EPISODE 3

Single European Sky Implementation support through Validation

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None	

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DOCUMENT CONTROL

Approval

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EXECUTIVE SUMMARY

This document describes the Exercise Plan of the Expert Group on En-route Complexity Management (EP3 WP4.3.1.1.1).

This Expert Group exercise is part of the Episode 3 work package WP 4.3.1, whose goal is to validate technologies, processes and procedures related to the en-route area of the execution phase.

The internal stakeholders of the Expert Group exercise are the Gaming (GE), Real Time Simulation (RTS) and Fast Time Simulation (FTS) Exercises that complete the validation activities included in the Cycle 1 of WP4.3.1. These exercises will be performed after the conclusion of this Expert Group using its conclusions as starting point.

Main objective of the Expert Group is to define the Complexity Management procedure establishing:

- procedure objectives and goals;
- roles and responsibilities of different actors for identifying, measuring, monitoring, predicting and resolving an en-route complex situation;
- interactions between actors implied;
- scenarios to be used for the next validation exercises;
- KPAs affected and the OI Steps that should be developed to support the Complexity Management procedure.

The Exercise Plan includes a description of the Delphi Method which has been chosen as appropriate to steer the Expert Group. This methodology establishes a cycle of questions-answers structured en four phases. The questionnaires aim to obtain a detailed analysis of the Complexity Management process in a comprehensive way. One important feature of this methodology is that tries to avoid influences of one expert opinion on the others, what has been demonstrated as key issue when detailed conclusions from an expert group are expected.

The planning of the whole process and the profile of participants are included in this document. A list of identified risks with their contingency and mitigation action is also included.

The conclusions of the Expert Group will be summarised in the Expert Group Report, including all information and conclusions coming from the four planned phases and meetings. All questionnaires and the answers summary report of each one will be provided within this report as annex.

1 INTRODUCTION

1.1 PURPOSE OF THE DOCUMENT

The goal of this document is to establish the general rules that are going to steer the proposed Expert Group dedicated to Conflict Management in En-Route High & Medium/Low Density operations.

1.2 INTENDED AUDIENCE

The intended audience includes:

- E3 WP4 En-Route and Traffic Management.
  - EP3 WP 4.1 Leader.
  - EP3 WP 4.2.2 Leader.
  - EP3 WP 4.3.1.1.3 Leader.
  - EP3 WP 4.3.1.1.4 Leader.
  - EP3 WP 4.3.1.1.6 Leader.
- Expert Group Partners.

1.3 DOCUMENT STRUCTURE

The structure of this document is based on the document Guidelines for Expert Group Exercise Plan [1]. This introduction explains the document purpose, structure and provides general background and supportive information. Section 2 explains the fit with the WP4 validation strategy and Section 3 gives the exercise scope. Section 4 gives the planning and management of the Expert Group and Section 5 and Section 6 give the analysis of specifications and the detailed exercise design, respectively. Finally, Section 7 lists the references and applicable documents.

1.4 BACKGROUND

Episode 3 is charged with beginning the validation of the operational concept expressed by SESAR Task 2.2 and consolidated in SESAR D3 [3]. The initial emphasis is on obtaining a system level assessment of the concept's ability to deliver the defined performance benefits in the 2020 time horizon corresponding to ATM Capability Level 2/3 and the Operational Improvement Step IP 2.

The validation process as applied in EP3 is based on the E-OCVM [2], which describes an approach to ATM Concept validation. However, to date the E-OCVM has not been applied to validation of a concept on the scale and complexity of SESAR. Such a system level validation assessment must be constructed from data derived from a wide range of different validation activities, integrating many different levels of system description, different operational segments and contexts and different planning horizons. The data will be collected through a variety of methods and tools and will vary in its quality and reliability.

The process of performing systematic validation and the integration of results must be actively planned and managed from the beginning of the whole validation activity. This validation management is coordinated by EP3/WP2.3, which is responsible for ensuring the effective application of the E-OCVM, the consolidation of the Episode 3 Validation Strategy, and establishing a Validation Framework, which will allow the integration of the validation results and the construction of the necessary system level view.

Validation exercises should produce evidence (preferably measured) about the ability (some aspect) of the concept to deliver on (some aspect) of the performance targets. In order to be able to do Validation Exercises, there is a need for concept clarification, requirements development or elaboration activities in preparation for downline validation activities.

The clarification exercises are one of the tasks of the Expert Groups. Very generally speaking, the Expert Group exercises will take place before any other validation exercise and will generate input for some of these exercises. Its key outputs will consist of a better understanding of how the concept needs to operate to be evaluated and a consensus on best assumptions (to then be documented).

This Expert Group exercise is included in the Episode 3 WP 4.3.1, where the aim is to validate technologies, process and procedures related to the en-route area of the execution phase. This WP is split in two cycles, during the first cycle the improvements will be assessed in separate environments trying to evaluate individual improvements for Complexity Management and Separation Management without any mutual interaction. During the second cycle a common study is envisaged incorporating all the conclusions derived from the first cycle and considering the whole problem as an addition of complexity and separation together. In this second one all validation exercises will consider scenarios addressing both situations to establish a common method to solve this kind of situations in a common way.

More specifically, the Expert Group exercise described in this document is included in WP 4.3.1.1.1, En-route Complexity Management, the objective of which is to explore en-route procedures for identifying and resolving complex situations, assessing the impact on the NOP (distortion of the RBT) and considering the capacity and efficiency of effects reducing complexity to a manageable level.

This document is based on the Description of Work 2.8 [8] extending on the objectives processes that will be used according to the Expert Group Guidelines for exercise plan [1].

1.5 Glossary of Terms

Term	Definition
ANSP	Air Navigation Service Provider
ATM	Air Traffic Management
ATC	Air Traffic Control
ATCC	Air Traffic Control Centre
ATCO	Air Traffic Controller
ATFCM	Air Traffic Flow and Capacity Management
AOCC	Airline Operation Control Centre
CDM	Collaborative Decision Making
CONOPS	Concept of Operations
DOD	Detailed Operational Description
EG	Expert Group
E-OCVM	European Operational Concept Validation Methodology
ERC	EUROCONTROL Research Centre
IP	Implementation Phase
KPA	Key Performance Area

Term	Definition
KPI	Key Performance Indicator
NOP	Network Operations Plan
RBT	Reference Business Trajectory
SESAR	Single European Sky ATM Research and Development Programme
WP	Work package

2 FIT TO VALIDATION STRATEGY

2.1 STAKEHOLDERS

There are two groups of stakeholders involved: the external ones to Episode 3 and the internal project participants.

The main external stakeholder groups in air transport industry involved in the Complexity Management process are described in [6].

The actual stakeholders of this Expert Group exercise are:

- Validation exercises within EP3 WP4 using the outputs from this Expert Group. These internal stakeholders are (see 2.4Overview of any Interactions, Relationships or Dependencies):
  - EP3 WP4.3.1.1.3 Gaming Exercise on En-route Complexity Management (ISDEFE);
  - EP3 WP4.3.1.1.4 Fast Time Simulation on a One Day Network Operations Plan (NOP) (ERC);
  - EP3 WP4.3.1.1.6 Generic Real-Time Simulation on Impact of the NOP at En-route Sector (ERC).
- Diverse representatives of the air transport industry are involved in the preparation and conduction of this Expert Group (see 4.1Resources) This ensures a realistic operational feedback and evaluation of the results;

2.2 EXPERT GROUP OBJECTIVES

The objective of this Expert Group is to support performance assessments that will provide evidence that the SESAR operational concept increases airspace capacity by reducing controller task load per flight. To address the controller tactical task load reduction, SESAR includes the reduction of complexity to simplify the ATM situation so that separation provision can be efficiently applied by human intervention (SESAR CONOPS [4], Section F3.2.1). The reduction of complexity is carried out with the assistance of appropriate automation that achieves the goal of reducing complexity with a minimum distortion of the trajectories concerned (SESAR CONOPS [4], Section F3.2).

More specifically, this exercise is aimed to define clearly the Complex Management procedure providing information on:

- the stages of the process including actors involved and roles and responsibilities for each one;
- the high level requirements for associated automated assistance tools for the identification, monitoring and resolution of complex situations;

- recommendations about new techniques and tool that will improve the ATCo workload in complex situations;
- operational scenarios;
- the KPAs affected by this procedure and the OI Steps that should be developed to support the Complexity Management procedure.

These objectives are directly linked with the expected outputs described in next section.

2.3 Expected Output

The Expert Group will produce the following results:

- Definition of Complexity Management and a list of key indicators that define a complex situation and that should be controlled;
- Detailed Complexity Management procedure indicating which are the steps to be followed when a complex situation is detected;
- Definition of actors involved and their responsibilities all along the defined procedure;
- Description of the relationship between complex situations and ATCo workload, answering the question about how the ATCo workload should be treated within the Complexity Management procedure;
- Assessment of expected impact in SESAR KPAs, analysing the procedure effects and considering the necessary trade-off between them due to the implementation of the CM procedure;
- List of the relevant Operational Improvements that will support the procedure;
- High level requirements for automation tools that could be used in the Complexity Management Procedure –e.g. detecting complexity, proposing solutions, implementing solutions–;
- Definition of possible solutions for complex situations that could be applied;
- Scenarios to be used by the subsequent simulation exercises; and
- Description of the differences between Complexity Management and Separation Management to avoid overlapping between them.

The minimum useful outcome would be a clear definition of all steps that define the CM procedure with all actors and their responsibilities identified in each step.

2.4 Overview of any Interactions, Relationships or Dependencies

During cycle 1there is only one Expert Group exercise addressing complexity issues in EP3 WP 4.3.1. Conclusions and outputs will be used by later exercise in this EP3 WP in order to get deeper knowledge and first indications about the potential of these complexity management methods. Figure 2-1 summarises the global structure for this EP3 WP 4.3.1 and the relationships among all tasks.

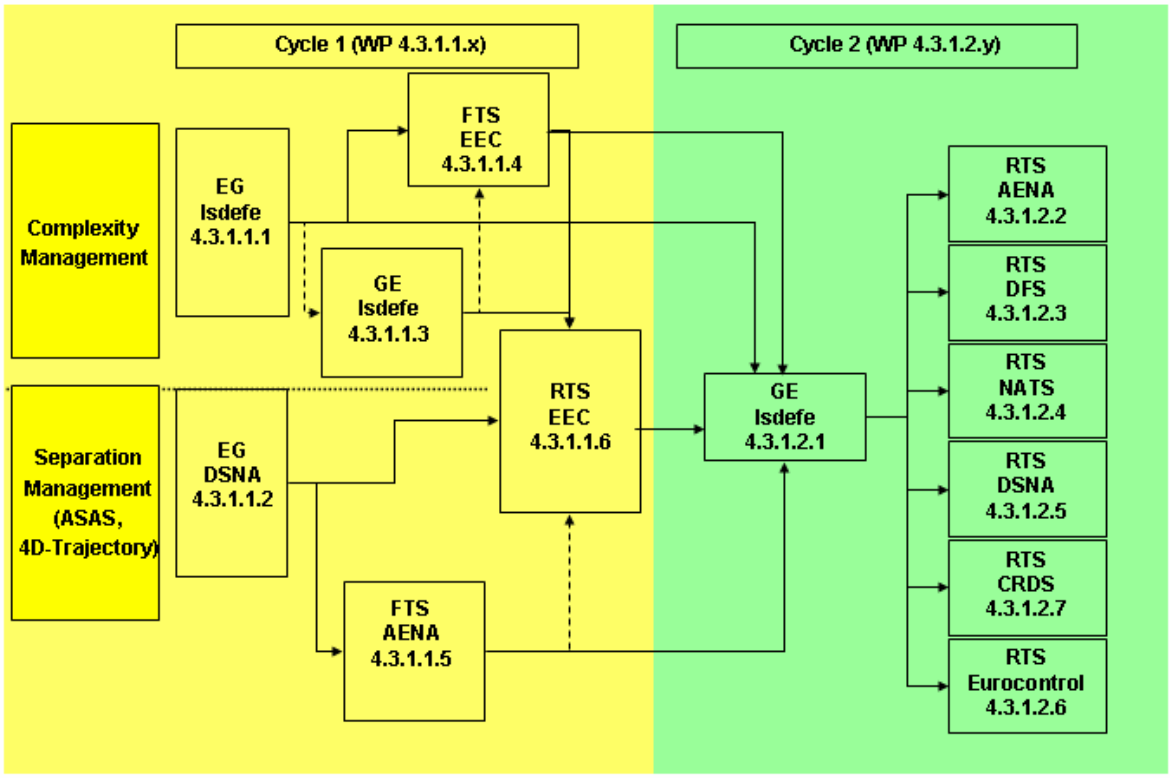

Figure 1 - Sequence of validation activities in WP4.3.1 (source [8)

The Expert Group provides direct input for the following exercises within EP3 WP 4.3.1:

- Gaming Exercise on Complexity Management (EP3 WP 4.3.1.1.3 ISDEFE);
- Fast Time Simulation (FTS) on a One Day Network Operations Plan (EP3 WP 4.3.1.1.4 EUROCONTROL).

Moreover, the outputs will be used in other work packages outside EP3 WP 4.3.1:

- Operational Concept Refinement (EP3 WP 4.2.2 NATS);
- Results Analysis and Report (EP3 WP 4.3.2 DFS).

Additionally, EP3 WP4.3.1.1.6 Generic Real-Time Simulation on Impact of the NOP at En-route Sector (EUROCONTROL) is also being fed by the assumptions and clarifications produced by this Expert Group. The Expert Group is aware of the subsequent validation exercises needs and expectations.

3 EXERCISE SCOPE

3.1 DESCRIPTION OF ATM PROBLEM AND CONCEPT

The issue under study in the planned Expert Group is the En-route Complexity Management, which entails the detection of zones/volumes of high complexity to enable the following processes to ensure the safe and orderly management of air traffic:

- The timely transition from operations without route structures to periods when en-route structures are essential to assure the required capacity with safety;
- To determine the optimum sectorisation organisation to assure the efficiency of the separation provision service, including the use of dynamic sector configurations with multi-sector planning;
- The modification of individual trajectories to reduce complexity if it is considered that the efficiency of separation provision might be compromised.

Traffic complexity management also includes the objective to free controller mental resources by minimising the level of risks perceived by the controllers (SESAR CONOPS [4], section F3.2.1).

Complexity has temporal and geographical dimensions. There are times of the day when airspace could feature high-complexity operations and appropriate procedures would apply. The requirement is that the periods during which the different procedures are in force must be clearly defined and controlled: users and ANSP need certainty with regard to the procedures in use (SESAR CONOPS [4], section F3.2.2).

For a description of the main characteristics of the SESAR proposed solutions and the Operational Improvements concerned wholly or partially with the en-route phase of flight please refer to WP4 Validation Strategy [5].

3.2 TOOL(S) AND TECHNIQUE(S) USED TO CONDUCT THE EXPERT GROUP

For the conduction of this Expert Group the Delphi Method [7] was identified as an appropriate technique. This method consists of the systematic solicitation and collation of judgments on a particular topic through a set of carefully designed sequential questionnaires interspersed with summarized information and feedback of opinions derived from earlier responses.

The Delphi Method does not suggest any kind of meetings where experts are able to discuss some key points, share information and consolidate the results. Since these kinds of meetings are considered important, the present Expert Group will use a modified Delphi method, by including some meetings where the analysed information coming from the questionnaires will be showed and studied by all participants.

The Expert Group management method proposed here aims to extract and maximize the benefits that every Expert Group method presents and minimize its disadvantages. It takes advantage of the synergy of the group discussion and removes undesirable social interactions that exist within any group [1], so that the consensus reached is as reliable as possible. The Expert Group Management is based on three main features:

- Anonymity: Various sets of questionnaires will be distributed to all experts and the answer of each one gathered prior to the subsequent meeting. The proposals and opinions of each member of the group will be anonymous, being disseminated to other experts in an integrated form, without specifying the author of each clarification. This has the following positive aspects:
  - Avoid that one group member can influence the others;

- Allow that a member can re-establish the former opinion without any loss of reputation;
- Allow that members can defend their own arguments, knowing that in case these are erroneous, the other members will not know the mistake.

- Controlled feedback and iteration process. There will be various rounds of questionnaires plus meetings, which allow the members of the Expert Group to know other member opinions and thus modify their former opinions.
- The final results are given in a statistical form. The presented information of the group will not be just the opinion from the point of view of the majority. Moreover this will give the grade of consensus reached by the group. . The number of experts is very low to make a complete statistical analyse. Only the quartiles will be considered in order to identify if any expert has a very different opinion about any issue. Furthermore taking into account the distance from 1st to 3rd quartiles, the level of consensus could be known.

3.3 ASSUMPTIONS

It is assumed that the state of maturity of SESAR Detailed Operational Descriptions for En-Route Execution Phase - i.e. main work document for the Experts participating in the discussion- at the beginning of the Expert Group exercise is sufficient for further clarification and refinement.

4 PLANNING AND MANAGEMENT

4.1 RESOURCES

This section lists the kind of expertise, skills and knowledge required of the participants from a SESAR point of view. Maximum expected number of participants in the Expert Group conduction is 15 and minimum is 10.

- Civil Airspace Expert:

  To maximise the utilisation of available airspace by dynamic time-sharing and, at times, by segregating airspace among various categories of users based on short-term needs.

  To collaborate with the Network management to plan airspace usage in a way that balances the impact on civil air traffic flow and capacity management with military needs.

- Military Airspace Expert:

  To collaborate with the Network management to plan airspace usage in a way that balances the impact on civil air traffic flow and capacity management with military needs.

- Regional Network Expert:

  To assure stability of the whole network in the face of traffic demand, facilitating dialogue between airspace users, ANSPs and airport operators so that traffic demand and capacity balancing issues can be resolved in an efficient manner.

To check unexpected network effects of sub-regional decisions prior to their implementation.

- Local Network Expert:

  To determine the optimum deployment of regional resources to meet the airspace users actual or predicted demands.

  To resolve situations where sufficient capacity cannot be provided by means of CDM processes involving all stakeholders.

  To develop scenarios to cope efficiently with diverse events.

- Executive Air Traffic Controller:

  To control the traffic flow in the sector under consideration.

  To maintain the traffic within safety rules.

  To manage the traffic according to RBTs agreed whenever possible.

- SESAR CONOPS Expert:

  He/she should be involved in the development of the ATM Planning process defined in the SESAR CONOPS.

4.2 ACTIVITIES TO BE UNDERTAKEN

The conduction of the Expert Group has been structured as an iterative process aiming to clarify what complexity management means, how to identify complex situations and which procedures have to be improved or developed to cope with situations of high complexity. Isdefe´s role in the Expert Group is as that of a facilitator in the discussions, interfering as little as possible in the final conclusions extracted.

The activities have been grouped in four phases, each one following an iterative sequence composed by the following steps:

- Questionnaire distribution;
- Answers/comments gathering;
- Answers/comments integration;
- Report distribution.

Once the experts have been consulted following this iterative method, two two-day face-to-face meetings will be held in order to ease experts' discussions and opinion exchange, taking as a basis the previous reports' conclusions (integrating all the answers/comments gathered through the four previous phases).

4.2.1 1st Phase

The 1st phase will begin with an introductory meeting, right after the release of the final version of the Expert Group Experimental Design. This introductory meeting will serve as kick-off of the exercise and its agenda will comprise the explanation of the methodology to be followed.

The first questionnaire will be issued after the conclusion of the kick-off meeting and distributed to the experts for comments. These comments can vary from answering specific questions to proposals for modification of these questions. The questionnaire will be composed by 10 to 15 questions. Some of these questions will be open questions in order to implicate and encourage the experts to express their opinions. Other questions will be focused on numerically quantifying the initial concepts, assumption and other issues that come from the inputs or from the initial meeting.

This questionnaire will be sent to the experts who should answer and return it back in a week.

4.2.2 2nd Phase

Once all the questionnaires coming from the experts had been received, the second phase can start. All questionnaires will be analysed extracting the new ideas and concepts that experts had considered. These new ideas should be checked and will be taken into account in the second questionnaire. All the information gathered through the questionnaires will be analysed and the results will be sent together with each next questionnaire.

This second questionnaire will be more specific than the first one and will be composed of a greater number of questions. Most of the questions will ask for a numerical quantification. However some open questions will be included to carry on, allowing experts to contribute with new ideas.

The members of the Expert Group will again within one week answer and to return the questionnaire.

4.2.3 3rd Phase

Again this phase will begin once all the experts have delivered their answered questionnaires. In case that the opinions issued by an expert in the first and second questionnaires were strongly different from the other experts' opinions, this particular expert would be the focus of an extra questionnaire. This extra-questionnaire will aim to gather further details about his/her judgement in order to highlight this particular point of view in the third questionnaire, fostering some reaction from the other experts.

After this process, the third questionnaire will be issued. The questionnaire will be sent to the experts together with the detailed opinions strongly divergent and the results of the analysis. This questionnaire will be mainly composed by test-type questions and statements to be rated

by the experts in accordance with their degree of conformance. However, some open questions focused on those issues causing disagreement will be included. Experts will have to answer and return the questionnaires in a week.

4.2.4 4th Phase

As in the other phases, this phase will begin when all questionnaires have been received. The questionnaires will be merged and analysed. This phase will follow the same steps that the 3rd phase, aiming to reach a great grade of consensus.

A last questionnaire will be sent to the experts who will have to answer and return it back within the next week.

4.2.5 Final Phase

The final phase will consist of an analysis of the set of questionnaires that have been produced, extracting from them the overall opinion of the Expert Group and preparing an interim report including the results analysis and preliminary conclusions. The interim report will then serve as a basis for two two-day face-to-face meeting at which the experts will have the opportunity to discuss these results in detail and agree on the Expert Group conclusions.

The information issued during these face-to-face meetings will be fed to the first draft version of the Expert Group Report. This draft will be discussed and corrected in the course of a final meeting. The success of the exercise and of the final results will be evaluated against the degree of accomplishment of the initial objectives as well as in terms of the degree of final consensus reached.

4.3 TIME PLANNING

The timeframe to develop the activities described above is 3 months starting in February 2008. Figure 2 - EP3 WP 4.3.1.1.1 Schedule

, shows the expected planning and the party being responsible for each activity: I-ISDEFE; E-Experts; M-Meeting (all).

2008		Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Week 15
		Jan 28th	Feb 4th	Feb 11th	Feb 18th	Feb 25th	Mar 3rd	Mar 10th	Mar 17th	Mar 24th	Mar 31st	Apr 7th	Apr 14th
1st Phase	Release of Experimental Plan	I											
	First Meeting, methodology explanation		M										
	1st Questionnaire		I										
	Feedback from Experts			E									
2nd Phase	Synthesis, selection and redefinition				I								
	2nd Questionnaire				I								
	Feedback from Experts					E							
3rd Phase	Merging and statistical analysis						I						
	3rd Questionnaire						I						
	Feedback from Experts							E					
4th Phase	Merge and statistical analysis								I				
	4th Questionnaire								I				
	Feedback from Experts								E				
Final Phase	Results Analysis and Preliminary Conclusions									I			
	Meeting, initial results and feedback										M		
	Release of Exercise Report Draft											I	
	Meeting, final results and feedback												M
	Release of Expert Group s Report												I

Figure 2 - EP3 WP 4.3.1.1.1 Schedule

4.4 RESPONSIBILITIES IN THE EXERCISE

There are two different roles involved in the execution of the Expert Group: the Expert Group Manager and the Experts. The main responsibilities for each one is given below.

- Expert Group Manager

  To conduct the exercise as described in this document (Expert Group Exercise Plan);

  To issue the questionnaires within the established time frame;

  To collect all answers, summarise them and extract conclusions;

  To organise and facilitate the meeting establishing specific targets;

  To consolidate the conclusions with the Experts in order to define a clear output;

  To compile and issue the Expert Group Report.

- Experts

  To answer the questionnaire in due course;

  To attend the meetings;

  To consolidate conclusions;

  To review and comment the Expert Group Report.

4.5 RISKS

The results expected from this Expert Group exercise have some dependencies that could put in risk the quality and validity of its outputs or produce delays in the planned schedule. The main risks identified are:

Risk 1:	Status of En-Route Execution Phase DODs		
Description:	This is the main document that details the procedure to be assessed by the Expert Group regarding En-route Complexity Management. The detailed operational description should not have gaps or inconsistencies, in other case the EG outputs will not be as precise and useful as could be expected otherwise.		
Impacted Area:	☒ Own Exercise	☐ Other Exercise	☐ WP
Level:	☐ Low	☐ Medium	☒ High
Possibility of occurrence:	☐ Low	☒ Medium	☐ High
Contingency Actions	Provide detailed comments to the documents owners requesting a deep detail about necessary issues for the development of the EG.		
Mitigation Actions:	Ask experts about topics not completely detailed in the DODs.		
Responsible:	DODs owner		

Risk 2:	Participants profile and experience exactly with required Experts Profiles.		
Description:	The Participants profiles and experience do not match exactly with required Experts Profiles.		
Impacted Area:	☒ Own Exercise	☐ Other Exercise	☐ WP
Level:	☐ Low	☐ Medium	☒ High
Possibility of occurrence:	☒ Low	☐ Medium	☐ High
Contingency Actions	Detail the expected experts' profiles as much as possible.		
Mitigation Actions:	Encourage participants to improve their knowledge providing papers and experimental reports regarding Complexity Management.		
Responsible:	EG Leader		
Risk 3:	Delays with the questionnaire answers		
Description:	Experts should respond within the defined period, some delays will produce a big impact in schedule.		
Impacted Area:	☒ Own Exercise	☐ Other Exercise	☐ WP
Level:	☐ Low	☐ Medium	☒ High
Possibility of occurrence:	☒ Low	☐ Medium	☐ High
Contingency Actions	Detail the schedule previous to the beginning of the EG and highlight the importance of send back the questionnaires on time.		
Mitigation Actions:	Recover the delay speeding up the process gathering the answers and issuing the next questionnaire in a short period.		
Responsible:	EG Leader		
Risk 4:	Experts not having deep knowledge of SESAR Operational Concept		
Description:	N/A		
Impacted Area:	☒ Own Exercise	☐ Other Exercise	☐ WP
Level:	☒ Low	☐ Medium	☐ High
Possibility of occurrence:	☒ Low	☐ Medium	☐ High
Contingency Actions	Request experts with knowledge of of SESAR Operational Concept		

Mitigation Actions:	Plan a presentation of key points of SESAR Operational Concept to be held during the first meeting.		
Responsible:	EG Leader		
Risk 5:	No final consensus		
Description:	Conclusions at the end of the Expert Group not fully supported by experts		
Impacted Area:	☒ Own Exercise	☐ Other Exercise	☐ WP
Level:	☒ Low	☐ Medium	☐ High
Possibility of occurrence:	☒ Low	☐ Medium	☐ High
Contingency Actions	Detailed questions during the planned phases.		
Mitigation Actions:	Face-to-face meeting to get a common understanding about the Complexity Management procedure.		
Responsible:	EG Leader		
Risk 6:	Experts not being able to assist meetings		
Description:	N/A		
Impacted Area:	☒ Own Exercise	☐ Other Exercise	☐ WP
Level:	☒ Low	☐ Medium	☐ High
Possibility of occurrence:	☒ Low	☐ Medium	☐ High
Contingency Actions	Plan the meeting long time before		
Mitigation Actions:	Communicate the experts how important is their participations in the meetings to reach clear conclusions. Move the meeting if necessary.		
Responsible:	EG Leader		

Table 1 - Risks identification

5 ANALYSIS SPECIFICATION

5.1 TRAINING REQUIREMENTS

In order to reduce to the minimum the risk related to SESAR ConOps, it would be useful to conduct a brief training to the experts focused on Complexity Management in En-Route High & Medium/Low Density Operations during the first meeting.

5.2 MEASUREMENT AND ANALYSIS METHODS

The methodology applied to steer the Expert Group will consist of several questionnaire phases. In each phase a questionnaire is provided to each member of the Expert Group.

Then all the members send their answered questionnaires, which will be merged and analysed to extract an overall result. Due to this analysis, the consensus reached by the Expert Group can also be quantified.

There is not a specific method to collect the information and extract conclusions, but anyway the questionnaires will allow identification of the most likely solution, or sort all of them regarding the opinion of experts.

- The questionnaires will be structured with two different kind of questions: Open Questions, where experts are requested to give their opinion, understanding or consideration to a definition, statement or idea. All alternatives are valid;
- Quantitative Questions, where experts will evaluate the elements giving a score.

A summary report will be issued for each questionnaire gathering all response to the proposed questions. In the case of quantitative questions the information provided will be:

- Average, referring to the arithmetic mean;
- Mode, value that has the largest number of observations;
- Quartiles, any of the three values which divide the sorted data set into four equal parts (25th, 50th & 75th percentiles).

5.3 EXPERT GROUP REPORT

The structure of the report integrating the results of the Expert Group will be in accordance with the following main sections:

- Introduction
  - Exercise Background;
  - Scope and objectives of the expert group;
  - Analysis methodology.
- Results and Discussions
  - Generally only high level meaningful results(details will be included as annex);
  - Any problems encountered during the activity;
  - As in the analysis contributions, results should be related back to the original criteria and placed in operational context;
- Conclusions and recommendations.

6 DETAILED EXERCISE DESIGN

This section contains the list of Expert Group participants (both the experts and the Expert Group Leader) and the main issues to be discussed during the EG execution.

6.1 EXPERT GROUP COMPOSITION

This section includes the name and short resume (main skills and knowledge areas) of the experts taking part in the Expert Group and the manager who will steer the expert group.

6.1.1 Expert Group Manager

- Enrique Juan Casado Magaña [ECM]
  - Company: Isdefe;
  - Profession: Aerospace Engineer;
  - Education: Universidad Politécnica Madrid (2000);
  - Areas of professional expertise:
    - ATM System Validation & Verification.

  Mr. Enrique Casado is a project engineer in Isdefe in the area of Architecture and Simulation. He is working since 2007 in Isdefe within Episode 3 and SESAR Programmes. His current responsibilities are related to the development of Performance Framework (E3 T2.4.1.), the definition of requirements for gaming validations exercises (E3 WP4) and SESAR WP 4.2.3 Modelling, Simulation & Validation Tools.

6.1.2 Civil Airspace Expert

- Othmar Schnabel [OSL]
  - Company: DFS;
  - Profession: ATCO and Expert ATM Operations;
  - Education: ATCO;
  - Areas of professional expertise:
    - Air Traffic Control;
    - ATM Concepts;
    - Project Management.

  Mr. Othmar Schnabel is an Expert in ATM Operations in DFS. He has worked as a APP/TWR Controller for the DFS at Munich TWR/ACC/UAC, including practical and simulator training. Participation in Munich 2 airport implementation project. Since the end of 1993 he is working as an Expert for ATM Operations at the DFS Headquarter. His experience includes experience in ATC/ASM/ATFM concepts and planning, including ATFCM/ASM procedures, ASM current operations (AMC) and future implementations. Also experience in project management, including fast and real time simulations. Presently main task development and implementation plans for Operational Concept of FABEC.

- Alex McLellan
  - Company: NATS;
  - Profession: Chartered Engineer;

- Areas of professional expertise:

System performance assessment;

Software development.

Mr. Alex McLellan has spent 22 years with a UK system and software house working mainly on digital simulations for weapon system performance assessment. He also spent some time in the QA division.

In the early 1990's he developed the Quality Assurance system for the software development for CAATS - the Canadian Automated Air Traffic System. He then worked on the CAATS software requirements for conflict prediction and resolution (for procedural control in Canadian Domestic and Oceanic airspace), and then the requirements for MAATS, the Military version of CAATS. His last job on CAATS/MAATS was to manage the maintenance of all the system and software requirements.

In the mid-1990's he went to EUROCONTROL, as a contractor in the Future Concepts Division. He spent 10 years in Brussels, working on early versions of the EATM Operational Concept, the ATM 2000+ Strategy, Operational Improvements and system enablers. Later on, he worked for Henk Hof in the ATM Content Integration Group (ACIG), where it was produced a pre-cursor of the ATM Master Plan, called the Strategic Performance Framework. ACIG is now responsible for producing SESAR D5.

His last assignment at EUROCONTROL was to produce a database to allow the Civil-Military Co-ordination directorate (DCMAC) to monitor the equipage of State aircraft with Mode S and with 8.33 kHz radios.

- Matthew Flood
  - Company: NATS;
  - Profession: ATCO and Network Manager;
  - Areas of professional expertise:

Air Traffic Control;

Air Traffic Flow & Capacity Management;

Air Traffic Planning.

Mr Matthew Flood is an expert in Network and ATM Operations in NATS. He worked as an En-route Controller at the Scottish Area Control Centre before working in NATS Headquarters for 5 years where he was responsible for ATM Policy and Development. During this period he was involved in a number of EUROCONTROL activities to develop operational concepts for future ATM systems such as Mode S and datalink. Since 2001 he has worked operationally as a Network Manager based at the London Area Control Centre where he remains operationally valid.

6.1.3 Regional/ Local Network Expert

- Quan Li [LIQ]
  - Company: ATMB;
  - Profession: Engineer;
  - Education: NUAA (2006);
  - Areas of professional expertise:
    - ATFM systems research and analysis;

- ATC Automation System Test and evaluation;
- ATM Simulation System Research.

Mr. Quan Li is engineer in ATMB in the area of ATC Automation related systems. His education background is civil transport information system. He has worked since 2006 in the technical centre of ATMB. His primary research is air traffic flow management, especially ground delay program based on collaborative decision making mechanism. He also has some experience in air traffic control automation systems, including radar data processing and flight plan processing. His major work in ATMB is the management and research on some scientific research projects.

- Robert Koerner [RKR]
  - Company: DFS;
  - Profession: ATCO and Expert ATM Operations;
  - Education: University of Applied Sciences, Langen, Germany;
  - Areas of professional expertise:
    - Air Traffic Control;
    - ATM Concepts;
    - Project Management.

Mr. Robert Koerner is an Expert in ATM Operations in DFS. He has worked as a TWR-Controller for the German Air Force and as an En-route Controller for the DFS at Munich ACC/UAC. Since the end of 2005 he is working as an Expert for ATM Operations at the DFS Headquarter in Langen. His experience includes the development and implementation of Operational Concepts as well as regular contribution to European initiatives like DMEAN, FABEC and SESAR.

- Serge Manchon [SMN]
  - Company: EUROCONTROL;
  - Profession: Aerospace Engineer;
  - Education: ENAC;
  - Areas of professional expertise:
    - Air Traffic Flow & Capacity Management;
    - Air Traffic Planning.

Mr. Serge Manchon spent 9 years at CENA (national research centre for the French CAA) as air traffic flow management project leader. In 1999, he worked for the SCTA (Air Traffic Control Services) as head of the “flow management and planning” subdivision. He joined the EUROCONTROL Experimental Centre in July 2000 as expert in Air Traffic Flow & Capacity Management. He is currently working on the SESAR Single European Sky ATM Research concept.

6.1.4 Air Traffic Controller

- Yonggang Yan [YGY]
  - Company: Beijing ACC;
  - Profession: ATC supervisor. ATC engineer;
  - Education: Civil Aviation University of China (1995);
  - Areas of professional expertise:

- ATC or ATM operation;
- TRM-Team resource management.

Mr. Yonggang Yan is a ATC supervisor in Beijing ACC. He has worked since 1999 in Beijing ACC. In 2005 he worked as a ATC engineer at the ATC Department of ATMB of North China. His experience includes the participation of airspace simulation with Boeing. He has a strong expertise in the area of ATC operation, including Tower, Approach, Area control. He acts as an ATC supervisor, at the same time as instructor in the operation of ATC. He has a background in the development of ATM systems.

6.1.5 SESAR Expert

- Nicolás Suárez Tetzlaff [NST]
  - Company: Isdefe;
  - Profession: Aerospace Engineer;
  - Education: Kansas University (1987);
  - Areas of professional expertise:
    - ATM and ATFM systems analysis, design, implementation and operation;
    - ATM System Validation & Verification;
    - Design of distributed systems.

  Mr. Nicolas Suarez is a project manager in Isdefe in the area of Architecture and Simulation. He has worked since 1990 in Isdefe in different technical areas related to Air Traffic Management (ATM). Within the different ATM areas he has a strong expertise in the area of ATM system validation –including the design of metrics and the development of validation plans. His experience also includes the elaboration of capacity and operation models of an airport; including elements such as the control tower, the apron or the taxiway. He also has a strong background in the development of Operational Concepts for the operation of an ATM system.

  He is a member of the AIAA (American Institute of Aeronautics and Astronautics), and the IEEE (Institute of Electric and Electronics Engineering).

- Víctor Manuel Bustos Bustos [VBB]
  - Company: INECO;
  - Profession: Aerospace Engineer;
  - Education: BEng in Aeronautical Engineering (1994). Polytechnic University of Madrid;
  - Areas of professional expertise:
    - ATM Operations expert;
    - ATM System Operational Concept elements validation;
    - ATM System support tools design;
    - Systems engineering;
    - Project Management.

  Mr. Víctor Bustos is the Head of Modelling of Systems Department. He has been working for INECO since 1995. As main activities carried out, for the purpose of this resume, it could be highlighted:

- Co-ordination of capacity and efficiency studies of the Spanish ATM System including tasks performed together with external organisations (EUROCONTROL, The National Aerospace Laboratory (NLR) from the Netherlands, The Mitre corporation, etc.).
- Design and development of simulation an optimisation models for the analysis of Air Traffic Flows and Control Sectors;
- Participation on SESAR Task 2.2.2 (Concept of Operations) as "Working (W)" level.

- Qiang Bu [BUQ]
  - Company: ATMB Technical Centre;
  - Profession: Engineer;
  - Education: BeiHang University (2005);
  - Areas of professional expertise:
    - ATM and ATFM systems analysis, design, technical support;
    - ATM System project management;
    - Computer science.

  Mr. Qiang Bu is technical engineer in Technical Centre, ATMB in the area of Architecture and Design. He has worked since 2005 in Technical Centre in different technical areas related to Air Traffic Management (ATM). Within the different ATM areas he has a expertise in the area of ATM system –including the design Pre-Departure Clearance (PDC) system, initial Nation ATFM system. His experience also includes ATC system operation; including Voice Communication System for Qing Dao project. He also has a background in the computer hardware and software development.

- Predrag Terzioski [PTK]
  - Company: EUROCONTROL;
  - Profession: ATC Expert;
  - Education: ATCO + BBA;
  - Areas of professional expertise:
    - ATC Ops Concept and requirement development;
    - ATC tools prototyping and implementation;
    - ATM System Validation & Verification;
    - ATCO/ACC Supervisor /ATFM officer.

  Mr. Predrag Terzioski is a OPS expert in EUROCONTROL EATM DAP/ATS DIVISON in charge of En-route related developments. He was involved in creation of the EC Multi Sector Planning and Complexity Management Operational Concepts and integration of these concepts in SEASAR target OC.

  Presently main task for the activity run Mr. Terzioski is definition of detail description of the concept and creation of Operational Requirements and prototypes for Automated tools required for MSP and Complexity Management, this includes production and validation of algorithms for complexity prediction and assistance tools for dynamic airspace planning and constrain management. Work in this area also involved cooperation with MUACC on MANTAS project (early deployment of

MSP) and NASA AIMS on Dynamic Sectorisation and Dynamic Airspace management.

6.2 MAIN TOPICS TO BE ASSESSED BY THE EXPERT GROUP

Due to the special nature of this kind of clarification exercise, only the initial topics that are going to be assessed during the Expert Group execution (First Questionnaire) are detailed in this section. The progress of this group, the information provided by the experts and the refinement of the initial ideas will drive the conclusions to a specific target. The main topics to be analysed regarding Complexity Management are listed below.

As detailed in 3.2Tool(s) and Technique(s) Used to Conduct the Expert Group, the Delphi Method, which is used to steer Expert Group, establishes that questionnaire of one phase should be built with the answers of the previous questionnaire, going deeper in those areas that stay unclear or not enough defined.

6.2.1 Assessing the Problem

The first step is to have a common understanding about what Complexity Management is, who is involved in the process and what the most relevant events are.

6.2.2 ATCO Workload

Complex situation have an strong impact in the ATCO workload, it is very important to control the complexity of traffic that should be managed by a single controller. Complexity Management entails the surveillance of complexity avoiding controller overloads. The relationship between CM and ATCO workload is very tight.

6.2.3 Solutions

Once a Complex situation has been identified some actions should be carried out to solve it, trying to minimise the impact in the ATCO workload.

6.2.4 Automation

The processes of identifying Complex situations and its further resolution can be very complicate. Thus some applications can be use to release these tasks.

6.2.5 Other topics

From the SESAR point of view, Complexity Management will improve the system performances, but it is important to know what impact and benefits should be expected from the validation exercise outputs in terms of Key Performance Areas (KPAs).

7 REFERENCES AND APPLICABLE DOCUMENTS

Ref.	Document	Name	Applicability
[1]	E3-WP2-I34-1-WKP	Guidelines for expert group exercise plan	Applicable
[2]	E-OCVM V2.0	European Operational Concept Validation Methodology	Applicable
[3]	SESAR D3	DLM-0612-001-02-00a- The ATM Target Concept	Applicable
[4]	SESAR Task 2.2.2	DLT-0612-222-02-00 D3 Concept of Operations	Applicable
[5]	D4.2.1-01	WP4 Validation Strategy	Applicable
[6]	SESAR Task 2.4.2	DLT-0612-242_00_09-Roles and Responsibilities	Applicable
[7]	ISBN 0-201-04294-0	The Delphi Method: Techniques and Applications	Applicable
[8]	E3 DOW v2.8	Episode 3 Annex 1 – Description of work	Applicable

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