Final Project Report

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Abstract

This deliverable represents the final project report for the project 16.05.03- Guidance for an effective information presentation. It summarizes the project contribution to the ATM master plan in regards to the progress made, standardization and roadmap for deployment and lists the project achievement. In addition also lesson learned within the project are summarized.

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Publishable summary

With the expected increase of the traffic by a factor of 3 understanding the context and tasks for human actors will become more and more complex. Additionally within the change of operation first to a trajectory based operation and then to a performance based operation new methods and new ways of operating have to be introduced to the air traffic controller as well as to the aircraft pilot. Within these changes increased automation, bringing the human in the centre of the system design process aims at de-complexifying the tasks and work of the ATM actors.

The results of the project 16.05.03 Guidance for an effective information presentation move just in this direction providing guidance on how to achieve an effective information presentation for the main actors involved in the ATM field The guidance material has been evaluated by the primary project 6.09.02 and is taken into consideration within the prototype projects 10.10.03 and 12.05.04. The evaluation has shown the usefulness of the material in the creation of the requirements as it covers aspects regarding the development of the HMI and is closely related to situational awareness aspects. It is also seen as useful in the development of the prototypes as by following the guidance material Human Factors issues can be addressed clearly and thus mitigated at an early phase of the design and development phase.

The resulting guidance material of the project is divided into two parts:

1. The Generic SESAR HP Information Presentation Process

   As a high-level process for ground and air applications related to information presentation topics this process represents a structured method to achieve an effective information presentation. Following the HP Information Presentation process, required information can be identified, prioritized and Human Factors issues can be addressed. In relation to this guidance for performing a task analysis, guidance for the use of Human Performance (HP) cards and guidance for the prioritization of information is included. HP cards summarize questions concerning a specific aspect that might occur during the project run time and give hints on how to address this aspect so the negative effects can be mitigated. Methods and processes developed within 16.05.03 are explicated and linked to the Human Performance assessment process and the various EOVCM V-phases.

2. The Generic SESAR Information Presentation Style Guide

   A style guide applicable for ground applications. This style guide can be seen as a tool to achieve a common HMI over Europe and a higher level of harmonization of application within a controller working position. By giving guidance for the general look of windows and by describing interaction patterns the Generic SESAR Information Presentation Guide ensures that applications within the SESAR ground side context (TWR and Enroute/TMA) look similar and use identical interaction patterns and thus a higher level of harmonization is achieved. It also provides general basics on information processing, coming from cognitive psychology which is helpful to achieve an effective information presentation.

The HP information presentation process proposes the use of the following 3 types of material:

- HP cards related to 4 modules: High level HP criteria (including regulations), Task allocation & automation principles, user tasks & information needs (in terms of content and format), HMI usability principles and information presentation,,
- a specific guidance for the task analysis related to information needs,

- some information prioritization criteria for complementing task analysis

With this the project managed to provide an evaluated approach and material allowing the consideration of the HP aspects of information presentation, in early phases and process steps, in an iterative way. The approach developed in the frame of 16.05.03 leads to the identification of the information needs associated to the operational tasks before the definition of the way of presenting information. The process proposed includes 4 process steps and is linked to the human performance assessment process as shown in the following table:

STEP	HP ASSESSMENT PROCESS	HP INFORMATION PRESENTATION PROCESS
Step 1	Understand ATM concept	Define the change (linked to the introduction of the new concept) and identify the information needs
Step 2	Understand HP implications	Identify HP issues (related to information needs and presentation)
Step 3	Improve and validate the concept	Perform validation HP activities (on information presentation)
Step 4	Collate findings and produce report	Provide conclusion and evidence (on information presentation efficiency)

Table 1: Steps of the HP information presentation process

In addition to the human information presentation process the results of the project also consist of a style guide which supports the goal of an effective information presentation serves as:

- A tool for ensuring consistency across a product set
- A way to get groups to work together
- The repository for design guidelines and standards
- A training aid for new members of the product team

The style guide can be used as following:

- DEL 06, Chapter 3 and its sub sections to understand principles of information presentation and information processing especially in regards to an integrated HMI during the requirement phase
- DEL 06, Appendix A as specific guidance during the development of the applications either in form of a mock-up, a prototype or an industrialized solution.

The style guide part is used as the basis for the more specific style guides created by 10.10.02 and 12.05.04 for the dedicated environment TMA and TWR with the goal to achieve a higher harmonization of the HMI within a controller working position.

A short guidance material also produced by 16.05.03 leads the users of the material to the relevant sections for each step in the process. The application of the guidance material created within 16.05.03 by airbus and Frequentis has proven that the process can be applied even outside of SESAR and that the process enables to identify the required information of the relevant actors.

1 Introduction

1.1 Purpose of the document

The purpose of this document is, as stated in the Multilateral Framework [1], to

- Summarises the results and conclusions relating to the concerned Members' participation in the Project (publishable summary);
- Describe the contribution of the Member to the development of new Standards and Norms Proposals in the Project;
- Describe the contributions made, through the Project, to the roadmap for deployment activities;
- Explain the progress made, through the Project, towards the execution of the ATM Master Plan;
- Provide an overview of the final achievement of the Deliverables and an explanation of the discrepancies between the planned and the actual work carried out in the Project;
- Provide for each Member involved in the Project, a Project Costs Breakdown Form of the total Eligible Costs incurred by the Member during the Project, including interest accrued on the Pre-Financing payments and any other Revenue related to the Project.
- Analyse the lessons learnt at project level.

1.2 Intended readership

The intended readership consists mainly of the Members of SJU, project members of 16.05.03, project members of 16.06.05 and other SESAR projects who need a short summary of the project outcome and might intend to use the guidance material provided by 16.05.03.

1.3 Inputs from other projects

No previous work from other project was used as input for the production of this document.

1.4 Glossary of terms

Term	Definition
ATM	Air Traffic Management
ConOps	Concept of Operations
DEL	Deliverable
E-OCVM	European Operational Concept Validation Methodology
HF	Human Factors
HP	Human Performance
MFA	Multilateral Framework Agreement
SESAR	Single European Sky ATM Research Programme

Term	Definition
SJU	SESAR Joint Undertaking
TMA	Terminal Manoeuvring Area
TWR	Tower
UI	User Interface
V-phases	Validation phases
WP	Work Package

Table 2: Abbreviations

2 Project contributions

2.1 Progress made toward the ATM Master Plan

In the ATM Master plan it is stated that Humans will be central in the future European ATM system as managers and decision-makers; and that humans (with appropriate skills and competences, duly authorised) will constitute the core of the future European ATM System's operations. There it has been identified that this however, requires an advanced level of automation support for the humans. As this will affect also system design, competence requirements and relevant regulations the material provided by 16.05.03 is seen as a support to manage the effects especially in regard to system design on an HMI level. Within the material provided the role of the user has been the focus point and the process developed has been created with the goal to achieve an effective information presentation for the user. In this regard users have been involved in the project in the form of Airspace Users, HF experts and operational experts in the form project members from both operational and technical projects.

Note: The involvement of staff organisation has been discussed but it was decided that they are not required in the project as the project itself does not cause any changes itself. It provides material to be used by other projects only

Additionally the project supports the HP assessment process which is based on the transversal improvement HPT-005 Development of a commonly used toolbox of generic Human Performance methods and techniques with providing a process and method to be followed by other projects. As defined in the initiation phase it originally supported the two enablers:

- HUM171-006 Usable and acceptable machine interaction
- HUM171-07 Optimized automation support

Note: In the updated list of enablers (edition 2) those enablers do no longer exist.

2.2 Contributions to the roadmap for deployment activities

This section is not applicable. As this project was defined as a transversal project it did not have a direct link to deployment activities. Although it is assumed that the guidance material could support the deployment in a way that the material is taken into account during the design and development phase of future systems to achieve an effective information presentation within corresponding applications.

2.3 Contribution to standardization

No efforts in regard to standardization have been initiated and undertaken by the project. Thus this section is not applicable. The guidance material provided might however be used as input to further standardization processes.

3 Project lessons learnt

This section identifies the main lessons learnt of the project and that may help the Programme to be improved.

What worked well?
Small team, close coordination and cooperation
Efficient work share with clear roles & responsibilities
Contributors from airborne, ANSPs and ground industry resulted in an efficient implementation and good results. Giving each contributor the possibility to bring in his experience.
The guidance material created by the project has proven itself as useful during the project design phase. In this sense the process developed by 16.05.03 is used within Airbus and Frequentis already. Additionally the style guide part of D06 builds the basis for the internal Frequentis style guide. Also within SESAR the material has been successfully used as a basis for more detailed style guides for the TWR and TMA environment created by the projects 12.05.05 and 10.10.02 and will be taken into account during the prototype development.
What should be improved?
Late start of the transversal projects (WP16) in regard to operational and technical projects. The non-sequential and not synchronized starting of the technical and operational projects did not allow a linear flow of information. Sometimes the reference input was lacking, or was not mature enough.
Formal management procedures and processes resulted difficult to deal with, complex and time consuming. Although progress and steps forward were made over time, room for improvement is certainly possible in this area.
Project management effort exceeded the allowed effort from the PIR phase given by the SJU.

Table 3 - Project lessons learnt

4 Project achievements

4.1.1 Project deliverables

Del. code	Del.Name	Description	Assessment Decision	Explanations
16.05.03.D02	Information Needs – Baseline Report	This report summarizes information gained through a screening of existing guidelines and/or standards and information from previous research or development projects (also outside of SESAR) and existing standards (HF related, certification requirements) and HCI literature.	No reservation (P)	The deliverable matches with the description
16.05.02.D03	Information Needs – Analysis Findings	The report describes the results of the analysis of information needs of controllers and pilots. Hereby the project puts also a focus on information related to automation processes and regarding presentation. It also contains information about the state of the art of existing and new facilities and equipment. This document is an updated document of the Information Needs - Baseline Report plus additional information from the described subtasks.	No reservation (P)	The deliverable matches with the description
16.05.03.D04	Information Needs – Categorization of Information	This deliverable includes the description of a process that enables a categorization and classification of the available information on the basis of its priority and is based on the information from the previous deliverables and combines information from these two deliverables. It describes rules and methods to	No reservation (P)	As step 2 activities have been delayed and information regarding new procedures and required information from operational projects was only available in a limited extend the scope changed to the definition of a method enabling a classification of the presented

		enable to decide which information is in the end presented to the user in which way. This process and thus these rules will also be included into the Generic SESAR Information Presentation Guide that will build an important input to the technical projects. The deliverable will also include a categorization of the presented information in accordance to those rules and methods. After completion of this task its outputs will be combined with previous deliverables of Task 002 and 003 to achieve a final version of the Analysis Report on Information needs and build the basis for the following development of the Generic SESAR Information Presentation.		information on the basis of its priority. The method only addresses the first steps of the HP assessment process, meaning that it deals with Information needs and issues identification (with a focus on task analysis) and the use of criteria allowing to determine priority among information (further guidance on how to present the prioritized information is addressed in DEL05). The first step of the approach (Task analysis and information related needs) is described through an example of how task analysis can help to identify prioritization of information in basic steps (defining purpose and required data, collect task data, summarize task data and analyze data). The second step of the approach (identification of information prioritization criteria) delivers a list of information prioritization (IPr) criteria with their associated definition. These criteria aimed to be used following the identification of required information based on IPr needs and related HP issues (collected thanks to the use of DEL03 blocks, including the task analysis block). The IPr criteria aim to contribute to the definition of priority between all information needed for

				a task and a given context. Finally, the use of information prioritization criteria are illustrated through air and ground SESAR cases studies in order to support SESAR operational and technical projects in the use of the method. The case studies provide an idea on the related issues and needs related to information prioritization that a project team may address by applying Information Prioritization criteria.
16.05.03.D05	Generic SESAR Information Presentation Guide	This Generic SESAR Information Presentation Guide gives guidance on an effective information presentation to be used during the design and development of systems for ground based and airborne related systems within the SESAR programme and especially in regard to air/ground coordination tasks. As such it ensures that applications within the SESAR ground side context (TWR and Enroute/TMA) look similar and use identical interaction patterns where identified as necessary in the analysis of needs. It contains methods for the selection and prioritization of information with principles of ecological interface design. For the ground side it describes used controls, the general look of windows (design patterns), icons, interaction patterns and colour conventions together with the feedback to provide the controller with the information that the system has accepted his input or	No reservation (P)	Due to the change in the scope of the previous task minor changes also have been made to the D05. As such the Generic SESAR Information Presentation Guide gives guidance on how to achieve an effective information presentation. The first part of the document describes a high-level process for ground and air applications applied to information presentation topics. This process is based on the HP assessment process (refer to 16.04.01). Included in this process is the refinement and reorganization of the methods for the selection and prioritization of information from the previous documents of this project especially the documents produced within the deliverables T16.05.03.D03 & D04. The second part of the document consists of a

		action. For airborne applications, high-level principles will be described in the document concerning the information presentation related to the on-board view on ATM functions, as detailed principles are part of cockpit philosophies. Also processes e.g. a User Interface (UI) design process or processes in relation to categorizing information are described within this project and included in this deliverable.		style guide applicable for ground applications. This style guide can be seen as a tool to achieve a common HMI over Europe. By giving guidance for the general look of windows and by describing interaction patterns the Generic SESAR Information Presentation Guide ensures that applications within the SESAR ground side context (TWR and Enroute/TMA) look similar and use identical interaction patterns. For airborne applications, this guide is not intended to be applied, as detailed principles are part of cockpit philosophy.
16.05.03.D06	Updated Generic SESAR Information Presentation Guide	This deliverable consists of an update of the Generic SESAR Information Presentation Guide produced within the previous tasks. It takes the results documented in the evaluation report by 16.6.5 into account and incorporates the necessary changes into the style guide. Also updates in regard to changed operational procedures as a result of the validation activities of the operational projects will be taken into account.	No reservation (P)	The deliverable reflects the update of the D05 with the results of the evaluation from 16.06.05. This includes comments from 16.06.05 plus remarks from the project 6.09.02. Updates made in the document address those comments with the aim to increase the understanding. Additionally due to the comments received a short guidance material pointing to appropriate sections for each phase of the Human Performance Information Presentation process has been created to ease the handling of the guidance material produced by the project.

Table 4 - List of Project Deliverables

5 Total Eligible Costs

This section is based on the Project Costs Breakdown Forms of the eligible costs incurred by project Members during the project and these will be sent to the SJU separately by each member. The Project Manager should not complete this section.

6 References

Reference to main documentation, delete if not required

[1] SESAR, MFA, Identification number, Edition, date

[2] 16.05.03.D02 Information Needs – Baseline Report

[3] 16.05.03.D03 Information Needs – Analysis Findings

[4] 16.05.03.D04 Information Needs – Categorization of Information

[5] 16.05.03-D05 Generic SESAR Information Presentation Guide

[6] 16.05.03.D06 Updated Generic SESAR Information Presentation Guide

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