-if information passed from UDPP service to assess the situation by the AUs actors has been validated. The outputs of the qualitative questionnaire showed that AUs were confident about the accuracy of the what-if information passed from the UDDP service to assess a situation, of the new delay information, calculated and provided by NM, and of the new UDPP cut-off-time information provided by NM.	PJ07-ZUR-HP-RECOM-04	PJ07-ZUR-HP-REQ-07
2.2	Does the performance of the technical system support the human in carrying out their task?						

Arg. 2.2.1: The accuracy of information provided by the system is adequate for carrying out the task.							
HFI-ARG2.2.1-ZRH-07-V3-001	HP Issue: An inaccurate information provided by the what-if tools should not allow AUs to know if they could prioritise their flights. Furthermore, they could not test their flights prioritisation before submitting them. A gap between what-if and the real outcome may negatively impact the confidence of the result. It might lead to a low level of trust in the process and may be a potential field for reduced acceptance.	Closed	OBJ-07-W2.39-V3-VALP-HP6-001	Real-Time Gaming session (EXE01 Zurich)	The issue regarding the accuracy of information provided by the what-if tools should allow AUs to know if they could prioritise their flights has been validated. The outputs of the qualitative questionnaire showed that AUs consider that the accuracy of the information provided by the tools allows them to know if they could prioritise my flights. Moreover, they estimated to be confident in the information provided by the tool to prioritise their fleet.		
HFI-ARG2.2.1-ZRH-07-V3-002	HP Issue: An inaccurate information provided by NM automatic process should not allow AUs and L-DCB actors to manage the flights. (e.g.: new delay information calculated and the new UDPP cut-off-time information provided by NM). It might negatively impact the confidence about the accuracy of the information provided and may be a potential field for reduced acceptance.	Closed	OBJ-07-W2.39-V3-VALP-HP6-001	Real-Time Gaming Simulation (EXE01 ZUR)	The issue regarding an accurate information provided by NM automatic process should allow AUs and L-DCB actors to manage the flights has been validated. The outputs of the qualitative questionnaire showed that both AUS and L-DCB actors considered that the NM automatic process allows them to manage the flight in a relevant in an accurate and in a timely manner.		
Arg. 2.2.2: The timeliness of information provided by the system is adequate for carrying out the task.							
HFI-ARG2.2.2-ZRH-07-V3-001	HP Issue: The timeliness of information and data provided by the UDPP tool/Service is considered not sufficient by the Human relevant actors. Furthermore, the latencies in information provision can yield to disruption in create UDPP measure with regulation. It might lead to increased cognitive workload and may be a potential field for reduced acceptance.	Closed	OBJ-07-W2.39-V3-VALP-HP6-001	Real-Time Gaming Simulation (EXE01 ZUR)	The issue regarding the timeliness of information and data provided by the UDPP tool/Service is considered sufficient by the Human relevant actors has been validated. The outputs of the qualitative questionnaire showed that all actors considered that the response time of response time of the NM B2B services is sufficient for performing their tasks. In addition to L-DCB actors' estimated that the timeliness of the information/data provided allows	PJ07-ZUR-HP-RECOM-04	PJ07-ZUR-HP-REQ-08

					them to easily create UDPP Measure with regulation. Nevertheless, during the debriefing session, it reported that AUs Responses 'time was not fast enough due to a low system latency regarding the What-if and Submit features and the integration of business data. It assumed that with automation improvement, it could be better. AUS highlighted that process is dynamic situation and its necessary to make lot of changes for adjustment. The tool must always show up-to-date information to cope with this dynamic situation. It is recommended to improve the AU FOC system responsiveness.		
Arg. 2.3.1: The type of information provided satisfies the information requirements of the human.							
HFI-ARG2.3.1-ZRH-07-V3-001	HP Issue: The information provided by the tools is not exhaustive (not enough) for AUs actors and does not allow them to know which flights could be prioritised. Irrelevant information could negatively impact the level of workload and impact situation awareness.	Closed	OBJ-07-W2.39-V3-VALP-HP6-001	Real-Time Gaming Simulation (EXE01 ZUR)	The issue regarding of the sufficient (exhaustive) information provided by the tools for AUs actors which allow them to know which flights could be prioritised has been validated. The outputs of the qualitative questionnaire showed that all actors considered that the quantity of information displayed is appropriate (not too confusing). The AUs considered that the information provided by the tools are sufficient for knowing if they could prioritise their flights and to assess the new time prioritisation of their fights on their fleet. During debriefing session, it had been highlighted that some key information should be visible for all actors. (E.g. UDPP cut-off time, type of measure)	PJ07-ZUR-HP-RECOM-04	PJ07-ZUR-HP-REQ-09
HFB-ARG2.3.1-ZRH-07-V3-001	HP Benefit: The quantity of information provided by the indicators used for the integration of UDPP mechanism for managing CCS is appropriate (not too confusing) to allow actors to have a better	Closed	OBJ-07-W2.39-V3-VALP-HP6-001	Real-Time Gaming Simulation (EXE01 ZUR)	The issue regarding of the quantity of information provided by the indicators used for the integration of UDPP mechanism for managing CCS has been validated. The outputs of the qualitative questionnaire showed mixed feedback. The AUs and	PJ07-ZUR-HP-RECOM-04	

	understanding of the situation to identify the impact of the proposed solution. The relevant information may increase the situation awareness and the decision-making process.				the L-DCB actors considered that the quantity of information displayed is appropriate (not too confusing). Whereas the NMOC estimated that is not appropriate to identify which flights are under UDDPP process from ETFMS. For AUS, the information provided by the tools are accurate, relevant and sufficient for knowing if I could prioritise my flights. In addition, L-DCB considered that the accuracy and timeliness of the information/data provided allows them to easily create UDPP Measure with regulation.		
HFB-ARG2.3.1-ZRH-07-V3-002	HP Benefit: The level of clarity of information provided by the indicators used for the integration of UDPP mechanism for managing CCS is acceptable to allow actors to have a better understanding of the situation to identify the impact of the proposed solution. The relevant information may increase the situation awareness and the decision-making process.	Closed	OBJ-07-W2.39-V3-VALP-HP6-001	Real-Time Gaming Simulation (EXE01 ZUR)	The issue regarding of the level of clarity information provided by the indicators used for the integration of UDPP mechanism for managing CCS has been validated. The outputs of the qualitative questionnaire showed mixed feedback. The AUs and the L-DCB actors considered that the level of clarity of information is acceptable. Whereas the NMOC expressed negative feedback about the level of clarity.	PJ07-ZUR-HP-RECOM-04	
Arg. 2.3.6: The usability of the user interface (input devices, visual displays/output devices, alarm& alerts) is acceptable. [V1: AIR only]							
HFB-ARG2.3.6-ZRH-07-V3-001	HP Benefit: The usability of the user interface (input devices, visual displays/output devices, alarm& alerts) is acceptable. Does the usability of the HMI and its features allow relevant human actors (AUs, L-DCB, and NMOC) to achieve goals (tasks) in an effective, efficient, and satisfactory way?	Open	OBJ-07-W2.39-V3-VALP-HP6-002	Real-Time Gaming Simulation (EXE01 ZUR)	The issue regarding of the usability of the user interface (input devices, visual displays/output devices, alarm& alerts) has not been assigned. Nevertheless, during the debriefing sessions, usability recommendations had been considered for next user interface.		
HFB-ARG2.3.6-ZRH-07-V3-002	HP Benefit: The what-if display should allow users to compare different solution from the initial state to allow them to easily see the improved state of the prioritization	Closed	OBJ-07-W2.39-V3-VALP-HP6-002	Real-Time Gaming Simulation (EXE01 ZUR)	The issue regarding of the usability of the what-if display which allow users to compare different solution from the initial state to allow them to easily see the improved state of the prioritization and to		

	and to improve the decision-making process. The information well displayed might improve human performance, confidence in the tool and situation awareness.				improve the decision making has been validated. The outputs of the qualitative questionnaire showed that AUs actors with the What-if features, the system allows them to generate decision options, and to select the most appropriate decisions and actions to be performed. They also estimated to be confident about the accuracy of the what-if information passed from the UDDP service to assess a situation.		
Arg. 2.3.7: The user interface design reduces human error as far as possible.							
HFB-ARG2.3.7-ZRH-07-V3-001	HP Benefit: The user interface design reduces human error as far as possible. Can the displayed information of the UDPP tool/Service reduce human error as far as reasonably possible? (By ensuring that displayed information is unambiguous or by facilitating the detection of incorrect system inputs)	Open	OBJ-07-W2.39-V3-VALP-HP6-002	Real-Time Gaming Simulation (EXE01 ZUR)	The issue regarding the reduction of human error with usability of the user interface (input devices, visual displays/output devices, alarm& alerts) has not been addressed. Nevertheless, during the debriefing sessions, usability recommendations had been considered for next user interface.	PJ07-ZUR-HP-RECOM-03 PJ07-ZUR-HP-RECOM-04	
Arg. 2.3.8: The user interface supports a sufficient level of individual situation awareness.							
HFB-ARG2.3.8-ZRH-07-V3-001	HP Benefit: The user interface design supports a sufficient level of individual situation awareness. It relates to a human actor's perception & understanding of what has happened in the past, what is currently happening and therefore what is likely to happen in the near future (cf. Endsley, 1995).	Closed	OBJ-07-W2.39-V3-VALP-HP6-002	Real-Time Gaming Simulation (EXE01 ZUR)	The operational acceptance issue regarding the user interface design which supports a sufficient level of individual situation awareness to allow actors to better managing CCs resolution process has been partially validated. The outputs of the qualitative questionnaire showed mixed feedback. All actors considered globally that the new collaborative framework allows them to better understand the situation. The AUs considered that, as it has been set up and used in the exercise, the information displayed improve their situation awareness and they were able to maintain situational awareness for the coordination with NM, for assessing the impact of the delay on my fleet, for setting priorities and margins on flight	PJ07-ZUR-HP-RECOM-04	PJ07-ZUR-HP-REQ-10

					concerned and for testing my flights prioritisation before submitting them. Nevertheless, the NMOC considered that the information displayed did not improve their situation awareness and some features tool must set up for future development. From NM side, more information on flight under UDPP process must be added in the slot list/flight list which should help them to identify from ETFMS which flights are under UDPP process.		
<u>Arg. 2.3.9: The user Interface design supports a sufficient level of team situational awareness.</u>							
HFB- ARG2.3.9- ZRH- 07-V3- 001	HP Benefit: The methods, tools and indicators used for the integration of UDPP mechanism should support a sufficient level of situation awareness for all actors involved in a collaborative framework for managing CSS. It will allow to them to understand better the situation through the overall and each step of the process (initialisation, Flight prioritisation and Optimization phase). A better understanding improves the decision-making process and may be a potential field for improved acceptance.	Closed	OBJ-07- W2.39-V3- VALP-HP6- 002	Real-Time Gaming Simulation (EXE01 ZUR)	The operational acceptance issue regarding the user interface design which supports a sufficient level of team situational awareness to allow actors to better managing CCs resolution process has been validated. The outputs of the qualitative questionnaire showed that all actors (AUs, L-DCB, NMOC) considered globally that with the method, tools and indicators used for the integration of UDPP mechanism in collaborative framework for managing CCS, their situational awareness is slightly higher. In addition, they were able to understand in which phase of the process, they must act [initialisation of the process (measure creation & activation), the Flight prioritisation (AU prioritisation & commit) and Optimisation phase (Optimise arrival sequence)] In addition they were able to identify the impact of a proposed solution in their area of responsibility. Nevertheless, they highlighted that with the current prototype, the impact on the operation is displayed only for a limited number of factors. By example, a more complete integration into the existing systems would increase the ability to identify the impact. An	PJ07-ZUR-HP- RECOM-04	PJ07-ZUR-HP- REQ-11

					tools features improvement might be considered to improve the situation awareness and the making decision process.		
3.2	The allocation of tasks between human actors supports human performance						
Arg. 3.2.4: Team tasks can be achieved in a timely and efficient manner.							
HFI-ARG3.2.4-ZRH- 07-V3-001	HP Issue: During the collaboration phase, if coordination is in one-to-one with AUs then the process would be heavier for the L-DCB and impact the level of workload and pressure. Coordination tasks could lead to investigate new task and dispatch between actors or additional support tool which mitigate the workload impact.	Closed	OBJ-07-W2.39-V3-VALP-HP2-006	Real-Time Gaming Simulation (EXE01 ZUR)	The operational acceptance issue regarding the team (all actors involved in the coordination process) tasks achievement in a timely and efficient manner has been validated. The outputs of the qualitative questionnaire showed AUs were able to define UDPP prioritisation on concerned flights and from his side, L-DCB were able to update the UDPP measure if needed in a relevant, an accurate and in a timely manner. Nevertheless, during debriefings session, actors highlighted that the coordination mechanism depends on the tool and the level of automation. Indeed, the number of flights handled impact the level of workload which it linked to the level of automation provided by the tools. In addition, to mitigate the workload impact, it is necessary to find a balance among the tool, the number of flights and the role. (By example: role of the FOO (Flight Dispatcher, MOD/Supervisor) of the AU)	PJ07-ZUR-HP-RECOM-03	
3.3	The concept introduces additional communication needs. Does the communication between team members support human performance?						
Arg. 3.3.3: Changes in communication means & modalities are identified and acceptable.							
HFB-ARG3.3.3-ZRH- 07-V3-001	HP Benefit: Changes in communication means & modalities are identified and acceptable. The concept introduces additional communication needs. Are changes in communication means & modalities identify and acceptable by between team members? Communication means relate to the technical enablers that	Cancelled	OBJ-07-W2.39-V3-VALP-HP2-005	Real-Time Gaming Simulation (EXE01 ZUR)	This communication issue had not been addressed.		

	support the transfer of information between human actors.						
Arg. 3.3.4: The communication load of team members is acceptable in normal and abnormal conditions and degraded mode of operations.							
HFB-ARG3.3.4-ZRH-07-V3-001	HP Benefit: The communication load of team members is acceptable in normal and abnormal conditions and degraded mode of operations. What the communication load of team members is acceptable in normal and abnormal conditions and degraded mode of operations? Communication load refers to the part of subjective or objective workload that can be attributed to the requirement of exchanging information with other human actors.	Cancelled	OBJ-07-W2.39-V3-VALP-HP2-005	Real-Time Gaming Simulation (EXE01 ZUR)	This communication issue had not been addressed.		
Arg. 3.3.5: Team members can maintain a sufficient level of shared situation awareness.							
HFB-ARG3.3.5-ZRH-07-V3-001	HP Benefit: Team members can maintain a sufficient level of shared situation awareness. Overall team situation awareness is good if every individual member has good individual situation awareness, so that there is no weak links in the chain. Another important factor in team situation awareness is the team's ability to communicate & interact with other team members.	Cancelled	OBJ-07-W2-39-V3-VALP-HP2-001	Real-Time Gaming Simulation (EXE01 ZUR)	This communication issue had not been addressed.		
4.1	Is the proposed solution acceptable to affected human actors?						
Arg. 4.4.1: Changes in operator's profiles have been identified. (V3 only)							
HFB-ARG4.1.1-ZRH-07-V3-001	HP Benefit: The automation feature and HMIs should support actors in the decision-making process. The HMI assessment will be a high impact on the acceptance of the	Closed	OBJ-07-W2.39-V3-VALP-HP6-004	Debriefing (exercises) Real-Time Gaming	The acceptance of the proposed solution regarding the automation feature and HMIs to support actors in the decision-making process has been identified.		

	project. What should the automation feature and HMI support relevant actors in the decision-making process? The HMI assessment will be a high impact on the acceptance of the project.			Simulation (EXE01 ZUR)	The outputs of the qualitative questionnaire showed that the automation feature and HMIs must support actors in the decision-making process. The overall outputs of the qualitative questionnaire had positive feedback from all actors about the Collaborative Arrival Management process. Even if some prioritisation tasks were considered as easy and to perform and achieve in timely and accurate manner, all actors involved in process highlighted that for further reduction of workload, supporting automation facilities in the FOC tools are highly recommended. The level of automation appropriate provided by the tools was necessary to mitigate the workload impact.		
4.5	Training needs are identified for the affected human actors. [V3 only]						
Arg. 4.5.3: The required types of training (i.e., classroom, simulator, on-the job training) are identified. (V3 only)							
HFB-ARG4.5.3-ZRH-07-V3-001	HP Benefit: The introduction of the concept needs training for relevant human actors on new procedures. Training is identified on new HMIs and automation feature, also new process, and operating methods.	closed	OBJ-07-W2-39-V3-HP4-001	Debriefing (exercises) Real-Time Gaming Simulation (EXE01 ZUR) Stakeholder's Workshop	The identification of training on new HMI automation feature, also new process and operating methods were identified during the outputs of qualitative questionnaire and debriefing session.		

Table 9: Summary of the HP results and recommendations/ requirements for each identified issue & related argument

4.4.1.2 EXE2# Collaborative management of constraints on arrivals at Alicante Airport (ALC)

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
HFI- ARG1.1.3- ALC-07-V3- 001	HP Issue: The description of roles & responsibilities which is clear and consistent for all human actors involved in the Collaborative Management Process.	Closed	OBJ-07- W2.39-V3- VALP-HP1- 001	Stakeholder Workshop Real-Time Gaming Simulation (EXE02 ALC)	The clarity and the consistency regarding the description of roles & responsibilities has been validated. The outputs of the qualitative questionnaire and debriefing regarding the clarity and consistency of roles & responsibilities with their daily work showed positive feedback. Overall, AUs, APOC and NMOC actors confirmed that they clearly understand them during all phases of the process. Additionally, NMOC considered the new process substantially change (in a way that is likely to have a strong effect in decision making process) the role and responsibility of the NMOC		
Operating methods are exhaustive and support human performance.							
Arg. 1.2.4: The content of operating methods is clear and consistent (in V1: non-contradictory).							
HFI- ARG.1.2.4- ALC-07-V3- 001	HP Issue: The operating methods related to the consideration of UDPP might lead to misunderstandings or unsatisfied expectations from both APOC and AUs if the rules for its consideration are not clearly defined.	Closed	OBJ-PJ07- W2-39-V3- VALP-HP1- 002	Workshop Stakeholders (with safety and operational expert) Real-Time Gaming Simulation (EXE02 ALC)	The issue regarding the clarity and the consistency of the operating methods related to the consideration of UDPP process has been validated. The outputs of the qualitative questionnaire showed mixed feedback regarding the overall feasibility of the concept. APOC (L-DCB) participants reported that the concept was clear to them and considered the collaborative arrival capacity imbalance resolution operational procedures to be usable. Nevertheless, even if the AUS agreed that the collaborative CCs resolution process offers increased flexibility to me by adding more options to manage my operations, the actors have expressed neutral opinion about the	PJ07-ALC-HP- RECOM-01	

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Obj. ID	Valid. activity conducted	results / evidence	recommendations	requirements
					added value of the Flight prioritization (Priority with margin) to decrease the impact of the delays. They also expressed neutral opinion about that the local TTA assignment and subsequent delays on flights are considering the AU Flight prioritization. Moreover, they expressed a neutral opinion about the fact that their UDPP inputs (Priority and margin) and their constraints (more parameters of the measure change (start/end times, duration, rate) are correctly reflected the CCS resolution. During debriefing session, AUS also highlighted a lack of transparency in the process on which flights will be subjected to delays. This resulted in some flights to be prioritized which were not impacted by the measure. APOC confirms operating procedures are clear, consistent, and usable, however observations by experiment leads highlight some inconsistencies. NM confirms roles and responsibilities are clear, there are however some concerns regarding the impact of the concept at network level and the compatibility with current NCP regulation procedures FMP did not participate in the process. Concept clarification is recommended		

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/ Obj. ID	Valid. activity conducted	results / evidence	recommendations	requirements
HFI- ARG.1.2.5- ALC-07-V3- 001	HP Issue: The consideration of UDPP might lead to time inefficiencies when the airport imbalance severity requires immediate resolution actions.	Open	OBJ-PJ07- W2-39-V3- VALP-HP1- 002	Workshop Stakeholders (with safety and operational expert) Real-Time Gaming Simulation (EXE02 ALC)	The issue regarding the accuracy, efficiently and timeliness of the UDPP operating methods has been partially validated due to limited FMP (L-DCB) participation. The outputs of the qualitative questionnaire showed mixed feedback regarding the operating methods related to consideration of UDPP NCP measure process. From AUS consideration, they agreed to be able to assess if the flights concerning a UDPP NCP measure had to be prioritized to decrease the impact of the delay on their fleets in a relevant, an accurate and a timely manner. Nevertheless, the limitation of feature of the tools as single indicator (e.g., full list instead of individual flight) did not allow them to know first which flights were part of the UDPP NCP measure, secondly to be able to define UDPP prioritization (Margin and priority) on concerned flights in a timely manner (Not enough time to react. Only assess the measure for the relevant flight). The AUS actors agreed that with the new process, they were able to define Margin and priorities on flights concerned by a UDPP NCP measure before the “prioritise by HH:MM” in relevant, accurate manner but they had not enough time to refine priority and check priority. In addition, they had not enough time to refine and check priority before submission UDPP Flight prioritisation (Margin and priority) on concerned flights to the NOP.		PJ07-ALC-HP-REQ- 01
1.3	Human actors can achieve their tasks (in normal & abnormal conditions of the operational environment and degraded modes of operation).						

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Obj. ID	Valid. activity conducted	results / evidence	recommendations	requirements
Arg. 1.3.1: The potential for human error is reduced as far as possible.							
HFI- ARG.1.3.1- ALC-07-V3- 001	HP Issue: The manual allocation of TTAs (non-automated procedure) might lead to potential human errors in the number of flights and flight sequence required to solve the imbalance, with the subsequent negative impact on Safety.	Open	OBJ-PJ07- W2-39-V3- VALP-HP2- 002	Real-Time Gaming Simulation (EXE02 ALC)	Due to the limited participation of the end-user's actors (FMP did not participate in the process), the issue regarding the Potential human errors of the UDPP operating methods was non-conclusive. Nevertheless, according to the responses to the post-experiment questionnaire, the integration of the new concept to existing APOC processes would not compromise L-DCB (APOC) objectives for resolving arrival imbalances. But the concept was found to be inadequate for its original intent of resolving runway capacity issues. This issue needed further investigation	PJ07-ALC-HP- RECOM-03	
Arg. 1.3.2: Tasks can be achieved in a timely manner.							
HFI- ARG.1.3.2- ALC-07- V3-001	HP Issue: The allocation of TTAs (non-automated procedure) might not be performed on-time (high number of flights involved) and, consequently, the airport imbalance might not be resolved	Closed	OBJ-PJ07- W2-39-V3- VALP-HP2- 006	Real-Time Gaming Simulation (EXE02 ALC)	The issue regarding the timely manner achievement of AUs prioritisation with the allocation of TTAs has been validated. The outputs of the qualitative questionnaire showed mixed feedback about the feasibility of the concept to use NCP+UDPP information to resolve airport imbalances using TTAs. The APOC actors considered use of AU flight preferences as part of an arrival imbalance resolution process as feasible, and they were able to consider the AU "Time not after" value in resolving arrival imbalances via cherry-picking. From AUs side, they were able to define UDPP prioritization (Margin and priority) on concerned flights and to assess if the flights concerning a UDPP NCP measure must be	PJ07-ALC-HP- RECOM-02	PJ07-ALC-HP-REQ- 01

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Obj. ID	Valid. activity conducted	results / evidence	recommendations	requirements
					prioritized to decrease the impact of the delay on their fleets in timely manner. Nevertheless, the limitation of feature of the tools as single indicator (e.g., full list instead of individual flight) did not allow them to know first which flights were part of the UDPP NCP measure, secondly to be able to define UDPP prioritization (Margin and priority) on concerned flights in a timely manner (Not enough time to react. Only assess the measure for the relevant flight). In addition, they had not enough time to refine and check priority before submission UDPP Flight prioritization (Margin and priority) on concerned flights to the NOP.		
Arg. 1.3.3: The level of workload (induced by cognitive and/or physical task demands) is acceptable.							
HFI- ARG.1.3.3- ALC-07- V3-001	HP Issue: The consideration of UDPP might lead to a negative increase of the APOC actors' workload when the number of flights involved in the airport imbalance and associated priorities and margins is too high.	Open	OBJ-PJ07- W2-39-V3- VALP-HP3- 001	Prototyping session Real-Time Gaming Simulation (EXE02 ALC)	The issue regarding the level of subjective workload due to the consideration of the number of flights involved in the airport imbalance and associated priorities and margins is too high has been non-conclusive. Some feature provided by the AIRPORTIA tool were not allow APOC actors to complete their task. By example APOC tool did not provide basic functionalities for assessing, creating, and resolving capacity imbalances using TTAs; core APOC tool functionalities for using AU priorities and margins were not working and The APOC tool was inadequate for resolving non-capacity related airport imbalances. In addition, FMP-specific "what-if" tool has not been developed for this solution for the L-DCB actors	PJ07-ALC-HP- RECOM-03	PJ07-ALC-HP-REQ- 02
Arg. 1.3.4: The level of trust in the new concept/the new procedures is appropriate.							

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Valid. Obj. ID	activity conducted	results / evidence	recommendations	requirements
HFI- ARG.1.3.4- ALC-07- V3-001	HP Issue: The level of information exchanged between AUs and APOC concerning UDPP might lead to trust issues (operating method related) if the information exchanged is not really used by the APOC or if the information exchanged is not enough to capture the appropriate flights.	Closed	OBJ-PJ07- W2-39-V3- VALP-HP2- 008	Real-Time Gaming Simulation (EXE02 ALC)	The operational acceptance issue regarding the appropriate level of trust in concept the has been validated. The outputs of the qualitative questionnaire showed a that AUs expressed neutral feedback about in collaborative resolution process which allow them to define their UDPP prioritization. The AUs actors considered the local TTA assignment and subsequent delays on flights were considering the AU Flight prioritization. They estimated that Priority and Margin will be respected by the local DCB and in working in the AUs favour. In addition, they considered that the collaborative CCs resolution process when one or more parameters of the measure change (start/end times, duration, rate), that their constraints and/or UDPP inputs were correctly reflected in the updated measure.		
Arg. 1.3.5: Human actors can maintain a sufficient level of situation awareness.							
HFB- ARG.1.3.5- ALC-07- V3-001	HP Benefit: During the UDPP NCP measure resolution process, all human actors should always be able to obtain the up-to-date status of the situation which allow them a better understanding of the global situation and the elaboration of the solution. It allows them to be able to maintain a sufficient level of awareness of the operational situation which might	Closed	OBJ-07-W2- 39-V3-VALP- HP2-001	Real-Time Gaming Simulation (EXE02 ALC)	The operational acceptance issue regarding level of all human actor's situation awareness during the UDPP NCP measure resolution process has been validated. The outputs of the qualitative questionnaire showed mixed feedback about the situation awareness. The APOC actors confirmed high situational awareness, however observations during the experiment show situations where SA was not adequate. (For example, there was an important occurrence of oversight related to aircraft previously assigned a CTOT value in one simulation run) In addition, these comments highlight potentially	PJ07-ALC-HP- RECOM-03	PJ07-ALC-HP-REQ- 02

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Obj. ID	Valid. activity conducted	results / evidence	recommendations	requirements
	impact positively the ability to make appropriate decision				greater issues with the AIRPORTIA tool, given that APOC participants had some issues in identifying relevant information to implement the concept and in identifying flights captured in NCP measures which were not eligible for optimisation. NM actors estimated that the situational awareness was adequate. Nevertheless, the AUs actors estimated to have a low level of situational awareness, caused mostly by the lack of transparency on how the provided information would be used to resolve the imbalance situation.		
2.1	Is there an appropriate allocation of tasks between the human and machine (i.e., level of automation)?						
Arg. 2.1.4: The level of workload (induced by the allocation of tasks between the human and the machine) is acceptable.							
HFB-ARG.2.1.4-ALC-07-V3-001	HP Benefit: The level of workload induced by the calculation of TTAs (without considering UDPP in an automated manner) might be reduced if the system already proposes the corresponding TTAs trough a drag and drop functionality.	Closed	OBJ-PJ07-W2-39-V3-VALP-HP3-001	Real-Time Gaming Simulation (EXE02 ALC)	The issue regarding the level of subjective workload of all actors has partially been validated. (The qualitative questionnaire has been partially filled). The outputs of qualitative questionnaire showed positive feedback regarding the level of subjective workload. AUs considered they, I can always plan and organise their work as expected. They also confirmed acceptable level of workload, as long as the extent of the NCP measure is within reasonable limits.		
HFB-ARG.2.1.4-ALC-07-V3-002	HP Benefit: The level of workload induced by the communication of TTAs between APOC and NM might be reduced with the implementation of B2B services.	Open	OBJ-PJ07-W2-39-V3-VALP-HP3-001	Real-Time Gaming Simulation (EXE02 ALC)	The issue regarding the level of subjective workload of APOC and NM actors has been non-conclusive. Due to AIRPOC system limitations for APOC actors, the tools used did not allow actors to test fully the process.	PJ07-ALC-HP-RECOM-03	

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Obj. ID	Valid. activity conducted	results / evidence	recommendations	requirements
					Overall workload was perceived to be low by the APOC participants. However, in the light of the difficulties in working with the AIRPORTIA tool which were previously highlighted in previous sections well as the limitations of the system during the validation exercises, it would assume that workload in a more complex environment would increase significantly unless these shortcomings are addressed. Although the NMOC operator can always plan and organised his work as expected and confirmed acceptable level of workload, he estimated that additional monitoring of the CP regulation and associated delay increase the complexity of the current tasks.		
2.3	The design of the human-machine interface supports the human in carrying out their tasks.						
Arg. 2.3.6: The usability of the user interface (input devices, visual displays/output devices, alarm& alerts) is acceptable. [V1: AIR only]							
HFB-ARG.2.3.6-ALC-07-V3-001	HP Benefit: The new HMI functionality implemented for the communication of TTAs to NM via B2B services might lead to overall system usability improvements.	Open	OBJ-PJ07-W2-39-V3-VALP-HP5-002	Real-Time Gaming Simulation (EXE02 ALC)	The issue regarding the usability of the systems and services associated with the collaborative CCS resolution based on Network Cherry-pick measure to facilitate the need and objectives of the AUs actors by NM and L-DCB (APOC) actors has been non-conclusive. The outputs of the qualitative questionnaire showed positive feedback concerning the applicability of supporting tools which meet the participant's requirements. Regarding the information provided, The NM actors considered the quantity of information displayed in the NM prototype as appropriate (not too confusing) and the level of clarity of information is	PJ07-ALC-HP-RECOM-04	PJ07-ALC-HP-REQ-02

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Obj. ID	Valid. activity conducted	results / evidence	recommendations	requirements
					acceptable and the information displayed improve his situational awareness. The NM actors estimated that the NM automatic process allows him to manage the flight in a relevant, accurate and timely manner and the response time of my main system is sufficient to perform their task. The outputs of the qualitative questionnaire showed positive feedback on the APOC tools. However, observations from experiment leads during the validation exercise execution highlight several shortcomings of the AIRPORTIA tool with regards to the proposed concept. Overall, the AIRPORTIA tool did not provide accurate, sufficient, and relevant information to support actors in the decision-making process. (By example; to perform the assignment of TTAs using AU provided priorities and margins was not easily accessible to the APOC participants.) Following debriefing discussions with APOC participants, a list of functionalities had been identified and would need to be incorporated into future versions of the AIRPORTIA tool to allow for increased usability together with airport systems.		
HFB-ARG.2.3.6-ALC-07-V3-002	HP Benefit: The new HMI functionality implemented to assign TTAs (drag and drop) might lead to overall system usability improvements.	Closed	OBJ-PJ07-W2-39-V3-VALP-HP5-002	Real-Time Gaming Simulation (EXE02 ALC)	The issue regarding the usability of the systems and services associated with the collaborative CCS resolution based on Network Cherry-pick measure to facilitate the need and objectives of the AUs actors has been partially validated. The outputs of the qualitative questionnaire showed that AU tools partially meet the participant's requirements. Regarding the information provided	PJ07-ALC-HP-RECOM-05 PJ07-ALC-HP-RECOM-06	PJ07-ALC-HP-REQ-01 PJ07-ALC-HP-REQ-03

Issue ID	HP issue / Benefit	HP Benefit Status	Issue/ HP/ Obj. ID	Valid. activity conducted	results / evidence	recommendations	requirements
					they considered that the systems help them in comparing and analysing different information item and the information provided is useful and supports me in the in the decision-making process. They considered that the quantity of information displayed in the AUs' prototype is appropriate (not too confusing) and the level of clarity of information in the AUs' prototype is acceptable. Nevertheless, during the exercise it observed that AUS had some issues in assigning the new priority one or in updating their priorities in a manual way. In addition, the AUS actors reported that prioritization should be process automatically or should be make use of “drag and drop” functionalities instead of doing manually. They also considered that the information displayed did not improve their situational awareness and they would have preferred some additional functionalities to improve situational awareness and usability.(By example: Information about crew rotations on flights; Depiction of the flight number, alongside the callsign; Information about scheduled in-block times; Potential to update priorities of flights using “drag and drop” functionalities; Decrease the numbers of clicks required to perform actions; Ability to assign “priority 1” to multiple flights captured in different regulations)		
3.3	The concept introduces additional communication needs. Does the communication between team members support human performance?						

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/ Obj. ID	Valid. activity conducted	results / evidence	recommendations	requirements
HFB- ARG.3.3.4- ALC-07-V3- 001	HP Benefit: The implementation of B2B services means to communicate TTAs between APOC and NM might lead to workload improvements, situational awareness improvements, and communication load reductions and to an overall reduction in the potential for human error.	Cancelled	OBJ-PJ07- W2-39-V3- VALP-HP2- 005	Real-Time Gaming Simulation (EXE02 ALC)	The issue regarding the benefit of implementation of B2B services means to communicate TTAs between APOC and NM might lead in term of workload improvements, situational awareness improvements, and communication load reductions and to an overall reduction in the potential for human error has not been addressed		

Table 10: Summary of the HP results and recommendations/ requirements for each identified issue & related argument

4.4.1.3 EXE4# Collaborative management of constraints on arrivals at Paris CDG Airport (CDG)

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Obj. ID	Valid. activity conducted	results / evidence	recommendations	requirements
Arg. 1.1.1: Operating methods cover operations in normal operating conditions.							
HFI- ARG1.1.1- CDG-07-V3- 001	HP Issue: The description of roles & responsibilities for each human actors likely to be affected by the change with the introduction of Collaborative Management Process in the resolution solution might not be fully described.	Closed	OBJ-07- W2.39-V3- VALP-HP1- 001	Stakeholder Workshop	The description of roles & responsibilities for potentially affected actors (L-DCB, AUs & NM Operator) are fully described during Stakeholders Workshop.		
HFI- ARG1.1.2-	HP Issue: The description of roles and responsibilities is not complete and all the tasks to be performed by the human operators have	Closed	OBJ-07- W2.39-V3-	Stakeholder Workshop	The description of roles & responsibilities for potentially affected actors (L-DCB, AUs & NM Operator) and all the tasks to be performed by the		

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Obj. ID	Valid. activity conducted	results / evidence	recommendations	requirements
CDG-07-V3-001	not been considered and described. This includes the new tasks and modified tasks that may result from the proposed project changes, as well as the former existing tasks that remain unchanged.		VALP-HP1-001		actors have been considered during Stakeholders Workshop. In addition, the outputs of the debriefing sessions during Real-Time Gaming Simulation confirmed that the role and responsibility remain the same overall, but L-DCB actors highlighted that the decision-making process was slightly changed, knowing what is important for the AUs.		
HFB-ARG1.1.3-CDG-07-V3-001	HP Benefit: The description of roles & responsibilities which allows to AUs participation via setting a UDPP NCP measure is clear and consistent for all human actors involved in the Collaborative Management Process.	Closed	OBJ-07-W2.39-V3-VALP-HP1-001	Stakeholder Workshop	The clarity and the consistency regarding the description of roles & responsibilities which allows to AUs participation via setting a UDPP measure during the initialisation process has been validated. The outputs of the qualitative questionnaire showed that L-DCB and AUs actors estimated clearly understand their role and responsibility during all phases of the process. It also confirmed that the roles and responsibilities of the AU dispatcher and the L-DCB had not changed. It also reported that there is a new task for the AU – to prioritise flights in the NCP measure. The FMP's task of allocating TTAs will change on account of having to use AU prioritisations to assign TTAs. Nevertheless, due operational constraints (busy summer period) NM operators' feedback were not collected.		
HFI-ARG1.1.3-CDG-07-V3-001	HP Issue: The description of roles & responsibilities which allows AUs to set their flight prioritisation (Priority with Margins) during the optimisation phase is not clear and not consistent for all human actors involved in the Collaborative Management Process. An ambiguous definition of roles and responsibilities	Closed	OBJ-07-W2.39-V3-VALP-HP1-001	Stakeholder Workshop Real-Time Gaming Simulation (EXE04 CDG)	The clear understanding regarding the description of roles & responsibilities during the Initialisation of the process, Flight prioritisation and Optimisation phase for L-DCB and AUs actors involved in the Collaborative Management Process has been validated. The overall outputs of the qualitative questionnaire showed positive feedback. All actors estimated that	PJ07-CDG-HP-RECOMM-09 PJ07-CDG-HP-RECOMM-010	PJ07-CDG-HP-REQ-01

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Obj. ID	Valid. activity conducted	results / evidence	recommendati ons	requirements
	could lead to inefficient operating methods and in turn impair the overall concept acceptability.				they clearly understand their role and responsibility during all phases of the process. In addition, they estimated their role and responsibility consistent (coherent) with their daily work during all phases of the process.		
Operating methods are exhaustive and support human performance.							
Arg. 1.2.1: Operating methods cover operations in normal operating conditions.							
HFB- ARG1.2.1- CDG- 07- V3-001	HP Benefit: The operating methods related to the consideration of the AUs flight prioritisation (Priority with Margins) by the L-DCB actors in operating conditions are fully defined for all human actors involved in the Collaborative Management Process.	Open	OBJ-07-W2- 39-V3-VALP- HP1-002	Workshop Stakeholders (with safety and operational expert) Real-Time Gaming Simulation (EXE04 CDG)	The outputs of the qualitative questionnaire showed positive feedback regarding the consideration of the AUs UDPP prioritisation by the L-DCB actors in operating conditions. The AUs considered that L-DCB actors always respected all their Flight prioritisation they submitted. Nevertheless, they also mentioned that the tool should highlight what it was been done (not the case during the exercise).		
Arg. 1.2.2: Operating methods cover operations in abnormal operating conditions.							
HFI- ARG1.2.2- CDG- 07- V3-001	HP Issue: The Prioritisation operating methods developed are not fully defined for the AUs actors and not cover operations in operational issue conditions. The rationale is that as the AU will not really know what the result of L-DCB solution and the AU will be just send Margins in hoping that the result will cover his needs, the AU will not be able to assess the impact of a prioritisation on its fleet and will not test any possible optimisation	Closed	OBJ-07-W2- 39-V3-VALP- HP1-002	Workshop Stakeholders (with safety and operational expert) Real-Time Gaming	The operational acceptance issue regarding the fully definition of the different phases of the new process has been validated in normal operating conditions and the acceptance issue regarding an assessment in abnormal operating conditions had not been addressed and covered. The outputs of the qualitative questionnaire showed positive feedback regarding the clarity and the	PJ07-CDG-HP- RECOMM-06	PJ07-CDG- HP-REQ-08

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Obj. ID	Valid. activity conducted	results / evidence	recommendations	requirements
	by applying on the flight in the UDPP NCP measure.) It could lead to inefficient operating methods and in turn impair the overall concept acceptability.			Simulation (EXE04 CDG)	consistency of the different phases of the new process. The AUs and L-DCB actors considered that the procedure for Flight Prioritization were clear to them and consistent with their current operating methods (daily work).		
HFI-ARG1.2.2-CDG-07-V3-002	HP Issue: The Optimization operating methods developed are not fully defined for all actors (L-DCB/AUs/NMOC) involved in the UDPP NCP measure and not cover operational conditions. It could lead to inefficient operating methods and in turn impair the overall concept acceptability.	Closed	OBJ-07-W2-39-V3-VALP-HP1-002	Workshop Stakeholders (with safety and operational expert) Real-Time Gaming Simulation (EXE04 CDG)	The operational acceptance issue regarding the fully definition of the Prioritisation phase of the new process has been validated. The overall outputs of the qualitative questionnaire showed positive feedback regarding the clarity and the consistency of the Flight prioritization procedures with their current operating methods (daily work) Nevertheless, during the debriefing session, AUs mentioned that the only problem incurred is the timing to prioritize the flights. Sometimes UDPP time is already over before the prioritization process is done. They suggested that the sooner the prioritization is done the better the processes will be. Also they had enough time to update the prioritization if needed. Also, from L-DCB side, they mentioned that usually they send TTA right after the MCP/NCP creation. In the new process, they had to wait for the flight prioritization process to be complete. They highlighted that in real Operational conditions, they might not have the time to wait.	PJ07-CDG-HP-RECOMM-01 PJ07-CDG-HP-RECOMM-02 PJ07-CDG-HP-RECOMM-03	PJ07-CDG-HP-REQ-01

Arg. 1.2.4: The content of operating methods is clear and consistent (in V1: non-contradictory).

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Obj. ID	Valid. activity conducted	results / evidence	recommendations	requirements
HFI- ARG1.2.4- CDG- 07- V3-001	HP Issue: The operating methods related to the process which allow to L-DCB actor to use a UDPP NCP measure and Target Time of Arrival (TTA) issued to flights in pre-departure phase to solve DCB issue are not clearly defined. Furthermore, as the AUs actors will not really know what the result of L-DCB solution will be, the process which allows AU actors to provide Margins with priorities for flights could be not consistent for all actors involve in this process. It might have a negative impact on actor's performance.	Closed	OBJ-07-W2- 39-V3-VALP- HP1-002	Workshop Stakeholders (with safety and operational expert) Real-Time Gaming Simulation (EXE04 CDG)	The issue regarding the clarity and the consistency of the different phases of the new process has been validated. The outputs of the qualitative questionnaire showed positive feedback regarding the overall feasibility of the concept. The L-DCB actors considered that they always had enough time to take account of the priorities of the AUs and then to submit TTAs always respected all their prioritizations that they submitted. And from AUs side, they were able to clearly identify Flights concerned by a ATFM regulation and were able to identify the impact of a proposed solution in my area of responsibility. In any case, observations during the exercise indicate that some important details of the concept were unclear to participants. For example: The unexpected use of priority values to make prioritizations while neglecting TNAs; Setting an NCP measure for a bunch of flights whose UCOTs were imminent; The FMP steering the AU to prioritize a subset of flights, rather than all flights in the bunch; Potential issues over fairness). It is recommended to clarify concept in lowest detail.	PJ07-CDG-HP- RECOMM-05 PJ07-CDG-HP- RECOMM-010	PJ07-CDG- HP-REQ-01
HFI- ARG1.2.4- CDG- 07- V3-002	HP Issue: The operating methods related to coordination and communication processes between actors are not clearly defined. The new process introduces the notion of cut-off-time which determine boundaries'	Closed	OBJ-07-W2- 39-V3-VALP- HP1-002	Workshop Stakeholders (with safety and	The operating acceptance issue regarding the clarity coordination and communication processes between actors has been validated. The outputs of the qualitative questionnaire showed mixed positive feedback regarding the operating	PJ07-CDG-HP- RECOMM-01 PJ07-CDG-HP- RECOMM-02	PJ07-CDG- HP-REQ-01

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Obj. ID	Valid.	activity conducted	results / evidence	recommendations	requirements
	intervention for actors involved in the process. This absolute flight time defined when the "UDPP NCP Measure" is initiated and specify until when AUs can set priorities with margins on their flights. Over this time, the last prioritisation given by AUs on their flights are taken as "latest time for TTA submission" to elaborate final solution. An unclear and inconsistent process for all actors involved may lead negative impact on actor's performance.				operational expert) Real-Time Gaming Simulation (EXE04 CDG)	methods related to the interaction process between AUS and L-DCB. the AUs considered that they were able to submit Flight Prioritizations within the 10-minute "prioritise by HH:MM" time limit but also the mentioned that sometimes 10 minutes was not enough. In addition, L-DCB considered that Optimisation was operationally feasible within the timeframes given by operational circumstances. Nevertheless, during the exercises, the L-DCB accepted a Prioritize By period of 10 minutes. It had been observed that increasing it to greater than 10 minutes could disaffect L-DCB and/or make the process unusable operationally from the L-DCB perspective. In addition, during debriefing session they mentioned that it was feasible if the L-DCB was not too busy with other tasks and due to time pressure was still strong, the response from the AU was needed shortly.	PJ07-CDG-HP-RECOMM-03 PJ07-CDG-HP-RECOMM-012	
Arg. 1.2.5: Operating methods can be followed in an accurate, efficient, and timely manner.								
HFI-ARG1.2.5-CDG-07-V3-001	HP Issue: All actors involved in the AU prioritisation based on the UDPP NCP measure process, might be not achieve their tasks in a timely manner. During this phase, the L-DCB actor's initiates a UDPP NCP measure which allow AUS to provide prioritisation (Margins with priority) for their flights until the UDPP cut-off time. Prioritisation can be provided until the "Prioritise by HH:MM" deadline" given by the L-DCB. The rationale is that prioritisation window could be flexible and have an impact on the taskload of the different actors. A shorter	Closed	OBJ-07-W2-39-V3-VALP-HP2-006		Real-Time Gaming Simulation (EXE04 CDG)	The issue regarding the accuracy, efficiently and timeliness of the UDPP operating methods has been validated. The outputs of the qualitative questionnaire showed mixed feedback regarding the operating methods related to consideration of UDPP NCP measure process. The AUs considered that they were able to submit Flight Prioritizations within the 10-minute "prioritise by HH:MM" time limit in relevant, accurate and timely manner but they are also the mentioned that the Prioritize By period of 10 minutes was tight and might be too short under operational conditions where there might be distractions and other	PJ07-CDG-HP-RECOMM-01 PJ07-CDG-HP-RECOMM-02 PJ07-CDG-HP-RECOMM-03 PJ07-CDG-HP-RECOMM-012	PJ07-CDG-HP-REQ-01

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Obj. ID	Valid. activity conducted	results / evidence	recommendations	requirements
	timeframe could not enough to allow AUS to provide their all prioritisation and another hand a larger timeframe could be not enough for L-DCB to elaborate solution with TTAs. It might generate workload pressure and reduce performance in the task's achievement.				priorities. Also, the L-DCB considered to have enough time for UDPP solution optimisation between flights' UDPP cut-off times and last possible TTA issue times. Nevertheless, they considered that have not enough time to do it in accurate manner.		
HFI-ARG1.2.5-CDG-07-V3-002	HP Issue: The UDPP NCP measure operating methods cannot be followed in an accurate, efficient, and timely manner. Furthermore, the methods to set the UDPP cut-off-time impacts the ability of the two actors (AUs and L-DCB) to achieve their tasks. The rationale is that an earlier cut-off-time decreases the possibilities for AU to set prioritisation and a later cut-off-time decrease the possibility to set TTAs. It might generate workload pressure and potential error.	Closed	OBJ-07-W2-39-V3-VALP-HP2-010	Real-Time Gaming Simulation (EXE04 CDG)	The issue regarding the accuracy, efficiently and timeliness of the UDPP operating methods has been validated. The outputs of the qualitative questionnaire showed mixed feedback regarding the operating methods related to consideration of Flight prioritisation process. The AUs considered that they were able to submit Flight Prioritizations within the 10-minute "prioritise by HH:MM" time limit in relevant, accurate and timely manner but they are also the mentioned that sometimes 10 minutes was not enough. Nevertheless, in some case, the L-DCB considered they cannot always plan and organise their work as expected. The reason was that Prioritisation added some complexity to the FMP task and they had to wait for the data to come from the airline. In addition, they did not know when or at what time the prioritisation data will be available. This aspect might lead impact negatively the level of workload for L-DCB actors.	PJ07-CDG-HP-RECOMM-01 PJ07-CDG-HP-RECOMM-02 PJ07-CDG-HP-RECOMM-03 PJ07-CDG-HP-RECOMM-012	PJ07-CDG-HP-REQ-01
1.3	Human actors can achieve their tasks (in normal & abnormal conditions of the operational environment and degraded modes of operation).						

Arg. 1.3.1: The potential for human error is reduced as far as possible.

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Obj. ID	Valid. activity conducted	results / evidence	recommendati ons	requirements
HFB- ARG1.3.1- CDG- 07- V3-001	HP Benefit: Arg. 1.3.1: The potential for human error is reduced to a tolerable level. Are Potential human errors and mitigations to bring them to an acceptable level identify?	Closed	OBJ-07-W2- 39-V3-VALP- HP2-002	Real-Time Gaming Simulation (EXE04 CDG)	The issue regarding the Potential human errors of the UDPP operating methods has been validated. The outputs of the qualitative questionnaire showed positive feedback by the actors. AUs and L-DCB actors considered that the likelihood of error with Flight Prioritisation is no higher than with Mandatory Cherry Picking.		
Arg. 1.3.2: Tasks can be achieved in a timely manner.							
HFB- ARG1.3.2- CDG- 07- V3-001	HP Benefit: The AU prioritisation based on the UDPP NCP measure could allow the AUs actors to achieve their tasks in a timely manner. The rationale is that the new process might allow to the AUs to mitigate the delay on their flight by providing prioritisation (Margins with priority) for flights to L-DCB. The AUs should see (via B2B services) which flight are concerned by the measure and could be able to refine their flight prioritisation in advance to the that are still before their UDPP cut-off-times. It should improve timeliness of task-related of analysing and decision-making flights prioritisation actions.	Closed	OBJ-07-W2- 39-V3-VALP- HP2-006	Real-Time Gaming Simulation (EXE04 CDG)	The issue regarding the timely manner achievement of AUs prioritisation based on the UDPP NCP measure by the AUs has been validated. The outputs of the qualitative questionnaire showed positive feedback regarding the achievement of their tasks in a timely manner during the Flight prioritisation (AU prioritisation & commit). They considered to be able to submit UDPP Flight Prioritizations (Margin and priority) on concerned flights to the NOP, to clearly know which flights are part of the UDPP NCP measure, to allocate Flight Prioritisations on my flights, to assess if the flights in a UDPP NCP measure have to be prioritized to decrease the impact of the delay on my fleet and to check the new delay on flights in a UDPP NCP measure (I can see the CTOTs).		
Arg. 1.3.3: The level of workload (induced by cognitive and/or physical task demands) is acceptable.							
HFI- ARG1.3.3-	HP Issue: The Collaborative Management Process allow a better anticipation of the resolution of the problems decreasing the last-minute request for both actors AUs and L-DCB. The level of	Closed	OBJ-07-W2- 39-V3-VALP- HP3-001	Prototyping session	The issue regarding the level of subjective workload as consideration of as cost saving task in that way has been validated.	PJ07-CDG-HP- RECOMM-02	PJ07-CDG- HP-REQ-01

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Obj. ID	Valid.	activity conducted	results / evidence	recommendati ons	requirements
CDG-07- V3-001	workload should be investigated as cost saving task in that way.				Real-Time Gaming Simulation (EXE04 CDG)	The outputs of the qualitative questionnaire showed mixed feedback that the level of subjective workload due to the consideration of the new process The outputs indicated that the new workload for the AU is acceptable to assess the impact of a prioritisation or a delay on their fleet. They also considered the level of workload acceptable to manage the flights and to submit prioritizations with NM automatic process. Nevertheless, AUs considered that the level of workload was significant to set prioritizations and to change them once they have been set (or sent).		
HFI- ARG1.3.3- CDG-07- V3-002	HP Issue: The level of workload could be increase slightly for NM actor. The rationale is that NM may need to verify proposed TTAs solutions which may lead a possible increase the level of workload.	Open	OBJ-07-W2- 39-V3-VALP- HP3-001		Real-Time Gaming Simulation (EXE04 CDG)	The operational acceptance issue regarding the level of workload of the NM actor has not been assessed.		
Arg. 1.3.4: The level of trust in the new concept/the new procedures is appropriate.								
HFI- ARG1.3.4- CDG-07- V3-001	HP Issue: The tools should support the human actors in the decision-making process. A not accurate and timeliness information provided to actors may not allow them to select the most convenient TTA to solve the imbalance. It will lead to a too low level of trust and may reduce acceptance in the new concept and operating methods by actors involved in the Collaborative Management Process.	Closed	OBJ-07-W2- 39-V3-VALP- HP2-008		Real-Time Gaming Simulation (EXE04 CDG)	The operational acceptance issue regarding the appropriate level of trust in the tool has been validated. The outputs of the qualitative questionnaire showed that AUs were confident about in the information provided by the FOC prototype to prioritise their flights		

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Obj. ID	Valid.	activity conducted	results / evidence	recommendations	requirements
HFI- ARG1.3.4- CDG- 07- V3-002	HP Issue: The new process allows to AUs to communicate their flights prioritisation (Margins with priority) for their flights to L-DCB, which also leads to give more power to L-DCB to decide of the solution. As AUs will have just to provide their flight priority without really know what the result of L-DCB solution and hope will be that the result will cover his needs, the level of trust should be investigate as the trust in the L-DCB decision making. If the result will not cover AUs needs, it might lead to a low level of trust in the process and may reduce acceptance in the new concept and operating methods by actors involved in the Collaborative Management Process.	Closed	OBJ-07-W2- 39-V3-VALP- HP2-008		Real-Time Gaming Simulation (EXE04 CDG)	The operational acceptance issue regarding the appropriate level of trust in Flight prioritisation has been validated. The outputs of the qualitative questionnaire showed that AUs considered that L-DCB always respected all their prioritizations that they submitted. They also considered that their Flight Prioritizations were correctly reflected in the CTOTs they received and their Flight Prioritizations when one or more parameters of the measure changed (e.g., start/end times, duration, rate) were respected. During the exercise, it observed that constraints were mostly respected by the FMP. (AFR was aware, of course, that constraints cannot always be respected for operational reasons.) Some TNAs were exceeded. Nevertheless, the exercise never explored how the FMP would react / cope if all the flights in the NCP measure were prioritised. Perhaps guidance is needed for the FMP suggest how such a situation could be managed. It is recommended to develop MOPS.	PJ07-CDG-HP-RECOMM-010 PJ07-CDG-HP-RECOMM-09	PJ07-CDG-HP-REQ-01
HFB- ARG1.3.5- CDG- 07- V3-001	HP Benefit: During the UDPP NCP measure resolution process, all human actors should always be able to obtain the up-to-date status of the situation which allow them a better understanding of the global situation and the elaboration of the solution. It allows them to be able to maintain a sufficient level of awareness of the operational situation which might impact	Closed	OBJ-07-W2- 39-V3-VALP- HP2-009		Real-Time Gaming session Debriefing session Real- Time Gaming Simulation (EXE04 CDG)	The operational acceptance issue regarding level of all human actor's situation awareness during the UDPP NCP measure resolution process has been validated. The outputs of the qualitative questionnaire showed that the new collaborative framework allows AUs and L-DCB actors to better understand the overall situation and in which phase of the process, they must act [initialisation of the process (measure creation & activation), the Flight prioritisation (AU prioritisation &	PJ07-CDG-HP-RECOMM-08 PJ07-CDG-HP-RECOMM-011 PJ07-CDG-HP-RECOMM-012	PJ07-CDG-HP-REQ-04 PJ07-CDG-HP-REQ-08

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

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Obj. ID	Valid. activity conducted	results / evidence	recommendati ons	requirements
	positively the ability to make appropriate decision				commit) and Optimisation phase (Optimise arrival sequence). Nevertheless, they reported that improvements could be made. Observations during the exercise indicated that there are significant problems with situational awareness and that it requires significant improvement prior to deployment of the concept. Of particular concern is for the AU. Regarding AUs: It was difficult for AUs to find the flights to prioritize and to know what actions had been done by the L-DCB, (i.e., when a flight received a TTA) As a consequence, the AU had to check all the time her flights which might impact negatively the level of workload. Regarding L-DCB: They received no notification/information about what the AU was doing and when or if prioritisations were going to be sent. In addition, the AUs and L-DCB need to know when the prioritisation period starts and ends. Many of these problems can be resolved with a redesign of the FOC prototype with relevant feature. A chat facility dedicated to discussion between actors, should improve situational awareness between AU and L-DCB. If unavailable in real operations this could reduce situational awareness further.		

2.1 Is there an appropriate allocation of tasks between the human and machine (i.e., level of automation)?

Arg. 2.1.1: The task allocation between the human and the machine is consistent with automation principles

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Obj. ID	Valid. activity conducted	results / evidence	recommendations	requirements
HFB- ARG2.1.1- CDG- 07- V3-001	HP Benefit: There is an appropriate allocation of tasks between the human actors and machine. The new concept considers that the actors performing the tasks will be assisted by additional HMIs. On the AUs side to manage the UDPP inputs and to submit their inputs to UDPP service. UDPP service (expected to be within NM) will also mean new interfaces. Automation for different parts of the process is envisaged as mitigation to prevent negative impacts on workload. The level of automation/distribution of tasks between the human and machine must be consistent with HF automation principles.	Closed	OBJ-07-W2- 39-V3-VALP- HP2-007	Review of the HP guidelines Real-Time Gaming Simulation (EXE04 CDG)	The operational acceptance issue regarding the appropriate allocation of tasks between the human actors and machine has been validated. The outputs of the qualitative questionnaire showed that AUs actors considered that the distribution between the system automation and human action with the FOC prototype is well balanced for performing their tasks.		
Arg. 2.1.2: Changes to the task allocation between human and machine support human performance.							
HFI- ARG2.1.2- CDG- 07- V3-001	HP Issue: All during phases of Collaborative Management Process, all human actor's cognitive and task demands could be not acceptable. The impact of the changes in the task on situational awareness, workload, human error/ performance must be considered.	Closed	OBJ-07-W2- 39-V3-VALP- HP2-007	Review of the HP guidelines Real-Time Gaming Simulation (EXE04 CDG)	The acceptance issue regarding an appropriate allocation of tasks between the human actors and machine has been validated and no negative impact has been established. The outputs of the qualitative questionnaire showed that AUs and L-DCB actors considered that information provided by the tool is useful and supports them in the decision-making process. They also considered that with the method, tools and indicators used for Flight Prioritization, their situational awareness was slightly higher. In particular, the AUs considered that the FOC prototype allowed them to publish the priorities within NM easily.	PJ07-CDG-HP- RECOMM-06 PJ07-CDG-HP- RECOMM-08 PJ07-CDG-HP- RECOMM-011	PJ07-CDG- HP-REQ-02 PJ07-CDG- HP-REQ-05 PJ07-CDG- HP-REQ-09

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Obj. ID	Valid. activity conducted	results / evidence	recommendati ons	requirements
					However, the exercise showed that the FOC prototype needs significant improvement in terms of presentation of data and latency before entering operation. The AU tool will be key component in any successful coordination in operations. Deeper integration of the AU's systems would support the AU dispatcher. In the exercise, the flight list and allocating priorities were done with the FOC prototype, but the cost data necessary to make prioritisation decisions were available on a separate system (a separate screen).		
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- CDG- 07- V3-001	HP Issue: During the prioritisation and optimisation process the level of workload of L-DCB actors might be increased if tools do not support it. The L-DCB will prepare and send TTAs. L-DCB should be in total control of the solution but without any tools or automation the execution of the process would be extremely difficult. A manual Cherry pick is a task which needs mental calculations by the L-DCB, the task to assess the effectiveness of the UDPP NCP measure manually and without automation tool may lead increase cognitive workload.	Closed	OBJ-07-W2- 39-V3-VALP- HP3-002	Real-Time Gaming Simulation (EXE04 CDG)	The issue regarding the level of subjective workload of L-DCB actors during the prioritisation and optimisation process has been validated. The outputs of the qualitative questionnaire showed that the L-DCB actors estimated that prioritisation adds some complexity to the FMP task given that they must wait for the data to come from the airline. They also reported that Prioritisation added a new step in the MCP process for the FMP, therefore the workload is slightly higher.	PJ07-CDG-HP-RECOMM-02 PJ07-CDG-HP-RECOMM-03 PJ07-CDG-HP-RECOMM-07 PJ07-CDG-HP-RECOMM-08 PJ07-CDG-HP-RECOMM-011	PJ07-CDG-HP-REQ-09 PJ07-CDG-HP-REQ-07

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Obj. ID	Valid. activity conducted	results / evidence	recommendations	requirements
HFI- ARG2.1.4- CDG- 07- V3-002	HP Issue: The level of workload will increase slightly for L-DCB relevant actor during the optimisation process. Once, the L-DCB actor received AUS prioritisation, he must prepare TTAs for set of flights for each Airline. TTAs calculation could be done either manual or automated. As manual calculation of TTAS could be based on experience or expertise, it could be dealt different following actors background and impact the level of workload. An important number of TTAs to calculate could be also have a negative impact of the level of workload.	Closed	OBJ-07-W2- 39-V3-VALP- HP3-001	Real-Time Gaming Simulation (EXE04 CDG)	The issue regarding the level of subjective workload of L-DCB actors during the prioritisation and optimisation process has been validated. The outputs of the qualitative questionnaire showed that implementation of NCP measure increases the L-DCB's cognitive workload. The FMP reported an increased complexity and workload to the task of assigning TTAs. In particularly, L-DCB considered that to access relevant flight information, to access the flight delays submitted by AUs, to prioritise requests, to access the flight priorities and margins submitted by AUs, to gather and interpret information and to check impact on arrivals list did take perceptible and moderate effort. The rationale is that An NCP measure increases the FMP's cognitive workload because the allocation of TTAs must consider more information, i.e., the prioritisations. Accommodating priority values and TNAs impose (loose) constraints on solutions, possibly making the task harder than it otherwise would be. prioritisation adds some complexity to the FMP task given that they must wait for the data to come from the airline. They also reported that Prioritisation added a new step in the MCP process for the FMP, therefore the workload is slightly higher.	PJ07-CDG-HP-RECOMM-02 PJ07-CDG-HP-RECOMM-03 PJ07-CDG-HP-RECOMM-07 PJ07-CDG-HP-RECOMM-08 PJ07-CDG-HP-RECOMM-011	PJ07-CDG-HP-REQ-09 PJ07-CDG-HP-REQ-07
HFI- ARG2.1.4- CDG-07-V3- 003	HP Issue: The level of workload for L-DCB will increase without support tool. The rationale is that the new process allows to AUs to communicate their flights prioritisation (Margins with priority) for their flights to L-DCB, which in charge to elaborate solution and accommodate	Closed	OBJ-07-W2- 39-V3-VALP- HP3-002	Real-Time Gaming Simulation (EXE04 CDG)	The issue regarding the level of subjective workload for L-DCB will increase without support tool has been validated. The outputs of the qualitative questionnaire showed positive impact about the support tool regarding information availability provided by NM and displayed by IODA. The L-DCB actors reported that their	PJ07-CDG-HP-RECOMM-07 PJ07-CDG-HP-RECOMM-08	PJ07-CDG-HP-REQ-09 PJ07-CDG-HP-REQ-07

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Obj. ID	Valid. activity conducted	results / evidence	recommendations	requirements
HFI- ARG2.1.4- CDG- 07- V3-004	each AUs needs. But, in the current operating methods, the TTAs sequence is done by CASA based on equity automatic process. In the new process, the CASA is not used, and it will up to the L-DCB to do it manually. It will be an additional task to consider for the L-DCB.				system (IODA, in the exercises) support them well overall in using Flight Prioritisation. They considered that IODA brings all the relevant & necessary data regarding Flight Prioritisation to perform the required debunching in the NCP measure although sometimes it's difficult to identify the cut-off time of a flight. Nevertheless, they expressed that some tool improvement must be done.	PJ07-CDG-HP- RECOMM-011	PJ07-CDG- HP-REQ-06
HFI- ARG2.1.4- CDG- 07- V3-005							
HFB- ARG2.1.4- CDG- 07- V3-001							
HFB- ARG2.1.4- CDG- 07- V3-002	HP Benefit: The level of workload (induced by the allocation of tasks between the human and the machine) should be acceptable by relevant NM actors. Workload for NM actors likely to increase slightly but should stay acceptable.	Open	OBJ-07-W2- 39-V3-VALP- HP3-002	Real-Time Gaming Simulation (EXE04 CDG)	The issue regarding the level of subjective workload for NM operator has not been validated.		

2.2 Does the performance of the technical system support the human in carrying out their task?

Arg. 2.2.2: The timeliness of information provided by the system is adequate for carrying out the task.

HFI- ARG2.2.2- CDG- 07- V3-001	HP Issue: The timeliness of information provided by the UDPP tool/Service is not sufficient by the Human relevant actors. Excessive latencies in information provision can yield to disruption in task performance.	Closed	OBJ-07-W2- 39-V3-VALP- HP5-001	Real-Time Gaming Simulation (EXE04 CDG)	The issue regarding the timeliness of information and data provided by the support tool is considered sufficient by the Human relevant actors has been validated. The outputs of the qualitative questionnaire showed that the response time given by the FOC prototype to update the flight was considered as		
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Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Obj. ID	Valid. activity conducted	results / evidence	recommendati ons	requirements
					acceptable by the AUS. They also considered that the timeliness of the information provided by the FOC tools allows me to prioritise their flights. From L-DCB side, the timeliness of the information/ data provided by NM and displayed by IODA allowed L-DCB to easily create UDPP Measure.		
Arg. 2.3.1: The type of information provided satisfies the information requirements of the human.							
HFB- ARG2.3.1- CDG- 07- V3-001	HP Benefit: The information provided by the human-machine interface is acceptable and allows the relevant human actors to achieve their task. The relevant information may increase the situation awareness. In contrary, an irrelevant information could create clutter and may negatively impact situation awareness.	Closed	OBJ-07-W2- 39-V3-VALP- HP5-001	Real-Time Gaming Simulation (EXE04 CDG)	The issue regarding of the relevant information provided by the tools for all actors which allow them to achieve their task has been validated. Regarding the FOC prototype, the outputs of the qualitative questionnaire and debriefing session showed that AUS considered that the quantity of information displayed is appropriate (not too confusing). The AUs considered that the information provided by the tools were accurate to know if they could prioritise their flights, allowed them to define prioritises & Margins to the necessary flights and know whether the L-DCB could accommodate the prioritisation. During debriefing session, it had reported additional feature like that implement cost delay in the same tool to make the process the easiest possible. Regarding information availability provided by NM and displayed by IODA, the outputs of the qualitative questionnaire and debriefing session showed that L-DCB considered that the information/ data provided were accurate, useful, and relevant to easily create	PJ07-CDG-HP- RECOMM-011	PJ07-CDG- HP-REQ-010 PJ07-CDG- HP-REQ-06

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Obj. ID	Valid. activity conducted	results / evidence	recommendati ons	requirements
					UDPP Measure. To manage the arrival sequence airport, they also considered that The UDPP service provided them with sufficient information to consider which flights to cherry-pick. during the debriefing session, they also reported that changes needed to the IODA systems might improve the use of Flight Prioritisation (e.g., better identification of the cut-off time of a flight, knowing better number of regulations on a flight to identify if TTAs will be sent easily, (e.g., TTA data derived from TNA)		
3.2	The allocation of tasks between human actors supports human performance						
Arg. 3.2.4: Team tasks can be achieved in a timely and efficient manner.							
HFI- ARG3.2.4- CDG- 07- V3-001	HP Issue: During the collaboration phase, if coordination is in one-to-one with AUs then the process would be heavier for the L-DCB and impact the level of workload and pressure. Coordination tasks could lead to investigate new task and dispatch between actors or additional support tool which mitigate the workload impact.	Closed	OBJ-07-W2- 39-V3-VALP- HP2-006	Real-Time Gaming Simulation (EXE04 CDG)	The issue regarding the achievement tasks of the actors involved in the collaboration has been validated. the exercise demonstrated that it is technically feasible for the FMP and AUs to coordinate the resolution of airport local DCB imbalances. The prototyping exercise showed that coordination is feasible in a relaxed, non-operational context, but it remains to be seen if timely and successful coordination is possible when using the Prioritize By period of 10 minutes in a busy, pressurized, operational context. The AU was given some indication of which flights to prioritize by the FMP, which reduced the time necessary to submit prioritisations. If this assistance will be unavailable in real operations this could increase the workload of the AU dispatcher, and	PJ07-CDG-HP-RECOMM-03 PJ07-CDG-HP-RECOMM-07 PJ07-CDG-HP-RECOMM-08 PJ07-CDG-HP-RECOMM-012	PJ07-CDG-HP-REQ-06 PJ07-CDG-HP-REQ-07 PJ07-CDG-HP-REQ-09 PJ07-CDG-HP-REQ-011

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Obj. ID	Valid. activity conducted	results / evidence	recommendati ons	requirements
					increase the time needed to submit prioritisations. Also, observations from the validation team indicate that there are significant problems with situational awareness and that it requires significant improvement prior to deployment of the concept. (See SA ...) Many of these problems can be resolved with a redesign of the FOC prototype,		
3.3	The concept introduces additional communication needs. Does the communication between team members support human performance?						
Arg. 3.3.3: Changes in communication means & modalities are identified and acceptable.							
HFB- ARG3.3.3- CDG- 07- V3-001	HP Benefit: Changes in communication means & modalities are identified and acceptable. The concept introduces additional communication needs. Are changes in communication means & modalities identify and acceptable by between team members? Communication means relate to the technical enablers that support the transfer of information between human actors.	Open	OBJ-07-W2- 39-V3-VALP- HP2-005	Real-Time Gaming Simulation (EXE04 CDG)	This argument was not addressed during the validation exercise. Nevertheless, observations from the validation team indicate that there are significant problems with situational awareness and that it requires significant improvement prior to deployment of the concept. It investigated that a chat facility might improve situational awareness between AU and L-DCB. If unavailable in real operations this could reduce situational awareness further	PJ07-CDG-HP- RECOMM-011 PJ07-CDG-HP- RECOMM-08	PJ07-CDG- HP-REQ-011
Arg. 3.3.5: Team members can maintain a sufficient level of shared situation awareness.							
HFB- ARG3.3.5- CDG- 07- V3-001	HP Benefit: Team members can maintain a sufficient level of shared situation awareness. Overall team situation awareness is good if every individual member has good individual situation awareness, so that there is no weak links in the chain. Another important factor in team situation awareness is the team’s ability to communicate & interact with other team members	Closed	OBJ-07-W2- 39-V3-VALP- HP2-001	Real-Time Gaming Simulation (EXE04 CDG)	The issue regarding of acceptable shared situation awareness between the team member has been addressed as coordination between actors involved in the prioritisation process. The feedback from the AU and FMPs via the questionnaires was generally positive about situational awareness but indicated that improvements could be made. Observations from the validation team indicate	PJ07-CDG-HP- RECOMM-06 PJ07-CDG-HP- RECOMM-07 PJ07-CDG-HP- RECOMM-012	PJ07-CDG- HP-REQ-01 PJ07-CDG- HP-REQ-04 PJ07-CDG- HP-REQ-05

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Obj. ID	Valid. activity conducted	results / evidence	recommendations	requirements
					that there are significant problems with situational awareness and that it requires significant improvement prior to deployment of the concept. Of particular concern is for the AU. Many of these problems can be resolved with a redesign of the FOC prototype, but not all. The following issues had been reported •It was difficult for AUs to know what actions had been done by the FMP, i.e., when a flight received a TTA. Therefore, the AU had to check all the time her flights. •There was no notification/information about what the AU was doing and when or if prioritisations were going to be sent. During the Prioritize By period, are FMPs waiting for nothing, or are AUs working on prioritisations? •The chat facility improved situational awareness between AU and FMP. If unavailable in real operations this could reduce situational awareness further.		PJ07-CDG-HP-REQ-08
4.1	Is the proposed solution acceptable to affected human actors?						
HFI-ARG4.1.2-CDG-07-V3-001	HP Issue: During the prioritisation phase, L-DCB builds the UDPP NCP measure solution integrating AU Flight Prioritisation to manage the UDPP NCP measure. The rationale is that the number of AUs involved in the UDPP NCP measure, number of AUs request and the wish to accommodate all AUs request may potentially increase workload and pressure (it may lead pressure due to not satisfied all request or to try). It may lead potential impact on the human error	Closed	OBJ-07-W2-39-V3-VALP-HP4-002	Debriefing (exercises) Real-Time Gaming Simulation (EXE04 CDG)	The exercise demonstrated that systems and services supported the resolution of local demand-capacity imbalances. However, work is required to improve the HMI and timeliness of the prototype FOC prior to its use in a subsequent UDPP exercise, and before deployment. Technical feasibility has been demonstrated, although there is a problem with latency between FOC prototype and NMVP platform, and between NMVP and IODA.	PJ07-CDG-HP-RECOMM-011 PJ07-CDG-HP-RECOMM-08	PJ07-CDG-HP-REQ-07 PJ07-CDG-HP-REQ-09

Issue ID	HP issue / Benefit	HP Issue/ Benefit Status	HP/ Obj. ID	Valid. activity conducted	results / evidence	recommendati ons	requirements
	and job satisfaction. It may have a high impact on the acceptance of the project.						
4.5	Training needs are identified for the affected human actors. [V3 only]						
Arg. 4.5.3: The required types of training (i.e., classroom, simulator, on-the job training) are identified. (V3 only)							
HFB-ARG4.5.3-CDG-07-V3-001	HP Benefit: The introduction of the concept needs training for relevant human actors on new procedures. Training is identified on new HMIs and automation feature, also new process, and operating methods	Closed	OBJ-07-W2-39-V3-HP4-001	Debriefing (exercises) Real-Time Gaming Simulation (EXE04 CDG) Stakeholder's Workshop	Improvement of tools so necessary training on new tools and develop detailed guidelines for FMPs for how to allocate TTAs fairly. FMPs and AUs should be involved in this work. Participants – quite correctly – used the guidance given, their operational experience and knowledge of the concept to perform their functions during the exercise. Resulting from the exercise's observations, realistic and detailed operational procedures can now and should be written for the next validation exercise. Section 3.2 of the OSED (i.e., the detailed operational description of the new method) needs updating too. - Produce guidelines for AUs. - Produce guidelines or a procedure for FMPs;	PJ07-CDG-HP-RECOMM-010 PJ07-CDG-HP-RECOMM-011 PJ07-CDG-HP-RECOMM-012	PJ07-CDG-HP-REQ-01

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

4.4.2 Maturity of the Solution

This section contains the Human Performance maturity review at the end of the V3 validation activities conducted to give advice on the transition to the V-phase. Based on the assessment of whether sufficient evidence has been produced to support the HP arguments, advice is formulated on whether the Solution's transition to the next V phase from an HP point of view is recommended.

4.4.2.1 SESAR Solution PJ07

See next page.

maturity checklist for finalising the V3 assessment

ID	Question	Answer	Comments
1	Has a Human Performance Assessment Report been completed? Have all relevant arguments been addressed and appropriately supported?	YES	HP Arguments 1,2 and 3 have been addressed and the required evidence at V3 level has been provided. Recommendations and suggestion for further clarity on role and responsibilities (HP argument 1) and requirement made for certain HMI and functionality improvements had reported and listed (HP Argument 2). HP Arguments 3, regarding the task achievement had in collaborative way been highlighted that some automation functions should be added to avoid unnecessary workload for users. Recommendation and requirement had been investigated. There was not any issue identified for Argument 4. Please, refer to PJ07 Solution 39, Human Performance Assessment results in PJ07 HPAR (Section 4.4.1.1).
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)?	YES	Benefits and issues in terms of human performance and operability had been covered for all main HP argument and for all actors involved in the concept. The evidence gathered for each benefit and issue identified correspond to V3 criteria according to PJ19 SESAR HP Reference Material. Nevertheless, due to limited participation of the APT actor and FMP in some scenario runs and thus of insufficient exposure to the proposed process, the qualitative feedback and quantitative results were implicitly restricted to a small sample. The benefits and issues in terms of human performance and operability should be reassess. Please, refer to PJ07 Human Performance Assessment results in PJ07 HPAR (Section 4.4.1.1 and Appendix E). The evidence gathered for each benefit and issue identified correspond to V3 criteria according to PJ19 SESAR HP Reference Material. Please, refer to PJ07 Human Performance Assessment results in PJ07 HPAR (Section 4.4.1.1 and Appendix E).
3	Have all the parts of the solution/concept been considered?	YES	Through HP activities based on Stakeholder's workshop, feedback issue from qualitative questionnaire and debriefing and observation during validation exercises, all the parts of the UDPP concept have been, considered and validated. In summary, operational feasibility and acceptance at each stakeholder's level and human performance aspects such as workload and situation awareness. Please, refer to PJ07 Human Performance Assessment results in PJ07 HPAR (Section 4.4.1.1).
4	Have potential interactions with related projects/concepts been considered and addressed?	YES	Interactions with PJ04-W2-28.3 "Connected large airports" for their consideration in AOP/ NOP integration and one of the elements is TTA from airport perspective. Interaction with PJ07-W2-38" Enhanced integration of AU trajectory definition and network management processes" for their consideration in P-FDCI complementarity. And further in PJ07 solution 39, Use Case 2

			Based on cherry-pick measure: “Network Cherry-pick” allows AUs to express and feed prioritisation to Local DCB (FMP/Airport) for L-DCB consideration when flights are cherry picked and Use Case 2bis based on ATFM regulation but with high initial reg rate (Alicante arrivals EXE#2, CDG arrivals RTS EXE#4). They were considered during the analysis of issues/benefits related to these SESAR Solutions, as well as during the development of recommendations and requirements. Please, refer to PJ07 Human Performance Assessment results in PJ07 HPAR (Section 4.4.1.1, Appendix B and Appendix C).
5	Is the level of human performance needed to achieve the desired system performance for the proposed solution consistent with human capabilities?	YES	The overall results obtained in terms of workload, situational awareness, task efficiency is consistent with human capabilities, and considered at an acceptable level or show a positive increase comparing the Solution Scenario against the Reference Scenario. It can be concluded that the use of the different applications of the UDPP concept is viable in an operational environment. The validations undertaken within this Solution show that the concept has the potential to deliver significant benefits to the AUs, without compromising the objectives of other ATM stakeholders and without a significant workload increase for these stakeholders. In some case, it investigated that the automation could be reduce or maintain an acceptable level of workload. Please, refer to PJ07 Human Performance Assessment results in PJ07 HPAR (Section 4.4.1.1, Appendix B and Appendix C).
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	The results obtained show a positive compliance of the concept expectations. Please, refer to PJ07 Human Performance Assessment results in PJ07 HPAR (Section 4.4.1.1, Appendix B Appendix C and Appendix E).
7	Has the proposed solution been tested with end-users and under sufficiently realistic conditions, including abnormal and degraded conditions?	YES	The HP activities have been conducted with all the relevant end-users, including L-DCB actors (FMPs and Airport operator), AUs (Airlines) and NMOC. However, it must consider a limited participation of the APT actor in EXE#1 ZUR in the scenario runs and thus of insufficient exposure to the proposed process, the qualitative feedback and quantitative results were implicitly restricted to a small sample. Also, given operational constraints, the limited participation availability from some actor to the intended the PJ07-W2 S39 validation activities occurred. NMOC was unable to provide an NM Operator for the EXE#4 CDG exercise because the exercise will take place during the busy summer period. Also, it was not possible to obtain direct FMP participation in the EXE#2 Alicante PJ07-W2 S39 validation activities which limited the responses obtained for the L-DCB actor to those of the Alicante APOC participants. Besides, an FMP from ENAIRE was participating in the last run validations and this was also an opportunity to exchange the FMP’s experience with the PJ07-W2 S39 team attending the simulation and provided valuable input to the concept. Despite of participants remained at their places of work and the tools and platform will be connected via the internet and no observation under the shoulder had been done, simulation scenarios have been judged by operational staff

			participating in the validation activities adequate to exercise needs. Due to the uncertainty in air traffic recovery from the decline in 2020 and the inherent risk of low traffic levels during the exercise execution, it has been agreed with the Solution partners that the validation plan for would be developed in parallel in two streams (Full shadow-mode validation setup (FSM); and augmented shadow-mode (ASM), potentially with injected traffic. In both cases, the real-time nature, and the nature of NMVP feed from OPS meant that the Solution scenarios were fully realistic in terms of dynamicity of the Network...Please, refer to SESAR Solution 39 VALR Edition 00.01.00.
8	Do validation results confirm that the interactions between human and technology are operationally feasible, and consistent with agreed human performance requirements?	YES	The overall results obtained in terms of interactions between human and technology are operationally feasible, and consistent with agreed human performance requirements. The distribution between the system automation and human action is considered as well balanced for all actors (AUs, L-DCB and NM operator) for performing their task. Debriefing outputs indicated that the workload is highly dependent on the system support with low system latency and automatization of the Prioritisation phase (Phase 2). It is recommended that for further reduction of workload, supporting automation facilities in the AUs tools are highly desirable (e.g., automatic computation and assignment of UDPP inputs based on a range of customisable objectives). Please, refer to PJ07 Human Performance Assessment results in PJ07 HPAR (Section 4.4.1.1, Appendix B Appendix C and Appendix E).
9	Has all relevant SESAR documentation been updated according to the HP activities outcomes (OSED, SPR)?	YES	PJ07 Human Performance Assessment Report will be considered as input to OSED and SPR updates.
10	Do the outcomes satisfy the HP issues/benefits to reach the expected KPA?	YES	The overall results obtained through the validation exercises satisfy the HP issues/benefits through in terms of validation exercises to reach expected KPA.
11	Have HP recommendations and HP requirements correctly been considered in HMI design, procedures/documentation, and training?	YES	The HP recommendations and HP requirements have regarding the HMI design and usability, the clarification of concept in terms of roles, responsibilities and the operating procedures had been considered at each step of the process and listed. Additionally, the identification of training on new HMI automation feature, also new process, and operating methods (MOPS) were identified during the outputs of qualitative questionnaire and debriefing session. Please, refer to HPAR PJ07 (Section 4.4.1.1, Appendix B Appendix C and Appendix E).
12	Have the major factors that can influence the transition feasibility (e.g., changes in competence requirements, recruitment, and selection, training needs, staffing requirements, and relocation of the workforce) been addressed? Are there any ideas on how to overcome any issues?	YES	No major HP issues were identified that could become an impediment to concept implementation. However, relevant issues were identified and analysed, and recommendations and requirements consequently developed for Operating methods refinement, training needs, level of automation needed, HMI usability and task allocation between human and machine.

			Please, refer to PJ07 Human Performance Assessment results in PJ07 HPAR (Section 4.4.1.1, Appendix B Appendix C and Appendix E).
13	Have any impacts been identified that may require changes to regulation in HP/ATM? This includes changes in roles & responsibilities, competence requirements, or the task allocation between human & machine.	YES	Clarification in roles and responsibilities (Interaction process), as well as tasks allocation issues between human and machine (HMI and automation) have been identified and not yet assessed. However, none of these issues require changes in the existing regulations but in the operational procedures. Please, refer to PJ07 Human Performance Assessment results in PJ07 HPAR (Section 4.4.1.1, Appendix B Appendix C and Appendix E).
14	Has the next V-phase sufficiently been prepared (additional testing conditions, open HP issues to be addressed)?	YES	Based on the HP activities conducted, and results obtained, some issues are still open and recommendations for further research have been developed. These issues and recommendations are mainly related to consideration of an appropriate level of tool automation to deal with a lot of information and data needed to support the decision-making process (sequence to apply, margins, priority,) and from the HP perspective (mainly workload, situation awareness and timeliness of coordination and communication procedures). Please, refer to PJ07 Human Performance Assessment results in PJ07 HPAR (Section 4.4.1.1, Appendix B Appendix C and Appendix E).

5 References

N/A

Appendix A – Additional HP activities conducted

N/A

Appendix B – HP Recommendations Register

B.1 SESAR Solution PJ07 Solution 39 EXE-01

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
PJ07-ZUR-HP-RECOM-01	Concept feasibility	(Operating methods / procedures) The issue regarding the fully definition of the different phases of the new process has been partially validated. The Optimisation phase should be addressed to Alicante and CDG exercises validation activities dedicated to Use case 2 and 2bis.	The issue regarding the manner that operating methods can be followed and the manner that tasks can be achieved have not been covered for the Optimisation phase by this exercise (Use case). It should be recommended to be addressed by Alicante and CDG exercises validation activities dedicated to Use case 2 and 2bis.	Address to UC2 and UC2bis PJ07. S39 CDG_EXE#4 PJ07. S39 ALC_EXE#2	Ground		To be accepted		
PJ07-ZUR-HP-RECOM-02	Training	It should be recommended to provide overall training regarding the MOPS rules developed (Indicator, data, and information) and on the use the new automation function.	Even it's a daily business, there is a lot of information and data needed to support the decision-making process (sequence to apply, margins, priority,) this process could be complex. There was lot of data to manipulate and lot of information and data needed to support the decision-making process, like sequence to apply, margins, priority. In addition, due to the complexity information to manage, new feature and automation	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		

			function should be required to reduce the complexity of the tasks. A training about the overall consideration of MOPS rules developed (Indicator, data, and information) and on the use the new features and automation function should be recommended.						
PJ07-ZUR-HP-RECOM-03	System design	Automation It should be recommended that some automation functions should be added to avoid unnecessary workload for users.	Even it's a daily business, there is a lot of information and data needed to support the decision-making process (sequence to apply, margins, priority,) this process could be complex. During debriefings session, actors highlighted that the coordination mechanism depends on the tool and the level of automation. Indeed, the number of flights handled impact the level of workload which it linked to the level of automation provided by the tools. Due to the consideration of this complexity information available, should be treated in automation way to prevent operator should not do that and to avoid unnecessary workload for users.	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		
PJ07-ZUR-HP-RECOM-04	System design	HMI Usability It should be recommended to review the performance of the technical system to support all actors in carrying out their tasks regarding flight prioritisation process.	Even if, all actors expressed overall positive feedback with the method, tools and indicators used for the integration of UDPP mechanism in collaborative framework for managing CCS, some improvement had been requested. AUs highlighted that there was sometimes a discrepancy between What-If and Submit information. Although this is explained in the concept, it could result in lower confidence. The AUs responses' time was not fast enough. AUS highlighted that process was dynamic	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		

			situation and it was necessary to make lot of changes for adjustments. The tool should always show up-to-date information to cope with this dynamic situation. They highlighted that with the current prototype, the impact on the operation was displayed only for a limited number of factors. They also mentioned that some key information should be visible for all actors. (E.g., UDPP cut-off time, type of measure). From NM side, more information on flight under UDPP process should be added in the slot list/flight list which should help them to identify from ETFMS which flights are under UDPP process. It should be recommended to review the quantity, clarity, accuracy timeliness and relevant feature and data provided to support all actors to improve their situation awareness and avoid unnecessary workload for users.						
PJ07-ZUR-HP-RECOM-05	Concept feasibility	Optimisation process (UDPP NCP measure): It should be recommended to clarify the process collaboration between AU and Airport during the optimisation phase.	Even if, all actors expressed overall positive feedback about the role and responsibilities, some feedback about the Airport operator had been expressed during the coordination with AUs. It is recommended to clarify the process collaboration between AU and Airport during the optimisation phase. A MOPS should be provided to the actors to detail the rules and protocols.	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		

PJ07-ZUR-HP-RECOM-06	New objective	Considering the automation, recommendations and that it might have an impact on the timeliness of the tasks to be performed and tasks load. It should be recommended to assess workload with and without automation.	To be link with: PJ07-ZUR-HP-RECOM-03; PJ07- ZUR -HP-RECOM-04. PJ07-ZUR-HP-REQ-01; PJ07-ZUR-HP-REQ-02; PJ07-ZUR-HP-REQ-01	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		
PJ07-ZUR-HP-RECOM-07	Concept feasibility	OPS (operating methods / procedures) It should be recommended that further clarity on Role and responsibilities must be established on the L-DCB actors	The output results showed that FMP considered that Flight prioritisation and Optimisation phases were not clear. It should be recommended that further clarity on roles and responsibilities should be established on the L-DCB stakeholder side prior to deployment of the concept.	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		
PJ07-ZUR-HP-RECOM-08	Concept feasibility	Concept clarification OPS (operating methods / procedures) It should be recommended to clarified concept with local framework between AUs and Airports	The output results showed that some aspect of the Optimisation phase (phase 3) may affect the resulting AU benefits or potentially even produce disbenefits for AUs. It should be recommended to clarified concept with local framework between AUs and Airports that would establish guide for use the specifically the optimisation phase.	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		
PJ07-ZUR-HP-RECOM-09	New objective	It should be recommended re-assess workload with better representative sample for the APT actors,	The exercise (Use Case 1) focused on a specific environment around Zurich Airport arrivals and as such, it represents a single environment of application of the concept and the given Use Case. The exercise involved one representative of each stakeholder from the target environment, i.e., Skyguide as ANSP, SWISS as the AU and Zurich Airport as Airport stakeholder – these were complemented by an NMOC stakeholder.	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		

			Therefore, while very valuable and of high quality, the qualitative feedback and quantitative results were implicitly restricted to a small sample. The assessment of the level of workload remains an open question, due to limited participation of the APT actor in the scenario runs and thus insufficient exposure to the proposed process. It should be recommended to re-assess the level of workload with a better representative sample of the actors.						
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Table 12: HP recommendations EXE-01

B.2 SESAR Solution PJ07 Solution 39 EXE-02

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
PJ07-ALC-HP-RECOM-01	Concept feasibility	Concept feasibility Concept clarification should be recommended for all actors to avoid loss of trust in the concept and impact negatively the operational acceptance	The lack of transparency and fairness of the concept might lead a lack of trust in the concept and negatively impacted the operational acceptance. Even if the AUS agreed that the collaborative CCs resolution process offers increased flexibility to me by adding more options to manage my operations, AUS also highlighted	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		

			a lack of transparency in the process on which flights will be subjected to delays. This resulted in some flights to be prioritized which were not impacted by the measure. (AUS (Flight prioritization selection by APT/I-DCB, a lack of transparency in the process on which flights will be subjected to delays). Even if APOC participants clarified that they tried to maintain equity among all captured flights in their decision making, which could some potential issues concerning equity aspect with the concept. The lack of transparency and fairness of the concept might lead a lack of trust in the concept and impact negatively the operational acceptance.						
PJ07-ALC-HP-RECOM-02	Training	It should be recommended to provide overall training regarding the MOPS rules developed (Indicator, data, and information) and on the use the new automation function.	A training about the overall consideration of MOPS rules developed and, on the use, the new features and automation function should be recommended.	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		
PJ07-ALC-HP-RECOM-03	New objective	It should be recommended re-assess workload with better representative sample of the end-user's actors.	Due to the limited participation of the end-user's actors (FMP did not participate in the process), the issue regarding the Potential human errors of the UDPP operating methods was non-conclusive. It should be recommended to re-assess workload with better representative sample of the end-user's actors. The issue regarding the level of subjective workload of APOC and NM actors has been non-conclusive. Due to AIRPOC system limitations for APOC actors, the tools used did not allow actors to test fully the process.	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		

			Overall workload was perceived to be low by the APOC participants. However, in the light of the difficulties in working with the AIRPORTIA tool which were previously highlighted in previous sections well as the limitations of the system during the validation exercises, it would assume that workload in a more complex environment would increase significantly unless these shortcomings are addressed. Although the NMOC operator could always plan and organised his work as expected and confirmed acceptable level of workload, he estimated that additional monitoring of the CP regulation and associated delay increased the complexity of the current tasks.						
PJ07-ALC-HP-RECOM-04	New objective	APOC tools (AIRPORTIA)Level of trust should be assessed when the improvement of HMI will be done	Even it's a daily business, there was a lot of information and data needed to support the decision-making process (sequence to apply, margins, priority,) this process could be complex. There was lot of data to manipulate was a lot of information and data needed to support the decision-making process, like sequence to apply, margins, priority. In addition, due to the complexity information to manage, new feature and automation function should be required to reduce the complexity of the tasks. A training about the overall consideration of MOPS rules developed (Indicator, data, and information) and on the use the new features and automation function should be recommended.	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		

PJ07-ALC-HP-RECOM-05	New objective	HMI prototyping session and usability assessment should be foreseen.	To be link with: PJ07-ALC-HP-RECOM-04; PJ07-ALC-HP-RECOM-05; PJ07-ALC-HP-RECOM-08 PJ07-ALC-HP-REQ-03; PJ07-ALC-HP-REQ-06; PJ07-ALC-HP-REQ-07; PJ07-ALC-HP-REQ-08; PJ07-ALC-HP-REQ-09; PJ07-ALC-HP-REQ-010; PJ07-ALC-HP-REQ-012	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		
PJ07-ALC-HP-RECOM-06	New objective	Considering the automation, recommendations and that it could have an impact on the timeliness of the tasks to be performed and tasks load. It should be recommended to assess workload with and without automation.	To be link with: PJ07-ALC-HP-RECOM-04; PJ07-ALC-HP-RECOM-05; PJ07-ALC-HP-RECOM-08 PJ07-ALC-HP-REQ-01; PJ07-ALC-HP-REQ-02; PJ07-ALC-HP-REQ-01	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		
PJ07-ALC-HP-RECOM-07	Concept feasibility	OPS (operating methods / procedures Concept clarification should be recommended for all actors to avoid loss of trust in the concept and impact negatively the operational acceptance.	Inappropriate operating methods of the concept might lead to a loss of trust in the concept and impact negatively the operational acceptance. The lack of transparency and fairness of the concept might lead a lack of trust in the concept and impact negatively the operational acceptance. It was found that the concept was not very well suited for resolving runway capacity issues. The freedom of flexible departure maintained by non-cherry-picked flights in the Cherry Pick measure could make it impossible to resolve the capacity constraint in an operational scenario (i.e., due to late departures), and could only be resolved in a regulation which affects all flights, thus making the concept irrelevant.	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		

PJ07-ALC-HP-RECOM-08	System design	Information and data provided (availability). A further development and improvement of design of the HMI regarding the availability of the information and data provided to supports the human in carrying out their tasks should be recommended.	Information and data provided (availability). It highlighted that participants would have required additional information sources to facilitate decision making. APOC support HMI: APOC participants would have required additional information sources integrated into the AIRPORTIA tool to obtain full situational awareness and allow for improved decision making. AUs support HMI: The AU tool functionalities allowed AOC participants to quickly identify flights impacted by an NCP regulation and provide their priorities and margins. AUs actors were quite comfortable with the provided tools; however, they would have preferred some additional information to support their decision making. A further development and improvement of design of the HMI regarding the availability of the information and data provided to supports the human in carrying out their tasks is recommended. An irrelevant and not relevant information might lead negative impact of the SA, workload, trust and should impact negatively the operational acceptance.	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		
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Table 13: HP recommendations EXE-02

B.3 SESAR Solution PJ07 Solution 39 EXE-04

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
PJ07-CDG-HP-RECOMM-01	Concept feasibility	Concept clarification Operating methods / procedures) It should be recommended to clarify "AU access and flexibility / timeframes prior to the UDPP cut-off times " part of the concept	Action time: Management of priorities The output results showed that AUS considered that the only problem incurred is the timing to prioritize the flights. Sometimes UDPP time is already over before the prioritization process is done. They estimated that the sooner the prioritization is done the better the processes will be. They also considered that the time limit (10 mins) was not enough to submit Flight Prioritizations within the 10-minute "prioritise by HH:MM" time limit. the AU could not be able to assess the impact of a prioritisation on its fleet and will not test any possible optimisation by applying on the flight in the UDPP NCP measure.). An inappropriate Operating method could lead to inefficient tasks and in turn impair the overall concept acceptability.. It should be recommended to clarify "AU access and flexibility / timeframes prior to the UDPP cut-off times " part of the concept.	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		

PJ07-CDG-HP-RECOMM-02	Concept feasibility	Concept clarification Operating methods / procedures) It should be recommended to clarify "L-DCB access and flexibility / timeframes prior to the UDPP cut-off times " part of the concept.	The output results showed that FMP considered that Flight Prioritization procedure, regarding the time management, might not be used if the flight prioritization process is too long and replace by their current operating methods (daily work). Usually, the FMP sends TTA right after the MCP/NCP creation. In this case they had to wait for the flight prioritization process to be complete. They estimated that in real Ops, they could not have the time to wait. They also considered that Prioritisation adds some complexity to the FMP task given that they had to wait for the data to come from the airline. Prioritisation adds a new step in the MCP process for the FMP, therefore the workload is slightly higher. An inappropriate Operating method could lead to inefficient operating methods and impact negatively the level of workload and in turn impair the overall concept acceptability.	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		
PJ07-CDG-HP-RECOMM-03	Concept feasibility	Concept clarification Operating methods / procedures) It should be recommended to clarify "Time period time" during the optimisation phase (FMP).	The output results showed that FMP considered optimisation phases should be not operationally feasible within the timeframes given by operational circumstances. FMP was too busy with other tasks, time pressure was still strong, the response from AU was needed shortly. An inappropriate Operating method could turn into inefficient operating methods and in turn impair the overall concept acceptability. It should be recommended to clarify "Time period time" during the optimisation phase " part of the concept.	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		

PJ07-CDG-HP-RECOMM-05	Concept feasibility	Concept clarification Operating methods / procedures) It should be recommended to clarify concept operating procedure for all actors involved in the process to avoid inefficient operating methods and in turn impair the overall concept acceptability.	Debriefing and observations during the exercise indicated that some important details of the concept were unclear to participants. For example: The unexpected use of priority values to make prioritizations while neglecting TNAs; Setting an NCP measure for a bunch of flights whose UCOTs were imminent; The FMP steering the AU to prioritize a subset of flights, rather than all flights in the bunch; Potential issues over fairness. It should be recommended to clarify concept operating procedure for all actors involved in the process to avoid inefficient operating methods and in turn impair the overall concept acceptability.	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		
PJ07-CDG-HP-RECOMM-06	Design	(AUS) HMI Usability It should be recommended to improve the Metron's FOC prototype usability in term of interactivity to easily modify prioritization and overall availability of data /information displayed to avoid a loss of situation awareness and loss in trust of the support tool which could lead to inefficient operating methods and in turn impair the overall concept acceptability.	See requirement: PJ07-CDG-HP-REQ-02; PJ07-CDG-HP-REQ-03; PJ07-CDG-HP-REQ-04. PJ07-CDG-HP-REQ-05; PJ07-CDG-HP-REQ-10;	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		

PJ07-CDG-HP-RECOMM-07	Design	(FMP) HMI Usability It should be recommended to improve the IODA tool usability in term of availability of data /information displayed to avoid a loss of Situation awareness and loss in trust of the support tool which could lead to inefficient operating methods and in turn impair the overall concept acceptability.	See requirement: PJ07-CDG-HP-REQ-06; PJ07-CDG-HP-REQ-07; PJ07-CDG-HP-REQ-10;	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		
PJ07-CDG-HP-RECOMM-08	Training	It should be recommended to provide overall training regarding tool and features of the HMI improvement.	See requirement: PJ07-CDG-HP-REQ-02; PJ07-CDG-HP-REQ-03; PJ07-CDG-HP-REQ-04. PJ07-CDG-HP-REQ-05; PJ07-CDG-HP-REQ-06; PJ07-CDG-HP-REQ-07. PJ07-CDG-HP-REQ-08; PJ07-CDG-HP-REQ-09;	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		
PJ07-CDG-HP-RECOMM-09	Training	It should be recommended to provide overall training regarding the MOPS rules developed.	See Recommendation: PJ07-CDG-HP-RECOM-04; PJ07-CDG-HP-RECOM-013 See requirement: PJ07-CDG-HP-REQ-01	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		
PJ07-CDG-HP-RECOMM-010	Concept feasibility	Concept clarification It should be recommended to produce MOPS (Guide) to clarify Role, responsibility and operating methods for all actors involved in the process of Flight Prioritisation.	The observation and debriefing during exercise highlighted that there were different schemes for applying prioritisations and these could be interpreted differently by the FMP. An ambiguous definition of operational procedures could lead to inefficient operating methods and in turn impair the overall concept acceptability.	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		

			It appeared that there are no guidelines (or a procedure) for FMPs to explain how to interpret and use the priorities sent by AUs, and how to allocate TTAs fairly. It should be recommended to provide MOPS for all actors involved in the process.						
PJ07-CDG-HP-RECOMM-011	New objective	Considering HMI features improvement and the automation, recommendations and that it might have an impact on the timeliness of the tasks to be performed and tasks load. It should be recommended to assess workload and HMI usability with and without automation.	See requirement: PJ07-CDG-HP-REQ-02; PJ07-CDG-HP-REQ-03; PJ07-CDG-HP-REQ-04; PJ07-CDG-HP-REQ-05; PJ07-CDG-HP-REQ-06; PJ07-CDG-HP-REQ-07; PJ07-CDG-HP-REQ-08; PJ07-CDG-HP-REQ-09.	PJ07-W2 Solution 39			To be analysed		
PJ07-CDG-HP-RECOMM-012	New objective	Considering a clarification and refine of the concept should be done, it should be recommended to re-assess the feasibility and acceptability of the concept regarding the cognitive workload, situation awareness, trust of the concept, (including HMI usability assessment) with the end user's actors.	See requirement: PJ07-CDG-HP-REQ-02; PJ07-CDG-HP-REQ-03; PJ07-CDG-HP-REQ-04; PJ07-CDG-HP-REQ-05; PJ07-CDG-HP-REQ-06; PJ07-CDG-HP-REQ-07; PJ07-CDG-HP-REQ-08; PJ07-CDG-HP-REQ-09.	PJ07-W2 Solution 39			To be analysed		

Table 14: HP recommendations EXE-04

Appendix C – HP Requirements Register

C.1 SESAR Solution PJ07 ZUR EXE-01

Reference	Type of requirement	Requirement	Rationale	Assessment source + Reference report if available	Scope	Concept/solution involved	Requirement status	Rationale in case of rejection	Comments
PJ07-ZUR-HP-REQ- 03	System Design	Automation shall be recommended to avoid unnecessary workload for users.	Even it's a daily business, there was a lot of information and data needed to support the decision-making process (sequence to apply, margins, priority,) this process could be complex. Due to the consideration of this complexity information available, shall be treated in automation way to prevent operator shall not do that and to avoid unnecessary workload for users	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		
PJ07-ZUR-HP-REQ- 04	System Design	HMI Usability Review of the feature regarding the accuracy of "What-If" and "Submit" information/data shall be recommended	Even if, the AUs were confident about in the information provided by the tool to prioritise their fleet and that their UDPP inputs are correctly reflected in the CCS resolution, they highlighted that there is sometimes a discrepancy between What-If and Submit information. Although this is explained in the concept, it could result in lower confidence.	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		
PJ07-ZUR-HP-REQ- 06	System Design	HMI Usability Overall usability of tools and automation level shall be	To mitigate the impact of the workload, it shall be recommended to improve tools usability. (E.g: limitation of the submit task (click), better task automation of task, better feature to deal	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		

Reference	Type of requirement	Requirement	Rationale	Assessment source + Reference report if available	Scope	Concept/solution Involved	Requirement status	Rationale in case of rejection	Comments
		recommended (E.g: limitation of the submit task (click)).	with lot of information and data provided to the users.						
PJ07-ZUR-HP-REQ- 07	System Design	HMI Usability The What-if tool information improvement shall be recommended.	Even if, the level of automation for the what-if tool was judged acceptable to carry out their tasks effectively. Some tool functionality improvement shall be required regarding the what-if feature. It must somehow display previous state with the improved state of the prioritization to be able to briefly see the improvement. It should improve situation awareness and facilitate the decision-making process.	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		
PJ07-ZUR-HP-REQ- 08	System Design	System Design The improvement of the system responsiveness shall be recommended.	Even if, the response time of response time of the NM B2B services was sufficient for performing their tasks and the timeliness of the information/data provided allowed them to easily create UDPP Measure with regulation. During the debriefing session, the AUS Responses 'time was not fast enough. AUS highlighted that process was dynamic situation and its necessary to make lot of changes for adjustment. The tool shall always show up-to-date information to cope with this dynamic situation. It shall be recommended to improve the system responsiveness to avoid unnecessary workload for users and pressure to not achieve their task.	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		
PJ07-ZUR-HP-REQ-09	System Design	HMI Usability	The issue regarding of the sufficient (exhaustive) information provided by the tools for AUS actors which allow them to know which	SESAR 2020 VALR for	Ground		To be analysed		

Reference	Type of requirement	Requirement	Rationale	Assessment source + Reference report if available	Scope	Concept/solution Involved	Requirement status	Rationale in case of rejection	Comments
		It shall be recommended to share some information for all actors involved in the process	flights could be prioritised has been validated. During debriefing session, it had been highlighted that some key information should be visible for all actors. (E.g. UDPP cut-off time, type of measure) in order improve the decision-making process.	PJ07-W2 Solution 39					
PJ07-ZUR-HP-REQ-10	System design	HMI Usability More added information on flight under UDPP process in the slot list/flight list on NM tools shall be recommended.	Even if, the AUs considered that, as it has been set up and used in the exercise, the information displayed improve their situation awareness and they were able to maintain situational awareness for the coordination with NM, for assessing the impact of the delay on my fleet, for setting priorities and margins on flight concerned and for testing my flights prioritisation before submitting them. By his side, the NMOC considered that the information displayed did not improve their situation awareness. From NM side, more information on flight under UDPP process must be added in the slot list/flight list which should help them to identify from ETFMS which flights are under UDPP process. To improve their situation awareness and avoid unnecessary workload for users, it shall be recommended to add more information on flight under UDPP process in the slot list/flight list on NM tools.	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		
PJ07-ZUR-HP-REQ-11	System Design	HMI Usability Additional factors (indicators) to identify the impact of the proposed solution in all	Even if all actors (AUs, L-DCB, NMOC) considered globally that with the method, tools and indicators used for the integration of UDPP mechanism in collaborative framework for	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		

Reference	Type of requirement	Requirement	Rationale	Assessment source + Reference report if available	Scope	Concept/solution Involved	Requirement status	Rationale in case of rejection	Comments
		actor's area of responsibility shall be recommended.	managing CCS, their situational awareness was slightly higher. they highlighted that with the current prototype, the impact on the operation was displayed only for a limited number of factors. By example, a more complete integration into the existing systems would increase the ability to identify the impact. An tools features improvement shall be considered to improve the situation awareness and the making decision process.						
PJ07-ZUR-HP-REQ-12	System Design	System design automation Investigation of the appropriate le level of automation for heavy and complex task to avoid unnecessary workload for users shall be recommended.	The outputs of the qualitative questionnaire showed AUs were able to define UDPP prioritisation on concerned flights and from his side, L-DCB were able to update the UDPP measure if needed in a relevant, an accurate and in a timely manner. Nevertheless, during debriefings session, actors highlighted that the coordination mechanism depends on the tool and the level of automation. Indeed, the number of flights handled impact the level of workload which it linked to the level of automation provided by the tools. In addition, to mitigate the workload impact, it is necessary to find a balance among the tool and the number of flights.	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		
PJ07-ZUR-HP-REQ-13	Concept feasibility	Concept clarification It shall be recommended to produce MOPS to clarify Role,	See Recommendation: PJ07-ZUR-HP-RECOM-07,	SESAR 2020 VALR for	Ground		To be analysed		

Reference	Type of requirement	Requirement	Rationale	Assessment source + Reference report if available	Scope	Concept/solution Involved	Requirement status	Rationale in case of rejection	Comments
		responsibility and operating methods for all actors involved in the process of Flight Prioritisation.	PJ07-ZUR-HP-RECOM-08	PJ07-W2 Solution 39					

Table 15: HP Requirements EXE-01

C.2 SESAR Solution PJ07 ALC EXE-02

Reference	Type of requirement	Requirement	Rationale	Assessment source + Reference report if available	Scope	Concept / solution Involved	Requirement status	Rationale in case of rejection	Comments
PJ07-ALC-HP-REQ-01	System Design	HMI Usability AUs Tools / Design recommendation Additional relevant information and data provided shall be recommended to support actors on the decision-making process.	It highlighted that participants would have required additional information sources to facilitate decision making. The AU tool functionalities allowed AOC participants to quickly identify flights impacted by an NCP regulation and provide their priorities and margins. The AU participant was quite comfortable with the provided tools; however, they would have preferred some additional information to support their decision making, namely, information about crew rotations on flights, depiction of the flight number, and scheduled in-block times. During prioritisation process, the limitation of feature of the tools as single indicator (e.g., full list instead of individual flight) did not allow AUs to know first which flights were part of the UDPP. Added information and indicators should be provided (e.g., having individual flight instead of full Flight list to allow users to better identified which flights were part of the UDPP NCP measure) A further development and improvement of design of the HMI regarding the availability of the information and data provided to supports	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		

Reference	Type of requirement	Requirement	Rationale	Assessment source + Reference report if available	Scope	Concept / solution Involved	Requirement status	Rationale in case of rejection	Comments
			the human in carrying out their tasks shall be recommended. An irrelevant and not useful information may lead negative impact of the SA, workload, trust and could negatively impact the operational acceptance.						
PJ07-ALC-HP-REQ-02	System Design	APOC tools (AIRPORTIA) Additional relevant information and data provided shall be recommended to support actors on the decision-making process	It highlighted that the system limitations and of the tools used did not allow actors to test fully the process (Like lack of information display). APOC participants would have required additional information sources integrated into the AIRPORTIA tool to obtain full situational awareness and allow for improved decision making. Some feature provided by the AIRPORTIA tool were not allow APOC actors to complete their task. By example APOC tool did not provide basic functionalities for assessing, creating, and resolving capacity imbalances using TTAs; core APOC tool functionalities for using AU priorities and margins were not working and The APOC tool was inadequate for resolving non-capacity related airport imbalances. These comments highlight potentially greater issues with the AIRPORTIA tool, given that APOC participants had some issues in identifying relevant information to implement the concept and in identifying flights captured in NCP	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		

Reference	Type of requirement	Requirement	Rationale	Assessment source + Reference report if available	Scope	Concept / solution Involved	Requirement status	Rationale in case of rejection	Comments
			measures which were not eligible for optimisation. The most relevant pieces of information would be scheduled in-block/off-block times, stand-availability, taxi-in/out times, flight number information and turn-around time. A further development and improvement of design of the HMI regarding the availability of the information and data provided to supports the human in carrying out their tasks shall be recommended. An not relevant information may lead negative impact of the SA, workload, trust and could negatively impact the operational acceptance.						
PJ07-ALC-HP-REQ-03	System Design	HMI Usability It shall be recommended to review the usability and the level of automation of tool to support all actors in carrying out their tasks regarding flight prioritisation process.	It highlighted that the system limitations and of the tools used did not allow actors to test fully the process and some automated support functionalities shall be required. AU tools: the AUS reported that the tool should update their priorities automatically or make use of “drag and drop” functionalities. HMI prototyping session and usability assessment shall be foreseen. During the exercise it observed that AUS actors had some issues in assigning the new priority one or in updating their priorities in a manual way. They reported that prioritization should be	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		

Reference	Type of requirement	Requirement	Rationale	Assessment source + Reference report if available	Scope	Concept / solution	Requirement status	Rationale in case of rejection	Comments
			process automatically or should be make use of “drag and drop” functionalities instead of doing manually. Potential to update priorities of flights using “drag and drop” functionalities; Decrease the numbers of clicks required to perform actions; Ability to assign “priority 1” to multiple flights captured in different regulations). A further development and improvement of automation design of the HMI regarding the availability of the information and data provided to supports the human in carrying out their tasks shall be recommended. HMI prototyping session and usability assessment shall be investigated. An irrelevant information may lead negative impact of the SA, workload, trust and could negatively impact the operational acceptance.						

Table 16: HP Requirements EXE-02

C.3 SESAR Solution PJ07 CDG EXE-04

Reference	Type of requirement	Requirement	Rationale	Assessment source + Reference report if available	Scope	Concept/solution involved	Requirement status	Rationale in case of rejection	Comments
PJ07-CDG-HP-REQ-01	Concept feasibility	Concept clarification It shall be recommended to produce guidelines for AUs and guidelines or a procedure for FMPs actors involved in the process of Flight Prioritisation.	The observation and debriefing during exercise highlighted that there were different schemes for applying prioritisations and these could be interpreted differently by the actors. An ambiguous definition of operational procedures could lead to inefficient operating methods and in turn impair the overall concept acceptability. It shall be recommended to produce guidelines for AUs and guidelines or a procedure for FMPs	SESAR Solution 39 VALR ALC_EXE Section 3.2 of the OSED (i.e., the detailed operational description of the new method)	Ground		To be analysed		
PJ07-CDG-HP-REQ-02	System Design	(AUS prototype) System Design It shall be recommended to improve the system responsiveness. It shall be recommended to improve the Metron's FOC prototype usability (latency and	The exercise demonstrated that systems and services supported the resolution of local demand-capacity imbalances. However, the exercise showed that the FOC prototype needs significant improvement in terms of presentation of data and latency before entering operation. The AU tool shall be key component in any successful coordination in operations.	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		

Reference	Type of requirement	Requirement	Rationale	Assessment source + Reference report if available	Scope	Concept/ solution Involved	Requirement status	Rationale in case of rejection	Comments
		consistency with action)							
PJ07-CDG-HP-REQ-03	System Design	(AUS prototype) HMI Usability It shall be recommended to improve the Metron's FOC prototype usability (minimal action /input device) to avoid unnecessary workload for users	(AUS prototype): It shall be recommended HMI usability improvement. HMI usability was the extent to which a system allows people to achieve tasks in an effective, efficient, and satisfactory way. To ensure its usability, aspects of the system shall include several usability principles such as: The computer interface shall: - Reduce the number of action (input device with less click). Need to decrease the number of click (To just click on flight to select priorities. led fields: margin field and click to select	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		
PJ07-CDG-HP-REQ-04	System Design	(AUS prototype) HMI Usability It shall be recommended to improve the Metron's FOC prototype usability (availability of data /information displayed) to improve	(AUS prototype): It shall be recommended HMI usability improvement. HMI usability is the extent to which a system allows people to achieve tasks in an effective, efficient, and satisfactory way. To ensure its usability, aspects of the system must	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		

Reference	Type of requirement	Requirement	Rationale	Assessment source + Reference report if available	Scope	Concept/solution Involved	Requirement status	Rationale in case of rejection	Comments
		the Situation awareness and facilitate the decision-making process	include several usability principles such as: The computer interface shall: -provide helpful information; information display (readable and understanding) * N" to indicate whether the flight is on the measure or not. It needed to click on each flight to know/Call sign should always-visible (NM) & Search by call sign versus flight number (Both information needed to be merged in a single tool.) - IF the CTOT is integrated on the schedule view, they would be able to see that. But the tools itself does not give this information. in the future it should be integrated - Means/features need to speed up prioritization process (e.g most costly flight.): implement cost delay in the same tool to make the process the easiest possible - require an operator to recognise information rather than to recall information from memory.						

Reference	Type of requirement	Requirement	Rationale	Assessment source + Reference report if available	Scope	Concept/solution Involved	Requirement status	Rationale in case of rejection	Comments
			Flight which could be prioritise should be highlighted in the tool - use terms and procedures familiar to the user (common wording and phraseology) Wording shall be improved. call sign number instead of Flight Id. It led WK b time consuming to define priorities						
PJ07-CDG-HP-REQ-05	System Design	(AUS prototype) HMI Usability It shall be recommended to improve the Metron's FOC prototype usability (availability of data /information displayed) to improve the Situation awareness and facilitate the decision-making process.	(AUS prototype): It shall be recommended HMI usability improvement. HMI usability is the extent to which a system allows people to achieve tasks in an effective, efficient, and satisfactory way. To ensure its usability, aspects of the system must include several usability principles such as: The equipment shall: -match the job or task, be logically organised/laid out and decision aiding. * It shall be useful to have the possibility to reorganise the rank by preference/to have filters searching by name, airport, measure type, and by times/useful to rearrange the flight into a list. Eg: Flag and to drag	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		

Reference	Type of requirement	Requirement	Rationale	Assessment source + Reference report if available	Scope	Concept/solution Involved	Requirement status	Rationale in case of rejection	Comments
			flight into a list on the right/It will be easier to reassign priority and give new time (Not Time after) -be simple to follow. AUS considered that define (Margin and priority) on concerned flights to the NOP is not too fluent. AUs actors considered that (AUS) that Set prioritization generate moderate effort and any change (before and after) generate severe effort. It was a little difficult to modify what we have already completed -keep the user informed of the status. (AUS) After a regulation the best thing that can happen for a company is that prioritization list given is considered. During the exercise it was the case. The only problem that the tool does not highlight what it has been done. (By the FMP)						
PJ07-CDG-HP-REQ-07	System Design	Prioritization process: HMI Usability It shall be recommended to improve the IODA tool usability (latency and consistency with action)	NM data Information provided: FMP reported that Prioritisation adds some complexity to the FMP task. Timeliness of information was inappropriate, and they had to wait for the data to come from the airline.	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		

Reference	Type of requirement	Requirement	Rationale	Assessment source + Reference report if available	Scope	Concept/solution Involved	Requirement status	Rationale in case of rejection	Comments
			They did not know when or at what time the prioritisation data will be available. HMI usability is the extent to which a system allows people to achieve tasks in an effective, efficient, and satisfactory way. To ensure its usability, aspects of the system must include several usability principles such as feedback, prompting, queuing and job- performance aiding. An inappropriate latency of the system could unnecessary workload for users and pressure to not achieve their task. It shall be recommended HMI usability improvement regarding the timeliness of the system						
PJ07-CDG-HP-REQ-08	Concept feasibility	Situation awareness It shall be recommended to assess the level of situation awareness when clarification of the concept and the improvement of HMI will be done. An inappropriate level loss situation awareness could lead	Debriefing and observations during the exercise indicated significant problems with situational awareness and that it requires significant improvement prior to deployment of the concept. Of particular concern is for the AU. For some of these problems, a requirement was associated and can be resolved with a redesign of the FOC prototype. The FMP was sometimes unaware of the UCOTs, which meant some	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		

Reference	Type of requirement	Requirement	Rationale	Assessment source + Reference report if available	Scope	Concept/solution Involved	Requirement status	Rationale in case of rejection	Comments
		to inefficient operating methods and in turn impair the overall concept acceptability.	bunches had very little time to receive prioritizations before passing their UCOTs. The AUs and FMP needed to know when the prioritisation period starts and ends. AUs needed help to find the flights to prioritize. The FMP indicated which subset of AFR flights to prioritise [Day 2 run 2]. Without this support in operations, AUs won't know which of their flights are in the bunch, so may prioritise all flights in the NCP measure). The level of situation awareness shall be assessed when the improvement of HMI will be done						
PJ07-CDG-HP-REQ-09	System Design	System design automation It shall be recommended to increase the level of automation of heavy and complex task to avoid unnecessary workload for users and pressure to not achieve their task.	(AUs prototype): HMI usability is the extent to which a system allows people to achieve tasks in an effective, efficient, and satisfactory way. To ensure its usability, aspects of the system must include several usability principles such as reduce the number of not useful task to perform. Some automated feature shall be taken in consideration. Automation drag and drop prioritisation instead of doing	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		

Reference	Type of requirement	Requirement	Rationale	Assessment source + Reference report if available	Scope	Concept/solution Involved	Requirement status	Rationale in case of rejection	Comments
			manually. It shall be useful to have a proposal priority for the flight. Like a machine learning impact						
PJ07-CDG-HP-REQ-010	System Design	HMI Usability It shall be recommended to improve the FOC tool usability in term of information provided or functionality which allow them to keep the user informed of the status. It avoids a loss of situation awareness and loss in trust of the support tool which could lead to inefficient operating methods and in turn impair the overall concept acceptability.	Observations and debriefing session indicated that there were significant problems with situational awareness and that it required significant improvement prior to deployment of the concept, and it could be resolved with a redesign of the FOC prototype. HMI usability is the extent to which a system allows people to achieve tasks in an effective, efficient, and satisfactory way. To ensure its usability, aspects of the system must include several usability principles such as the computer interface shall keep the user informed of the status, It was difficult for AUs to know what actions had been done by the FMP, i.e., when a flight received a TTA. Therefore, the AU had to check all the time her flights. •There was no notification/information about what the AU was doing and when or if prioritisations were going to be sent. •The chat facility improved situational awareness between AU and FMP. If unavailable in real	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		

Reference	Type of requirement	Requirement	Rationale	Assessment source + Reference report if available	Scope	Concept/solution Involved	Requirement status	Rationale in case of rejection	Comments
			operations this could reduce situational awareness further.						
PJ07-CDG-HP-REQ-011	System Design	(AUS) HMI Usability It shall be recommended to improve the Metron's FOC prototype usability in term of logically organised / laid out displayed to avoid a loss of situation awareness and loss in trust of the support tool which could lead to inefficient operating methods and in turn impair the overall concept acceptability.	Metron prototype (AUs prototype): HMI usability is the extent to which a system allows people to achieve tasks in an effective, efficient, and satisfactory way. To ensure its usability, aspects of the system shall include several usability principles such as the interface should match the job or task, i.e., be logically organised / laid out and decision aiding. Functionality of prioritisation shall be integrated with the rest of the AUs Ops system rather to switch between two screens (bt it was in the framework of exercise)	SESAR 2020 VALR for PJ07-W2 Solution 39	Ground		To be analysed		

Table 17: HP Requirements EXE-04

Appendix D – HP Log



HPLOG
PJ07-W2-S39. Ed 01.



Appendix E – HP Objectives Assessment

E.1 SESAR Solution ZUR EXE01

HP Objective ID	HP Objective	Success Criteria ID	Success Criteria	Success Criteria Status	HP Objective Status
OBJ-07-W2.39-V3-VALP-HP1-001	To ensure role of the human is consistent with human capabilities and limitation for all relevant staff involved in the Collaborative Management process	CRT-PJ07-W2-39-V3-VALP-HP1-001-001	V3. For each human actor likely to be affected by the change, the description of roles and responsibilities and tasks has been established.	OK	OK
		CRT-PJ07-W2-39-V3-VALP-HP1-001-002	V3. Roles & responsibilities have been determined to be clear and consistent by end users and linguistic experts.	OK	OK
OBJ-07-W2.39-V3-VALP-HP1-002	To determine that operating methods are exhaustive and support human performance for all relevant staff involved in the Collaborative Management process	CRT-07-W2.39-V3-VALP-HP1-002-001	V3. Operating methods are found to cover the identified normal operating conditions.	OK	OK
		CRT-07-W2.39-V3-VALP-HP1-002-002	V3. Operating methods are found to cover the identified abnormal operating conditions.	Out of scope of the exercise	Out of scope of the exercise

		CRT-07-W2.39-V3-VALP-HP1-002-004	V3. The content of the operating methods has been determined to be clear and consistent by end users and native speakers/linguistic experts.	OK	OK
OBJ-07-W2.39-V3-VALP-HP2-001	To demonstrate that team members can maintain a sufficient level of shared situation awareness	CRT-07-W2.39-V3-VALP-HP2-001-001	V3. [GND only] Level of team situational awareness in the solution not lower than in the reference scenario.	OK	OK
OBJ-07-W2.39-V3-VALP-HP2-002	To identify whether Potential human errors and mitigations (recovery means) are not significantly higher than in the reference (acceptable level) than in the reference scenario.	CRT-07-W2.39-V3-VALP-HP2-002-001	V3. Likelihood of errors in the solution not significantly higher than in the reference.	NOK (must be assess)	NOK (must be assess)
OBJ-07-W2.39-V3-VALP-HP2-004	To ensure that Human actors have an appropriate picture of the automation process and the operator's task demands.	CRT-07-W2.39-V3-VALP-HP2-004-001	V3. Understanding of the technical system's behaviour is consistent with the operator's task demands.	OK	OK
OBJ-07-W2.39-V3-VALP-HP2-005	To demonstrate that communication means, and modalities allow an efficient task accomplishment	CRT-07-W2.39-V3-VALP-HP2-005-001	V3. Level of communication load in the solution not higher than in the reference scenario.	Cancelled	Cancelled
	To demonstrate that communication means, and modalities allow an efficient task accomplishment	CRT-07-W2.39-V3-VALP-HP2-005-002	V3. Changes in communication means & modalities do not increase cognitive demands.	Cancelled	Cancelled

OBJ-07-W2.39-V3-VALP-HP2-006	To determine that human actors can achieve their tasks (in normal and abnormal operational conditions and degraded modes of operation).	CRT-PJ07-W2-39-V3-VALP-HP2-006-001	V2. Tasks are effectively achieved.	OK	POK (automation tools must be investigated)
OBJ-07-W2.39-V3-VALP-HP2-007	To determine that allocation of tasks between the human and the machine is appropriate.	CRT-07-W2.39-V3-VALP-HP2-007-001	V3. Task allocation is found to be consistent with good deliverables of 16.5.1, "Guidance material for HP automation support", and/ or other automation guidelines.	OK	OK
	To determine that allocation of tasks between the human and the machine is appropriate.	CRT-07-W2.39-V3-VALP-HP2-007-002	V3. There are no adverse effects on human tasks in terms of an increase in cognitive demand or potential errors.	OK	OK
OBJ-07-W2.39-V3-VALP-HP2-008	To ensure that the level of trust in the UDPP Management process is appropriate by the end user.	CRT-07-W2.39-V3-VALP-HP2-008-001	V3. [GND only] Level of trust is not lower in the solution than in the reference scenario.	OK	OK
OBJ-07-W2.39-V3-VALP-HP2-009	To ensure that Level of situational awareness not lower in the solution than in the reference scenario	CRT-07-W2.39-V3-VALP-HP2-009-001	V3. [GND only] Level of situational awareness not lower in the solution than in the reference scenario.	OK	OK
OBJ-07-W2.39-V3-VALP-HP2-010	To determine whether operating methods can be followed in an accurate, efficient, and timely manner.	CRT-07-W2.39-V3-VALP-HP2-010-001	V3. Level of workload not significantly higher in the solution than in the reference scenario.	OK	OK

OBJ-07-W2.39-V3-VALP-HP3-001	To validate that the level of workload is not significantly higher in the solution than in the reference scenario.	CRT-07-W2.39-V3-VALP-HP3-001-001	V3. Level of workload not significantly higher in the solution than in the reference scenario.	OK	POK (automation tools must be investigated)
OBJ-07-W2.39-V3-VALP-HP3-002	To ensure that the Level of workload (induced by the allocation of tasks between the human & the machine) is acceptable	CRT-07-W2.39-V3-VALP-HP3-002-001	Level of workload within acceptable limits ('acceptable limits' to be defined regarding the tool used for the assessment).	OK	OK
OBJ-07-W2.39-V3-HP4-001	To identify required training needs for the affected human actors.	CRT-PJ07-W2-39-V3-HP4-001-001	V3. Training types needed per actor group are identified (preliminary identification only; N/A for Airbus).	OK	POK (automation tools must be investigated)
OBJ-07-W2.39-V3-VALP-HP6-001	To demonstrate that the performance of the technical system supports the human in carrying out their task.	CRT-07-W2.39-V3-VALP-HP6-001-001	V3. [GND only] Information accuracy ratings not lower in the solution than in the reference scenario.	OK	OK
OBJ-07-W2.39-V3-VALP-HP6-001	To demonstrate that the performance of the technical system supports the human in carrying out their task.	CRT-07-W2.39-V3-VALP-HP6-001-002	V3. Timeliness of information experienced as sufficient by the end user.	OK	OK
OBJ-07-W2.39-V3-VALP-HP6-001	To demonstrate that the performance of the technical system supports the human in carrying out their task.	CRT-07-W2.39-V3-VALP-HP6-001-003	V3. Information requirements are in line with the information needs of the human.	OK	POK (tools information improvement)

OBJ-07-W2.39-V3-VALP-HP6-002	To ensure that usability of the user interface is acceptable by the end users,	CRT-07-W2.39-V3-VALP-HP6-002-001	V3. [GND only] Usability rating for the integrated interface not lower in the solution than in the reference scenario.	OK	OK
OBJ-07-W2.39-V3-VALP-HP6-002	To ensure that usability of the user interface is acceptable by the end users,	CRT-07-W2.39-V3-VALP-HP6-002-002	V3. End user experiences integrated interface including any new system components as sufficiently usable.	OK	POK (tools information improvement)
OBJ-07-W2.39-V3-VALP-HP6-002	To ensure that usability of the user interface is acceptable by the end users,	CRT-07-W2.39-V3-VALP-HP6-002-003	V3. [GND only] Level of individual situational awareness not lower in the solution than in the reference scenario.	OK	POK (automation tools must be investigated)
OBJ-07-W2.39-V3-VALP-HP6-003	To ensure that the visual display support a level of situational awareness not lower in the solution than in the reference scenario.	CRT-07-W2.39-V3-VALP-HP6-003-001	V3. [GND] Level of team situational awareness not lower in the solution than in the reference scenario.	OK	POK (automation tools must be investigated)
OBJ-07-W2.39-V3-VALP-HP6-004	To determine that proposed solution is acceptable to affected human actors. (Means for mitigating potential negative impacts are identified)	CRT-07-W2.39-V3-VALP-HP6-004-001	V3. End users do not predict negative impact with regard to changes in roles and responsibilities or means for mitigating negative impacts are identified.	OK	POK (automation tools must be investigated)

Table 18: Objectifs HP assessment EXE-01

E.2 SESAR Solution ALC EXE02

HP Objective ID	HP Objective	Success Criteria ID	Success Criteria	Success Criteria Status	HP Objective Status
HP1-Consistency of human role with respect to human capabilities and limitations					
OBJ-07-W2.39-V3-VALP-HP1-001	To validate that operating method is consistent and clear for the human actors and is within the limits of human performance.	CRT-07-W2.39-V3-VALP-HP1-001	V3. Roles & responsibilities have been determined to be clear and consistent by end users and linguistic experts.	OK	POK (Process clarification)
OBJ-07-W2.39-V3-VALP-HP1-002	To determine that operating methods are exhaustive and support human performance for all relevant staff involved in the Collaborative Management process.	CRT-07-W2.39-V3-VALP-HP1-002-004	V3. The content of the operating methods has been determined to be clear and consistent by end users and native speakers/linguistic experts.	POK	POK (Process clarification)
OBJ-07-W2.39-V3-VALP-HP2-001	To demonstrate that all actors in the collaborative CCS resolution process confirm that their situational awareness (i.e. the ability to obtain the up-to-date situation within acceptable timeframes) is not reduced.	CRT-07-W2.39-V3-VALP-HP2-001-001	V3. [GND only] Level of team situational awareness in the solution not lower than in the reference scenario.	NOK	NOK
OBJ-07-W2.39-V3-VALP-HP2-002	To identify whether Potential human errors and mitigations (recovery means) are not significantly higher than in the reference (acceptable level) than in the reference scenario.	CRT-07-W2.39-V3-VALP-HP2-002-001	V3. Likelihood of errors in the solution not significantly higher than in the reference.	POK	POK (Concept feasibility)
OBJ-07-W2.39-V3-VALP-HP2-006	To determine that human actors can achieve their tasks (in normal and abnormal operational conditions and degraded modes of operation).	CRT-PJ07-W2-39-V3-VALP-HP2-006-001	V3. Tasks are effectively achieved	POK	POK (with new design HMI reassess)

OBJ-07-W2.39-V3-VALP-HP2-008	To ensure that the level of trust in the UDPP Management process is appropriate by the end user.	CRT-07-W2.39-V3-VALP-HP2-008-001	V3. [GND only] Level of trust not significantly lower in the solution than in the reference scenario.	POK	POK (with new design HMI reassess)
OBJ-07-W2.39-V3-VALP-HP3-001	To validate that the level of workload is not significantly higher in the solution than in the reference scenario.	CRT-07-W2.39-V3-VALP-HP3-001-001	V3. Level of workload not significantly higher in the solution than in the reference scenario.	POK	NOK
OBJ-07-W2.39-V3-VALP-HP3-001	To ensure that the Level of workload (induced by the allocation of tasks between the human & the machine) is acceptable.	CRT-07-W2.39-V3-VALP-HP3-001-002	Level of workload within acceptable limits ('acceptable limits' to be defined regarding the tool used for the assessment).	NOK	NOK (with new design HMI reassess)
HP2-Suitability of technical system in supporting the tasks of human actors					
OBJ-07-W2.39-V3-VALP-HP3-002	To ensure that the Level of workload (induced by the allocation of tasks between the human & the machine) is acceptable.	CRT-07-W2.39-V3-VALP-HP3-002-001	V3. Level of workload is not significantly higher in the solution than in the reference scenario.	NOK	NOK (with new design HMI reassess)
OBJ-07-W2.39-V3-VALP-HP5-002	To ensure that usability of the user interface is acceptable by the end users.	CRT-07-W2.39-V3-VALP-HP5-002-001	V3. [GND only] Usability rating for the integrated interface not lower in the solution than in the reference scenario.	POK	POK (with new design HMI reassess)
HP3-Adequacy of team structure and team communication in supporting the human actors					
OBJ-07-W2.39-V3-VALP-HP2-005	To demonstrate that communication means, and modalities allow an efficient task accomplishment.	CRT-07-W2.39-V3-VALP-HP2-005-002	V3. Changes in communication means & modalities do not increase cognitive demands.	Cancelled	Cancelled

Table 19: Objectifs HP assessment EXE-02

E.3 SESAR Solution CDG EXE04

HP Objective ID	HP Objective	Success Criteria ID	Success Criteria	Success Criteria Status	HP Objective Status
HP1-Consistency of human role with respect to human capabilities and limitations					
OBJ-07-W2.39-V3-VALP-HP1-001	To ensure role of the human is consistent with human capabilities and limitation for all relevant staff involved in the Collaborative Management process	CRT-PJ07-W2-39-V3-VALP-HP1-001-001	V3. For each human actor likely to be affected by the change, the description of roles and responsibilities and tasks has been established.	OK	OK
		CRT-PJ07-W2-39-V3-VALP-HP1-001-002	V3. Roles & responsibilities have been determined to be clear and consistent by end users and linguistic experts.	OK	OK
OBJ-07-W2.39-V3-VALP-HP1-002	To determine that operating methods are exhaustive and support human performance for all relevant staff involved in the Collaborative Management process	CRT-07-W2.39-V3-VALP-HP1-002-001	V3. Operating methods are found to cover the identified normal operating conditions.	OK	POK (concept clarification)
		CRT-07-W2.39-V3-VALP-HP1-002-002	V3. Operating methods are found to cover the identified abnormal operating conditions.	NA	NA
		CRT-07-W2.39-V3-VALP-HP1-002-004	V3. The content of the operating methods has been determined to be clear and consistent by end users and native speakers/linguistic experts.	OK	POK (concept clarification)

OBJ-07-W2.39-V3-VALP-HP2-002	To identify whether Potential human errors and mitigations (recovery means) are not significantly higher than in the reference (acceptable level) than in the reference scenario.	CRT-07-W2.39-V3-VALP-HP2-002-001	V3. Likelihood of errors in the solution not significantly higher than in the reference.	POK	POK
OBJ-07-W2.39-V3-VALP-HP2-006	To determine that human actors can achieve their tasks (in normal and abnormal operational conditions and degraded modes of operation).	CRT-07-W2.39-V3-VALP-HP2-006-001	V3. Tasks are effectively achieved.	OK	POK (concept clarification)
OBJ-07-W2.39-V3-VALP-HP2-010	To determine whether operating methods can be followed in an accurate, efficient, and timely manner.	CRT-07-W2.39-V3-VALP-HP2-010-001	V3. Level of workload not significantly higher in the solution than in the reference scenario.	OK	OK
OBJ-07-W2.39-V3-VALP-HP2-008	To ensure that the level of trust in the UDPP Management process is appropriate by the end user.	CRT-07-W2.39-V3-VALP-HP2-008-001	V3. [GND only] Level of trust not significantly lower in the solution than in the reference scenario.	OK	OK
OBJ-07-W2.39-V3-VALP-HP2-009	To ensure that Level of situational awareness not lower in the solution than in the reference scenario	CRT-07-W2.39-V3-VALP-HP2-009-001	V3. [GND only] Level of situational awareness not lower in the solution than in the reference scenario.	POK	POK (HMI usability/OM)
OBJ-07-W2.39-V3-VALP-HP3-001	To validate that the level of workload is not significantly higher in the solution than in the reference scenario.	CRT-07-W2.39-V3-VALP-HP3-001-001	V3. Level of workload not significantly higher in the solution than in the reference scenario.	OK	POK (HMI usability)
HP2-Suitability of technical system in supporting the tasks of human actors					
OBJ-07-W2.39-V3-VALP-HP2-007	To determine that allocation of tasks between the human and the machine is appropriate.	CRT-07-W2.39-V3-VALP-HP2-007-001	V3. Task allocation is found to be consistent with good deliverables of 16.5.1, "Guidance material for HP automation support", and/ or other automation guidelines.	OK	POK (HMI usability)

		CRT-07-W2.39-V3-VALP-HP2-007-002	V3. There are no adverse effects on human tasks in terms of an increase in cognitive demand or potential errors.	POK	POK
OBJ-07-W2.39-V3-VALP-HP3-001	To ensure that the Level of workload (induced by the allocation of tasks between the human & the machine) is acceptable	CRT-07-W2.39-V3-VALP-HP3-001-001	V3. Level of workload is not significantly higher in the solution than in the reference scenario.	OK	POK (HMI usability)
OBJ-07-W2.39-V3-VALP-HP3-002	To ensure that the Level of workload (induced by the allocation of tasks between the human & the machine) is acceptable	CRT-07-W2.39-V3-VALP-HP3-002-001	Level of workload within acceptable limits ('acceptable limits' to be defined about the tool used for the assessment).	OK	POK Complexity Workload effect
OBJ-07-W2.39-V3-VALP-HP5-001	To demonstrate that the performance of the technical system supports the human in carrying out their task.	CRT-07-W2.39-V3-VALP-HP5-001-002	V3. Timeliness of information experienced as sufficient by the end user.	POK	POK
HP3-Adequacy of team structure and team communication in supporting the human actors:					
OBJ-07-W2.39-V3-VALP-HP2-001	To demonstrate that team members can maintain a sufficient level of shared situation awareness	CRT-07-W2.39-V3-VALP-HP2-001-001	V3. [GND only] Level of team situational awareness in the solution not lower than in the reference scenario.	OK	POK
OBJ-07-W2.39-V3-VALP-HP2-005	To demonstrate that communication means, and modalities allow an efficient task accomplishment	CRT-07-W2.39-V3-VALP-HP2-005-001	V3. Level of communication load in the solution not higher than in the reference scenario.	OK	OK
OBJ-07-W2.39-V3-VALP-HP2-006	To determine that human actors can achieve their tasks (in normal and abnormal operational conditions and degraded modes of operation).	CRT-PJ07-W2-39-V3-VALP-HP2-006-001	V2. Tasks are effectively achieved.	OK	OK

HP4-Feasibility regarding HP-related transition factors:					
OBJ-07-W2.39-V3-VALP-HP2-006	To determine that human actors can achieve their tasks (in normal and abnormal operational conditions and degraded modes of operation).	CRT-PJ07-W2-39-V3-VALP-HP2-006-001	V2. Tasks are effectively achieved.	OK	OK
OBJ-07-W2.39-V3-HP4-001	To identify required training needs for the affected human actors.	CRT-PJ07-W2-39-V3-HP4-001-001	V3. Training types needed per actor group are identified (preliminary identification only; N/A for Airbus).	OK	OK
OBJ-07-W2.39-V3-HP4-002	To determine that Job satisfaction for human actors is no worse than before. (Means for mitigating potential negative impacts are identified)	CRT-07-W2.39-V3-VALP-HP4-002-001	V3. End users do not predict negative impact regarding changes in roles and responsibilities or means for mitigating negative impacts are identified.	OK	OK

Table 20: Objectifs HP assessment EXE-04

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